# Atomic wonderland

## Science and progress in twentieth century Australia

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# Statement

This thesis contains no material which has previously been accepted for the award of any other degree or diploma in any university or other institution and, to the best of my knowledge, contains no material previously published or written by another person, except where due reference is made in the text of the thesis.

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# Abstract

The development and use of the atomic bomb was a turning point in history. It seems so obvious— the world was changed, a new age dawned. But this was not the first turning point, nor the last. History is littered with critical moments, crossroads, watersheds and points of decision. Each brings a new sense of urgency, each draws renewed attention to the fate of humankind, but the moment soon passes and the urgency fades...until next time.

This thesis uses the dawn of the atomic age in Australia as the inspiration for an examination, not of key moments, but of the journey that sweeps through them— this thing we call progress. It is a journey that carries us from past to future, from old to new; a journey where space and time exchange metaphors and meanings. But where do individual hopes fit within the march of civilisation? How are our ambitions and achievements measured alongside the growth of nations or the development of science? Progress imagines a steady passage onwards, but we know that our own journeys are circuitous and intermittent. We stop, we go back, we think ahead, we live in the past.

This thesis shifts between individual and nation, from the dreams of a disappointed poet, to the terrifying power of the atom. Traversing much of twentieth century Australia, it examines the interactions between science and the state, between knowledge and power. Where have we sought the key to progress and who has been granted authority to speak in its name? What dangers have emerged to threaten our destiny, and where have we sought protection? Answers are to be found by charting the shifting boundaries of trust and authority, participation and control, that separate science and public, citizen and state.

# Acknowledgements

I started thinking about this subject many years ago in the History and Philosophy of Science Department at the University of Melbourne. There, Rod Home inspired my interest in the history of Australian science, and encouraged my first forays into the Atomic Age. I am also grateful for the advice and support of Stuart Macintyre and Richard Gillespie, who stepped into Rod's supervisory shoes at various times. Stuart, in particular, I must thank for first pointing me in the direction of EJ Brady— it was some time before I really followed up on his suggestion, but when I did it helped to change the whole focus of my project. Thanks, too, to all the staff and students of the HPS Department who gave me the intellectual space to throw around many ideas.

I was extremely fortunate in being able to pursue my interest in the history of Australian science while earning a crust, working for the Australian Science Archives Project. At ASAP, I increased my knowledge of the field, getting to know well a number of the characters who now inhabit these pages. The challenge of seeking to communicate the achievements and oddities of Australian science to a general audience also encouraged me to think about writing in a way I had not before. I began to concentrate more on narrative and character— on telling a story. It was a very valuable experience, and I thank Gavan McCarthy and all the staff at ASAP (now Austehc) for creating such a stimulating and enjoyable environment. In particular, I'd like to thank Rosanne Walker for her help, both as a member of the ASAP Canberra Office, and as the Basser Librarian at the Australian Academy of Science. Katrina Dean, another of the ASAP alumni now forging a career in the history of science, has been a constant source of inspiration and encouragement.

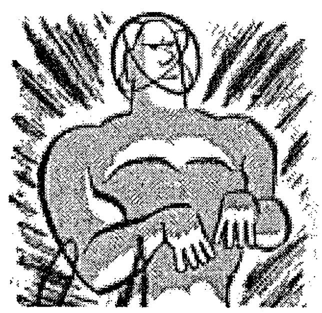
This thesis, however, would never have been written if not for the encouragement and example of Tom Griffiths and Libby Robin, who convinced me that the project was worth completing. I remain inspired by their interdisciplinary enthusiasm, their openness to new ideas, and their commitment to writing history that is accessible as well as illuminating. They cheerfully indulged me as my project expanded in all sorts of unexpected directions, and have respected my attempts at experimentation. I thank them for their unfailing support. Nicholas Brown also provided useful comments on some of my early drafts.

The History Program in the Research School of Social Sciences at the Australian National University provided me with a congenial location to set up camp once more. Thanks to all the staff and students for making the painful process of writing a thesis as pleasant as possible.

Anne-Marie Condé has been patient and supportive throughout all the ups and downs, and I thank her for her love and counsel. I returned to this project six months after the birth of our first child, Harry, and submitted my thesis a little more than six months after the birth of his sister, Lizzie. A more entertaining and enriching set of bookends I could scarcely imagine. They have given inspiration, even as they have helped set the travails of 'Daddy's big book' in proper perspective. Like EJ Brady, I hope the result provides them with 'a sort of heritage'.

# Contents





# Introduction

What is atomic wonderland? As this introduction explains, the metaphor of 'atomic wonderland' is intended to connote a study more complex and revealing than one limited to the Atomic Age, or even 'atomic culture'. Atomic wonderland brings challenges to our understanding of time, meaning, significance, and style.

This introduction traces the intellectual development of this thesis from the 'turning point' of Hiroshima, through to the problem of communicating historical complexity. It explains how an exploration of the Atomic Age in Australia became focused on the meaning of progress; how a story of pioneering scientists became a cultural history of Australian science; and how a thesis became an experiment in some of the possibilities of narrative.

## The Atomic Age

As the twentieth century neared its end and pundits began to compile their lists of significant moments in history, it was hardly surprising to find that the development of the atomic bomb ranked high amidst the top ten turning points.[1] With the destruction of Hiroshima, it seemed, the world had changed in an instant. The power of the bomb had obliterated a city, killed many thousands, and brought the end of the war suddenly near. But the bomb also wrought changes in politics and culture, as an unwary humanity was suddenly confronted with the possibility of its own apocalyptic demise. The Atomic Age had begun.

Delivering the 1956 Dyason Lecture, historian Arnold Toynbee reflected on the meanings of both democracy and the Atomic Age. They were, he argued, 'portmanteau words', whose contents had to be carefully unpacked.[2] The Atomic Age comprised intellectual and technological elements, Toynbee noted, but the factor that loomed largest was apprehension inspired by the prospect of atomic war. The Atomic Age was a

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[1] *Daily Telegraph*, 25 February 1999, p. 26. The Newseum website conducted polls of journalists and the public, and both nominated the bomb as the most significant event of the twentieth century. See: <http://www.newseum.org/century/century_essay.html>.

[2] Arnold J. Toynbee, *Democracy in the Atomic Age, The Dyason Lectures, 1956*, Oxford University Press, Melbourne, 1957, p.1

label, a period of time, an index of technological development, and a feeling. It is a phrase that conjures still a range of familiar images, from missile silos to 'duck and cover', from bad sci-fi to the prospect of a technological utopia. Where do we begin in a study of the Atomic Age— with the scientists? the technology? And what do we mean when we talk about the Atomic Age in Australia, a country whose involvement with the atomic energy has been largely as an exporter of uranium and testing site for British bombs? For something that seems so familiar, so obvious, so central to an understanding of the twentieth century, the meaning of the Atomic Age remains elusive.

Alwyn McKay seems untroubled by such questions in his 1984 account of 'how the atomic age came into being'.[3] For McKay, the Atomic Age simply represents a stage of scientific development. His is a story of pioneering scientists labouring to expand the boundaries of knowledge. The work of atomic scientists, including a number of prominent Australians, has been similarly documented in biographies, memoirs, institutional studies, and numerous histories of the bomb.[4] But as scientists themselves quickly realised, the Atomic Age revealed the political context of their research more clearly than ever before. As the bomb entered the realm of international diplomacy and nations began to quibble over the ownership of 'atomic secrets', scientists joined the political fray as experts, activists and, sometimes, victims.[5]

The politics of the Atomic Age have provoked much lively historical debate, especially since Gar Alperovitz focused critical attention on Truman's decision to use the bomb

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[3] Alwyn McKay, *The making of the atomic age*, Oxford University Press, Oxford, 1984, p. vii.
[4] Lennard Bickel, *The deadly element: the men and women behind the story of Uranium*, Macmillan, London, 1979; Ronald W Clark, *The birth of the bomb: the untold story of Britain's part in the weapon that changed the world*, Phoenix House Ltd, London, 1961; Ronald W Clark, *The greatest power on earth: the story of nuclear fission*, Sidgwick & Jackson, London, 1980; Lansing Lamont, *Day of Trinity: the dramatic story of the men who opened the nuclear age*, Hutchinson, London, 1965; Richard Rhodes, *The making of the atomic bomb*, Simon & Schuster, New York, 1986; Richard Rhodes, *Dark sun : the making of the hydrogen bomb*, Simon & Schuster, New York, 1995; Spencer Weart, *Scientists in power*, Harvard University Press, Cambridge, Massachusetts, 1979.
[5] For example, see: Alice Kimball Smith, *A peril and a hope: the scientists' movement in America 1945-47*, MIT Press, Cambridge, Massachusetts, 1970; Greta Jones, *Science, politics and the Cold War*, Routledge, London, 1988; Greta Jones, 'The mushroom-shaped cloud: British scientists opposition to nuclear weapons policy, 1945-57', *Annals of Science*, vol. 43, no. 1, January 1986, pp. 1-26. For Australian 'victims', see: Phillip Deery, 'Scientific freedom and postwar politics: Australia, 1945-55', *Historical Records of Australian Science*, vol. 13, no. 1, June 2000, pp. 1-18; Jean Buckley-Moran, 'Australian scientists and the Cold War', in Brian Martin, C.M. Ann Baker, Clyde Manwell and Cedric Pugh (eds), *Intellectual suppression: Australian case histories, analysis and responses*, Angus & Robertson, Sydney, 1986, pp. 11-23.

against Japan.[6] As Alperovitz demonstrates, the bomb was perceived by US policymakers as a political as well as a military weapon. Its dramatic revelation provided an effective first strike in the burgeoning superpower struggle with the Soviet Union. The possibilities of the Atomic Age were framed against an increasingly tense and divided world, its origins and implications entwined with those of the Cold War.[7] The early history of the Atomic Age is thus dominated by questions of control, as scientists, politicians, religious leaders, and the public, all sought to imagine a system that would disarm the threat of atomic annihilation, while hastening the use of the new energy for peaceful purposes.[8] Nations like Australia sought to balance their commitment to international cooperation with a pragmatic acceptance of the American atomic monopoly.[9]

The struggle for the scientific know-how necessary to fuel the Atomic Age provides a potent theme in the history of Australia's frustrated atomic development. As Britain pushed ahead with its own atomic program, Australia hoped for some form of collaboration. But the British themselves hoped to renew their partnership with the US, and so remained wary of the ambitions of their eager Commonwealth colleagues.[10] In my study of the participation of Australian scientists in the British atomic tests, I argued that Australian hopes for useful information were thwarted by the prospect of 'unfortunate repercussions in Washington'.[11] This theme has been elaborated within

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[6] Gar Alperovitz, *Atomic diplomacy: Hiroshima and Potsdam*, expanded and updated ed., Penguin, New York, 1985; Gar Alperovitz, *The decision to use the atomic bomb and the architecture of an American myth*, Harper Collins, London, 1995.

[7] Greg Herken, *The winning weapon: the atomic bomb in the cold war, 1945-1950*, Knopf, New York, 1980.

[8] See, for example: Joseph I Lieberman, *The scorpion and the tarantula: the struggle to control atomic weapons, 1945-1949*, Houghton Mifflin Company, Boston, 1970; Lawrence S Wittner, *The struggle against the bomb, vol. 1, One world or none: A history of the world nuclear disarmament movement through 1953*, Stanford University Press, Stanford, 1993.

[9] Tim Sherratt, 'A physicist would be best out of it: George Briggs and the United Nations Atomic Energy Commission', *Voices*, vol. 3, no. 1, 1993, pp. 17-30; Meredith Burgmann, 'Hot and cold: Dr Evatt and the Russians, 1945-1949', in Ann Curthoys and John Merritt (eds), *Australia's first cold war, 1945-1953*, Allen & Unwin, Sydney, 1984, pp. 80-108.

[10] The politics of Britain's nuclear ambitions is extensively examined in Margaret Gowing, *Independence and deterrence: Britain and atomic energy, 1945-1952*, 2 vols, Macmillan, London, 1974.

[11] Tim Sherratt, 'A political inconvenience: Australian scientists at the British atomic weapons test, 1952-3', *Historical Records of Australian Science*, vol. 6, no. 2, 1985, pp. 137-52. See also: Tim Sherratt, 'Australian scientists at the British atomic weapons tests', in Robyn Williams (ed.), *Science Show II*, Thomas Nelson, Melbourne, 1986, pp. 216-9.

Alice Cawte's *Atomic Australia* and Wayne Reynolds' *Australia's Bid for the Atomic Bomb*, which chart the nation's quest for atomic enlightenment through a web of personalities, politics and super-power suspicions.[12] Reynolds focuses too much on the bomb, rather than the broader field of atomic development, but he usefully explores the way in which the influence of atomic policy was expressed through a wide variety of government initiatives— from the Snowy Scheme, to the restructuring of Australia's security apparatus.

The labours of scientists and policymakers have been crucial in defining the key moments of the Atomic Age. In Australia we can catalogue a series of events and institutions such as the British atomic tests, the appointment of Mark Oliphant to the Australian National University, the establishment of the Australian Atomic Energy Commission, the development of uranium mining, and the controversy surrounding the handling of atomic secrets.[13] All of these have received some attention from historians and together they contribute to our broad understanding of the terrain. But what is it that links such events? This question seemed crucially significant in the early 1980s with the escalation of Cold War tensions and the renewed possibility of nuclear war. How was it that the bomb could remain such a threat?

Theorists began to argue that the bomb was not merely a political weapon, but that it fostered a new type of politics altogether— the 'nuclear state'. EP Thompson described the development of 'exterminism', a political configuration, like militarism or imperialism, 'whose institutional base is the weapons system, and the entire economic, scientific, political and ideological support-system to that weapons system'.[14] In cultural studies the new field of 'nuclear criticism' similarly sought to probe the bomb's

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12 Alice Cawte, *Atomic Australia: 1944-1990*, New South Wales University Press, Sydney, 1992; Wayne Reynolds, *Australia's bid for the atomic bomb*, Melbourne University Press, Melbourne, 2000. See also: Tim Sherratt, review of Wayne Reynolds, *Australia's bid for the atomic bomb*, *Historical Records of Australian Science*, vol. 13, no. 4, December 2001, pp. 536-8.

13 In addition to Cawte and Reynolds cited above, see, for example: Robert Milliken, *No conceivable injury: the story of Britain and Australia's atomic cover-up*, Penguin, Melbourne, 1986; Stewart Cockburn, and David Ellyard, *Oliphant: the life and times of Sir Mark Oliphant*, Axiom Books, Adelaide, 1981.

14 Edward Thompson, 'Notes on exterminism, the last stage of civilisation', in New Left Review (ed.), *Exterminism and Cold War*, Verso, London, 1982, pp. 1-34.

ideological underpinnings, inspired by Jacques Derrida's colourfully-titled paper, 'No Apocalypse, Not Now (Full Speed Ahead, Seven Missiles, Seven Missives)'.[15] Concerns were fuelled further in Australia by continuing controversies over uranium mining and the legacies of the British atomic tests. Australia's role in the global nuclear network was subjected to critical analysis.[16]

Such studies drew attention to the state formations that structured our engagement with nuclear technology, and gestured towards the ideological assumptions that continued to hold us in the bomb's deadly grasp. Joel Kovel made a compelling case for the significance of fear, arguing that the nuclear state intimidates its citizenry through the orchestrated terror of the bomb.[17] Others stressed the importance of language, demonstrating how nuclear technology had been naturalised by the manipulation of words and images— a process one group of authors described as 'nukespeak'.[18] By drawing attention to the practices of a nuclear elite, arguments like these provide a useful basis for political critique and resistance. But they are less satisfactory as tools for historical analysis. There is a certain deft functionalism in the image of the nuclear state commanding allegiance through its control of our feelings and our words. There is a tendency to portray fear as some sort of all-purpose explanatory mechanism, capable of gripping a people, or being diverted— turned on and off like a tap. Language too is a convenient culprit, but like fear it has its own history and context. To understand the Atomic Age as something lived, we have to examine its culture, not as the expression of idealised state formation, but as something with its own historical integrity.

Paul Boyer provided the first detailed examination of the culture of the Atomic Age in his 1984 book, *By the bomb's early light : American thought and culture at the dawn of the Atomic*

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15 The field is surveyed in Ken Ruthven, *Nuclear criticism*, Melbourne University Press, Melbourne, 1993.
16 Jim Falk, *Global fission: the battle over nuclear power*, Oxford University Press, Melbourne, 1982; Jim Falk, *Taking Australia off the map*, Penguin, Melbourne, 1983; Michael Denborough (ed.), *Australia and nuclear war*, Croom Helm, Canberra, 1983; Harry Redner, and Jill Redner, *Anatomy of the world*, Fontana, Melbourne, 1983.
17 Joel Kovel, *Against the state of nuclear terror*, South End Press, Boston, 1984.
18 Stephen Hilgartner, Richard C Bell, and Rory O'Connor, *Nukespeak*, Penguin, Harmondsworth, 1982.

*Age*.[19] Boyer documents American reactions to the bomb, examining how the implications of the new technology were explored through debates over control, morality, religion, progress and science. His ground-breaking study has been the inspiration for many others, charting variations in the bomb's cultural expression through literature, film and elsewhere.[20] Australian press reactions to the bomb have been surveyed in an article by Prue Torney-Parlicki, though the emphasis is on the portrayal of its Japanese victims.[21] A broader study of atomic imagery in Australian art and media has been undertaken by Rodney James.[22]

The cultural history of the Atomic Age is now the subject of a substantial body of work, revealing many of the ways in which atomic energy has become integrated into our ways of seeing, of thinking, of living. Yet there remains a certain hesitancy in probing the origins of this influence. Commenting on the upsurge in anti-nuclear activism in the early 1980s, Boyer admits a depressing sense of *déjà vu*— it all seemed to have happened before.[23] Elsewhere he observes that early responses to the bomb were 'uncannily familiar'. The arguments and outrage, fear and fantasy, had been recycled again and again in the decades after the war. 'All the major elements of our contemporary engagement with the nuclear reality', he argues, 'took shape literally within days of Hiroshima'.[24] In tracing these 'continuing cycles of activism and apathy', Boyer hopes that a sense of history might free us at last from the ritual of nuclear forgetting. But why stop at the bomb?

If we are looking at the way images and arguments are regularly recycled as immediate and new, then surely we should look beyond the turning-point of Hiroshima to see

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19 Paul Boyer, *By the bomb's early light: American thought and culture at the dawn of the Atomic Age*, Pantheon Books, New York, 1985.
20 For example: Margot A Henriksen, *Dr Strangelove's America: society and culture in the atomic age*, University of California Press, Berkeley, 1997; M Langer, 'Why the atom is our friend: Disney, General Dynamics and the USS Nautilus', *Art History*, vol. 18, no. 1, March 1995, pp. 63-96.
21 Prue Torney-Parlicki, '"Whatever-the-thing-may-be-called": the Australian news media and the atomic bombing of Hiroshima and Nagasaki', *Australian Historical Studies*, vol. 31, no. 114, April 2000, pp. 49-66.
22 Rodney B James, 'Representation of the Bomb in Australian art and culture, 1945-1959', MA, Monash University, 1990.
23 Boyer, *By the bomb's early light* p. 364.
24 *ibid*., p. xix.

whether there are deeper continuities. One of the most compelling features of the Atomic Age was the sense of newness— it was a 'new era', promising revolutions in almost every aspect of life. But was this sense of newness new? Boyer, and much of the cultural history of the Atomic Age, takes it for granted that the bomb provides a unique starting point. And yet the discussions about science, progress and morality that followed in its wake, drew upon well-established themes.

Spencer Weart also documents detailed reactions to the bomb. But instead of starting with the news from Hiroshima, he looks back to a combination of images that have long surrounded science and mysticism. The bomb, he argues, merely serves as a 'receptacle for projections' of pre-existing cultural myths and images— 'hidden thoughts'— themselves born of fundamental psychological needs.[25] 'Modern thinking about nuclear energy', he concludes, 'has less to do with current physical reality than with old, autonomous features of our society, our culture, and our psychology'.[26] Weart travels further and deeper than Boyer, probing our collective unconscious for the inchoate fears that were ultimately to find expression in responses to nuclear energy. But while he does highlight some of the connecting threads that belie the bomb's sense of newness, Weart robs the Atomic Age of its own context and meaning. The Cold War is incidental in Weart's account; place and personality are of limited interest. We gain a much expanded sense of time, but lose our sense of history.

Boyer's bomb is compelling and immediate, demanding humanity's attention, while Weart's bomb is a pastiche of ancient images. Such opposing characterisations prompt Jeff Smith to ask, 'Is the bomb basically a very new thing, or a very old thing?' In his book, *Unthinking the unthinkable*, Smith concludes that the bomb is 'neither wholly new nor timelessly old, but *historically* old'. 'The "presentness" of nuclear weapons is no reason to see the world as basically changed', he adds, 'and their "pastness" is no reason

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[25] Spencer Weart, *Nuclear fear: a history of images*, Harvard University Press, Cambridge, Massachusetts, 1988, p. 424
[26] *ibid.*, p. 421.

to see it as never able to change'.[27] Both the continuities in our forms of cultural expression and the feeling of dramatic change are themselves topics for historical reflection rather than defining the boundaries of our study.

This thesis begins from the assumption that a cultural history of the Atomic Age should not take the parameters of its topic for granted. Beginnings and ends are fashioned as carefully as bombs and reactors. But once we begin to question the nature of the turning point at Hiroshima, a turning point that seems so critical to our understanding of twentieth century history, we are left with no clear starting point, no well-defined boundaries. Having unpacked the portmanteau we find the suitcase itself has vanished. What began as a history of the Atomic Age in Australia has thus become something different. The focus of this thesis has shifted from the implications of a moment, to the experience of a journey. This is the journey that runs through our revolutions and ages, a journey that gives the turning point its power and significance— a journey we call progress.

## Progress

What is progress? There are histories of progress that chart its meanings from ancient times to the present. There are treatises that explore its moral and spiritual dimensions, its eschatological origins, its apocalyptic fulfilment.[28] There are the familiar economic definitions, of course, as well as attempts to factor environmental health and human happiness into the calculations of the number crunchers.[29] But the most detailed studies of progress have been undertaken within the history of ideas, where JB Bury's 1920 definition still provides a useful point of reference. Progress, Bury asserts, 'is a theory which involves a synthesis of the past and a prophecy of the future. It is based on an

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[27] Jeff Smith, *Unthinking the unthinkable: nuclear weapons and western culture*, Indiana University Press, Bloomington, 1989, p. 18.
[28] For example: J B Bury, *The idea of progress: an inquiry into its origin and growth*, Macmillan, London, 1920; Sidney Pollard, *The idea of progress: history and society*, CA Watts & Co, London, 1968; John Baillie, *The belief in progress*, Oxford University Press, London, 1950.
[29] For example: Clive Hamilton, and Richard Denniss, *Tracking well-being in Australia: the Genuine Progress Indicator 2000, Discussion paper no. 35*, Australia Institute, Canberra, 2000; Richard Eckersley (ed.), *Measuring progress: is life getting better*, CSIRO Publishing, Melbourne, 1998.

interpretation of history which regards men [sic] as slowly advancing... in a definite and desirable direction, and infers that this progress will continue indefinitely'.[30]

Based on such a definition, historians have pieced together a generally accepted life history of progress. It is, as Bury notes, a surprisingly modern invention, having its birth alongside science itself amidst the intellectual ferment of the Renaissance. The idea gained strength through the Enlightenment, as thinkers wielded the power of rationalism to stake their claims over the future. A counter-thrust by the Romantics was swept aside by the nineteenth century, when progress seemed evident not only in the society's growing technological might, but, through evolution, in the very being of humankind.[31] By the late nineteenth century, progress was ascendant. In history, science, technology and commerce, civilisation seemed set in the path of conquest and expansion. No end was in sight. The twentieth century brought new doubts, however, as thinkers began to question the implicit linearity of progress and assumed dominance of rationalism.[32] But it was the carnage and destruction of World War One that finally dispelled the confidence of the nineteenth century. Since then a lingering sense of pessimism has tainted any assertion of progress— are things really getting better? Recent decades have brought the strongest critique, with cultural theorists identifying progress as one of the sustaining metanarratives through which the modern state achieves legitimation and control. It is in the questioning of progress, some argue, that we declare ourselves as defiantly *post*-modern.[33]

However, once we lapse into imagining that progress has a life of its own, we are in danger of ignoring the complexities of its historical expression. The assumption that there is a specific 'idea' which we can readily label 'progress', encourages us to perceive it as something monolithic and unchanging— the idea possesses the people, not the

30 Bury, *The idea of progress*, p. 5.
31 For more on the role of evolutionary thought in the idea of progress, see Peter Bowler, *The invention of progress: the Victorians and the past*, Basil Blackwell, Oxford, 1989.
32 Stephen Kern, *The culture of time and space, 1880-1918*, Harvard University Press, Cambridge, Mass, 1983.
33 Lyotard famously defined postmodernism as an 'incredulity towards metanarratives', of which the modern belief in progress is a prime example, see: Jean Francois Lyotard, *The postmodern condition: a report on knowledge*, University of Minnesota Press, Minneapolis, 1984.

people the idea. William Lines' book *Taming the Great South Land* observes the influence of the idea of progress upon Australia's history.[34] Progress is portrayed like a deadly virus, carried to Australia by European invaders only to wreak horrific damage upon the land and its indigenous inhabitants. Any sense of complexity or context is lost amidst the parade of stick-figure baddies driven by their devotion to this dangerous idea. Lines' book offers a powerful and timely polemic, but as history it is unsatisfying because it takes the very meaning of progress for granted. This thesis argues that progress did not merely exist in the minds of thinkers, in the workings of evolution, the machinations of the state, or the greed of developers, it was experienced, resisted, elaborated or rejected in the daily lives of people negotiating their own meanings and purpose.

Michael Roe examines some of this complexity in his book *Nine Australian progressives*.[35] Although his progressives share a broad vision of improvement, there is no easily defined program or set of beliefs. What emerges from his biographical studies is an awareness of the diversity of their enthusiasms, as well as a recognition of their common concerns. Nationalist fervour is mingled with the fear of degeneration, and confidence in the power of technology sits beside a passion for the natural world: Roe reveals that a commitment to progress can emerge from a mass of contradictions, opinions and uncertainties.

Studies of 'development ideology' in Australia have tended to focus on its role within conservative politics, though Lenore Layman has demonstrated that local context can also be significant.[36] Judith Brett, like Roe, has used biography as a means of plumbing the deeper meanings of progress and security, reflected in Robert Menzies' appeal to the 'forgotten people'.[37] 'Political language faces two ways', she argues, 'outwards to the

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[34] William Lines, *Taming the great south land: a history of the conquest of nature in Australia*, Allen & Unwin, Sydney, 1991.

[35] Michael Roe, *Nine Australian progressives: vitalism in bourgeois social thought, 1890-1960*, University of Queensland Press, St. Lucia, 1984.

[36] Lenore Layman, 'Development ideology in Western Australia', *Historical Studies*, vol. 20, no. 79, 1982, pp. 234-60. See also: Lenore Layman, 'Development', in Graeme Davison, John Hirst and Stuart Macintyre (eds), *The Oxford Companion to Australian History*, Oxford University Press, Melbourne, 1998, pp. 184-6; P Loveday, 'Liberals and the idea of development', *Australian Journal of Politics and History*, vol. 23, no. 2, 1977, pp. 219-226.

[37] Judith Brett, *Robert Menzies' forgotten people*, Sun, Sydney, 1993.

audience being addressed and support being wooed; inwards to the politician's own emotions and biographical experience'. The challenge, Brett continues, is to find 'the points through which personal desires can flow through into the public ideological forms of the day'.[38]

John Murphy has also sought to recover a sense of contingency and complexity from the clichés and stereotypes that dominate our impressions of the 1950s.[39] This is, of course, the era most closely associated with the Atomic Age, and one to which we readily ascribe a naïve devotion to the wonders of progress. But Murphy's research reveals a much more fragmented and fearful society. The prospect of economic prosperity was undercut by lingering fears of depression; the image of a happy family life was menaced by the threat of global conflict and continuing shifts in gender roles. Our 'contemporary imaginings of the fifties as stable, complacent and prosperous', Murphy argues, 'have obscured aspects that are much more dynamic and contradictory'.[40]

Just as we look to the fifties as a time of 'monocultural certainties' against which we can measure our own acceptance of diversity, so we imagine that progress itself is an idea that we can, and have, outgrown. Once we assume the monolithic character of progress, we are able to imagine its rejection as a symbol of our own increasing sophistication. Postmodernism proudly brandishes its prefix as a sign that we have moved beyond the delusions of the past— progress, like modernity itself, has been stripped of its disguise.[41] However, such confidence displays the same sort of temporal certainty expressed in the supposed dawning of the Atomic Age. Both imagine a succession of old by new, of ignorance by enlightenment. As we begin to explore the nature of progress, we should

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[38] *ibid.*, p. 26.
[39] John Murphy, *Imagining the fifties: private sentiment and political culture in Menzies' Australia*, UNSW Press, Sydney, 2000.
[40] *ibid.*, p. 5.
[41] For an examination of the supposed monolithic character of modernity, see Bernard Yack, *The fetishism of modernities: epochal self-consciousness in contemporary social and political thought*, University of Notre Dame Press, Notre Dame, Indiana, 1997.

perhaps admit that we cannot easily do without the feeling that our understanding of progress has progressed.

In his 2001 Boyer Lectures, Geoffrey Blainey reminded us that there was no single peak on developmental enthusiasm from which we can chart the dwindling of national optimism.[42] The excitement of 'Australia Unlimited' in the 1920s faded somewhat with the Depression and a gradual acceptance of the limits of the nation's potentialities. But it was resurrected in the postwar years with the added power of an atom-enriched science. In the 60s and 70s such confidence faced increasing suspicion, particularly with the rise of environmental concerns. But like Paul Boyer's cycles of activism and apathy, our engagement with progress has been marked not simply by growing cynicism, but by bouts of unconscious repetition. Even as we celebrate our onward march into the future, we regularly rediscover past ideas and visions as new. The nature of progress is closely bound to our experience of time.

'Time is the very stuff of history', Graeme Davison writes, 'as fundamental to its character as land to geography or matter to physics'. 'Historians constantly shape and reshape time, arrange events within it, make metaphors for it', he adds, but 'they seldom direct their attention to time itself as a basic dimension of social life'.[43] Davison, like Stephen Kern in his book *The culture of time and space*, is one of the few historians to specifically address the role of time in the construction of historical experience. While neither is directly concerned with the relationship between time and progress, it is clear from their studies that the mastery of time has been perceived as central to the pursuit of progress. Whether through the power of standardisation to exert control at a distance, or in the obsession with efficiency that Taylorism marked as the benchmark for industrial success, the precise manipulation of time offered opportunities for development and expansion.

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[42] Geoffrey Blainey, *This land is all horizons: Australian fears and visions, 2001 Boyer Lectures* ABC Books, Sydney, 2001, ch. 1.
[43] Graeme Davison, *The unforgiving minute: how Australia learned to tell the time*, Oxford University Press, Melbourne, 1993, p. 2.

The entwining of time and progress can be traced back to the modern 'invention' of time in the sixteenth and seventeenth centuries.[44] As chapter one of this thesis describes, a series of historical changes brought a shift in the experience of time. Time was divided and regulated, its passing marked with increasing precision by the ticking of the mechanical clock. But these discrete moments were also added together, enabling Enlightenment thinkers to assert their distance from the past. The passage of time came to be understood in linear terms as a journey through a metaphorical space— a journey given the name of progress. As Walter Benjamin argues: 'The concept of historical progress of mankind cannot be sundered from the concept of its progression through a homogenous empty time. A critique of the concept of such a progression must be the basis of any criticism of the concept of progress itself'.[45]

This thesis argues that rather than being an 'idea' that we can simply disown or outgrow, the characteristics of progress are embedded within the timekeeping practices that we still use to structure our days, imagine our histories, and construct our narratives. The idea of progress as a journey interspersed with significant turning points or crises, is a reflection of the way in which time itself is forged through a dialectic of accumulation and disjunction. It is this structure of 'disjunction, and irreversible sequence on either side of the disjunction' that Deborah Rose observes in the temporality of the Australian frontier.[46] The way in which progress is elaborated and experienced as a combination of both practices and ideas, is specifically addressed within the first three chapters which examine turning points, journeys, and the contrast of old and new.

Andrew Ross similarly argues that the 'maintenance of cultural and economic power' rests 'upon a dialectic of change and constancy, innovation and stability, progress and conservation'.[47] But Ross observes this dialectic, not in the workings of time *per se*, but

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[44] Samuel L Macey, *Patriarchs of time: dualism in Saturn-Cronos, Father Time, the Watchmaker God, and Father Christmas*, University of Georgia Press, Athens, Georgia, 1987, ch 4.
[45] Quoted in Jonathon Boyarin, 'Space, time, and the politics of memory', in Jonathon Boyarin (ed.), *Remapping memory: the politics of timespace*, University of Minnesota Press, Minneapolis, p. 1.
[46] Deborah Rose, 'The Year Zero and the North Australian frontier', in Deborah Rose and Anne Clarke (eds), *Tracking knowledge in North Australian landscapes*, NARU, Darwin, 1997, p. 27.
[47] Andrew Ross, *Strange weather: culture, science and technology in the age of limits*, Verso, London, 1991, p. 232.

in the growth of science against 'an intractably stable order of nature'. It was not merely time and progress that emerged together from the seventeenth century. As Ross reminds us, this newly-imagined journey was one marked by the increasing power of science and rationalism. 'To focus on the ever-modified shape of that dialectic from moment to moment', he continues, 'is to reject the explanatory power of ultimate linear narratives about progress'.[48] It is in the history of Australian science that this thesis seeks to observe this dialectic at work.

## Science

It seems almost self-evident to assert that science shapes our understanding of progress. Through continuing advances in knowledge and technology, science invests progress with much of its sense of dynamism and inevitability. This hold on the future was dramatised by the development of the atomic bomb. No longer, it seemed, could implications of science be ignored by any responsible government. The Atomic Age, nuclear physicist Ernest Titterton argued, was 'an era in which science has become so important in our lives that all our decisions, including political ones, must be made with scientific considerations in mind'.[49]

Science, as in this case, is commonly portrayed as something external to the revolutions it conjures upon an impotent and unsuspecting world, as an engine of change constructed to its own internal specifications. But just as the meaning of the Atomic Age cannot be simply read from the activities of scientists, so the relationship between science and progress is not one merely of cause and effect. To explore this relationship we have to lift the bonnet on the engine of science and tinker with the mechanics; we have to examine failed designs and superseded models; we have to ask who is doing the driving and why.

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[48] *ibid.*
[49] Ernest William Titterton, *Facing the Atomic Future*, FW Cheshire, Melbourne, 1956, p. 4.

This thesis seeks to explore the links between science and progress by embarking upon a cultural history of Australian science in the twentieth century— a field that scarcely exists. A reader can safely peruse most survey histories of Australia without being troubled by the appearance of science. There are exceptions of course: Hancock presents Farrer in an important cameo; Blainey is sensitive to the impact of new technology; while Serle includes the establishment of scientific institutions as markers of the country's cultural maturation.[50] However, compared to politics, war, and religion, or even sport and literature, science has been assigned a very minor role in the formation of nation and identity.

On the other side of the supposed 'two cultures' divide, Australian scientists have made significant efforts to document their history, but tend to remain suspicious of the theoretical concerns that shape the sorts of questions historians frame about the past. Historical and cultural analysis has given way, too often, to the antiquarian plod or the celebratory frolic.[51] The emergence, in the last few decades, of the history of Australian science as a distinct discipline, has offered hope of a more rigorous and insightful approach. Ann Moyal, Rod Home and Roy Macleod, amongst others, have done much to broaden the field's conceptual foundations.[52] Yet still the field seems dominated by a

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[50] William Keith Hancock, *Australia*, Ernest Benn, London, 1930; Geoffrey Blainey, *The rush that never ended : a history of Australian mining*, Melbourne University Press, Melbourne, 1963; Geoffrey Serle, *From deserts the prophets come: the creative spirit in Australia 1788-1972*, Heinemann, Melbourne, 1973.

[51] See: Tim Sherratt, 'Science, history of', in Graeme Davison, John Hirst and Stuart Macintyre (eds), *Oxford Companion to Australian History*, Oxford University Press, Melbourne, 1998, pp. 572-3.

[52] Moyal provided the first broad survey of Australian science in *A bright and savage land*, Penguin, Melbourne, 1993. As well as publishing on the history of Australian physics, Home has developed *Historical Records of Australian Science* as the only specialist journal in the field, and initiated the Australian Science Archives Project, see, for example: RW Home, 'Origins of the Australian Physics Community', *Historical Studies*, vol. 20, April 1983, pp. 383-400; RW Home, 'Australian science and its public', *Australian Cultural History*, no. 7, 1988, pp. 86-103; RW Home, 'Science on service, 1939-1945', in RW Home (ed.), *Australian science in the making*, Cambridge University Press, Cambridge, 1988, pp. 220-51. Macleod has published on a remarkable variety of topics relating to the history of Australian science, for example: Roy MacLeod, 'On Visiting the "Moving Metropolis": Reflections on the architecture of imperial science', *Historical Records of Australian Science*, vol. 5, no. 3, 1982, pp. 1-16; Roy MacLeod, 'The 'Practical man': Myth and Methaphor in Anglo-Australian Science', *Australian Cultural History*, no. 8, 1989, pp. 24-49; Roy Macleod, *The commonwealth of science: ANZAAS and the scientific enterprise in Australasia, 1888-1988*, Oxford University Press, Melbourne, 1988. For a general discussion of the development of the field, see: R W Home, 'History of science in Australia', *Isis*, vol. 73, no. 268, 1982, pp. 337-342; Sherratt, 'Science, history of'.

regular stream of institutional histories and biographies that ignore the cultural complexities of science.

The question of context remains problematic even for more academic studies. Rather than focusing on questions relating to the local production of knowledge, the history of Australian science has tended to be dominated by diffusionist models that emphasise the outward flow of knowledge from the metropolitan centre of Europe.[53] Australia receives the gift of science from abroad and eventually nurtures it to maturity. The focus is on the end point rather than the journey, on the connection between centre and periphery rather than that between science and culture. Indeed, science becomes science through eradication of cultural dependencies and contaminants. The end point, science in its 'modern' form, needs no explanation. This structure is reflected in *The making of Australian science*, the contents of which are divided into sections that mirror the stages of scientific development proposed by George Basalla.[54] As the essays move from 'early days' and 'colonial science' into the 'passage to modernity', the style of writing becomes more descriptive, focused increasingly on internal issues— personalities, funding and institutions. This movement reflects the idea that science is 'made' through the achievement of certain pre-determined criteria— the good guys always win. 'Science' can be no other way than it is within such a scheme, the only choices people can make are about the means of travel— the road itself is already marked.[55]

Of course, the reverse also holds. As we retreat from the self-contained certainty of modern science into the murky recesses of the past, the space allowed to cultural influences expands. So it is that studies of colonial science or, indeed, the science of exploration and 'discovery' display a much greater sensitivity towards the context in

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53 See, for example, the contents of: Nathan Reingold, and Marc Rothenberg (eds), *Scientific colonialism: a cross-cultural comparison*, Smithsonian Institution Press, Washington, 1987; RW Home, and Sally Gregory Kohlstedt (eds), *International science and national scientific identity*, Kluwer, Dordrecht, 1991.

54 RW Home (ed.), *The making of Australian science*, Cambridge University Press, Cambridge, 1988; George Basalla, 'The spread of western science', *Science*, vol. 156, 1967, p. 611. The Basalla model has been criticized and modified by a number of writers, such as: MacLeod, 'On Visiting the "Moving Metropolis"'; Ian Inkster, 'Scientific Enterprise and the Colonial "Model": Observations on Australian Experience in Historical Context', *Social Studies of Science*, vol. 15, no. 4, 1985, pp. 677-704.

55 See: Tim Sherratt, 'Making science for whom?' *Antithesis*, vol. 2, no. 2, 1989, pp. 13-18.

which knowledge is manufactured and received. For example, Barry Butcher's chapter in the *Making of Australian Science* traces the development of evolutionary ideas in Australia. But the controversy he examines, over whether monkeys have feet, 'finds its meaning and significance only because its discussion is embedded in larger cultural values'.[56] There is much to be gained by pursuing such richly-textured studies, and carrying some of the themes of 'colonial' science into the 'modern' era. However, as Wade Chambers has noted, the history of Australian science remains reluctant to embrace the significance of 'locality'.[57]

In a similar way, cultural history has tended to confine its sorties to the margins of Australian science: those realms in which the character of the science itself seems doubtful. Where scientific fads and fashions have been discredited, disowned, or discarded, culture rushes in to fill the void once occupied by truth. This is most evident in areas of medical or racial science where we are comfortable in condemning the scientific prejudices of the past. Eugenics has proved particularly popular with cultural historians, and the early work of Roe, Bacchi and Garton has been extended by a variety of scholars exploring questions of gender, identity and race.[58]

Scientists are also exposed to cultural scrutiny when they are perceived to have transgressed upon the domain of politics. It is notable that the British atomic tests constitute probably the most well-documented scientific undertaking in twentieth century Australia.[59] However, the literature tends not to address complex questions of

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[56] Barry W Butcher, 'Gorilla warfare in Melbourne: Halford, Huxley and 'man's place in nature", in Roderick Weir Home (ed.), *Australian science in the making*, Cambridge University Press, Cambridge, 1988, p. 153.
[57] David Wade Chambers, 'Does distance tyrannize science?' in Roderick Weir Home and Sally Gregory Kohlstedt (eds), *International science and national scientific identity*, Kluwer, Dordrecht, 1991, pp. 19-38.
[58] Roe, *Nine Australian progressives*; C L Bacchi, 'The Nature-Nurture Debate in Australia, 1900-1914', *Historical Studies*, vol. 19, no. 75, 1980, pp. 199-212; Stephen Garton, 'Sound minds and healthy bodies: reconsidering eugenics in Australia, 1914-1940', *Australian Historical Studies*, vol. 26, no. 102, 1994, pp. 163-81; Martin Crotty, John Germov, and Grant Rodwell (eds), *'A Race for a place: eugenics, Darwinism and social thought and practice in Australia, Proceedings of the history & sociology of eugenics*, Faculty of Arts & Social Science, University of Newcastle, Newcastle, 2000.
[59] In addition to works already cited by Sherratt, Tame and Robotham, and Millken, and the findings of the Royal Commission, other books include: Denys Blakeway, and Sue Lloyd-Roberts, *Fields of thunder: testing Britain's bomb*, Unwin Paperbacks, London, 1985; Judy Wilks, *Field of thunder: the Maralinga story*, Friends of the Earth, Melbourne, 1981; and the 'official' history, Lorna Arnold, *A very special relationship: British atomic weapon trials in Australia*, HMSO, London, 1987.

uncertainty and proof, or to examine the way in which scientific expertise is constructed and deployed in public debate. Rather, it prefers to separate good science from bad, to use the atomic tests as an instructive example of the dangers that follow the contamination of science by politics. Such a reading serves to protect the imagined neutrality of science. Highlighting the crimes of supposed transgressors reinforces the image of scientists as essentially apolitical, detached from the social world.

Non-science, wrong science, and old science can all be subjected to critical study without breaching the core of scientific integrity. Culture seeps in around the edges, softening the lines of demarcation, but rarely forcing its way through. Real science is different. Reluctant to challenge the conventional boundaries of scientific participation and authority, the history of Australian science thus remains a field intimidated by its subject.[60] Just as the complexities of progress are disguised as something monolithic and unyielding, so the historical nature of science is hidden behind its claim to special epistemological status.

Within science and technology studies, however, 'boundary work' has carved out its own methodological niche, with the demarcation of science shown to be dependent as much upon the rhetorical strategies of scientists as their privileged access to reality.[61] The growing literature reveals that the boundaries setting science apart are neither static nor predetermined. The territory of science is frequently contested as scientists and others construct their own maps of the social and intellectual landscape. Scientists can, moreover, champion more than one map at a time. As Tom Gieryn observes, it is common for scientists seeking public support to stress the fundamental utility of their work. If, however, such support comes with strings attached, a new map is promptly unfurled to demonstrate the essential autonomy of science.[62] Seemingly fixed and inviolable, the domain of science shifts from one debate to the next.

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60 Sherratt, 'Science, history of', p. 572.
61 Thomas F Gieryn, 'Boundaries of science', in Sheila Jasanoff, Gerald E Markle, James C Petersen and Trevor Pinch (eds), *Handbook of Science and Technology Studies*, Sage, Thousand Oaks, 1995, pp. 393-443.
62 Thomas F Gieryn, *Cultural boundaries of science: credibility on the line*, University of Chicago Press, Chicago, 1999, pp. 23ff.

But for all its insights, boundary work brings its own considerable frustrations. Like much work in science and technology studies, history tends to appear only in the form of convenient, bite-sized case studies. Moreover, there is a tendency to reduce the process of boundary-making itself to a catalogue of competing interests. Our newly-discovered appreciation of complexity is in danger of being lost amidst the clamour of battle, as we focus only on the contest for cultural power. This thesis seeks to take the idea of science as a shifting terrain into an examination of progress in twentieth century Australia. But instead of trying to isolate the key conflicts, to close down on the historical context for the sake of a compelling explanation, this thesis employs the insights of boundary work to open up the relationship between science and public. By examining some of the ways in which science is defined and defended, we can enrich our understanding of its cultural context. We can set about a history of Australian science in the twentieth century that does not take the character of science itself for granted.

Whenever the public has appeared in the story of Australian scientific achievement, it has tended to be characterised as a conservative force needing to be overcome. Like the astronomer HC Russell in 1888, Australian scientists have long complained of the utilitarian bias of Australian culture, of the public's indifference or hostility towards the pursuit of intellectual progress.[63] This complaint has been taken up by historians like Donald Fleming, seeking to categorise attitudes towards science in formerly frontier societies.[64] Australian scientific institutions have thus been imagined in a battle for legitimacy against an ignorant, short-sighted public, obsessed by the practical application of knowledge. Successful scientists are celebrated as 'Tall Poppies', having contributed to the advance of civilisation while resisting the public's penchant for pruning.[65]

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63 Russell is quoted in Roy MacLeod, 'From imperial to national science', in Roy MacLeod (ed.), *The commonwealth of science: ANZAAS and the scientific enterprise in Australasia, 1888-1988*, Oxford University Press, Melbourne, 1988, pp. 40-1.
64 Donald Fleming, 'Science in Australia, Canada, and the United States: some comparative remarks', *Proceedings of the 10th International Congress of the History of Science, Ithaca, 1962*, Paris, 1964, pp. 179-96.
65 See, for example the Australian Institute of Political Science's 'Tall Poppies' campaign: 'Salute to our tall poppies', *AQ*, vol. 72, no. 3, June-July 2000, pp. 17-20.

Even within this saga of scientific forbearance, considerable complexities have been revealed in the forms of public engagement and support. Currie and Graham's pre-history of the Council for Scientific and Industrial Research, observes the pernicious influence of utilitarianism while demonstrating that it was politicians, rather than scientists, who drove early efforts to win government support for science.[66] Read alongside Roe's *Nine Australian Progressives*, Currie and Graham's work provides a useful account of the way in which the cultural preoccupations of early twentieth century Australia fed into plans for scientific development. The supposed divide between science and utilitarianism becomes less clear cut when the influence of nationalism, or changing ideas about education and citizenship, are considered. The complexity of the relationship between the perceived nature of science and the needs of both nation and citizen is explored in chapters four and five of this thesis.

Effective communication of the content and methods of science have been deemed important not just for the edification of an ignorant and utilitarian citizenry, but to ensure public support for the scientific enterprise. No one who understands science, it is assumed, can be opposed to it. In the history of science, focus has thus lingered on the major conduits of scientific communication. The development of museums and educational institutions have been documented, as have some other efforts to bring science to the masses.[67] The centenary history of the Australian and New Zealand Association for the Advancement of Science (ANZAAS) broadly surveys the intersection of science and society, but it is the organisation's role in fostering the growth of the scientific community that is considered in most detail.[68]

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66 Sir George Currie, and John Graham, *The origins of CSIRO: Science and the Commonwealth Government 1901-1926*, CSIRO, Melbourne, 1966.

67 For example: Ronald Strahan, *Rare and curious specimens: an illustrated history of the Australian Museum*, Australian Museum, Sydney, 1979; Carolyn Rasmussen, *A Museum for the People: A history of Museum Victoria and its predecessor institutions*, Scribe Publications with Museum of Victoria, Melbourne, 2001; Libby Robin, 'Collections and the nation: science, history and the National Museum of Australia', *Historical Records of Australian Science*, vol. 14, no. 3, 2003, pp. 251-89; David Branagan, and Graham Holland (eds), *Ever reaping something new: a science centenary*, University of Sydney, Sydney, 1985; Jean Moran, 'Scientists in the political and public arena: a social-intellectual history of the Australian Association of Scientific Workers', M.Phil, Griffith University, 1983.

68 Roy Macleod, *The commonwealth of science: ANZAAS and the scientific enterprise in Australasia, 1888-1988*, Oxford University Press, Melbourne, 1988.

But how are scientific ideas transmitted? Generally, the processes of science communication have been characterised as ones of translation or diffusion.[69] Scientists have been urged to eschew specialist language, to make their research more accessible. Communication is assumed to be a matter of propagating knowledge outwards from the centres of learning and research. Recent work in the public understanding of science, however, has challenged the assumption of one-way traffic. Instead of portraying the public as 'empty vessels', ready to be topped-up with liberal doses of scientific enlightenment, a more complex picture has been suggested, where scientific certainties are received and interpreted within a web of local knowledge and events. 'Ignorance' can thus be understood not simply as an absence of knowledge, but as an actively constructed relationship with science[70].

This thesis is concerned with this broader meaning of communication, examining the way that science enters our lives through a host of connections, assumptions and images. At stake in the battle to map the territory of science is not merely status and power, but our own ability to imagine the future and find a place for ourselves within it. Chapter five examines some of the ideas that have shaped efforts at science communication. The ways in which such assumptions are played out within broader discussions of certainty, rationality, participation, and authority, are considered further in chapters six and seven.

To pursue the cultural history of Australian science, boundaries that separate science from culture, the scientist from the public, have to be challenged and overcome. Science has to be revealed as something inherently cultural, its meaning displayed not in a parade of breakthroughs and discoveries, but through the lives and hopes of people. One way of doing this is to humanise scientists, to consider the complexity of their motivations and beliefs. While most literature relating to the British atomic tests tends

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69 Stephen Hilgartner, 'The dominant view of popularization: conceptual problems, political uses', *Social Studies of Science*, vol. 20, 1990, pp. 519-39.

70 See the articles in Alan Irwin, and Brian Wynne (eds), *Misunderstanding science?: the public reconstruction of science and technology*, Cambridge University Press, Cambridge, 1996; especially Brian Wynne, 'Misunderstood misunderstandings: social identities and the public uptake of science', pp. 19-46, and Mike Michael, 'Ignoring science: discourses of ignorance in the public understanding of science', pp. 107-25.

to highlight the trangressions of 'bad' scientists, Roger Cross offers a more nuanced story in his description of the bitter battles between Hedley Marston and the Atomic Weapons Tests Safety Committee.[71] Marston's personality figures large in both his science and his grumpy refusal to be silenced by Ernest Titterton and his ilk. He is not quite a hero of scientific integrity, but a somewhat flawed champion of truth— his actions are those of both a scientist and a human being.

In a similar way, we can work to be more inclusive in charting 'public' participation in the construction and dissemination of scientific knowledge. Libby Robin's work expands upon the conventional cast of characters to include not just scientists, but activists, bureaucrats, and enthusiastic amateurs. She shows that disciplinary narratives need not take the accepted boundaries of knowledge-making for granted, and develops her stories in a landscape shaped by both politics and biology.[72]

Within the field of cultural history are some other examples of what is possible. In both *The quest for authority in Eastern Australia* and *Nine Australian progressives*, Michael Roe has examined the place of science within a broader constellation of beliefs. As has been stated, *Nine Australian progressives* is particularly relevant to this study, demonstrating the importance of science and technology in the reformist vision of early twentieth century liberals.[73] The progressives' excitement at the possibilities of the 'new', at the transforming power of technology, have been echoed in the Atomic Age and beyond. Tom Griffiths' *Hunters and collectors* is another work of cultural history which treats science not as an unwelcome visitor, but as an integral part of the lives and beliefs of its characters.[74] Similarly, David Walker's *Anxious nation* examines developmentalist rhetoric

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71 Roger Cross, *Fallout: Hedley Marston and the British bomb tests in Australia*, Wakefield Press, Adelaide, 2001. See also my review of Cross in *Historical Records of Australian Science*, vol. 14, no. 2, December 2002, pp. 209-10.
72 Libby Robin, *Defending the Little Desert: the rise of ecological consciousness in Australia*, Melbourne University Press, Melbourne, 1998; Libby Robin, 'Ecology: a science of empire?' in Tom Griffiths and Libby Robin (eds), *Ecology & empire: environmental history of settler societies*, Melbourne University Press, Melbourne, 1997, pp. 63-75.
73 Michael Roe, *Nine Australian progressives: vitalism in bourgeois social thought, 1890-1960*, University of Queensland Press, St. Lucia, 1984.
74 Tom Griffiths, *Hunters and collectors: the antiquarian imagination in Australia*, Cambridge University Press, Cambridge, 1996.

within the context of prevailing anxieties about climate, disease and racial integrity.[75] Within such works, science is simply part of the story, part of culture, part of life.

Science, Tom Gieryn explains, is 'nothing but a *space*... empty *until* its insides get filled and its borders drawn amidst context-bound negotiations over who and what is "scientific"'.[76] There is no centre from which knowledge and authority flow, there is no essence or core. This thesis explores the history of Australian science without assuming that science is at the centre of the story; without assuming that the boundaries have been fixed, the emptiness filled in. It is a history of Australian science where politicians and poets feature as prominently as scientists, where ideas are more important than institutions, where discoveries are not just made, but lived.

## Atomic wonderland

What started as a history of the Atomic Age has become something quite different. The supposed newness of the bomb has given way to a greater appreciation of continuity. Instead of setting the limits of this study to the temporal boundaries of the age, the way in which such limits are drawn, the nature of the turning points and dividing lines that structure our experience of the technology, have themselves become subjects for study. Instead of simply documenting an age, this history explores the nature of the journey that gives such turning points their power and meaning.

The journey is known as progress. But even as this name is uttered, as the concept solidifies, as the metaphor endows a familiar sense of onward movement, progress gains its own set of limits— a feeling of unity and coherence, of distance and direction. This is a history of progress, but it is not the history of a single idea. Instead of taking for granted the image of progress as a unifying creed, an ideology of domination, as the inevitable outcome of scientific development, this thesis attempts to explore some of

[75] David Walker, *Anxious nation: Australia and the rise of Asia 1850-1939*, University of Queensland Press, St Lucia, 1999.
[76] Gieryn, 'Boundaries of science', p.405

the practices, contradictions and assumptions that are gathered together under the heading of progress.

Science, of course, is an important part of the mix, featuring strongly in the articulation of progress and its consequences for society. This is a history that surveys many of the significant features of twentieth century Australian science, both to tease out the meaning of progress, and to broaden understanding of science's cultural context and content. This is an attempt to move beyond studies of the 'culture of science' towards an appreciation of 'science as culture'.[77]

The structure, content, style and methodology of this thesis have been developed through the questioning of boundaries— boundaries that define the limits of the Atomic Age, the meaning of progress, and the nature of science. Such boundaries not only set parameters for academic inquiry, they help to determine what society accepts as possible, inevitable, necessary, realistic, and rational. They constrain our choices for change. They set the limits of hope. The way in which science and progress combine to narrow the realm for action and imagination is another important thread within this thesis, explored, in particular, through the recurring image of the crossroads.

Thus, the argument of this thesis is developed through four major themes. The first insists that our assumptions of change and sequence, our fondness for dividing lines and turning points, must themselves be subjected to historical scrutiny. In the case of progress, it is argued, there are important continuities often obscured by our fascination with the 'new' and the comfort of our supposed sophistication. The second theme is concerned with the nature of progress itself, arguing for a greater appreciation of the complexities of its historical expression. Progress, it is maintained, consists of both ideas and practices, echoed as much in the rhetoric of business leaders as in the ticking of a mechanical clock. The third theme elaborates upon some of the connections between science and progress in twentieth century Australia. Such connections are not, it is argued, mere consequences of scientific development, they are part of the ongoing

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[77] Sherratt, 'Science, history of', p. 573.

battles of legitimation and authority that define what science is. The final theme insists that at the intersection of all these lines of inquiry is the question of choice, of our ability to imagine how the world might be different.

This is not the Atomic Age, this is 'Atomic Wonderland'. Instead of clearly defined boundaries there are questions and doubts, warnings that the normal rules do not always apply. Like Alice in her Wonderland, we find ambiguity, uncertainty and surprise— a journey of discovery in a world both alien and familiar. It was Lewis Carroll himself who coined the phrase 'portmanteau words'. In Wonderland, as in this thesis, words and meanings matter:

> 'When *I* use a word,' Humpty Dumpty said in a rather scornful tone, 'it means just what I choose it to mean— neither more nor less.'
>
> 'The question is,' said Alice, 'whether you *can* make words mean different things.'
>
> 'The question is,' said Humpty Dumpty, 'which is to be master— that's all'.[78]

The meaning and scope of 'Atomic Wonderland' is introduced in chapter one, which examines the 'newness' of the bomb and our passion for turning points. It begins at the crossroads, finding in this familiar metaphor a dialectic of accumulation and disjunction that underpins our conception of progress. Progress is assumed to be built upon the accumulated knowledge and power of preceding generations. Like the passage of time itself, progress is characterised as a journey carrying us inevitably onwards. And yet, progress is revealed most compellingly in the contrast between old and new, in the idea that it has wrought an irreversible break with the past— a revolution, a new age. This dialectic shapes our understanding of past and future; it is embedded within the practice of history; it limits our ability to imagine change. In setting about an exploration of Atomic Wonderland, this chapter ponders the nature of the journey that confronts both author and audience.

The spatial dimensions of progress are considered further in chapter two. Progress is imagined as a journey, its achievement assured through movement, acceleration, the

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[78] Lewis Carroll, *Through the looking-glass and what Alice found there*, Folio Society, London, 1962, p. 75.

accumulation of distance and the conquest of space. In a land of forbidding distances, and 'empty' spaces, Australian national progress was frequently imagined in spatial terms, as reflected in EJ Brady's book *Australia Unlimited*. This chapter focuses on Brady while examining the way concepts of space, distance and movement have entered into the rhetoric of national progress. Brady provides an important study, not only because of his insistence upon the value of Australian space, but also because of the way in which his work entwined knowing and travelling. The journeys of individual and nation were linked in the exploration of the continent's vast potentialities. Indeed, while Brady is often cited as a key propagandist for the developmentalist cause, the significance of such ideas is rarely considered within the broader sphere of his life and work. One of the aims of this thesis is to explore the complexities of progress, to examine some of the ways it enters our lives and hopes. This chapter tells the story of EJ Brady the lifelong socialist, the disappointed utopian, the failed entrepreneur, and the struggling writer. By understanding some of the detail of Brady's life and career, we can see how a belief in progress can combine emotion and intellect, disappointment and optimism, personal hopes and national ambitions. Progress is lived through its contradictions and ironies.

Chapter three continues to examine some of the complexities of progress, focusing on the experience of disjunction, the imagined contrast between old and new. At the beginning of the twentieth century, Australia was a 'new' nation, its character and potential contrasted with the 'old' nations of Europe. Throughout the century, 'newness' remained an indicator of national progress, as Australians were urged to seek advancement through a succession of new ages, new orders, new minds, and new men. Australia's destiny was presumed to lie in the remaking of land and people. From plans to bring life to the continent's 'dead heart', to the satisfaction gained through the latest household gadgets, this chapter considers the allure of transformation, noting, in particular, the role of science and technology.

The supposed connection between science and progress is taken up explicitly in chapter four. National progress is commonly assumed to be dependent upon the application of science and technology, but exactly what is to be applied, and how? The chapter examines various plans to turn the power of science to national ends. It focuses, in particular, on the early efforts of progressive liberal Littleton Groom, and the perceived role of Canberra as a centre for national scientific achievement. These plans reveal changing ideals of education and enlightenment, conflict over the best means of organising science, questions about the role of the individual and of government, even uncertainty about the nature of science itself. While the relationship between science and progress seems self-evident, the precise formula linking the two has remained elusive.

Chapter five continues to explore how discussions about progress brought to the fore questions about the nature of science and knowledge. The central case study concerns the establishment of the Commonwealth Institute of Science and Industry. Debate on the Institute often centred on the appropriate balance of theory and practice, with critics of the scheme being taken to reflect the utilitarian bias of Australian culture. The supposed conflict between scientific enlightenment and narrow-minded utility has proved a pervasive theme both in the history of Australian science and in scientists' attempts to win public support for their endeavours. Progress is portrayed as the conquest of ignorance. By examining the debate and a number of other crises and controversies, this chapter provides a more complex assessment. The battle lines between the scientist and the 'practical man' were constantly shifting in a contest of authority and legitimation. What was at issue was not just the nature of scientific knowledge, but the question of whose knowledge counts.

This question seems most critical in cases where uncertainty holds sway. Chapter six addresses the meaning of uncertainty by examining the significance of 'experiments' to Australian progress and security. Experiments are open-ended, offering advances in knowledge and utility that only the future can know. But who sets the parameters, who defines the objectives? The British atomic tests offer a useful case study in the interplay of uncertainty and authority, demonstrating how trust has been sought through the power of reason to dispel any 'unreal nervousness'. The control of 'experiments', the battle over the future, is reduced to a conflict between reason and emotion. Progress is portrayed as a victory over fear, with science enlisted to sooth our doubts.

The relationship between progress and fear is considered further in chapter seven. From the economic protection of Deakin to the border protection of Howard, concerns about development and defence have been constantly intertwined. Anxieties surrounding the 'atomic secret' illustrate the way in which progress has been assumed to be found in the maintenance of boundaries defining knowledge and participation. For all its revolutionary potential, progress brings a new set of limits. Our choices are revealed in the image of the crossroads, where progress is set against destruction as our only options. What sort of choice is this?

## Experiments in narrative

In setting out the scope of the argument and the contents of each chapter, it is obviously hoped that this thesis will display a certain logic. There is a beginning and an end, a literature to be addressed, problems to be solved, connections to be made. Each chapter is expected to build upon the last, to carry the reader onwards, perhaps even with a sense of inevitability. There is a familiarity to this journey, for the characteristics of a 'good' argument reflect our conception of progress. Point by point we proceed, as ideas and evidence accumulate towards enlightenment. This steady movement is punctuated by moments of insight and clarity that challenge our preconceptions and broaden our perspective. In a 'good' argument, all this is achieved within a framework of confidence and authority that gathers the reader's trust. Alternatives are considered and discarded, problems are solved— the journey seems so natural, its conclusions loom inevitable.

Such parallels between the conventions of argument and the structure of progress are hardly surprising. Both draw upon ideals of rationality and truth hammered into familiar form in the sixteenth and seventeenth centuries. The practices of history and science, the importance of evidence, the power of reason, were all developed together as part of the modern world's journey of improvement into an open, unknown future. But while the connections are obvious enough, still this adds to the burden of self-reflexivity, particularly when progress, science and certainty are themselves the subject of historical inquiry.

This thesis aims to explore some of the ways in which our choices are circumscribed by the presumed power of science and progress. And yet, this exploration is delivered in the form of a 'thesis', which similarly seeks to limit the reader's options, to draw them towards a predetermined conclusion.

The image of the crossroads, this thesis argues, offers the illusion of choice while reasserting the necessity of progress. Likewise, a persuasive historical argument keeps the reader on track through all manner of signposts and summaries. Chapters are bookended with convenient reminders of where you are going and where you have been. Cross-references offer a reassuring sense of continuity, even as headings and subheadings divide the experience into easily digestible chunks. A preface or an introduction (like this one) enables the author to set the ground rules, to guard, as Hayden White points out, against the danger of 'misreading'.[79] And, of course, a thicket of footnotes proffer proof through the borrowed authority of established scholars.

As Judith Brett notes, when an inquiry is conducted within an empiricist or positivist framework, the 'role of language in shaping and probing reality is denied and all questions about style are avoided'.[80] Conversely, we might add, when we focus upon the nature of truth as constructed through our conceptions of science and progress, questions of style become critical. The challenge is not simply what to write, but how to write it. How do you find a style, a language, that preserves some space around the argument for interpretation and experience? How do you find a style that avoids drawing too heavily upon the power of certainty and yet remains, in some sense, persuasive— one that can make a difference even as it gives up any claim to inevitability,

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[79] Hayden White, *The content of the form: narrative discourse and historical representation*, Johns Hopkins University Press, Baltimore, 1987.

[80] Judith Brett, 'The bureaucratization of writing', *Meanjin*, vol. 50, no. 4, Summer 1991, p. 519.

to progress? This has proved the greatest challenge in preparing this thesis, particularly since academic orthodoxies tend to discourage experimentation with the thesis form.

In discussing the writing of environmental history, Tom Griffiths argues that humanities scholars 'need to advocate the distinctive skills of the storyteller, to defend the logic of poetry, and to champion narrative not just as a means, but a method, and a rigorous and demanding one'.[81] Of course, narrative can be as effective as argument in limiting our choices and interpretations. Founding myths of exploration and conquest are frequently mobilised against diversity and change. The story of Anzac retains its significance even as historians mount wave after wave of critique. But narrative is open to experimentation in ways that argument is not. Storytelling, after all, is everywhere— in film, in television, in literature and art, in the fabric of our lives and interactions. Few of the stories we encounter daily follow a strictly linear or progressive form: they are partial, fragmented, discontinuous, and sometimes contradictory. The variety and vigour of narrative forms offer opportunities to historians. For example, cinematic techniques such as 'flashbacks, cross-cutting, and the alternation of scene and story' can, Peter Burke suggests, 'help historians in their difficult task of revealing the relationship between events and structures and presenting multiple viewpoints'.[82] Such experiments with narrative offer the ability to play with the certainties of argument. They enable us to cross boundaries between disciplines, between author and audience— to inhabit a territory between certainty and doubt.

Andrew Cayton also encourages historians to experiment with narrative, even while warning that they are likely to provoke 'consternation, if not outright indignation, from colleagues who want books to convey argument and information predictably and efficiently'.[83] Cayton imagines a new synthesis, where argument is embedded within narrative, where the meaning of a series of distinct stories can be told not through

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81 Tom Griffiths, *Forests of ash*, Cambridge University Press, Melbourne, 2001, p. 194.
82 Peter Burke, 'History of events and the revival of narrative', in Peter Burke (ed.), *New perspectives on historical writing*, Polity Press, Cambridge, 1995, p. 246.
83 Andrew R L Cayton, 'Insufficient woe: sense and sensibility in writing nineteenth-century history', *Reviews in American History*, vol. 31, 2003, pp. 334-35.

signposts and synopses, but by 'the pattern they form when the reader steps back and sees them as a whole'.[84] It is the experience that matters.

While this thesis does not completely dispense with the convenience of signposts or the power of authorial commentary, the argument is intended to be embedded more than explicit. A series of interconnected stories are presented, but the chronology is rarely linear, and few resolutions are offered. Meaning is developed through sudden shifts in time and subject, through juxtaposition and contrast, through turns of reflexivity— an insistent exploration of irony. Instead of being merely analysed and rejected, the rhetoric of progress is enacted against a reality more complex, more meaningful, more human.

Experiments in historical narrative, Cayton suggests, also provide an opportunity to deal more honestly with the problem of emotion, to admit that historical actors are individuals who experience their world in a way more complex and personal than any conventional argument can allow. 'How many of us want to explore the idea that human beings sometimes do things that are inexplicable or illogical?', he asks, 'To do so would be to engage in history that is untidy at best, to deal with a past that cannot be shoehorned into seeping generalisations about underlying structures'.[85]

This thesis uses narrative to give its major characters some space to live their own lives, and not merely serve as the passive victims of argument. This is important, I believe, both as an act of good faith on the part of those of us who are to play with the lives of others, and because emotion and irrationality are frequently defined in opposition to science, as an obstacle to progress. Similarly, the characters, events, and institutions selected as the basis for the narrative are not expected to provide a potted history of Australian science— a catalogue of heroes and highlights. After all, it is against our understanding of progress that such judgements about significance are made. By focusing on events that came to no clear conclusion, on institutions whose achievements were problematic, on individuals whose relevance seems marginal, this

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[84] *ibid.*, p. 335.
[85] *ibid.*, p. 336.

thesis attempts to decentre the narrative, to stray from the expected course and challenge our very assumptions of significance and success.

Narrative enables us to restore to the people of the past the emotional complexity of their own experience. But it also allows us to engage with the emotions of our audience. If an argument is embedded within a series of stories, we cannot expect that a reader will be easily able to parrot its major points, to *know* exactly where they are supposed to be. However, we can hope that they will at least *feel* something. This thesis aims to communicate with its audience in a way that cannot be reduced to a series of dot points. Instead, it ventures upon a journey whose end-point might be found somewhere within the realm of emotion. It's the experience that matters.

The metaphor of the journey recurs even as I seek to challenge the spatiality of progress. But journeys need not be strictly linear, our end-points need not be fixed. Progress offers a single path, a simple solution— space is controlled, boundaries fixed, direction unwavering. This thesis attempts to travel a different space, where there is room for uncertainty, disagreement and interpretation. A journey that leaves open many of the questions it raises.

# 1 Turning points

In January 1948, Phyllis Nicholls stood at the crossroads. The signpost before her pointed one way to 'Progress' the other to 'Destruction'— it was time to choose. Such a weighty burden for a thirteen-year-old.

Phyllis was visiting the 'Herald Atomic Age and Industrial Exhibition' in Melbourne's Exhibition Building. Around her, according to the advertising blurb, was 'one of the most remarkable, vital and timely Exhibitions ever produced', depicting 'the whole amazing, challenging story of Atomic Energy'.[1] From alchemists to atom-smashers, the Atomic Age was displayed in miraculous detail. Phyllis, the *Sun* noted, was in 'Atomic Wonderland'.[2]

In the midst of this wonderland stood the crossroads signpost. The choice facing Phyllis was the choice confronting humankind. On one side of the exhibition a scale model of Hiroshima illustrated the destructive power of the atomic bomb. On the other side, displays highlighting the peaceful applications of atomic energy held out the promise of a cleaner, safer, and richer world. Which was it to be? The dawning of the Atomic Age had brought the world to a 'turning point', two paths stretched off into the future— it was time to choose.

For Phyllis the choice was easy. She had, the *Sun* report noted, already 'covered the path of destruction', and so she simply 'turned with hope to the road to progress'. But what about the rest of us? We have thus far avoided an apocalyptic demise, but neither have we discovered our atomic Shangri-la. What happened? Did we choose? The crossroads that confronted Phyllis was but one of a continuing parade of critical turning points and world-changing crises that punctuate modern life. In the choices that they offer is an image of what is possible, what is necessary— an image of the future.

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[1] *Herald*, 21 January 1948, p. 2.
[2] Phyllis's visit to the exhibition was described in an article headed 'Phyllis In Atomic Wonderland', *Sun*, 3 February 1948, p. 5.

Phyllis's dilemma provides us with a starting point from which we can begin to explore the way in which such choices are constructed. By examining the outlines of this 'new' age, we can ponder the fractures that separate past, present and future. By looking beyond the crossroads we can focus on the journey that carries us on. By following Phyllis around the Atomic Age exhibition, we can find our way into the more complex and challenging world of 'Atomic Wonderland'.

## Another chapter in the atomic story

Tom Hollway seemed destined for great things. Elected in 1947 as the youngest Premier of Victoria, he promised to champion the forces of free-enterprise and progress against socialist-style controls. 'Young Hollway' was someone to watch, argued *Hard Comment*, 'Australia is due to hear much of him in the career now opening'.[3] As the nation began to shrug off the lingering burdens of war, Tom Hollway stood upon the threshold of achievement.

Opening the 'Herald Atomic Age and Industrial Exhibition' in January 1948, Hollway pondered the pace of change and the challenge of the future. 'The atomic age was launched like a bolt from the blue', he noted, leaving the world 'aghast, awe-stricken and in wonderment'. A 'new chapter in the lives of the peoples of the world' had been opened by 'the stupendous possibilities of atomic energy'.[4] So much could change so quickly. Within four years Hollway would be stripped of his leadership and expelled from the Liberal Party. As science and technology thundered ahead, Hollway's political horizons contracted, his career suddenly came to a close.[5]

Change is one of the characteristic features of our modern world, but few changes have seemed so dramatic as those wrought by the atomic bomb. In one cataclysmic instant a new weapon was unleashed, the end of a long and terrible war was brought within reach, science revealed its unsuspected mastery of the sub-atomic world, and tens of

[3] 'Public Figures – Young Hollway', *Hard Comment*, vol. 1, no. 9, December 1947, p. 3.
[4] *Herald*, 22 January 1948, p. 3.
[5] See obituary, *Age*, 31 July 1971, p. 2.

thousands of Japanese civilians were incinerated. It was a beginning and an end, a 'bolt from the blue' that had 'hurled the world without warning' into a 'new era'.[6] Welcome to the 'Atomic Age'.

Even as a battle-wearied nation embraced the prospect of peace, the development of a horrific, war-winning weapon provoked solemn contemplation. But attention quickly turned to the expanded horizons of human existence and achievement. 'It may be that humanity stands on the threshold of scientific and economic possibilities of such a nature as to make the imagination reel', pondered the *Argus*.[7] 'Behind the smoke and the ruin of Hiroshima', suggested another, 'may lie the picture and plan of a happier life in a saner world'.[8] 'Revolutions' seemed imminent in power, in industry, in all aspects of daily life. A new age promised a new world.

This sense of 'newness' was central to the experience of the Atomic Age. 'The whole thing is so new, so novel, so entirely different from anything that we have had that it would be absurd to speculate any further', commented the zoologist WJ Dakin, shortly after the news from Hiroshima.[9] A year later, AD Ross told the physics section of the ANZAAS congress: 'The era of atomic energy will see great changes. Old ideas and old methods will be swept aside. We must be ready to adopt and develop new principles and new means'.[10] 'The atomic bomb', Clem Christesen wrote in *Meanjin*, has 'severed the old world from the new with guillotine-like decisiveness'.[11]

Such unyielding novelty threatened to overwhelm the 'man-in-the-street', baffled by science, and intimidated by the power of technology. To counter this threat, the Melbourne *Herald*, the Brisbane *Courier Mail*, and the Sydney *Daily Telegraph* combined to import from London, 'the world's first exhibition to tell the full story of the Atomic Age

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6 *Age*, 29 May 1946, p. 2.
7 'A miracle of science', *Argus*, 8 August 1945, p. 2.
8 'Atom bomb is fruit of long years of research', *SMH*, 8 August 1945, p. 2.
9 Quoted in 'Atom bomb is fruit of long years of research', *SMH*, 8 August 1945, p. 2.
10 AD Ross, 'Physical science in the post-war world', *Report of the 25th meeting of the Australian and New Zealand Association for the Advancement of Science*, Adelaide, 1946, p. 20.
11 Clem Christesen, 'Editorial', *Meanjin Papers*, vol. 4, no. 3, Spring 1945, p. 149.

in a way everyone can understand'.[12] The 'Atomic Age Exhibition' premiered at the Brisbane Royal Show in August 1947 before travelling to Sydney and Melbourne.[13] The 'atomic-ignoramus' was promised 'a one-hour course in atoms and atomic energy', capped off by a 'vista of the atomic world of tomorrow'.[14] It was 'something everybody should see': 'You owe it to yourself, to your children, and to civilisation... '[15]

The bombs that 'changed the course of history' featured prominently, even though the exhibition deliberately sought to highlight 'the constructive possibilities of atomic power'.[16] But alongside the epochal events of recent times was presented a story that reached back into the dark ages. The 'black magic' of uranium separation was presented alongside a model of a 'medieval alchemist's den'.[17] The quest for transmutation of elements was traced from its mystical beginnings through to the work of Rutherford and the Cavendish Laboratory. A series of models and montages led 'logically on through the atomic story, from first principles to ultimate applications'.[18] This new age had a history.

The exhibition was divided into three main sections: the 'science behind the atomic bomb'; the effects of the five bombs exploded thus far; and the 'immediate and future possibilities' for the constructive use of atomic energy. The *Daily Telegraph* described these as the 'three phases of the Atomic Age'— the past, the present and the future.[19] Visitors were not simply confronted with the wonders and horrors of this new age, they journeyed through 'the story of the atom'. From a mere twinkle in an alchemist's eye, to the beneficent servant of man, they watched the atom grow up.

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12 *Courier Mail*, 29 July 1947, p. 1.

13 The exhibition was displayed at the Exhibition Buildings in Melbourne from January to February 1948, and then in Sydney at the Royal Easter Show, March 1948.

14 Robert J. Gilmore, 'The mighty atom – and what it means to you', *Herald*, 21 January 1948, p. 4.

15 *Daily Telegraph*, 21 March 1948, p. 2; advertisement in *Herald*, 20 January 1948, p. 7.

16 *The Herald Atomic Age and Industrial Exhibition*, Herald & Weekly Times, Meboume, 1948, p. 50; *Herald*, 3 January 1948, p. 1.

17 Gilmore, 'The mighty atom'; for a picture of the 'alchemist's den' see *Courier Mail*, 11 August 1947, p. 5.

18 *Herald*, 3 January 1948, p. 1.

19 *Daily Telegraph*, 11 March 1948, p. 9.

To bolster the exhibition's educative effect, the *Herald* published a 'souvenir booklet' recounting 'the story of the atom' in explicit detail. The atom's life history was presented as part of an 'age-old story of man's groping for new power'-the 'story of human civilisation'. It was a 'long story', the booklet remarked, a story in which the Atomic Age had 'opened a new chapter'.[20] This was not the end, of course, for the atom story remained unfinished. The 'world's best brains' would 'pick up the narrative', and the 'next chapter should be one of superb achievement'.[21] The dramatic newness of the Atomic Age was but a milestone marking the course of a familiar journey. 'Such is the march of man's progress', explained the *Argus*.[22]

Like the Iron Age or the Stone Age, the Atomic Age could be regarded as yet another phase in the development of human civilisation, another chapter in the story of progress. The release of atomic energy, AD Ross argued, 'may probably rank with the discovery of fire as the most momentous in the history of mankind'.[23] His South Australian colleague, Kerr Grant, agreed, arguing that the use of the atomic bomb marked 'an epoch in human history as definitely as does the first occasion, far in the prehistoric age, on which fire was first produced and controlled by human agency'.[24] Both sought to place this revolutionary moment within the continuing saga of scientific progress. This 'bolt from the blue' was in fact the 'climax of a long series of laborious researches', a product of humankind's unquenchable curiosity.[25]

'Ever since man in his primitive state began delving into Nature's mysteries', the *Argus* noted, 'the quest for knowledge has continued. And because his mind is what it is, the quest will not finish until his course upon this earth has been completed'.[26] Unfortunately, the coming of the Atomic Age also signaled that the course of

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20 Kim Keane, 'The story of the atom', *The Herald Atomic Age and Industrial Exhibition*, Herald & Weekly Times, Melbourne, 1948, pp. 6-9.
21 *ibid.* p. 48.
22 *Argus*, 8 August 1946, p. 2.
23 Ross, 'Physical science in the post-war world', p. 14.
24 Kerr Grant, 'Historical, scientific and technical aspects of atomic energy', in Kerr Grant and GV Portus (eds), *The Atomic Age*, United Nations Association, SA Division, Adelaide, 1946, p. 1.
25 Ross, 'Physical science in the post-war world', p. 14.
26 *Argus*, 1 July 1946, p. 2.

civilisation might be completed rather sooner than previously imagined. If atomic energy could not be controlled, if war could not be banished, then the world may indeed have reached the final chapter-end of story. Civilisation was at a 'turning-point', 'a crossroads signpost in the history of human existence'.[27]

The 'Herald Atomic Age and Industrial Exhibition' was intended both 'as a lesson and a warning'.[28] The structure of the exhibition encouraged visitors to contemplate the constructive possibilities of atomic energy, but offered 'a terrifyingly realistic side-glance into the atomic horror chamber'.[29] In the middle stood the crossroads, metaphor made exhibition prop. If the message was not clear enough, newsreels in the attached theatrette showed footage of the US atom bomb tests at Bikini Atoll— 'Operation Crossroads'. 'Science has given us an incalculable new force in atomic energy', the newsreel began, 'It is the responsibility of us all to see that it is used to benefit man-not used for his destruction... OURS IS THE CHOICE'.[30]

The crossroads imagined the world at a unique point in history marked by the development of the atomic bomb, but the urgency of the choice came from the momentum of scientific discovery, from the continued unrolling of the atomic story. The crossroads represented both turning point and journey, both new challenges and ancient quests. It was, the *Herald* argued, 'an old issue... restated now in terms which cannot be ignored'. 'We either bring our moral values into line with our scientific skill, or we admit ourselves beaten'— this was 'the one simple and inescapable condition of progress'.[31]

The opening of the Atomic Age was not represented by the exhibition's scale model of Hiroshima, but by a diorama portraying a scene in the New Mexico desert. There, at the 'Trinity' test site, the world's first atomic bomb was exploded. Tiny model scientists watch in awe as a massive fireball lights up the horizon. And there, emerging from the

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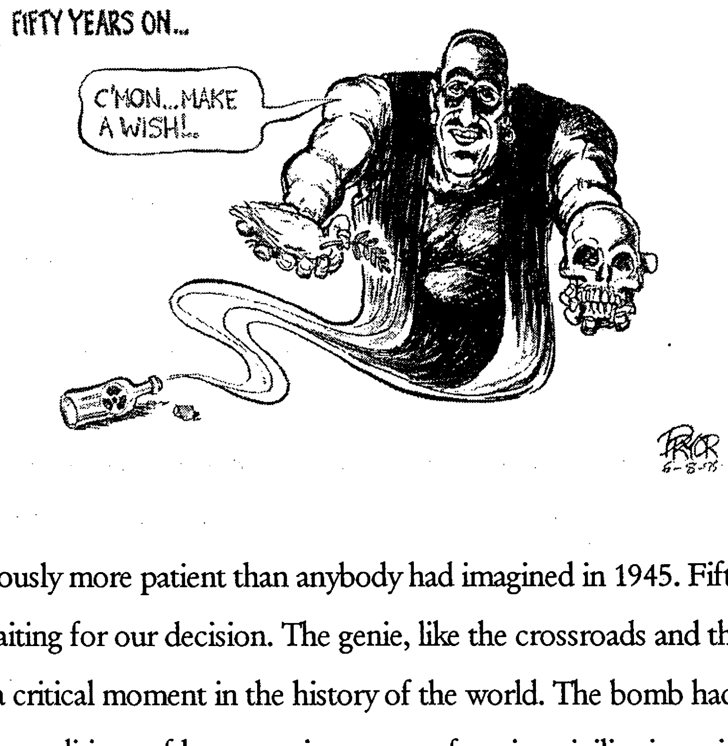
27 *SMH*, 8 August 1945, p. 2; Christesen, 'Editorial'.
28 Gilmore, 'The mighty atom'.
29 *ibid.*
30 The newsreel is available as Pathe newsreel, 'Experiment with death', Screensound: title no. 1070.
31 *Herald*, 17 January 1948, p. 4.

billowing clouds, a huge, threatening figure.[32] The same figure, hands poised portentously, electrons whizzing round his head like bushflies, adorned the cover of the souvenir booklet. He was another representation of the scientific journey that had brought humankind to this testing moment. Would his power be used for good or evil? There was no avoiding the question, there was no turning back. The atomic genie was out of the bottle.

## The crossroads of destiny

In August 1995, exactly half a century after the destruction of Hiroshima, the *Canberra Times* published a cartoon entitled 'Fifty years on'.[33] The cartoon shows a large, muscular genie emerging from a bottle labelled with the now familiar symbol for radioactivity. In one hand he holds a dove, in the other a skull, a death's head. 'C'mon make a wish!', he demands of us. Fifty years on...




The atomic genie was obviously more patient than anybody had imagined in 1945. Fifty years on and he was still waiting for our decision. The genie, like the crossroads and the turning point, symbolised a critical moment in the history of the world. The bomb had fundamentally changed the conditions of human existence, confronting civilisation with an urgent and inescapable choice. And yet, the moment itself seemed impossible to grasp. Rather than being anchored in 1945, it hopped and jumped from year to year, constantly renewing its sense of urgency, and reasserting its challenge to humankind.

[32] Gilmore, 'The mighty atom'; for a picture of the diorama, see *Courier Mail*, 11 August 1947, p. 5.
[33] *Canberra Times*, 6 August 1995, p. 8.

On the Sunday following the first use of the atomic bomb, the Rev. Dr Clifford Norman Button addressed his Ballarat congregation on the implications of this new weapon. Although it seemed 'too awful to contemplate', the bomb raised 'long range questions' about the future of humanity— questions that could not be ignored.[34] 'We have to learn to come to some sort of terms with the painful things of life', Button noted, 'if we would grow up'.[35] Described by the *Bulletin* as 'an argumentative little cleric with a pugnacious jaw', Button was always ready to take up the fight against privilege or hypocrisy.[36] But the bomb posed a different challenge. 'Humanity is at the cross-roads', he warned his congregation, 'This is a turning point in history, perhaps the most solemn turning point of all history'.[37]

Science itself wasn't the problem. Button expressed a keen layman's interest in physics, and his efforts to open Presbyterian teaching to scientific analysis had marked him out as a modernist.[38] The 'facts and forces of nature' that made the bomb possible were, Button argued, '*God's facts*, and *God's forces*'. The question was whether scientific progress could be matched by 'moral and spiritual progress'. Like many others grappling with the implications of the bomb, Button recalled God's challenge to Israel: 'I have set before you life and death, blessing and cursing; therefore choose life, that both thou and thy seed may live'.[39] The bomb was a test— if humankind was to survive, it had to learn to use God's gifts with wisdom and humility.

But this was not the first time that the world had faced such a choice. 'There have been many turning-points in history before', Button admitted, 'There has been a turning-point whenever there has been a great new invention or discovery'. Gunpowder, steam power, the aeroplane, the wireless, each had 'radically changed the life and habits of mankind', and each had been 'used both to bless and to curse'. So far humanity had failed to heed the crossroads challenge. Turning point after turning point had been

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34 CN Button, *God, Man, and The Bomb*, St Andrews Kirk, Ballarat, 1945, p. 3.
35 *ibid.*, p. 12
36 Patrick Weller, *Dodging raindrops – John Button: A Labor life*, Allen & Unwin, Sydney, 1999, pp. 9, 13.
37 Button, *God, Man, and The Bomb*, p. 8.
38 Weller, *Dodging raindrops*, p. 5.
39 Deuteronomy 30:19-20, quoted in Button, *God, Man, and The Bomb*, p. 1.

ignored; civilisation had continued upon the same doomed path, exploiting the bounties of science both for life and for death. But no more. With the coming of the bomb, God's challenge had been restated, it seemed 'for the last time'. The choice could no longer be avoided, humanity could not continue upon its thoughtless, middling way: 'It is one or the other now, life or death, blessing or cursing'.[40]

For the last time? The bomb represented the dramatic conclusion to humanity's secular ambitions. An age old story had taken a final unexpected twist. 'Steady!', exhorted Button in conclusion, 'The end of humanity is not yet! By God's grace it may be a new beginning!'[41] It was a denouement inspired by the bomb's radical break with the past, a new age demanded new solutions. The world had changed, hearts and souls must follow. But how new was the new? Postwar planners had begun charting the outlines of a 'new social order' long before the news from Hiroshima.[42] In 1937, Button himself contributed to a pamphlet entitled *The Church and the New Era* which outlined the challenges facing the church at a time when 'radical changes are taking place with alarming rapidity'.[43] 'We are entering into a new period of history', the pamphlet argued, 'the Christian Church faces to-day a greater menace than any which has assailed her during the last four centuries'.[44] Five years later, at a time that had 'no precedent in our national history', Button asked 'Whither Australia?' 'The plans of the new world that is to be', he insisted, 'are not to be found in Westminster or in Washington or in Canberra. They are laid up in heaven... '.[45] The feeling of rapid change, the sense that the present was somehow unprecedented, these were already regarded as characteristic of modern life. The bomb was an emblem, not an engine of this transformation.

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[40] Button, *God, Man, and The Bomb*, pp. 8-9.
[41] *ibid.*, p. 16.
[42] See chapter 3
[43] C N Button, Hector Maclean, JT Lawton, AT McNaughton, and HC Matthew, *The Church and the new era*, Presbyterian Church of Australia, Melbourne, 1937, p. 7.
[44] *ibid.*
[45] C N Button, *Whither Australia? An address delivered at the opneing of the General Assembly of the Presbyterian Church of Victoria, Monday 4th May 1942*, Waller & Chester, Ballarat, 1942, p. 11.

For the last time? Norman Button died suddenly in June 1950, mourned by his friend Tom Hollway, as 'a man of high ideals'.[46] Only months before his death came confirmation that the US was pushing ahead with the development of a new, even more terrifying weapon. Nine years after Button's address on the implications of Hiroshima, Canon EJ Davidson spoke to a packed Sydney Town Hall on the 'challenge of the hydrogen bomb'. 'Our civilization stands at the point of decision', he gravely proclaimed, either 'it meets, accepts and answers the challenge to use the power God has given it through science in the spirit of humility and service; or it follows other civilizations into the dust of oblivion'.[47] Another crisis, another last chance, another turning point to ignore.

How many such points have punctuated our journey since the dawn of the Atomic Age? How many dividing lines have we crossed? How many crises have demanded our urgent attention? And yet the challenges just keep coming— cold war, nuclear arms race, pollution, overpopulation, computerisation, gene technology, global warming, terrorism, globalisation— crossroad signposts sprouting at each footfall of history.

In 1982, Nobel prizewinning biologist, Macfarlane Burnet, reflected upon the 'challenge to Australia' wrought by modern science. In an article headed 'Mankind at the crossroads... ', he argued that the 'present and pending crises' confronting the world were 'utterly different from anything previously experienced by the human species'.[48] Try scanning the daily media, or the titles in a bookshop. 'We are at a turning point', notes the back cover blurb of a book on climate change.[49] 'The world has changed' proclaim media commentators in the aftermath of devastating terrorist attacks on the USA.[50] It is a 'turning point in history', one letter writer argues, 'the United States has

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[46] Hollway was a member of Button's congregation, and was married by him. See Weller, *Dodging raindrops*, p. 13.
[47] Canon EJ Davidson, 'Challenge to human nature', *Voice*, vol. 3, no. 7, April 1954, p. 19. See chapter 6 for more on this meeting.
[48] Frank Macfarlane Burnet, 'Mankind at the crossroads...', *Australian*, 19 May 1982, p. 7.
[49] Clive Hamilton, *Running from the storm: the development of climate change policy in Australia*, UNSW Press, Sydney, 2001, back cover.
[50] See, for example, *Herald Sun*, 24 September 2001, p. 18.

two paths it can take', it can 'lead us into a new era of peace or hell'.[51] We are, a recent work on postmodern theory suggests, 'currently at a crucial crossroads where the "fate of the Earth" hangs in the balance'.[52]

The belief that there are key moments, turning points, when destiny can be seized, when a different path can be taken, has offered inspiration to an army of revolutionaries and a plethora of self-help books. But somewhere amidst the headlines and the cliches is an attempt to grapple with the nature of change. Crossroads and turning points are an expression of hope, a pause amidst the overwhelming onslaught of the future. Caught in the swell of history we seize upon fractures and crises as evidence that things can be, must be, different. Button imagined a chastened humanity renewing its relationship with God. For Clem Christensen, the fall of the 'guillotine' had created a world in which the creative artist was invested with new powers and responsibilities.[53] Others believed that the bomb would bring an end to war, that national sovereignty itself would wither in a new era of international cooperation.[54] For all its terrors, the atomic crossroads offered the chance to create a better world.

So what happened? Why didn't we? Why do we continue to layer crossroads upon crossroads, imagining each new turning point to be the most urgent, the most significant, the most far reaching? Why does every generation imagine itself on the threshold of a new age?[55] Part of the answer may lie in modernism's oft-quoted fascination with the new. Old crises, like old ideas, last year's fashions and superseded computers, are regularly discarded and replaced by something more up-to-date. But our understanding of what is 'new' is itself part of the broader play of time. Elizabeth Eisenstein suggests that our recurrent sense of discontinuity is a product of 'history-

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[51] Anastasis Paltoglou, Letter to the editor, *Australian*, 14 September 2001, p. 18.
[52] Steven Best, and Douglas Kellner, *The postmodern adventure: science, technology, and cultural studies at the Third Millennium*, Guilford Press, New York, 2001, p. 274.
[53] Christesen, 'Editorial'. See also Lynne Strahan, *Just city and the mirrors: Meanjin Quarterly and the intellectual front, 1940-1965*, Oxford University Press, Melbourne, 1984, pp. 117-8.
[54] See chapter 6.
[55] Such feelings, writes Elizabeth Eisenstein, have 'been manifested by each generation in turn for over one hundred and fifty years', Elizabeth L Eisenstein, 'Clio and Chronos: An essay on the making and breaking of history-book time', *History and Theory*, vol. 5, Beiheft 6, p. 58.

book time'.[56] We assign the past to a series of sequential chapters, only to have the narrative break off at the 'most personally significant, densely packed, fact-crowded final chapter'.[57] We appear on the scene as the story ends, 'previous experience offers no sure guide' as we venture upon unknown territory: 'each generation discovers that earlier turning points have failed to turn after all, while remaining convinced that the *real* "great divide"... is occurring in its own day and age'.[58]

But even as we close the past behind us, we seek to extend the reach of the present. The modern conception of progress demands an 'open horizon', an empty future into which our treasures and achievements can be unpacked, our maps unfurled.[59] We annex the future as the storehouse of our security, our guarantee of continuity.[60] Every new turning point extracts an event from history's morass of contingency, and pushes it out into the open fields beyond. Existence is imagined as a problem whose solution lies somewhere in the future— in an 'extended present' that demands action but dissolves responsibility.[61] Continuities are lost as the conflicts and complexities of human society are compressed into a single critical moment that looms suddenly in our path. Aha! A crossroads! The journey is always onwards, the challenge is always ahead. The critical moment always exists slightly beyond reach, just the other side of now.

And so here we stand on threshold of a new book. A revolutionary analysis perhaps, one that will change the way you think about the world; a turning point in our understanding of the Atomic Age; an end to illusion and myth! At last, the final chapter of the atomic story! 'Why is it', asks Bernard Yack, 'that contemporary intellectuals cannot uncover a new or hidden development without declaring the coming of a new epoch in human history?'[62] Just as Norman Button sought to convey to his parishioners

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56 Eisenstein, 'Clio and Chronos'.
57 *ibid.*, p. 59.
58 *ibid.*, p. 60.
59 Helga Nowotny, *Time: the modern and postmodern experience*, Polity Press, Cambridge, 1994, p. 48.
60 Barbara Adam, *Time and social theory*, Polity Press, Cambridge, 1990, p. 138-40.
61 *ibid.*, p. 140-1.
62 Bernard Yack, *The fetishism of modernities: epochal self-consciousness in contemporary social and political thought*, University of Notre Dame Press, Notre Dame, Indiana, 1997, p. 138.

the crucial significance of their own moment in history, so, it seems, we still try to convince ourselves that there is something fundamentally different about our own times, our own thoughts, our own possibilities. Just as Button looked back across the divide that marked the beginning of a new age, so we can conceive of him and his audience only on the other side of a break in history— the world is different, we have moved on. We are separated not simply by time, but by the assumption of change, by the very idea of the 'new'.

The meaning of the Atomic Age lies not merely in the bomb, or our reactions to it, but in the way we grapple with change. We are linked with Button in an ongoing struggle to reconcile hope with inevitability, to find a timescale for action, to make our own destiny. Instead of focusing on the crossroads, perhaps we should explore the nature of the journey— this thing we call progress.

## The whoosh that killed 92,000

The centrepiece of the Atomic Age Exhibition was a 265 square foot diorama depicting the destruction of Hiroshima. Hanging above a reconstruction of the ruined city was a model of the atomic bomb, its workings revealed in cross-section. At regular intervals, the bomb whirred into life, and a recorded voice began to describe the events of 6 August 1945: 'At 8.20am, when the 250,000 people of Hiroshima were beginning their work, the bomb was dropped... in a mighty flash brighter than the sun... the uranium in the bomb changed from a small cold lump of metal to a mass of swelling gas millions of degrees hot... The heart of the city vaporized. Ninety-two thousand men, women and children were killed'. A ring of lights flashed on the model city, indicating the area that had suffered 'almost 100 per cent devastation'.[63] It was, one writer enthused, an 'amazingly lifelike table model', showing everything from the triggering of the bomb, to the final 'whoosh that killed 92,000'.[64]

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[63] *Courier Mail*, 2 August 1947, p. 3.
[64] *Herald*, 21 January 1948, p. 4.

A number of articles commented on the accuracy of the diorama, describing it as 'convincing and authentic', and noting that it was constructed using 'data from official photographs and reports'.[65] Even the New South Wales State Governor, Lieutenant-General Northcott, a 'keen student of atomic warfare', was enlisted to provide his expert opinion. Recalling a visit to Hiroshima in 1946, Northcott declared the model to be 'extraordinarily accurate'.[66] Emphasis on the accuracy of the model, and the 'scientific' credentials of the exhibition as a whole, reinforced the message that this was a serious, educational effort. 'To-day's world is in desperate need of an understanding of what atomic energy is capable of doing', commented the Brisbane *Courier-Mail*, 'We must educate ourselves'.[67]

Not only adults, but children needed to be equipped to deal with the demands of this new age. Publicity efforts often focused on visits by young people and school groups.[68] Phyllis's journey through 'Atomic Wonderland' was chronicled by the *Sun* as evidence of the exhibition's suitability for a young audience. The 'story of the atom', Phyllis affirmed, was 'easily understandable to a child'.[69] The *Herald* offered additional incentives to young visitors, organising an essay competition for 'atom-minded schoolchildren'. For a chance to win a trip to Mount Buffalo or a Healing portable radio, children were invited to ponder the topic, 'What the atom means to me'.[70]

Unsurprisingly perhaps, competition winners proved proficient at mouthing accepted atomic aphorisms. 'I am 10 years old and have been told that I am growing up in the Atomic Age', wrote Julian Napper, 'What will the Atomic Age mean? Will it mean a world of war or will it mean a world of ease and peace?' Ian Robertson won a bicycle for his essay which concluded: 'Actually "What the Atom Means to Me" could be summed up by the words— peace and progress, or destruction'.[71] Their responses seem

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65 *ibid.*; *Courier Mail*, 2 August 1947, p. 3.
66 *Daily Telegraph*, 31 March 1948, p. 8.
67 *Courier-Mail*, 9 August 1947, p. 2.
68 For example: 'Students see Atomic Age', *Courier Mail*, 20 August 1948, p. 5; 'Children throng atom show', *Herald*, 3 February 1948, p. 5; 'School parties visit atomic exhibition', *Herald*, 5 February 1948, p. 5.
69 *Sun*, 3 February 1948, p. 5.
70 *Herald*, 31 January 1948, p. 5.
71 *Herald*, 26 February 1948, p. 7.

as artificial as the Hiroshima model, as safe and well-managed as Phyllis's crossroads epiphany. Did Phyllis even pause as she raced between the model of Hiroshima and the ticking geiger counter? Did she notice the signpost? Did she care?

Phyllis's crossroads choice was a journalistic invention, a moment fashioned to fit the story, and yet the journey beyond was real enough. Like the competition winners, she *was* 'growing up in the Atomic Age'. What was it like? How do they remember it? If Julian or Ian found a copy of their essays amongst the family archives, how would they feel— embarrassed, nostalgic, amused? The idea of a scale model conveying, with a whoosh, Hiroshima's horrifying fate seems almost quaintly naïve. But it also fits our expectations of the Atomic Age as an era that can somehow be defined by the absurdities of 'duck and cover', or by the rampaging radioactive monsters that menaced B-grade movie audiences. It is a world both bizarre and familiar, a cultural theme park whose alarming innocence only serves to reassure us of our own sophistication. We recognise the films and the fashions, but do we recognise the people?

The Atomic Age Exhibition toured Australia in 1947 and 1948, and yet it somehow seems to be a very fifties phenomenon. Historical periods always tend to be a bit blurry about the edges, but the exhibition's assumption of progress and its overwhelming faith in the power of science and technology seem close to the core of fifties culture. This sort of temporal fuzziness is a result of the way we organise and deploy the past. As John Murphy argues, 'the Fifties' is no longer merely a decade, 'it is an adjective'. 'The Fifties' provides contemporary critics with a convenient metaphor for all that is 'bland, suburban, unimaginative, repressed, intolerant and complacent'. At the same time it signals 'our distance from what we imagine the fifties to represent'.[72] Both 'the Fifties' and the 'Atomic Age' embody a sense of uncritical naivete that we imagine ourselves to have outgrown. But this feeling of superiority comes at a cost, it results in 'one-dimensional history' which drains the past of its complexity, and robs its inhabitants of

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[72] John Murphy, *Imagining the fifties: private sentiment and political culture in Menzies' Australia*, UNSW Press, Sydney, 2000, p. 2.

their humanity.[73] Instead of trading in easy adjectives, Murphy suggests that 'we need to recollect the contingent and often fragile ways in which people built their lives'.[74]

What was Ian thinking when he sat down to write his essay? It's easy to read his parroting of the exhibition's rhetoric as evidence of an uncritical acceptance of the 'progress versus destruction' story, but perhaps he just wanted the bike. Ian had his own hopes, his own benchmarks of success, and was presumably just as capable of understanding the expectations of the competition's organisers as we are. Once we begin to assume that labels such as the fifties or the Atomic Age represent 'an expressive unity', it is easy to lose sight of individual motivations, to find in the personal and particular merely examples of an age.

Barraged by increasingly graphic images of destruction, both real and imagined, it is difficult for us to believe that anyone could have considered the Hiroshima model to be 'realistic' or 'lifelike'. A ring of lights embedded in a scale model of Hiroshima seems a ridiculously inadequate means of representing the power of the atomic bomb. Whoosh! But as audiences struggled with the possibility of atomic war, such devices might have offered a fleeting connection between the experience of Hiroshima and their own fears for the future. Immediately after the first atomic attack, newspapers attempted to translate the scale of devastation into more familiar terms. The *Herald* placed the unsuspecting town of Swan Hill at ground zero, and illustrated the extent of the bomb's effects with a large ring superimposed on a map of Victoria. 'Houses 200 miles away would feel the blast', it noted.[75] The following day it calculated how much of Melbourne would be 'wiped out' by a bomb dropped on the Exhibition Building.[76] Such images and calculations would have been familiar to many of those who visited the Atomic Age exhibition. 'One atomic bomb dropped on Sydney would exterminate all life and destroy all buildings in a broad track from Botany Bay to Circular Quay', noted a preview in the

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73 *ibid.*
74 *ibid.*, p. 222.
75 *Herald*, 7 August 1945, p. 1.
76 *Herald*, 8 August 1945, p. 1.

*Daily Telegraph*.[77] For all its supposed scientific accuracy, the Hiroshima model was also a 'warning'. A simple ring of lights could help convey the message— today Hiroshima, tomorrow... Sydney or Melbourne?

Only a few years before the Atomic Age Exhibition hit town, Australia had been under attack. The experience of war was still strong in memory. How many visitors to the exhibition had witnessed its horrors first hand? How many had lost loved ones in the fighting? And now, as young families sought to rebuild their lives, what did that simple ring of lights say to them about their future, their children's future? The newness of the Atomic Age did not wash away memories, it did not obliterate the past. Standing at the crossroads, what would 'progress' have meant to someone who little more than a decade earlier had been thrown out of work during the Depression? And what images of 'destruction' would the signpost have conjured before a former POW, a grieving widow, or a refugee from the Holocaust?

The Hiroshima diorama enabled visitors to view the bombing as if they were 'flying above' the pain and devastation.[78] But a nearby theatrette offered a less comfortable perspective. Here, courtesy of a captured Japanese film, visitors were invited to 'walk through the streets' of the ruined city, surveying the 'razed buildings' and 'crumpled masonry' and observing the 'effects of the bomb flash on survivors'.[79] We must make the same transition. Flying along in the comfort of 21st century sophistication, we observe the past from a distance, far, far below. From this distance it is easy to generalise, to attach labels that lump together a range of experiences as if they represent some coherent totality. But the people are invisible. 'We disempower the people of the past when we rob them of their present moments', writes Greg Dening, 'We dehumanise them, make them our puppets'.[80] If we want to avoid merely confirming our own assumptions about the Atomic Age, we have to find a way to walk the streets.

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[77] *Daily Telegraph*, 14 March 1948, p. 6.
[78] *Daily Telegraph*, 19 March 1948, p. 9.
[79] *ibid*; see also 'Jap film for atom age show', *Courier-Mail*, 5 August 1947, p. 3.
[80] Greg Dening, *Performances*, Melbourne University Press, Melbourne, 1996, p. 204.

Restoring to the past its own present is a task that demands empathy and imagination, but it also challenges us to consider the nature of the distances across which our imagination must work. We are forced into the effort of recovery by the feeling that we have moved on, that our journey has carried us away. The past is behind us, separated from our own experience by an ever-widening gap. Time begets distance.

The development of the mechanical clock heralded a change in perception.[81] From the sixteenth century onwards, improvements in time-keeping technology meant that time could be divided, and divided again. The rhythms and cycles of daily life began to be plotted on a grid of hours, minutes and seconds. Existence was reduced to a series of moments, each adding to the flow of history, but each representing a break, a birth, something new. Each tick of the clock added another chapter to the story of civilisation.

But if the present was created through the accumulation of moments, then so was the past. It became possible to measure the distance between present and past events just as it was possible to locate lines of latitude on the surface of the globe.[82] Events had an order, a chronology. Enlightenment thinkers, chafing under the oppressive authority of the ancients, could point to the vast gulf in time that separated them. The imminence of ancient philosophies faded across the accumulation of years. Moreover, the ticking of the clock signalled a break between old and new: the past was dismissed as time used up, while the present was welcomed as the realm of creative action. The modern mind created a space for itself in time.

Accumulated time proved a powerful tool, not only could the past be set at a distance, but the future could be brought within reach. Moment by moment the future became the present. Each tick of the clock brought the prospect of something better, a dream realised, a hope fulfilled. The possibilities of existence ballooned outwards as the future

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[81] Samuel L Macey, *Patriarchs of time: dualism in Saturn-Cronos, Father Time, the Watchmaker God, and Father Christmas*, University of Georgia Press, Athens, Georgia, 1987, ch. 4; Graeme Davison, *The unforgiving minute: how Australia learned to tell the time*, Oxford University Press, Melbourne, 1993, pp. 7-9; GJ Whitrow, *Time in history: views of time from prehistory to the present day*, Oxford University Press, Oxford, 1988, chs 8 & 9. For the continuing influence of 'clock time' see, Barbara Adam, 'Modern times: the technology connection and its implications for social theory', *Time & Society*, vol. 1, no. 2, 1992, pp. 175-91.

[82] Samuel L Macey, *The dynamics of progress*, University of Georgia Press, Athens, Georgia, 1989, p. 46-7.

became the receptacle for humanity's ambitions. The future was now a destination, and time was a journey of improvement. What was this journey called? A word which had previously applied to movement through space was borrowed to fill the metaphorical void, and so this journey became known as progress.[83]

The language of space shapes the modern conception of time. Once we begin to imagine ourselves on a journey, distance and direction become the measure of experience. Happiness and success are promised to those who put the past behind them, and turn to face the future. Challenges come in the guise of crossroads and turning points, but there can be no turning back. Time marches on. Perhaps we do not so readily assume that this journey amounts to progress, but for all our heightened postmodern sensibilities we continue to enjoy the feeling that our distance from the past is a measure of our own sophistication. 'Everyone, it seems, still wants to ride the wave of history', writes Bernard Yack, 'Never mind the fact that the very idea that history flows in a single direction is a manifestation of precisely the kind of unchastened, unreflective modern thinking that so many contemporary intellectuals explicitly reject'.[84]

Progress separates us from the past both by totting up the mileage on our supposed journeys, and by offering each generation a sense of their own uniqueness— perching them on yet another fracture between the old world and the new. Progress is expressed through accumulation and disjunction, by finding amidst the parade of inevitability, a sudden break, a new beginning.[85] The practice of history is complicit in this process, born of the same time-keeping prejudices. Through the diligent efforts of historians, moments are corralled into a succession of 'ages', or 'periods', interspersed with 'revolutions' and 'crises'. Continuity and change provide the two frames of analysis through which the historian measures moment against moment, age against age.

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83 Macey, *Patriarchs of time*, pp. 72-3; Macey, *The dynamics of progress*, p. 41.
84 Yack, *Fetishism of modernities*, p. 138.
85 Deborah Bird Rose, 'Hard times: an Australian study', in Klaus Neumann, Nicholas Thomas and Hilary Ericksen (eds), *Quicksands: foundational histories in Australia and Aotearoa New Zealand*, UNSW Press, Sydney, 1999, p. 6.

Historians are confronted always with the temptations of inevitability, with the easy pleasures of the starting point.

The challenge is to develop empathy and understanding across the distances and disjunctions; to question our starting points, the temporal frameworks that define our position and direction; to imagine journeys that do not simply move from past to present, but intertwine them in a way that enriches our understanding of both. Beginnings and ends need not determine the limits of our enquiries, nor our hopes.

The Atomic Age did not burst into being at Hiroshima or Almagordo. There was no point of detonation when the components of the new world came together to achieve critical mass— Flash! Boom! The newness of the bomb was not forged in an instant, but has been regularly reimagined and reasserted. It has appeared in the rallying cries of anti-nuclear activists, in the strategies of military analysts, and in the theorising of cultural critics. And so, this is a history of the Atomic Age in Australia that ranges across time from 1901 to 2003. This is a history of the Atomic Age in which the bomb is consigned to the role of supporting player, providing neither beginning nor end, cause nor explanation. This is an exploration of contested ground where science battles ignorance, where nation confronts fear, where freedom is locked in a bitter struggle with control. The origins of the Atomic Age can be discovered just as readily in our own attitudes to time, progress, science and society, as they can in the research of nuclear physicists in the 1930s and 1940s. There is no safe distance from which we can observe the foolishness of the past.

## Journeys in atomic wonderland

In 1980, the prizes at my school speech night were awarded by the eminent nuclear physicist, Sir Ernest Titterton. 'On these occasions I like to use the opportunity to say positive things rather than the usual generalities', Titterton wrote to the school's principal some months before the event.[86] Titterton was, of course, well known as one of the country's most outspoken advocates of nuclear energy, so it came as no surprise that his speech argued for the necessity of nuclear power to take over from dwindling fossil fuel reserves. Alternative sources of energy were 'unproved', he maintained, and in any case, 'governments planning the future of nations cannot gamble on *possibilities*, they must bank on *certainties*'.[87] I was annoyed, but not brave enough to wear my 'solar not nuclear' badge. I shook his hand, and took my prize.

It would be convenient to imagine that my encounter with Ernest Titterton represented a turning point in my life, that the journey begun that day ends now on these pages, with these words. Certainly Titterton inspired my first interest in the Atomic Age. In 1982, Adrian Tame and Rob Robotham published *Maralinga: British A-bomb, Australian legacy*, the first detailed study of the British atomic tests held in Australia between 1952 and 1957.[88] Titterton figures prominently as a member of the Atomic Weapons Tests Safety Committee, confidently assuring the Australian public that no harm could come from such important undertakings. As the media began to examine the tests' effects upon the health of servicemen and Aboriginal people, I wondered again about Titterton's 'certainties'.

For my honours thesis, I decided to investigate further the participation of 'Australian' scientists in the British atomic tests.[89] I travelled to the Australian National University to interview Titterton, who urged me to make it clear that the tests were completely safe. That same year a Royal Commission was established to make its own assessment of the

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86 Letter from EW Titterton to AMH Aikman (Principal, Haileybury College), 17 September 1980, Titterton papers, Basser Library: MS168, 3/8.
87 EW Titterton, 'Education, standard of living and energy', address given at Haileybury College speech night, 9 December 1980, Titterton papers, Basser Library: MS168, 4/81.
88 Adrian Tame, and FPJ Robotham, *Maralinga: British A-bomb, Australian legacy*, Fontana/Collins, Melbourne, 1982.
89 Titterton attended the tests as an Australian representative, though he had only arrived from Britain in 1950. The question of his allegiance is examined in Tim Sherratt, 'A political inconvenience: Australian scientists at the British atomic weapons test, 1952-3', *Historical Records of Australian Science*, vol. 6, no. 2, 1985, pp. 137-52. See also: Tim Sherratt, 'Australian scientists at the British atomic weapons tests', in Robyn Williams (ed.), *Science Show II*, Thomas Nelson, Melbourne, 1986, pp. 216-9; Robert Milliken, *No conceivable injury: the story of Britain and Australia's atomic cover-up*, Penguin, Melbourne, 1986, ch. 3.

test program and its consequences.[90] Titterton was singled out for criticism.[91] My thesis, which argued that the participation of Australian scientists was determined more by international politics than any concern for safety, was eventually submitted as evidence and remains amongst the Commission's records.[92]

Years later, working as an archivist, I found myself helping to catalogue Titterton's papers for deposit in the Basser Library at the Australian Academy of Science.[93] The collection included both his address at my school's speech night and correspondence concerning my interview with him. I could not escape, it seemed— I was a part of Titterton's story and he was a part of mine.

In retrospect I can trace back to the handshake a thread of interest, anger and guilt. I can find in my own work a preoccupation with Titterton's sense of certainty. I can imagine that brief moment on stage as a starting point from which this project developed. I can create for myself a story of steady progress, from then until now. But the project, as I conceived it originally, would have yielded something rather different to this. The journey between then and now has seen many changes in course, many dead ends, many new beginnings. Just as we create progress out of roads and turning points, so we give our own lives meaning through a series of imagined journeys. This thesis was not implicit in the Titterton handshake, what followed was not some inexorable march towards fulfillment. It has been a fitful and fractious beast, only barely known through the discipline of setting words upon paper. My own progress is to be found not only in the pages that follow, but in what is missing, what is silent, what is unexamined— in the paths not taken.

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90 Some of the background and proceedings of the Royal Commission are described in Milliken, *No conceivable injury*. See also, *The report of the Royal Commission into British nuclear tests in Australia*, 2 vols, Australian Government Publishing Service, Canberra, 1985.

91 The Royal Commission concluded that 'Titterton played a political as well as a safety role in the testing program', *The report of the Royal Commission into British nuclear tests in Australia*, vol. 2, Australian Government Publishing Service, Canberra, 1985, p. 526.

92 'Document - A political inconvenience: Australian scientists at the British atomic weapons tests 1952-3: Sherratt - 1984 - University of Melbourne - Presented 26/7/85 at Sydney', NAA: A6455, RC591.

93 Basser Library: MS168. See Rosanne Clayton, Anne-Marie-Conde, Mo Yimei and Tim Sherratt, *Guide to the records of Ernest William Titterton*, <http://www.asap.unimelb.edu.au/pubs/guides/titterton/titterton.htm>.

And yet, in setting this down, in constructing this thesis, I am narrating a journey for others to follow— a journey complete with its own sense of movement, its own set of signposts and distances. Retaining within this account a sense of what is missing, of paths not taken, of choices unarticulated, of voices fragmented and fading, constitutes a challenge both for writer and reader. Perhaps there are hidden signposts, hints and cheats for the canny player. Maybe there is a feeling that something is going on behind the scenes; a suggestion that the reader is being manipulated, or disorientated. This is, after all, a journey through 'Atomic wonderland', where nothing is quite as it seems. Alice's looking glass provided a reflection of reality and an opening into another world— similarly readers are invited to see through this narrative, to find their own ways home.

Near the centre of Woomera is a park like no other in Australia. Instead of barbeques and picnic tables, there are missiles and aircraft, some poised as if in flight. This is, of course, a tribute to the town's history, for here, amidst barren desert plains some 500km north of Adelaide, Australia provided the testing ground for Britain's postwar rocket program. Woomera was established in 1947 as the 'centre of a vast top-secret scientific enterprise' designed to keep the Empire from lagging behind in the race for ever more deadly weapons.[94] More recently, Woomera has become known as the site of a controversial refugee detention centre. For more than fifty years the town has been home to secrets and suspicion, a place where knowledge and movement have been controlled by fences, warning signs, and guards.

I first visited the missile park in 1987 and found it oddly appropriate. In that isolated location were gathered around many reminders of Australia's atomic escapades. To the west were Emu Field and Maralinga, the sites of nine British atomic tests between 1953 and 1958. To the north, a massive uranium mine was being developed at Roxby Downs. Parked at the shopping centre were US military personnel from nearby Nurrangar, a top secret satellite ground station involved in the gathering of electronic intelligence and the

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[94] *Herald*, 15 March 1952, p. 13. For a history of the Woomera rocket range see Peter Morton, *Fire across the desert: Woomera and the Anglo-Australian Joint Project 1946-1980*, AGPS, Canberra, 1989.

early warning of nuclear attack. And I was on my way to protest at the gates of Pine Gap, another US intelligence facility near Alice Springs.[95] Here in the middle of all this were the rockets, sleek and brightly painted, frozen in time like a diorama of Cold War ambitions, looking more than anything like a wonderfully exciting children's playground.

A turning point? Unfortunately, there was no epiphany on the road to Pine Gap, no sudden moment of clarity. I had been struggling with aspects of Australia's nuclear history for some time, and Woomera brought confirmation rather than revelation. The visit did, however, provide a strong sense of presence. There was more to the story than super-power machinations, more than the intricacies of defence planning and policy—something happened here, in this place, in Australia. No turning point perhaps, but I was moved and disturbed.

Against the imagined distances we can explore the experience of proximity. Against the onslaught of the new we can hear echoes of familiarity. Against the power of inevitability we can pursue the possibilities of irony. The Woomera missile park joins Phyllis at the crossroads as images of 'Atomic wonderland'. Both invite us to ponder their complexities and contradictions, their humour and their horror, their strangeness and reassurance. And they both remind us to be wary of the restricted areas beyond.

'The story of the atom is told in such a simple way that it is easily understandable to a child', Phyllis offers reassuringly.

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[95] The history and functions of Pine Gap and Nurrangar are described in Desmond Ball, *A suitable piece of real estate: American installations in Australia*, Hale & Iremonger, Sydney, 1980, ch. 5.

# 2 Australia unlimited

The glow of his campfire framed a simple tableau of pioneer life. Across this 'untenanted land', Edwin Brady mused, 'little companies', such as his own, sat by their 'solitary fires'. 'They smoked pipes and talked, or watched the coals reflectively'. Around them, the 'shadowy outlines' of the bush merged into the dark northern night, and 'the whispers' of this 'unknown' land gathered about. It seemed to Brady that this camp, this night, represented the 'actual life' of the Northern Territory as he had known it. But the future weighed heavily upon that quiet, nostalgic scene. The moment would soon fade, Brady reflected, as the 'cinematograph of Time' rolled on. It was 1912, and something new was coming.[1]

Staring into the flames of the campfire, Brady imagined he heard 'the whistle of the Trans-continental Express'. The 'rumble of freight trains' followed, and the sound of water churning in the wake of 'fast coastal steamers'. The night was filled with movement as Brady perceived an end to the north's crippling isolation, the conquest of its 'lonesome distances'. New industries too! The 'chug-chug' of sugar mills, 'the buzzing of cotton jinnys', 'the clinking of harvesters', 'the hissing of refrigerators'— as Brady listened, 'the thousand homely sounds of human progress' joined in a triumphant 'hymn of the Future'. The night's subtle whispers were lost amidst the clamor of technology on the move. Not mere campfires, but 'young cities', 'electric lit and alive with enterprise', would soon arise to defeat the darkness.[2] This was Brady's dream. This was progress.

Edwin James Brady, poet and journalist, visited the Northern Territory in September 1912, gathering material for his ambitious compendium of Australian developmental opportunities, *Australia Unlimited*.[3] Brady was travelling the country, charting the outlines of Australia's future with his typical optimistic zeal. His trip north was drawing to a close and, as he relaxed by his last campfire, he began to ponder the transformation of

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[1] Edwin James Brady, *Australia Unlimited*, George Robertson and Company, Melbourne, 1918, p. 570.
[2] *ibid.*, pp. 570-1.
[3] *ibid.*, pp. 515ff. Some details of Brady's travel arrangements, facilitated by the Commonwealth, are contained in NAA: A659/1, 1943/1/3907.

the Territory. The sounds and images conjured from the night reveal much about the spirit that invigorated his work. He imagined an end to isolation and emptiness, the growth of both population and production. The future was rising like a flood, lapping at the frontiers of settlement, ready to redeem Australia's waste lands with the regenerative flow of human ingenuity and enthusiasm. Australia's unlimited prospects lay both in the conquest of space and the fulfillment of time. Plotted against these two axes, the upward course of progress was clear.

Progress is conceived in spatial terms, as a journey of improvement, as the march of civilisation. In a continent whose most valuable resource seemed to be its 'emptiness', the possibilities of space have figured prominently in assessments of Australia's potential. Brady's vision of 'Australia Unlimited' provides a useful starting point in exploring the way that ideas about space and movement have entered into the rhetoric of national progress. But just as Northern Australia's future impinged upon Brady's lonely campsite, so the meaning of progress can also be glimpsed in personal experience— in the life and hopes of an individual. This chapter explores Brady's passion for travel, his love of nature, his political idealism, and his concerns for his family— for these are also part of the vision of 'Australia unlimited'. A broader understanding of Brady's beliefs, and of the circumstances surrounding the production of his book, provides an opportunity to examine some of the complexities of progress.

## The borders of fanaticism

EJ Brady has served Australian historians well. His sea shanties and bush ballads might now be forgotten, but Brady lives on as the eager champion of Australian development, the oft-quoted author of that 'profusely illustrated doorstopper', *Australia Unlimited*.[4] No account of Australia's developmental dreams seems complete without a colourful phrase or two lifted from Brady's hefty tome.[5] And why not? While some critics may have felt

[4] Joseph Michael Powell, Griffith Taylor and 'Australia Unlimited', The John Murtagh Macrossan Memorial Lecture, 1992, University of Queensland Press, Brisbane, 1992, p. 9.
[5] Powell, *Griffith Taylor and 'Australia Unlimited'*, p. 9; Stuart Macintyre, *1901-1942: The succeeding age, Oxford history of Australia*, vol. 4, Oxford University Press, Melbourne,1986, pp. 198-9; William Lines, *Taming the great south land: a history of the conquest of nature in Australia*, Allen & Unwin, Sydney, 1991, p. 168; David Day,

that he tended to the 'purple', there is no doubt that his 'celtic effervescence of adjectives' makes him eminently quotable.[6] The colour and confidence of his vivid sloganeering is irresistible.

Invested with Brady's considerable verve and style, the phrase 'Australia unlimited' captures still the sense of national destiny that prevailed in the early years of the twentieth century. Published as the First World War was nearing its end, *Australia Unlimited*'s spirit of optimism and opportunity nourished the nation's new-found pride. A people proved in battle might finally take full possession of their land, control of their future. 'The breed that stormed and held the heights of Anzac', Brady asserted, 'will grow stronger and more self-reliant as their generations follow'.[7] The belief that progress lay in the fulfilment of Australia's idle, empty lands was hardly new. The ethos of development had been a familiar strand in the country's political culture from at least the time of self-government.[8] But the interwar years brought a surge in confidence and activity, culminating in Prime Minister Bruce's formula for national achievement, 'men, money and markets'.[9]

But land settlement schemes failed and the economy faltered. In the 1930s, visions of 'Australia unlimited' gave way to depression and doubt. The deserts had not succumbed to the will of a hardy yeomanry; instead, overgrazing and soil erosion had set them on the march. An ever-growing chorus of experts spoke out against the 'boosters', offering a more modest and rational appraisal of Australia's potentialities. Where opportunities once blossomed, limits were found. *Australia Unlimited* seemed increasingly naive as

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*Claiming a continent: a history of Australia*, Angus & Robertson, Sydney, 1996, p. 253; Geoffrey Blainey, *This land is all horizons: Australian fears and visions, 2001 Boyer Lectures*, ABC Books, Sydney, 2001, p. 5; Tom Griffiths, *Hunters and collectors: the antiquarian imagination in Australia*, Cambridge University Press, Cambridge, 1996, p. 186; Warwick Anderson, *The cultivation of whiteness: science, health and racial destiny in Australia*, Melbourne University Press, Melbourne, 2002, pp. 163-4.

[6] Bertram Stevens, 'Australian writers - Edwin J Brady', *Herald*, 16 August 1919.

[7] Brady, *Australia Unlimited*, p. 101.

[8] Lenore Layman, 'Development', in Graeme Davison, John Hirst and Stuart Macintyre (eds), *The Oxford Companion to Australian History*, Oxford University Press, Melbourne, 1998, pp. 184-6; P Loveday, 'Liberals and the idea of development', *Australian Journal of Politics and History*, vol. 23, no. 2, 1977, pp. 219-226; Beverley Kingston, *Glad, confident morning, 1860-1900, Oxford history of Australia*, vol. 3, Oxford University Press, Melbourne, 1993, pp. 57-62.

[9] Macintrye, *The succeeding age*, p. 201; WH Richmond, 'S. M. Bruce and Australian Economic Policy 1923-9', *Australian Economic History Review*, vol. 23, no. 2, September 1983, pp. 238-257.

passion drained from the developmentalist crusade. A peak had been passed. Australia's future would be portrayed henceforth in increasingly sober hues.

EJ Brady, however, never wavered. What historians perceive as a peak in developmentalist rhetoric, was for Brady a brief moment of success in a life-long battle for recognition. It was 1906 when he first approached the Commonwealth government for assistance with *Australia Unlimited*.[10] Forty years later, at age 76, he was writing to Ministers Calwell and Dedman seeking their support for the publication of an updated 'Victory' edition.[11] 'I hope that the present edition, like the parent volume, will fulfil a useful purpose as a source of information and reference for many years to come', he remarked in the foreword.[12] Throughout the 1930s and 40s, Brady continued to state his case with vigour and wit, rebutting 'knockers', 'pessimists' and 'dervishes of the Desert Theory'.[13] What was lacking was not resources, he maintained, but commitment, leadership and a 'firm faith in Australia'. Brady's own faith in his country, he admitted, carried him 'to the borders of fanaticism'.[14]

Historians have little use for the EJ Brady of 1937 or 1946. Situated in 1918, his enthusiastic outpourings are assumed to reflect the spirit of the age, but, in 1937, they seem out of place, maybe even eccentric. It's as if time had passed him by. And yet Brady was, to the end, intelligent and alert, a voracious reader who eagerly devoured news of the latest scientific discoveries.[15] Rather than being left in the wake of history, Brady no doubt believed himself in the vanguard of progress, and perhaps he was, for when he died in 1952, a new swell of national optimism was building. In the 1950s,

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[10] Letter from JC Watson to EJ Brady, 17 March 1906, Brady papers, NLA: MS 206, Series 10b.
[11] Letter from EJ Brady to Calwell, 30 March 1946, Brady papers, NLA: MS 206, Series 10b.
[12] 'Australia Unlimited 1946 - Victory Edition - Foreword', draft in Brady papers, NLA: MS 206, Series 10a.
[13] EJ Brady, 'Faith in Australia: solving the national problem', *Life Digest*, vol. 9, no. 1, April 1946, p. 2. See also: EJ Brady, 'Can the dead heart of Australia be revived?', *Australasian*, 12 June 1937, p. 5; EJ Brady, 'What is to be done with our vast north?', *Australasian*, 3 July 1937, p. 5; EJ Brady, '"I's" for Australia - irrigation and immigration', *Australasian*, 21 August 1937, p. 5; EJ Brady, 'A map and some pins', *Bank Notes*, vol. 21, September 1938, pp. 10-13; EJ Brady, 'Brady replies to Shaw— "the arch legpuller of Whitehall Court"', *Life Digest*, vol. 8, no. 10, January 1946, pp. 8-10.
[14] Brady, 'Faith in Australia', p. 1.
[15] John Broughton Webb, 'A critical biography of Edwin James Brady, 1869-1952', PhD, University of Sydney, 1972, pp. 28-9, 269, 440.

Geoffrey Blainey notes, 'almost everything seemed possible— Australia was again unlimited'.[16] If Brady had lived but a few years longer, he could have read a detailed survey of Australia's developmental prospects, published in the *Sydney Morning Herald* under the title 'Australia Unlimited'. 'Confidence', the 32-page supplement declared, was the 'theme for the future'— 'no pessimism sours the conviction that confidence can prevail'. 'At last', the old man might have sighed, 'at last...'.

## The day of small things endeth

'Wars, revolutions, earthquakes...the invention of the motor car and airplane, the discovery of X-Rays, radium, and Tutankhamen's tomb'; these, Brady noted, were regarded as some of the 'major events' of his time. 'But what about the major events of our individual lives?', he pondered. What are the key moments, the turning points, that make us who we are? Standing with his father on a cliff-top near Watson's Bay, the young Edwin Brady experienced such a moment. There, for the first time, was the sea: 'Out to the horizon, to the edge of the world, to the Beyond where other countries, islands and continents lay, it spread like a level blue plain— the Sea'.[17]

Brady's lifelong fascination with the sea had begun, but there was something more. The feeling of space, of distant horizons, of places and experiences that lay 'beyond': these were obsessions that fed his restless journeying, and shaped his understanding of land as well as sea. The possibilities of space were central to the creed of 'Australia unlimited'. 'From sea to sea', Australia was 'one vast continent of undeveloped riches'.[18] The so-called 'waste spaces' would power the nation's future, providing ample resources for at least 100 million people. It was, Brady argued, 'a matter of simple arithmetic': 'if a Mildura will carry 5,000 people on 10,000 acres, 200,000 acres of equivalent land, on the banks of the Darling River, will carry 100,000 people'.[19]

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[16] Blainey, *This land is all horizons*, p. 11.
[17] Edwin James Brady, 'Life's highway - extracts (continued)', *Southerly*, vol. 14, no. 1, 1953, pp. 25-6.
[18] Brady, *Australia Unlimited*, p. 636.
[19] Brady, 'Can the dead heart of Australia be revived?', p. 5.

Calculations based on 'comparative statistics' were a popular means of assessing the value of Australia's continental possession. In his guise as correspondent for the *Morning Post*, Alfred Deakin described how the achievement of Federation brought much earnest discussion of the new nation's 'future potentialities'. 'One most vivid illustration', he reported, 'consists of a map of our Continent, within whose great extent are pictured all Europe— except Russia and Scandinavia— with a large surplus margin'.[20] Others noted that Australia's spatial endowments compared favourably with those of their American cousins. Surely, then, the new nation's prospects could be foreseen in the rapid growth and development of the United States.

In the late nineteenth and early twentieth centuries, size mattered. With the nations of Europe jostling for land and colonial possessions, space became an index of power. Expansion was assumed to be a natural process, essential for the continued health of the modern state, and those countries with room to spare, like Russia, were warily marked down as the ones to watch.[21] In the USA, the significance of space found expression in the frontier thesis. Continued expansion along an open frontier, it was argued, had shaped the very qualities of American democracy.[22] But even as politicians and historians pointed to the value of 'empty' space, they filled it with hope and vitality. It was, as Joel Kern argues, 'positive negative space', full of activity, full of potential, full of the future.[23] Amongst the greetings and well-wishes that greeted the achievement of Federation was a message from the US Vice-President and frontier ideologue, Theodore Roosevelt. Those who were 'awake to the great movements of our time', he commented, would 'watch with keen interest' the activities of 'the giant young Commonwealth of the South Seas'.[24] Australia was big with promise.

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20 Alfred Deakin, *Federated Australia: selections from letters to the Morning Post, 1900-1910*, ed. JA La Nauze, Melbourne University Press, Melbourne, 1968, p. 19.
21 Stephen Kern, *The culture of time and space, 1880-1918*, Harvard University Press, Cambridge, Mass, 1983, pp. 224-55
22 Kern, *The culture of time and space, 1880-1918*, pp. 164-6, 238-9.
23 *ibid.*, p. 153.
24 *The Review of Reviews for Australasia*, vol. 18, no. 4, 20 April 1901, p. 408.

Space carried with it the weight of destiny, driving the colonies onwards to union, and thereafter to greatness. Australia's vast land mass made Federation seem a natural, evolutionary change. 'Girt by sea' and united by soil, the colonies were merely following the call of geography.[25] Edmund Barton's famous rallying-cry— 'a nation for a continent and a continent for a nation'— highlighted Australia's spatial mission.[26] A united Australia would fill its continental boundaries, expanding its activities and influence, and enlarging the lives of its citizenry. In this, 'the day of great nationalities', commented the *Age* in 1895, small communities were inevitably giving way to 'large aggregations'.[27] Bigger was better. In 'The Psalm of United Australia', Morgan Hawkes proclaimed that Australia's history had entered upon 'a higher, grander stage': 'Broad, far-reaching vistas open, and the day of small things endeth!'.[28]

On 1 January 1901, the people of Sydney celebrated the inauguration of the Commonwealth of Australia with marching and maps. 'How many people during the last few weeks have been drawing maps?', asked the *Age*'s correspondent, 'The public buildings are placarded with acres of them.'[29] Maps portrayed both the achievement of Federation and the challenge of nationhood. Within its new boundaries, this much praised union remained mostly empty. The maps were blank. While, as Deakin noted, this emptiness could serve as a measure of Australia's 'potentialities', it was also, the *Sydney Morning Herald* remarked, something of a 'puzzle'.[30] Australia's destiny lay in the fulfilment of its vast, empty spaces, but how?

The tramp of marching feet signalled part of the answer. The procession that wound its way through Sydney streets was of largely traditional fare— soldiers and dignitaries— but as marchers battled oppressive heat to cover the allotted distance, they were playing out

25 John Hirst, *The sentimental nation: the making of the Australian Commonwealth*, Oxford University Press, Melbourne, 2000, pp. 15-19; Helen Irving, *To constitute a nation: a cultural history of Australia's constitution*, Cambridge University Press, Cambridge, 1999, pp. 31-2.
26 Quoted in Irving, *To constitute a nation*, p. 32.
27 *ibid.*, pp. 28-9.
28 In Richard Jordan and Peter Pierce (eds), *The poets' discovery: nineteenth-century Australia in verse*, Melbourne University Press, Melbourne, 1990, p. 433.
29 *Age*, 1 January 1901, p. 5.
30 *Sydney Morning Herald* (*SMH*), 1 January 1901, p. 8.

a larger story. It was a story Banjo Paterson had told in his 'Song of the future'; a story of pioneers, a ' westward marching host', who battled through drought and suffering to answer the call 'Of "better country further out"'.[31] It was the march of progress, a journey both real and symbolic. If Australia was to achieve its destiny, its distances had to be known and conquered.

## We have all been explorers

In 1899, EJ Brady bought a covered wagon and headed north from Parramatta. 'I longed to see Australia away from the geography and the guidebooks', he recounted in his book *The King's Caravan*, 'I had a recurring desire to cross mountains, ford rivers, and explore plains, slowly and deliberately'.[32] There was a restlessness in Brady's character, a romantic yearning for new scenes and new ideas. But the 'gipsy inclination' that set him aboard a caravan bound for Townsville, was sharpened by his literary ambitions. Unlike some of his *Bulletin* contemporaries, Brady believed that his hopes of becoming a 'representative Australian writer' carried 'an obligation to know more about the Island Continent'.[33] And to know Australia, you had to travel.

Brady's fifteen months on the roads of NSW and Queensland 'whetted his appetite for further knowledge', and it wasn't long before his 'wander-lust' took over again.[34] 'I'd like to take a motor boat down the Murray from Albury to Adelaide', he proposed to his mate Jim Jones one warm Sydney day. Sponsored by *The Lone Hand*, the two set out upon a 1500-mile journey upon 'the highway of adventure'— a 'world's record' for river travel.[35] But Brady's 'longest journeyings' had not yet begun. In 1912, he set about the compilation of *Australia Unlimited*, and spent the next few years travelling 'over all the Australian States, into the Northern Territory and out to Malaya and the Dutch Indies'.[36]

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[31] AB (Banjo) Paterson, 'Song of the future', in Rosamund Campbell and Phillipa Harvie (eds), *Singer of the bush, AB Paterson complete works, 1885-1900*, Lansdowne, Sydney, 1983, pp. 95-8.
[32] Edwin James Brady, *The king's caravan: across Australia in a wagon*, Edward Arnold, London, 1911, p. 3.
[33] Edwin James Brady, 'E.J. Brady, by Himself', *Life Digest*, vol. 3, no. 3, June 1949, p. 22.
[34] *ibid*, p. 20; Brady, *The king's caravan*, p. 3.
[35] Edwin James Brady, *River rovers*, George Robertson & Co., Melbourne, 1911, pp. 7-10.
[36] Brady, 'E.J. Brady, by Himself', p. 20.

Travel indulged Brady's love of the bush, and his genuine interest in the lives and hopes of its steadfast inhabitants. It was, moreover, an affirmation of his own 'Australianness'. 'Australia is most of my religion', he told an Irishman on the Atherton Tablelands, 'If there is any man between Cape York and the Leeuwin more Australian, I take my hat off to him'.[37] Travel was a patriotic duty, an opportunity to learn 'the truth about Australia', to catalogue its resources and marvel at its possibilities.[38] This was a work both practical and spiritual. Brady looked to the development of a unique local voice, one that would be able to convey 'the message of Australia'.[39] The pessimism that suffused the work of many Australian writers and poets, including Brady's long-time friend Henry Lawson, did not reflect the reality of the bush.[40] 'The men and not the country are responsible for the gloom and misery of the song', he argued in the *Bulletin*.[41] Instead, the progress of Australian literature could be traced in 'the reaction to an environment which no longer disturbs or upsets'. Artists were engaged in their own voyages of discovery, to find inspiration in nature, to chart the outlines of 'the true Australian spirit'.[42] 'In one sense', noted Brady, reflecting on his literary companions, 'we have all been explorers and pioneers'.[43]

The 1920s and 30s brought a surge in travel writing as Australians displayed a renewed interest in the hardships and heroism of outback life.[44] Writers such as Ion Idriess and Frank Clune were both prolific and popular, at a time when more 'literary' authors were struggling even to be published.[45] In 1934, the Australian National Travel Association established *Walkabout*, a magazine that aimed to help the public 'learn more of the vast Australian continent'. 'Travel', an early edition announced, 'teaches that the bigger

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[37] Edwin James Brady, *The land of the sun*, Edward Arnold & Co., London, 1924, p. 144.
[38] Edwin James Brady, 'The truth about Australia', *Bank Notes*, vol. 21, December 1938, pp. 13-17.
[39] Edwin James Brady, 'Life's highway - extracts (continued)', *Southerly*, vol. 15, no. 1, 1954, p. 58.
[40] Webb, 'A critical biography of Edwin James Brady', pp. 383-5, 398-9.
[41] Quoted in Webb, 'A critical biography of Edwin James Brady', pp. 384-5.
[42] Brady, 'Life's highway - extracts (continued)', *Southerly*, vol. 15, no. 1, 1954, p. 58.
[43] *ibid*, p. 54.
[44] Griffiths, *Hunters and collectors*, pp. 176-9.
[45] Brian Kiernan, 'Perceptions of Australia, 1915-1965', *Penguin new literary history of Australia*, special issue of *Australian Literary Studies*, vol. 13, no. 4, October 1988, p. 275; Richard Nile, and David Walker, 'Marketing the literary imagination: production of Australian literature, 1915-1965', *Penguin new literary history of Australia*, special issue of *Australian Literary Studies*, vol. 13, no. 4, October 1988, p. 297.

drama of life is played in the open'. Alongside the school, the church, the library and the museum, travel provided a 'university of experience' that could 'stimulate human vision and our powers of observation', at the same time serving to 'regulate imagination by reality'.[46]

Travel writers sought to document the 'real' Australia for the edification of their largely urban readership. And yet, for all their colour and romance, these celebrations of outback life were often tinged with a sense of change and loss. As Tom Griffiths points out, writers like Ernestine Hill were collectors, recording ways of life on the brink of disappearance.[47] Something new was coming. But even as these worn and weary fragments were duly mounted for posterity, the collector's eye ofttimes was caught by the glint of promise. Their collections ranged from the past to the future, cataloguing revolutions as well as relics, progress as well as pioneers.

On EJ Brady's wall was a map of Australia, liberally decorated with coloured pins. The pins carried labels such as 'Hydro-electric Supply Base', 'Irrigation Area' and 'Area for Tropical Settlement'. Every now and then Brady would add a pin or two. 'It is a harmless form of amusement', he remarked, 'and helps one to remain an optimist'.[48] Brady was a 'tremendous hoarder', who spent a lifetime collecting evidence of Australia's future greatness.[49] 'What in hell I accumulate such stuff for I don't know', Brady complained in 1947, 'For half a century I've been heaping up notes, reports, clippings, pamphlets, etc. on... all phases of the country's life and development'. As the elderly man surveyed the 'bomb blasted pile of rubbish' strewn about his writing tent, he admitted that 'this collecting is a sort of mania'.[50] The coloured pins traced a journey, one that Brady had begun in a caravan in 1899, and continued now, 'collating and tabulating', in his tent at Mallacoota.

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46 'Travel', *Walkabout*, vol. 1, no. 5, 1 March 1935, p. 9.
47 Griffiths, *Hunters and collectors*, pp. 190-2.
48 Brady, 'A map and some pins', p. 10.
49 Oscar Mendelsohn, 'One man's view of EJ Brady', *Southerly*, vol. 15, no. 1, 1954, p. 60.
50 Quoted in Mendelsohn, 'One man's view of EJ Brady', p. 61.

While perhaps none were quite so diligent as Brady, many travel writers shared his enthusiasm for Australia's developmental opportunities. At a time when expert scepticism was gathering force against the hopes of 'boosters', these writers provided some of the most vivid depictions of the possibilities of progress. Ion Idriess championed a scheme to irrigate Australia's arid lands. 'The dreams of today are the facts of tomorrow', he wrote in *The Great Boomerang*, blending outback anecdotes with plans for massive engineering works.[51] William Hatfield argued for a socialist reconstruction of Australia that would bring about the 'rehabilitation of our arid lands and basic improvement of the whole continent'.[52] Ernestine Hill, Frank Clune, George Farwell and others couldn't quite manage a scheme of their own, but were alert, nonetheless, to Australia's potential for development. Even casual observers felt compelled to consider the future. An early edition of *Walkabout* included one man's account of his trek across Australia by motorcycle. The expedition had been 'fraught with hardship', the intrepid traveller concluded, 'but I had learnt many things from it of a "land of promise", full of possibilities for our national development'.[53]

Travel seemed to change one's sense of time, past and future crowded in around the moment. Perhaps it was the feeling of movement, the traveller self-consciously swept up in the onward flow of time. 'Time marches on— time waits for no man', noted Idriess in a commentary on northern Australia.[54] Perhaps it was something in the nature of the journey itself: a remembered beginning, an imagined end, an episodic existence where each moment carries a weight of expectation and hope. Paul Carter draws attention to the 'double aspect of travelling', an experience that 'required places to rest as much as roads'.[55] This double aspect, he notes, was reflected in travellers' perceptions of the picturesque, embodied one moment in a pleasant site for settlement, the next in a dramatic vista that calls the traveller on. The picturesque, he adds, 'appears to telescope

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[51] Ion L Idriess, *The great boomerang*, Angus & Robertson, Sydney, 1941, p. v.
[52] William Hatfield, *Australia reclaimed*, Cumberland Newspapers Ltd, Sydney, 1944, p. 14.
[53] E Bankin, 'Across Australia by motor cycle', *Walkabout*, vol. 1, no. 10, 1 August 1935, p. 28.
[54] Quoted in Griffiths, *Hunters and collectors*, p. 187.
[55] Paul Carter, *The road to Botany Bay: an exploration of landscape and history*, Alfred A Knopf, New York, 1988, p. 232.

time'; it is an experience that brings the future closer, until it too becomes part of the scene.[56]

EJ Brady's campfire offered a place to rest and reflect amidst a dramatic onrush of change. That night in 1912, Brady was both nostalgic and excited. Revelling in the familiarity of old ways, he nonetheless felt the imminent presence of the new. Past and future combined in the experience of the journey.

## Linking horizons, bridging spaces

It was the 'whistle of the Trans-continental Express' that sounded as the first note in Brady's 'hymn of the future'. The rumbling of trains and the churning of steamships heralded the onrush of civilisation. In Brady's dream, as in the minds of many Australians, improvements in transport and communication were essential to the future development of the Northern Territory. The land could be brought to its full potential only once its isolation had been conquered. 'In a country of great distances like Australia', noted David Gordon in *Australia To-Day*, 'the problem of transportation is the problem of progress'.[57]

From the 1860s, colonial governments had invested heavily in railways to open up the country for settlement and growth.[58] With Federation came the promise of a truly national system, with railways that spanned the continent, from east to west and north to south. The completion of the rail line between Adelaide and Darwin was one of the conditions agreed to by the Commonwealth upon its takeover of the Northern Territory in 1911, though it would take nearly a century for the commitment to be met. 'If Australians are as big as their country, and are worthy of their Anzac sons', thundered Gordon, a member of South Australia's Legislative Council, 'they will not allow their legislators to trifle with destiny by neglecting to bridge their continent from sea to sea

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56 Carter, *The road to Botany Bay*, p. 244.
57 David J Gordon, 'Bridging a continent', *Australia To-Day*, no. 13, 21 November 1917, p. 107.
58 Geoffrey Blainey, *The tyranny of distance*, Pan Macmillan, Sydney, 2001, chapters 10 &11; Graeme Davison, 'Railways', in Graeme Davison, John Hirst and Stuart Macintyre (eds), *Oxford companion to Australian history*, Oxford University Press, Melbourne, 1998, pp. 542-4.

with a railway'. 'It is a big scheme', he added, 'but it can be carried through by big people with a bold policy'.[59] As well as promoting settlement, the construction of railways through central and northern Australia offered a means by which the nation could take full possession of its land. By 'bridging the continent', Australia could confirm its unity and legitimacy, gaining 'clear title' in the eyes of other nations.[60] 'As a home for a nation', argued James Smith, Australia exists only 'in so far as its internal and external communications are sufficing and effective'.[61]

Like the railway, the telegraph strengthened ambitions of nationhood against the dead weight of distance. 'Up hill and down dale they go', wrote Frank Hurley surveying the line of poles running through central Australia, 'linking horizons, bridging spaces, uniting a continent with the chatter of cities'.[62] Developments continued apace into the twentieth century, as radio, motor cars and aeroplanes added force to the denial of distance. 'Radio has eliminated time and space', the *Sydney Morning Herald* announced in 1930, the morning after Marconi had opened the Sydney Electrical and Radio Exhibition by switching on the lights of the Town Hall from his yacht in the harbour at Genoa.[63] Ernestine Hill, meanwhile, detected a growing 'spirit of national unity' fostered by technological advance: 'Quick travel by air and motor have widened the perspective, and to radio long-wave harmonies a continent tunes in'.[64] Each new marvel of science brought the continent's forbidding distances a little further within the ken and control of its would-be masters.

As the speed of transport increased, so did the tempo of life itself. Those who had 'grown up in the age of motor transport', Brady observed, 'cannot very well imagine the Horse Era, with its slow travel and rough roads'.[65] There was a difference, not only in the mode of transportation, but the very nature of existence. Previous generations had

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59 Gordon, 'Bridging a continent', p. 107.
60 John Flynn, 'Australia's north and centre', *Australia To-Day*, 11 November 1922, p. 109.
61 James A Smith, 'Linking a continent', *Australia To-Day*, 10 November 1924, p. 87.
62 Frank Hurley, 'The Red Centre', *Walkabout*, vol. 6, no. 12, 1 October 1940, p. 10.
63 'Tales of the genii', *SMH*, 27 March 1930, p. 10. See also 'When Marconi switched on the lights: the Sydney Electrical and Radio Exhibition', *Sydney Mail*, 2 April 1930, pp. 20-1.
64 Ernestine Hill, 'Along the last lost border', *Walkabout*, vol. 5, no. 7, 1 May 1939, p. 39.
65 Edwin James Brady, 'Life's highway - extracts (continued)', *Southerly*, vol. 14, no. 1, 1953, pp. 27.

known a 'slow way of living' that modern minds could scarcely imagine.[66] All over the western world, the new technologies of transport and communication combined experience of speed and simultaneity within a heightened sense of time— not only was life getting faster, but the pace of change itself seemed to be accelerating.[67] The 'march of science' had quickened, remarked the *Sydney Morning Herald* in 1914, to reveal 'wonders undreamt of by our fathers'. Who, in 1890, could have imagined that mail would be delivered by air, the newspaper asked, or that the continent would be ringed by 'a chain of wireless telegraphy stations'? A mere twenty-five years had brought a host of 'staggering marvels', and the pace of progress showed no signs of slowing.[68]

Two world wars added to the vertiginous rush. The battle for technological supremacy was fought in the realms of time and space, with combatants striving for more distance from their weapons, earlier warnings of attack. As threats mounted to the north, Australia had once again to face the challenge of its 'empty spaces'. By 1940 there was still no rail link to Darwin, only a rough track, impassable in the wet. But within a year, the army had pushed through a new, all-weather road, 'a dynamic trans-continental highway' that cut 'the heart of Australia open like a pair of scissors'. Travelling the road gave a 'feeling of possession', one visitor noted, 'it was a conquest' that revealed Australia as an 'entity' at last. The journey offered 'a vision of the future'.[69]

War telescoped time, bringing massive resources to bear on the demands of the moment. Years became months, months became days, and an instant was suddenly time enough to destroy an entire city. The development of the atomic bomb compressed decades of research into a few short years. A process that demanded the precise manipulation of ever-smaller units of time resulted in an explosive force that could not easily be quantified. The bomb challenged humanity's ability to measure.

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66 *ibid*, p. 22.
67 Kern, *The culture of time and space*; Graeme Davison, *The unforgiving minute: how Australia learned to tell the time*, Oxford University Press, Melbourne, 1993, ch. 4.
68 *SMH*, 29 July 1914, p. 8.
69 Edgar Laytha, 'Overland to Darwin', *Walkabout*, vol. 8, no. 2, 1 December 1941, pp. 7-8.

Just like the parade of revolutionary marvels that had preceded it, atomic energy was quickly enlisted in the fight against distance. Beyond the fancies of atom-powered planes, trains and automobiles, running on the standard 'teacupful' of uranium, there were persistent suggestions that atomic energy might accelerate the development of Australia's 'great spaces'.[70] Writing in the *Sydney Morning Herald*'s 'Australia Unlimited' supplement, the Chairman of the Australian Atomic Energy Commission, JP Baxter, described the possibility of 'package power stations for country towns and inland centres'. As a first step, Baxter suggested that reactors might serve 'the remoter parts of the continent'.[71]

But science's latest victory over isolation brought new dangers. Even Australia's remoteness might not be enough to shelter it from the consequences of atomic warfare. Distance meant little in the face of global annihilation. Advances in rocket science added to the threat, foreshadowing long-range delivery of death and destruction. The conquest of space moved upwards and outwards, as Cold War rivals sought to push their technologies higher, further and faster. British rocket scientists, keen to keep up in the new race for space, fixed upon Australia as the ideal location for a testing range. They were impressed by large tracts of 'unsettled' land and good visibility.[72] Rockets could be sent sailing thousands of miles across the continent with little danger to life or property. As one British MP explained, no other country, except for Russia, 'possesses such spaces or opportunities for experiments'. Australia's problematic interior was proclaimed as the 'world's best' site for probing the edges of 'outer' space.[73]

Woomera was expected to play a crucial role in the defence of the Empire, but other frontiers beckoned. The name 'Woomera', Ivan Southall suggested, brought to mind

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[70] JP Baxter, 'Peaceful uses for atomic energy', in 'Australia Unlimited' supplement, *Sydney Morning Herald*, 19 June 1957, p. 16; JP Baxter, 'What atomic energy can do for Australia', *New Commonwealth*, vol. 29, no. 10, 16 May 1955, pp. 467-470. For a discussion of atomic powered trains see 'Atomic powered locomotive', *Commonwealth Engineer*, vol. 43, 1 August 1955, pp. 7-8.
[71] Baxter, 'Peaceful uses for atomic energy', p. 16.
[72] See, for example: *Herald*, 2 April 1946, p. 9; *Herald*, 12 July 1946, p. 5; *Herald*, 8 August 1946, p. 1. For the history of the Woomera rocket range, see Peter Morton, *Fire across the desert: Woomera and the Anglo-Australian Joint Project 1946-1980*, AGPS, Canberra, 1989.
[73] *Herald*, 14 May 1947, p. 2.

'twin images of space': the 'desert space' in which it was located, and 'a still wider space that lies in darkness beyond the earth'.[74] In a supplement celebrating the coronation of the young queen Elizabeth, the *Herald* pondered the symbolism of Woomera, part of 'the live heart of the Great Australian Loneliness'. In pursuing their 'task of conquering far horizons in a remote quarter of the globe', Australians had developed skills and qualities shown to the fore in the exploits of their much-celebrated 'air navigators'. 'The same geographical factors', the *Herald* continued, 'now give Australia a privileged place not only in the conquest of the sky, but of space itself'.[75] Australia's vast, 'empty' lands might yet provide the launching pad for the future, as the nation's long battle to wrest progress from space was continued above and beyond its 'far horizons'.

'We should be space conscious in Australia', declared an article on developments in rocket science published in *Walkabout*. It was from Woomera, the article continued, 'that the first moon-ship will take flight'.[76] Such speculation may have seemed a little out of place amidst *Walkabout*'s terrestrial travelogues and outback oddities, but there was a sense of continuity with the journal's traditional fare revealed more explicitly in a later article by the same author. 'From Woomera to Luna' described in detail a tourist trip from Woomera to the moon.[77] In the future, it seemed, the familiar journey to the Centre would only be the beginning of Australians' experience of space. This feeling of continuity could also be reflected in the landscape. Flying into Woomera, Ivan Southall looked at barren land below, scarred 'with the rims of craters like the surface of the moon'.[78] In their struggles to bridge a continent and build a nation, Australians had shown themselves to be exceedingly 'space conscious'. Perhaps this made the prospect of interplanetary travel a little less fanciful. They had experienced emptiness, they were hardened to distance, they had witnessed the victory of technology over isolation. Why not take the next step?

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[74] Ivan Southall, *Woomera*, Angus & Robertson, Sydney, 1962, p. ix.
[75] 'Woomera symbols', in 'A vision splendid' supplement, *Herald*, 8 March 1954, p. 12.
[76] E I Rosenblum, 'Walkabout in space', *Walkabout*, vol. 20, no. 9, 1 September 1954, p. 10.
[77] E I Rosenblum, 'From Woomera to Luna: space travel - when?', *Walkabout*, vol. 23, no. 11, 1 November 1957, pp. 33-4.
[78] Ivan Southall, *Rockets in the desert*, Angus & Robertson, Sydney, 1964, p. 6.

Alan Moorehead made a real-life visit to the Woomera rocket range in 1952 and was entranced. Standing on a 'waterless plain' that stretched away 'apparently to infinity', Moorehead lifted his gaze to the heavens and found that 'the mind leaps outward... any extension of the imagination becomes a reasonable possibility'. As evening fell, Moorehead struggled to piece together the implications of what he had seen, to understand the 'spirit of the place'. Like Brady some forty years earlier, Moorehead's thoughts turned to the future. Standing in the company of an RAAF officer, Moorehead stood on a cliff-top, overlooking a dry salt lake marked with a 'pattern of star-like craters', the result of bombing tests. A brilliant new moon rose in the sky. 'It was not difficult to know what the Group Captain was thinking', he reported, ' The moon— it was not so far away. And if you could reach the moon why not all the rest?' Woomera offered 'endless space' for a new breed of pioneers. 'The sky here is the limit', he concluded, 'nothing else'.[79]

## The spirit of progress

EJ Brady's father, Edward, left famine-struck Ireland in 1849 in search of something new. He travelled first to America, where he was swept up by romantic tales of frontier life. After working a spell on the Mississippi, he joined the army and headed west, hoping 'to see and admire unoccupied American spaces'.[80] When his term was complete, a boyhood fascination with the voyages of Captain Cook lured him aboard a whaling ship bound from San Francisco. Sailing the Pacific from the Arctic Circle to Cape Horn, Edward arrived back on US soil four years later, just in time to join the Union Army in battle against the rebellious south. Injured but intact, Edward contemplated a somewhat quieter life and journeyed to Australia to meet up with family in Sydney. He soon joined the mounted police and headed inland in pursuit of bushrangers.

From his father, EJ Brady claimed to have inherited 'a longing to travel and a desire to be as far away from crowded places as I could get'. Perhaps he also gained a taste for

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[79] Alan Moorehead, *Rum Jungle*, Hamish Hamilton, London, 1953, pp. 88-92; Alan Moorehead, 'The sky's the limit at Woomera', *Herald*, 9 July 1952, p. 4.
[80] Edwin James Brady, *Two frontiers*, Frank Johnson, Sydney, 1944, p. 67.

the quirky and unconventional; for the young Brady, a knowledge of 'Real Life and Real Things' involved a thorough grounding in the habits of whales and Indians.[81] Brady published an account of his father's life in America and Australia under the title *Two frontiers*. More than just a biography, the book is a nostalgic journeying through the 'land of adventure' that framed Brady's childhood. It is also a tribute to the 'frontier folk' of both nations who were, he argued, 'much alike': 'Similar dramas were being presented in two theatres of untamed spaces'.[82]

Brady's admiration for the character and achievements of the pioneering generation suffuses much of his work. They were men and women 'with their feet upon the open highway of bold endeavour'. Sustained by 'patience and the courageous spirit of a homely, hospitable people' they set about 'blazing the trail, clearing the track, paving the way'.[83] Modern Australians could not 'afford to forget' the qualities of 'self-reliance and initiative' born of frontier necessity.[84] Theirs was a simple faith, a belief in themselves, the land, and the future. The solution to Australia's problems lay in the continued cultivation of this spirit, Brady argued, 'nations, like individuals, never progress without faith in themselves'.[85] And yet, while pioneer spirit was precious and resilient, pioneer life itself was fading into history. Lonely campfires were giving way to the electric brilliance of cities. The 'cinematograph of time' rolled on.

In the 1940s, Brady collaborated with Leslie Rubinstein, a financier and amateur economist, to produce a book entitled *Dreams and realities*. The book was divided into two parts, contrasting the Australia that 'has been' with the Australia that 'will be'.[86] In the first half, Brady told the story of Tom Tobin and his family, settlers in the rugged East Gippsland wilderness. Tom Tobin was 'a strong man' with 'large hopes and little money', who beheld in his densely-wooded selection a 'land of promise', a guarantee of

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81 Edwin James Brady, 'Life's highway - extracts', *Southerly*, vol. 13, no. 4, 1952, p. 196.
82 Brady, *Two frontiers*, pp. 236-7; see also pp. 126, 297-9.
83 Brady, 'Life's highway - extracts (continued)', *Southerly*, vol. 14, no. 1, 1953, pp. 22-3.
84 *ibid.*, p. 23; Brady, *Two frontiers*, pp. 298-9.
85 Brady, 'Faith in Australia', p. 1.
86 Edwin James Brady, and Leslie Rubinstein, *Dreams and realities*, York Press, Melbourne, 1944, foreword.

security.[87] But this was no story of pioneer conquest; it was a tragedy, a failure. After long years of struggle, Tobin's 'Land of Promise still stood like a great grey fortress defiant of attack'. Sick and broken, he quit the land and took work on the roads. The property stood idle, known to locals as 'Tobin's folly'.[88]

The second half of *Dreams and realities* presented an alternative to the 'old system of pioneering'. Instead of an 'unequal combat' that pitted individual, isolated settlers against the brutalities of nature, Rubinstein offered the vision of community settlement: a planned, co-operative system, based upon scientific methods and employing modern technology.[89] It was a scheme that promised to make rural life 'pleasant, convenient and profitable' in an Australia where 'the word "remoteness" will lose its meaning'.[90] 'With the baffled pioneers as a curtain-raiser', this new drama of settlement would 'begin with bulldozers roaring into the forest'. The 'Spirit of Progress' would at last be 'unchained'.[91]

In the early decades of the twentieth century, it became increasingly clear that new conquests would not be won by courage alone. 'The day of the hardy pioneer who blundered along earnestly but somewhat aimlessly is past', declared the *Sydney Morning Herald* in 1913.[92] It was to science, the *Argus* agreed, that Australians would look 'for guidance in their efforts to conquer the wilderness'.[93] Opening a conference in 1916 to discuss the establishment of a 'National Laboratory' to foster Australian development, Prime Minister Hughes declared that science could make 'the desert bloom like a rose, it could make rural life pleasant as well as profitable'. The policy of 'muddling through' was no longer sufficient, he argued, for 'to hope for success in modern industry without the aid of science was like attempting to navigate the trackless ocean without a compass'.[94] Beyond the narrow trails blazed by earnest pioneers, the light of science would guide the nation towards its destiny. 'All onward and upward movement is alone

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87 *ibid*, p. 112.
88 *ibid*, p. 109-11.
89 *ibid*, p. 133-4.
90 *ibid*, p. 215.
91 *ibid*, p. 221.
92 *SMH*, 3 June 1913, p. 8,
93 *Argus*, 7 January 1913, p. 6.
94 *Argus*, 6 January, p. 8.

made possible by the knowledge of facts', another editorial noted, 'the scientist is the scout in the onward march of progress'.[95]

From the early days of European exploration and invasion, science had plundered the continent for its novelties. But as the new century dawned the challenge was not to catalogue, but control. Australia itself was object of study, its potential to be measured, its problems understood. 'Little now remains for the geographical explorer to do', commented Brady in *Australia Unlimited*, 'but for the scientific investigator there is an almost limitless field'.[96] The task of science was framed in terms of space and geography. The 'field of scientific endeavour... is continent wide', explained the first Director of the Commonwealth Institute of Science and Industry, FM Gellatly.[97] 'Science never rests; never stands still', he noted elsewhere, 'every hill of knowledge that is climbed merely opens up new vistas for research'.[98] The pace of scientific progress contributed to the sense of movement. What the pioneers had begun, the scientists would complete, leading Australians on to better land and better lives. Brady saw the continent yielding to a 'silent conquering army' of farmers, armed with 'library and laboratory'. 'Led by the shining spirit of William Farrer', he imagined this 'Army of Invasion... preparing its assaults upon the outstanding citadels of nature'.[99]

War in the Pacific wrought a flurry of map-making, as military planners realised how little was known of Australia's exposed northern climes.[100] This cartographic enthusiasm carried on into the postwar years, fuelled by renewed hopes of progress. In 1949, the newly established Department of National Development set about the compilation of the *Atlas of Australian Resources*, aimed at providing 'an authoritative, co-ordinated collection of scientific knowledge about the continent'. The atlas contained economic as well as topographic data, a vision of 'the past, the present and the future'. In amongst

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95 *SMH*, 14 January 1911, p. 12.
96 Brady, *Australia Unlimited*, p. 53.
97 Francis Mephan Gellatly, 'The task ahead', *Science and Industry*, vol. 1, no. 5, September 1919, p. 287.
98 Francis Mephan Gellatly, 'The Institute and the States', *Science and Industry*, vol. 1, no. 3, July 1919, p. 130.
99 Brady, *Australia Unlimited*, pp. 286-7.
100 David Paver Mellor, *The role of science and industry, Australia in the war of 1939-1945, Series 4 (civil)*, vol. 5, Australian War Memorial, Canberra, 1958, pp. 544-9.

the mountains and rivers, its colourful maps revealed 'new avenues for development' and 'scope for future exploitation'.[101]

As geophysical survey methods improved, scientists were able to map an ever-greater range of economic opportunities.[102] The Bureau of Mineral Resources fanned the flames of 'uranium fever' in the early 1950s by releasing a series of maps showing 'possible deposits of uranium' in the Northern Territory.[103] Airborne scintillometers had been used to survey the region for 'radioactive anomalies' which private prospectors were then invited to investigate. Experts advised eager uranium hunters to provision themselves with a truck, a geiger counter, an ultra-violet lamp, camping equipment, food, and those staples of pioneer life, 'patience and energy'.[104]

HG Raggatt, Secretary of the Department of National Development, suggested in the 1957 'Australia Unlimited' supplement that the discovery of uranium and other minerals had brought the country to 'the threshold of a new pioneering era' that was 'just as thrilling and bigger with promise' than the gold rushes of the 1850s.[105] Uranium, the wonder metal of the Atomic Age, reinvigorated the pioneer legend with new tales of outback derring-do.[106] The story of John White, 'the man who found Rum Jungle', was a favourite amongst surveys of Australia's uranium hopes.[107] After a lifetime of struggle and hardship, White had won a victory for himself and his nation. The virtues of the pioneer had withstood the challenge; the harsh environment had 'burnt his skin to a black shade of brown', but it had 'never creased his soul nor interfered with his dogged perseverance'.[108] Similar tales were told of Norman McConachy, a 'bushman true', one

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101 'Putting Australia on the map', *National Development*, no. 5, September 1953, pp. 36-8.
102 'Australia's flying prospectors', *National Development*, vol. 1, no. 1, October 1952, pp. 23-7.
103 *Herald*, 14 October 1953, p. 3; 'Uranium prospecting maps to be released for public inspection', *Chemical Engineering and Mining Review*, vol. 46, 10 October 1953, p. 10.
104 *Herald*, 14 October 1953, p. 3.
105 H G Raggatt, 'Bright new era in mineral development', in 'Australia unlimited' supplement, *Sydney Morning Herald*, 19 June 1957, p. 10.
106 For example, see Ross Annabell, *The uranium hunters*, Rigby, Adelaide, 1971.
107 Douglas Lockwood, 'The man who found Rum Jungle', *Walkabout*, vol. 23, no. 11, 1 July 1957, pp. 14-15. See also: Annabell, *The uranium hunters*, pp. 25-7; Moorehead, *Rum Jungle*, pp. 83-4; Ross Annabell, 'Rum Jungle', *Exports of Australia*, vol. 8, no. 6, April-May 1954, p. 15; 'Rum Jungle uranium project opened', *Chemical Engineering and Mining Review*, vol. 47, 11 October 1954, pp. 4-6; Uranium for the Atomic Age', *National Development*, no. 1, October 1952, p. 11.
108 Lockwood, 'The man who found Rum Jungle', p. 15.

of the discoverers of the Mary Kathleen uranium mine. Despite his success, McConachy, like White, remained 'in spirit very close to the back country that fashioned his outlook'.[109]

But the prospectors' intuition was supplemented by science. Jack White, like the scores of new chums who took to the bush, used a geiger counter in his search for another Rum Jungle.[110] Ion Idriess, a sometime prospector, hailed this 'revolutionary invention'. 'Walking over the country listening in to a gadget for the clicks that tell of gamma rays seems to be Atomic Age prospecting with a vengeance', Idriess wrote, 'a far cry from pick and shovel and dish'.[111] The quest for uranium called the pioneer spirit to labour at the frontiers of science. Comforting stereotypes mingled with modern technology in the framing of the nation's future. After the prospectors came the miners, 'men, brown and hard', 'new pioneers' working to 'advance Australia's development'. The establishment of a uranium refinery at Rum Jungle was, one article commented, 'a triumph of ingenuity and determination over distance and conditions of considerable severity'.[112] If Australia was to prosper in this new age, the *Australasian Manufacturer* argued, it would need to summon 'all the tenacity, the grit, the skill, the speed, the courage, and the vision' that had served the nation in times past.[113]

Uranium offered not just wealth, but security. The 'new pioneers' who laboured at Rum Jungle, Radium Hill, or Mary Kathleen, were not only furthering their nation's economic prospects, they were contributing to the defence of the 'free world'.[114] Through their hard work, the US and Britain would be assured of fuel enough to power a nuclear

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109 George Farwell, 'Northern Australia: the everlasting promise', *Walkabout*, vol. 25, no. 11, November 1959, pp. 18-19. See also George Farwell, '"Mary K": model town in the spinifex', *Walkabout*, vol. 24, no. 5, 1 May 1958, pp. 13-14.
110 Moorehead, *Rum Jungle*, p. 86;
111 Ion L Idriess, *Fortunes in minerals - including uranium*, Sydney, Angus and Robertson, 1951, p. 255.
112 TAG Hungerford, 'Uranium refinery plant opens at Rum Jungle', *National Development*, no. 9, September 1954, p. 2-9.
113 'Atomic power for industry: Australia enters developmental field', *Australasian Manufacturer*, vol. 39, no. 2012, 23 October 1954, p. 20.
114 See, for example, comments by the Governor General at the opening of the Radium Hill uranium mine, 'A future for atomic power', *Australasian Engineer*, 7 January 1955, p. 95..

arsenal.[115] As ever, the pioneer spirit stood ready to play its part in the battle for freedom and security. In 1955, as the Australian government announced plans for the establishment of a permanent nuclear testing range at Maralinga, the Minister for Supply, Howard Beale, proclaimed 'it is a challenge to Australian men to show that the pioneering spirit of their forefathers who developed our country is still the driving force of achievement'.[116]

## A sort of heritage

The campfire was slowly dying, as was the dream. Brady continued to ponder the Northern Territory's future, but the sounds of progress filling his thoughts gradually yielded to the insistent 'tramp of young Australian feet at drill'. Instead of 'clinking' harvesters, he now heard 'the wireless keeping watch by night and day'; instead of rumbling freight-trains there was the sound of 'scouting aeroplanes coming home to their military hangars'. As the embers crumbled to ash, Brady concluded his campfire devotions, looking up at the stars 'glittering like bayonet points' and offering a prayer to the 'God of Nations and of Battles' that 'this Northern State-to-be might put her young feet upon the paths of Destiny... in peace'.[117] Brady's hymn of the future was scored to a martial beat; Australia's unlimited future could be assured only through determined vigilance and resolute defence.

*Australia Unlimited* was a 'Book with a Mission', the publisher's prospectus boldly announced. By leaving its 'Great Wastes' undeveloped, Australia was 'not keeping step in the Forward March of Nations'. 'A mere handful of White People', perched uncomfortably near Asia's 'teeming centres of population', could not expect to maintain unchallenged ownership of the continent and its potential riches. Australia's survival as a white nation depended upon 'Effective Occupation', secured by a dramatic increase in population and the development of its vast, empty lands— 'The Hour of Action is

115 For details of Australia's uranium deals see Alice Cawte, *Atomic Australia: 1944-1990*, New South Wales University Press, Sydney, 1992, ch. 5.
116 Quoted in Robert Milliken, *No conceivable injury: the story of Britain and Australia's atomic cover-up*, Penguin, Melbourne, 1986, p. 93.
117 Brady, *Australia Unlimited*, p. 571

Now!'. Stepping forward to defend the 'cherished ideals of Australian Nationhood', *Australia Unlimited* promised to set the country's attractions and possibilities before the world in 750 royal quarto pages. Potential immigrants would be inspired, and doubtful Australians would be enthused. *Australia Unlimited* would be 'the most important book yet published in the Commonwealth', a 'patriotic effort' addressing 'important national questions' in 'a cheerful literary fashion'.[118]

In typically flamboyant style, Brady proffered his literary skills in defence of a nervous nation. For all its youthful exuberance, the newly-minted Commonwealth of Australia was beset by doubts about its security and legitimacy.[119] How could it hold a continent it was unable to occupy? 'One has only to turn to the map, and see how unpeopled our northern lands are, to realize the obligation upon us', argued Littleton Groom, the Minister of External Affairs, in July 1909.[120] The blanks on the map were a warning to White Australia, a grave reminder of its failure to take full possession of its political inheritance. Only by 'effective occupation', by 'peopling' the land and extracting its potential, could Australia meet the obligations of nation, race and empire, and withstand the looming threat of Asia.

Maps haunted Australia's destiny, counterposing images of hope and of danger. In one of his poems, published in 1909, Brady imagines himself travelling across the country, admiring its vast, unused resources. All at once, he chances upon his old schoolroom. So much had happened in the intervening thirty years, and yet the map of Australia on the schoolroom wall seems little different than he remembered: 'It told no tale of centres new, nor inland cities great; / Nor townships in black circles drawn across each growing State'. Worried, Brady continues his journey, visiting the well-appointed halls of Federal Parliament, where politicians 'wormed and crawled' in the 'slime of little matters'. There on the wall, accusing and unheeded, another map hangs 'undotted blank unlined / A fringe of towns along a coast and Emptiness behind'. But while Australians

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118 A copy of the prospectus is contained in NAA: A659/1, 1943/1/3907.
119 David Walker, *Anxious nation: Australia and the rise of Asia 1850-1939*, University of Queensland Press, St Lucia, 1999, ch. 9.
120 *CPD*, vol. 50, 30 July 1909, pp. 1878-80.

foolishly ignored the map's urgent warning, 'slant-eyed cynics in the North' eagerly consult their charts: 'With High Ambition wedded to the Asian mode astute / They've marked a map in Japanese: "THIS CONTINENT TO LOOT"!'[121]

*Australia Unlimited* offered a recipe for progress and security. The needs of both defence and development would be served as roads, fences and towns were drawn in across the empty map. But as Brady set about the compilation of his mammoth book, he was troubled also by questions of personal security. The birth of his fourth child, in 1910, forced him to consider ways to bolster his modest income. 'Literature would have to be put aside for a time', he concluded, 'Mammon demanded the usual sacrifice'. And so Brady quit his much-loved camp in Mallacoota, and ventured forth with £10 in his pocket, vowing to multiply the sum 'three thousand times'. His formula for financial success included 'several commercial propositions', 'a plan for the development of east Gippsland', and 'a scheme for a great book on Australia'.[122] Wealth may have eluded him, but the 'great book', *Australia Unlimited*, did at least enable Brady to buy some land in Mallacoota and build a simple fibro house— a measure of security, perhaps even a sign of progress.

In 1890, the young Brady was dismissed from his post as a shipping clerk for supporting the maritime strike.[123] It was, indeed, a turning-point in his life. For the next sixty years he earned his living as a poet, journalist and author. The financial rewards were meagre, and in 'Pro Patria' he joked that occupation by Japan or Germany might at least improve the living conditions of Australia's ill-used poets: 'I rather gloat the vision / My secret mind within / Of sleek well-groomed Ah Lawson / Or jovial, stout Hans Quinn'.[124] But unlike his friend Henry Lawson, Brady's entrepreneurial bent encouraged him to turn his literary skills towards more remunerative ends. Constant 'warfare

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121 Edwin James Brady, 'A continent to loot', *Bulletin*, vol. 30, no. 1528, 27 May 1909, p. 6.
122 Edwin James Brady, 'Life's highway - extracts (concluded)', *Southerly*, vol. 16, no. 4, 1955, p. 199.
123 Webb, 'A critical biography of Edwin James Brady', pp. 18-19.
124 Edwin James Brady, 'Pro patria', *Bulletin*, vol. 31, no. 1566, 17 February 1910, p. 3.

between the writer and the journalist' resulted, as Brady struggled to make a living against the impulses of his art.[125]

For all its undoubted passion and commitment, *Australia Unlimited* was a commercial venture underwritten by subsidies and subscriptions. Brady had attempted a similar mix of travelogue, statistics, photography and advertising in two earlier publications, *Sydney Harbor* and *Picturesque Port Phillip*, but even a sympathetic critic remarked that these were 'pitched too high', with 'the flavour of a commercial "boost"'.[126] *Australia Unlimited* was aimed more at the immigrant than the tourist, a self-conscious contribution to 'national publicity' that was dependent on government support for its financial viability.[127] The chapter on the Northern Territory was paid for by the Commonwealth at the rate of £10 per page.[128] For that, the Commonwealth bought the right to soften Brady's concerns about the use of white labour.[129] The governments of Victoria, Queensland and New South Wales entered into similar contracts to ensure that their resources and industries were adequately represented.

As well as direct subsidies, all state and federal governments supported the project through the provision of maps, photographs, official publications, free rail travel and letters of introduction. Meanwhile, as Brady travelled the continent collecting data, his salesmen worked their own territories, gathering subscriptions from commercial firms and wealthy pastoralists. For a modest fee, such enterprising Australians could ensure that their own unique contributions to national progress were faithfully recorded. In March 1913, Brady reported to his publisher on the success of the business canvasser: 'He has got George Kiss of the Horse Bazaar for £30.00 but the AMP for only

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125 Vance Palmer, 'A note on E J Brady', *Meanjin*, vol. 11, 1952, p. 291.
126 Edwin James Brady, *Picturesque Port Phillip*, George Robertson & Company, Melbourne, 1911; Edwin James Brady, *Sydney Harbour*, Builder Printing Works, Sydney, 1903; Stevens, 'Australian writers – Edwin J Brady'.
127 Letter from Brady to Austin Chapman, 8 June 1921, Brady papers, NLA: MS206, Series 10(b).
128 For details of the arrangement see correspondence between the publishers, George Robertson & Co., and the Department of External Affairs, February-March 1912, NAA: A659/1, 1943/1/3907. Brady provides an account of the support provided by state and federal governments in his 'Author's statement re Australia Unlimited', July 1918, Brady papers, NLA: MS206, Series 10(a).
129 Memo by DB Edwards (External Affairs), 29 July 1915, NAA: A659/1, 1943/1/3907.

£16.10.00. The Govt Savings Bank £50 (5 pages @ £10 a page)'.[130] *Australia Unlimited* offered all manner of opportunities.

Brady's 'great book' provided him with a measure of financial security, but its production and distribution were beset with difficulties. As the book neared publication, Brady drafted a 'Author's Statement' defending himself against any 'Hostile Criticism' that might arise in parliament, the press, or amongst 'aggrieved clients'. The publisher, he claimed, was primarily to blame for any delays and omissions. He was disappointed also by publisher's failure to institute a 'scientific business-like method of selling the book'.[131] For several years thereafter, Brady was left to lobby federal ministers in an attempt to dispose of remaining stocks.[132] In 1921, he suggested that the government might purchase 5,000 of his 'golden-tongued literary missionaries' for distribution overseas.[133] But no, came the reply, cheap pamphlets were the preferred means of generating 'national publicity'. The election of the Bruce-Page government in 1923 offered new hope, and Brady journeyed to Melbourne to continue his sales pitch in person. He eventually returned to Mallacoota, disappointed and 'hundreds of pounds poorer in pocket'. Rejected once more in 1925, he concluded that 'nationalism in Australia seems to be on its last legs'.[134]

Yet despite a litany of setbacks and rejections, Brady remained enthusiastically committed to the vision of *Australia Unlimited*. Even before the book had been published, he had begun work on a second volume focusing on the nation's industrial development.[135] Brady imagined an 'Australia Unlimited Series' that would include volumes on Australian cities as well as an 'Australian Encyclopaedia of Agriculture and

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130 Letter from Brady to George Robertson and Co., 5 March 1913, Brady papers, NLA: MS206, Series 10(b).
131 'Author's Statement re Australia Unlimited', July 1918, Brady papers, NLA: MS206, Series 10(a).
132 See correspondence in Brady papers, NLA: MS206, Series 10(b).
133 Letter from Brady to WM Hughes (Prime Minister), 1 August 1920, NAA: A659/1, 1943/1/3907.
134 Letter from Brady to Austin Chapman, 14 August 1925, Brady papers, NLA: MS206, Series 10(b).
135 For various drafts and correspondence relating to the proposed volume see Brady papers, NLA: MS206, Series 11.

Farmers Guide'.[136] In the 1920s, he began work on an 'Edition De Luxe' of *Australia Unlimited* that would add new sections 'devoted to Australian celebrities in various walks of life'.[137] And then there was the film version! Opening with a 'pioneer prologue', Brady imagined the film as a stirring saga of development, 'a vitally national tale' invested with 'a patriotic moral'.[138] None of his plans succeeded. In 1943, Brady sought government support for a wholly new edition of *Australia Unlimited* that highlighted possibilities for postwar reconstruction. The offer was refused. The responsible minister reviewed the conditions of the earlier subsidy and concluded that 'we were swindled before and would be foolish indeed to be swindled again'.[139]

With its naïve enthusiam, *Australia Unlimited* seems to encapsulate the dreams of a simpler time— progress was something to be wrested from nature by a willing and determined people. It provides contemporary historians with a convenient archetype, while enabling them to underline their own comparative sophistication. But such easy characterisations become problematic when we examine the circumstances of the book's production. This paean to progress was subsidised by government and wealthy landowners. Its production was troubled by disagreements with the publisher, and thousands of copies remained unsold. For Brady it was a work of passion, but also a chance to win his family some financial ease. *Australia Unlimited* brought him his greatest success, but Brady's inability to build upon this modest achievement remained a source of frustration. The story of *Australia Unlimited* shows how progress entwines personal hopes and national ambitions, optimism and disappointment, fear and longing. The apparent simplicity of its expansionary creed is given depth and meaning through the uncertainties of its author's life. Instead of a providing a convenient example of the misguided enthusiasms of the past, *Australia Unlimited* demonstrates how the dream of progress is experienced as something much more complex and contradictory.

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136 See Brady papers, NLA: MS206, Series 10(a) for drafts and correspondence relating to various projects, in particular: 'Australia Unlimited Series (Section B) – Australian Encyclopaedia of Agriculture and Farmers Guide', typescript, 1918; 'Australia Unlimited Series – Vol III, Australian Cities', undated.
137 'Australia Unlimited – Edition De Luxe', undated, Brady papers, NLA: MS206, Series 10(a). This series also contains lists of names and addresses of 'celebrities' and draft letters seeking their subscriptions.
138 Letter from Brady to FLW Ashby, 1 March 1921, Brady papers, NLA: MS206, Series 10(b).
139 File note by JS Collings (Minister for the Interior), 16 July 1943, NAA: A659/1, 43/1/3907.

*Australia Unlimited* gained Brady broader recognition, but overshadowed his literary aspirations. It promised security for the nation and for himself, but delivered little. And yet he remained hopeful. One day the country might listen. One day he might be rewarded for his efforts. The dream of progress nourished him always, expressed in his schemes, his writing, and his family. Brady's youngest daughter, Edna June, was born to his third wife in 1946. What could he leave her? A 'modern edition' of *Australia Unlimited* lay completed but unpublished. 'If it fails to find a publisher', he remarked wistfully, 'the MSS will be a liberal education for her after she has outgrown her father's nonsense rhymes'. It was, Brady pondered, 'a sort of heritage'.[140]

## A world of destinations

The *Sydney Morning Herald*'s 1958 'Australia Unlimited' supplement took inspiration from the words of Prime Minister Robert Menzies. 'If I were a young man, with all the world in front of me', Menzies told a group of businessmen in Adelaide, 'I would want to be in Australia at the beginning of what will be its most wonderful period of development'.[141] The same sense of excitement carried through the supplement as it surveyed the nation's current and future progress. The story of 'Australia Unlimited' was a 'BIG story', the supplement proclaimed, 'a story to stir the pulse of all Australians'.[142] With an election nearing, Menzies and his Liberal colleagues certainly hoped the populace would be stirred by visions of continuing prosperity.[143] 'Our slogan is "Australia Unlimited"', Menzies declared in his campaign speech, 'and we pronounce it with confidence'.[144]

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140 Brady, 'E.J. Brady, by Himself', pp. 22-3.
141 'A continent on the march', in the 'Australia unlimited' supplement, SMH, 30 June 1958, p. 1. For an account of Menzies' speech see 'Australia's progress exciting', *Australasian Engineer*, 7 August 1958, pp. 93-7.
142 'A continent on the march', in the 'Australia unlimited' supplement, SMH, 30 June 1958, p. 1.
143 Marian Simms, *A Liberal nation: the Liberal Party and Australian politics*, Hale & Iremonger, Sydney, 1982, pp. 58-60.
144 Robert Gordon Menzies, 'For "Australia unlimited"', *Australian Liberal*, vol. 2, no. 1, November 1958, p. 1. See also the campaign pamphlet *Australia unlimited! - a nation on the march*, Liberal Party of Australia, Canberra, 1958.

In 1999, another Liberal Prime Minister took to the lectern under the banner of 'Australia Unlimited'. John Howard delivered a keynote address to 'Australia Unlimited 1999', a conference that sought to examine the 'future of Australian politics, the economy, business and society'.[145] Howard didn't seek to match the rhetorical vigour of his hero, Menzies, but he did seek to dispel the perception that Australia was beset by a 'crisis of confidence'. The optimism which had 'always characterised Australian society' was still strong and well justified, he argued, 'there are fewer limitations now on what Australia can achieve that at any time in the 25 years I have been in public life'.[146] 'Australia Relatively Unlimited' was perhaps the slogan of a less sanguine generation.

The conference was organised by the *Australian* newspaper, and like the previous incarnations of 'Australia Unlimited' was undertaken with due respect to the advertising dollar. Indeed, the large advertisements that dominated the *Australian*'s coverage of the conference revealed much about its themes. Ansett offered 'a world of destinations', Foxtel and CNN brought the news of the world to you 24 hours a day, while IBM described the 'treasure trove of products' available of the Web. 'Now it really is a small world', they explained.[147] The conquest of space remained a central preoccupation, but this space was no longer to be found within Australia's continental boundaries. Just as they had a hundred years earlier, developments in communications and transport encouraged a growing sense of simultaneity, proximity and speed. Australia's opportunities lay in a virtual space, a world made small through the power of technology and the promise of economic cooperation. An economy for a world, a world for an economy! Space and destiny were reunited in the latest of revolutionary trends. Globalisation was the future.

The 'forces of globalisation could not be resisted', the conference was told.[148] Globalisation was a 'runaway train', cascading change upon change at an ever-increasing

145 'Australia unlimited' special liftout, *Weekend Australian*, 8-9 May 1999, p. 2.
146 John Winston Howard, 'Time to build on bold ideas', in 'Australia unlimited' special liftout, *Weekend Australian*, 8-9 May 1999, p. 5.
147 See the *Australian*'s coverage of the conference in the week beginning 1 May 1999.
148 'Set policies to suit globalisation', *Australian*, 5 May 1999, p. 15.

rate. Taking on the role filled by progress in previous incarnations of 'Australia Unlimited', globalisation offered a renewed sense of dynamism and inevitability. The preoccupation with space and the unyielding sense of movement remained, however, as did the dual-edged promise of emptiness. Globalised space was free of boundaries and barriers, sustained by a lack of restrictive regulatory regimes. This emptiness offered vast opportunities for unfettered development, but raised new threats to 'social cohesion'. Sacrifices would have to be made, jobs would be lost, fear and disappointment would flow as the pace of change quickened. If globalisation was to wreak its transformative magic, Dennis Shanahan argued, 'the human need for security and other emotions has to be addressed'. The architects of the global economy had to consider 'how people feel'.[149]

How do people feel about the future? For Brady, progress was all about passion. Australia's hopes rested with the spirit of its people. But the passion seems to have drained with each new incarnation of 'Australia Unlimited'. Now, Brady's emotive excesses seem almost comical, and there is a reluctance even to use the word 'progress'. To modern ears there seems to be a quaint, moralistic ring to the word, unsuited to the dry, managerial discourse of global capitalism. In critical circles, of course, 'progress' can only be spoken with an ironic wink, identified now with the follies and deceptions of modernity. Cynicism has replaced the passion. Emptiness abounds. A sense of movement continues to pervade visions of the future, but the qualities of the journey, the experience of travelling, seem less important.

## Life's highway

'After nearly eight decades near association with the man', Brady wrote of himself in 1949, 'I have come to look upon him as the most successful failure in literary history'. This energetic booster of Australia's potentialities was well aware of his own life's mocking irony. 'He has not... made the wages of a wharf laborer out of book writing', he

[149] Dennis Shanahan, 'A fair and decent place', in 'Australia unlimited' special liftout, *Weekend Australian*, 8-9 May 1999, p. 1.

continued, 'yet he persists in asserting Australia is the best country in the world!'.[150] It was a recipe for bitterness— a poet who had fallen out of fashion, an artist diverted from his calling, a failed businessman, a disappointed utopian, an old man struggling to the end to leave his family more than just a catalogue of dreams. 'I had succeeded and failed', Brady concluded, reflecting on a life that had never quite fulfilled its promise, 'Should I end up, therefore, on a melancholy note?'[151]

In the last years of his life, Brady penned a series of autobiographical notes under the title 'Life's highway'.[152] The open road was Brady's metaphor, his source of meaning. Even though much of his later life was spent in Mallacoota, Brady was rarely still. The promise of space, the possibilities of travel, continued to prod his mind along the byways of discovery. The open road brought new horizons, new experiences, but it also brought escape. When Brady headed north aboard his covered wagon in 1899, he was fleeing the bitter breakdown of his second marriage.[153] His quest to know Australia joined with a need to get away, to forget. In *River Rovers*, his planned stay in Mildura was cut short by news of a friend's death. 'Bad news makes hateful the most pleasant place of abiding', Brady wrote mournfully, 'I strained to open the gate of departure to go forth again into a wilderness of salt bush and sere sand'.[154] Just as Australia's 'empty spaces' were laden with dangers as well as opportunities, so the journey along 'life's highway' was measured both in achievement and regret, pride and self-reproach. Movement excited the senses and dulled the pain.

According to one biographer, Brady was 'a perennial optimist, full of vitality and good humour, with a touch of the flamboyant and debonair'.[155] Brady's optimism gave him strength and succour, nourishing him always with images of a future in which the conflicts and compromises of the present would be resolved. The journey itself would

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150 Brady, 'E.J. Brady, by Himself', p. 23
151 Brady, 'Life's highway - extracts (concluded)', *Southerly*, vol. 16, no. 4, 1955, p. 201.
152 Extracts from the manuscript were published in *Southerly* beginning with vol. 13, no. 4, 1952, and concluding with vol. 16, no. 2, 1955.
153 Brady, 'E.J. Brady, by Himself', p. 22.
154 Edwin James Brady, *River rovers*, George Robertson & Co., Melbourne, 1911, pp. 92-4.
155 Webb, 'A critical biography of Edwin James Brady', p. 440

bring the answers. But there was fear too in Brady's restless yearning. As a young child, he had suffered severe burns in a household accident. Alone, in his pain and delirium, the stricken child found himself travelling 'a strange road', one he would later recognise in Poe's 'Ulalume'. Somewhere 'out of Space and out of Time', Brady journeyed onwards, deeper into the 'Valley of Shadow'. He knew he was going to die. 'All of my life, as a consequence', Brady confessed, 'I have suffered from a nervous apprehension, a recurring dread of impending calamity, which requires some philosophy to overcome...'.[156] The optimism of the open road guided Brady from the depths of oblivion, but the darkness lurked nearby. He had to keep moving.

*Australia Unlimited* articulated a vision of wealth and destiny, of riches unbound. But for Brady, the vision brought disappointment and frustration. His plans to capitalise on the book's success were thwarted, and his own attempts to foster development failed. With his undoubted flair and charm came a reckless zeal, a fondness for grand gestures, that oft-times led him into doubtful business ventures. From grass trees to gold mines, his many plans brought little success.[157] Brady's restive, romantic dreaming carried him quickly from scheme to scheme, unable to focus his energies, or make the most of his undoubted abilities. 'Life's highway' called him ever onwards, but to where?

*Australia Unlimited* was not a portrait of Brady's utopia. His hopes for an ideal society extended beyond possibilities for national development to questions of ownership, distribution and justice. *Australia Unlimited* was a means, not an end. In the midst of compiling his great book, Brady took a moment to respond to the Socialist League's request for a donation, quipping: 'One day, (after I have established a few more capitalistic enterprises), I shall send a more liberal donation to the Socialist fund'.[158] Brady's sense of irony masked a constant, nagging 'warfare' between 'the idealist and the entrepreneur'.[159] Even as the would-be businessman sought out opportunities for

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[156] Edwin James Brady, 'Life's highway - extracts', *Southerly*, vol. 13, no. 4, 1952, pp. 194-5.
[157] Many of Brady's business failures are described in Webb, 'A critical biography of Edwin James Brady', for example: farming in the NT, timber production at Mallacoota, pp. 64-5; oysters, grass trees, East Coast Railway, film production, salt, pp. 72-5; gold mining, publishing, pp. 86-7.
[158] Quoted in Webb, 'A critical biography of Edwin James Brady', p. 66.
[159] Palmer, 'A note on E J Brady', p. 291.

financial gain, railing against the 'dead hand of officialism', he imagined a world where money offered no measure of wealth, a system that guaranteed health and security for all.[160] Brady, the high prophet of 'Australia Unlimited', was a former secretary of the Socialist League, an early member of the Labor Party, a hopeful revolutionary whose commitment to social justice and the plight of the working man rarely faltered.[161] The contradictions 'harrassed' him, and yet, Vance Palmer argued, they 'kept him alive'.[162]

What was the meaning of progress in this land of unlimited opportunities? The man who dreamed that Australia's empty spaces might be filled with the clamour of human progress was happiest away from crowds and bustle. 'He cannot live for any length of time in cities', Brady said of himself, 'because parallelograms, rectangles and mechanical noises affect his nerves'.[163] He sought instead the tranquility of nature, and, in times of stress, always found his way back to Mallacoota: 'an Australian Arcadia where Virgin Nature abided, an Arcadia yet innocent of progress, still undisturbed by despoiling hands'.[164] But even as he revelled in the quiet simplicity, Brady excitedly imagined roads and railways pushing through the forest. He looked forward to a time when the land would be cleared, when new communities would be established, when Mallacoota would become a thriving commercial centre. The idealist and the entrepreneur battled constantly for the mastery of paradise.

Just as Brady's campfire dreaming was suffused with a sense of nostalgia and loss, so the inevitable changes wrought by the onward march of civilisation were sometimes greeted with ambivalence. In *King's Caravan* he pondered the 'rapid decay' of the Aboriginal population, 'exterminated because the Age of Steel is stronger than the Age of Stone'. 'Savages fortified by muskets' had taken the land from 'savages armed with stone-axes, spears and boomerangs'. 'Civilisation— which is as yet only savagery slightly veneered—

160 Brady, 'Life's highway - extracts (concluded)', p. 198.
161 Brady's political views are discussed in Webb, 'A critical biography of Edwin James Brady', ch. 3.
162 Palmer, 'A note on E J Brady', p. 291.
163 Brady, 'E.J. Brady, by Himself', p. 23.
164 Brady and Rubinstein, *Dreams and realities*, p. 121.

has treated the aborigine diabolically', Brady concluded, 'but no worse than it treats millions of white slaves'.[165]

Neither was science a guarantee of improvement. Brady, always a keen student of the latest scientific discoveries, showed remarkable foresight when, in 1907, he pondered a world powered by 'intra atomic energy'. 'The steam engine, the petrol motor, the electric generator will be as out-of-date in the civilised world as greenstone axes are today', he suggested in *The Native Companion*.[166] But for all its revolutionary potential, Brady was unsettled by this new vista of scientific achievement. Without 'a corresponding change in the system of ownership and distribution', it seemed that this new source of energy would 'further enslave mankind to the machine'.[167] And what of the possibilities for destruction? 'Seventy six years of life have passed over my head', Brady wrote, shortly after the bombing of Hiroshima, 'for the last thirty-seven years I have watched in alternating hope and apprehension for a discovery which may either end terrestrial life or invest it with a beauty and benevolence, beyond the dreams of poets'. The moment had finally arrived. 'Mankind has come to the cross roads of destiny', the worried old man concluded.[168]

Ernest Lane fondly remembered a time in the 1890s when he and Brady were 'overflowing with enthusiasm and ideals of human emancipation and brotherhood'.[169] Such hopes stayed with Brady till the end; his enthusiasm dented, but never lost. Even as he contemplated the awful possibility of a third world war, he looked to 'a New World, a World of Reason and Decency' that might emerge yet from the 'whirlwind of blood and fire'.[170] The journey along 'life's highway' was riven with contradictions that could only be resolved in the potential of humanity, in the ultimate triumph of

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165 Brady, *The king's caravan*, p. 113.
166 Edwin James Brady, 'A Columbus of science', *Native Companion*, vol. 2, no. 1, 1 August 1907, pp. 50-52. The possibilities of atomic power also inspired Brady's poem, 'Steam (obit 1912?). An epitaph', *Bulletin*, vol. 30, no. 1550, 28 October 1909, p. 43.
167 Edwin James Brady, 'The almighty atom', *Midday Times*, 1 September 1945, p. 8.
168 Draft of letter from Brady to *Midday Times*, undated (letter was published 1 September 1945), in 'Science and discovery' cuttings book, Brady papers, NLA: MS206, Series 14.
169 Quoted in Webb, 'A critical biography of Edwin James Brady', pp. 21-2.
170 *ibid*, p. 107.

goodness. Brady's was a desperate quest for hope and meaning in a world that rewarded dreams with disappointment, that crowned optimism with irony. Acting on his utopian impulses, Brady provided land for a community farm, a place of refuge for unemployed workers during the Great Depression. The scheme failed, and he sank further into debt.[171] Instead of moving forward towards an ideal society, Brady was forced to sell the simple fibro shack he had built with the proceeds of his one great success, *Australia Unlimited*.

'Life's highway' brought no guarantee of glory, no easy path to riches and success. 'I do not care two hoots what they inscribe on my tombstone if I get enough to eat, live the life of a free man and write', wrote the man now remembered as 'the author of *Australia Unlimited*'.[172] Brady provided a vivid portrayal of Australia's future destiny, finding in the country's empty spaces the guarantee of greatness. But it was an emptiness brimming with the modest hopes of ordinary people, bridged by bonds of friendship and responsibility. The pull of destiny could be found only in the expression of a nation's humanity; the inevitability of progress could be sustained only by individual acts of will and defiance. We look to Brady expecting to find simplicity and naivety, but are reminded instead that the meaning of progress is something complex and contingent. It is woven from our dreams and disappointments, invested with our loves and insecurities, given strength by our fears and longings. We may no longer believe in 'progress', but still we live each day in its expectation.

This chapter has examined some of the ideas of space, distance and movement that contribute to our understanding of progress. We have traversed this domain in the company of EJ Brady, for whom knowing and travelling were closely entwined. But while progress seems to compel us upon paths from which there can be no diversion, no turning back, the ironies of Brady's life remind us that journeying is a process where the promise of new lands is suffused with a sense of memory, loss and regret. This chapter has restored to Brady some of the choices and possibilities that history has

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171 *ibid.*, pp. 172-4.
172 Edwin James Brady, 'Life's highway - extracts (continued)', *Southerly*, vol. 15, no. 4, 1954, p. 282.

tended to deny. In doing so it has sought to question the grip of linearity upon the destinations we imagine, the stories we tell, the answers we seek— the way we imagine the future.

Brady continued to write and continued to struggle. He remarried, and at the age of seventy-seven became a father once more. Life brought more successes, more failures. 'Should I end, therefore, on a melancholy note?' Brady's journey along 'Life's Highway' was nearing its end, but still he looked to the horizon. No, he answered, 'that would be ratting on the Anzac spirit'. There was no disgrace in living, no defeat in hoping. He was a sick old man with every right to be bitter, but he would not be overtaken by the 'cinematograph of time'. 'I decline to become mournful', he defiantly proclaimed, 'I refuse to grow old'.[173]

[173] Brady, 'Life's highway - extracts (concluded)', p. 201.

# 3 Old and new

Len Beadell was leading a survey party through the mulga scrub of central South Australia, when he came across something unusual, even unnerving. 'It was almost like a picket fence', he described, with posts made from 'slivers of shale'. Atop a small plateau dotted with casuarinas, Beadell counted close to sixty of these slivers, three foot high and spaced about two yards apart. In this 'eerie', isolated location, Beadell found himself wondering about the 'near mythical' people who had arranged the stones. It 'was obviously an ancient Aboriginal ceremonial ground', he concluded, 'built by those primitive, stone-age nomads in some distant dreamtime'— an 'Aboriginal "Stonehenge"'.[1]

Beadell was a surveyor and explorer whose road-building exploits have themselves attained close to mythic status. Between 1947 and 1963, he coaxed his battered Landrover thousands of kilometres across the harsh Western Desert country, blazing the way for a series of roads, including the Gunbarrel Highway.[2] For most of this time, Beadell was attached to the Long Range Weapons Establishment (LRWE), working at the behest of British defence planners. In 1947, he helped survey the site for Woomera. Five years later, as Britain began exploding atomic bombs in Australia, Beadell was enlisted to identify a suitable mainland test site. 'Emu Field', a large open area about 285 kilometres west of Coober Pedy, was chosen for the first round of tests, but was deemed too isolated for continued use. And so, as the time of detonation neared, Beadell packed his swag and headed south from Emu Field in search of a permanent testing range— one that would become known as 'Maralinga'.[3]

Beadell's reconnaissance had scarcely begun when he stumbled upon the 'Aboriginal "Stonehenge"'. As he scrabbled in the dust, searching for a piece of charcoal that might be used to fix this mysterious structure in time, he pondered the 'ironic clash of old and new': 'only a few short miles away the first mighty atomic bomb ever to be brought to

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[1] Len Beadell, *Blast the Bush*, Rigby, Adelaide, 1976, pp. 173-6.
[2] Mark Shepherd, *A lifetime in the bush: the biography of Len Beadell*, Corkwood Press, Adelaide, 1998.
[3] Beadell describes his exploits at Emu Field and Maralinga in *Blast the bush*.

the mainland of Australia was to be blasted into immediate oblivion…, and it was by-products of this very weapon which could be used for determining the age of the charcoal from these prehistoric fires'. Beadell began to conjur images of secret ceremonies, of naked dancers 'ochre painted and glistening with sweat'. But his mind drifted inexorably from past to future. 'I couldn't help asking myself', he admitted, 'what these people...would have imagined if they had witnessed the glow from our atomic upheaval'.[4] Here in this rugged, barren wilderness the clash of old and new seemed at its most stark, its most brutal.

## A song written—but unsung

A few minutes before midnight on 31 December 1900, a message from Alfred Deakin, one of the leaders of the Federation movement, was projected before the crowd assembled in Melbourne's Town Hall: 'May the new year of the new century usher in a new Nation, whose history shall be an illustrious record of progress in all the arts of peace'.[5] The conjunction was compelling: the year, the century, everything was 'new'. The following morning, the *Sydney Morning Herald* also welcomed the new year, the new century and Australia's 'entry on a new and broader nationhood'. 'It is not often in history', the editorial continued, 'that we meet with coincidences so striking'.[6] Federation had been many years in the making, but the timing of Australia's inauguration helped focus attention away from the process, towards the moment. It was not an end, but a beginning.

'Awake! Arise! The wings of dawn Are beating at the Gates of Day': George Essex Evans won fifty guineas for his ode in honor of Federation, which, like the work of many other poets, writers and speechmakers, located Australia's nationhood within natural processes of growth and development.[7] It was a birth, a coming-of-age, the dawn of a new day. Celebratory effusions also commonly invoked images of portals and

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[4] Beadell, *Blast the Bush*, pp. 175-6.
[5] Quoted in the *Age*, 1 January 1901, p. 5.
[6] *SMH*, 1 January 1901, p. 14.
[7] George Essex Evans, *Ode for Commonwealth Day*, Sydney, 1901.

gateways, thresholds to be crossed, journeys begun. 'Our Commonwealth like a mighty ship of State has been launched on the great ocean of destiny', proclaimed John Quick.[8] The decorative arches, which framed the route through Sydney towards the official ceremony, stood as symbolic gateways, reinforcing the feeling of movement, the passage from old to new.[9] Such metaphors combined continuity and change, constructing Australia's life history from the contrast imagined between its past and its future.

The past, however, was not located solely in the histories of Australia's constituent colonies. Federation was, according to Quick, 'the greatest triumph of freedom and democracy, combined with cherished respect for traditional principles, that the world has ever seen'.[10] Having joined the life of nations, Australia sought to map its lineage, seeking its progenitors not in Melbourne or Sydney, but in Europe. Australia was new, while Europe was old; Australia was fresh, young and pure, while Europe was tired and battle-scarred.[11] Federation offered a new start to the civilizing mission: 'from the old world wrecks which strew the ground', concluded George Essex Evans' 'Federal Song', 'We build anew'.[12] Australia's destiny was foretold in its youth. It was, as Brady reflected in the introduction to *Australia Unlimited*, 'yet like a flower in the seed, or a song written— but unsung'.[13]

Modernism was rising, and the 'new' was in vogue. Around the world, intellectuals, artists and revolutionaries were seeking to wrest control of destiny from the inhibiting grasp of nineteenth century determinism. Thinkers like Bergson and Nietzsche reconceptualised the present, emphasising it as the realm of creative involvement.

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[8] *Age*, 1 January 1901, p. 5.
[9] Helen Irving, *To constitute a nation: a cultural history of Australia's constitution*, Cambridge University Press, Cambridge, 1999, pp. 9-12; Tessa Milne, *Archways to Federation: the story of the celebratory arches of 1901*, *Researching Federation manual no. 2*, 1901 Centre, University of Technology, Sydney, 2000; Robert Freestone, and Sharon Veale, 'The street beautiful: triumphal arches and urban improvement in Sydney, 1888-1925', *Public History Review*, vol. 4, 1995, pp. 25-40.
[10] *Age*, 1 January 1901, p. 5.
[11] John Hirst, *The sentimental nation: the making of the Australian Commonwealth*, Oxford University Press, Melbourne, 2000, pp. 19-24; Irving, *To constitute a nation*, p. 36; Richard White, *Inventing Australia*, George Allen & Unwin, Sydney, 1981, ch. 7.
[12] George Essex Evans, 'A federal song', in Richard Jordan and Peter Pierce (eds), *The poets' discovery: nineteenth-century Australia in verse*, Melbourne, Melbourne University Press, 1990, pp. 421-2.
[13] Edwin James Brady, *Australia Unlimited*, George Robertson and Company, Melbourne, 1918, p. 17.

Action and experience were favoured over received wisdom or idle contemplation.[14] In politics and social policy, progressives took up the reformist challenge, investing nineteenth century liberalism with new energy and zeal, and looking increasingly to the state to set the course of progress.[15] It was a time for new ideas, a time for change.

Helen Irving argues that a fin de siècle spirit of experimentation smoothed the path to Federation. The new nation was conceived and realised within a 'utopian moment' that encouraged creativity and dulled suspicion of change.[16] To some, Federation offered an example of the new political and social forms that could emerge through the energising power of nationalism. William Jethro Brown, Professor of Law at the University of Tasmania, suggested that Federation would enrich the character of Australian democracy, fostering national ideals 'to fire the enthusiasm and... impart a generous ardour to the imagination'.[17]

The spirit of experimentation was carried into the newly-formed Commonwealth Parliament, where would-be nation builders imagined it possible to sweep away old conflicts and divisions. Alfred Deakin's liberals championed 'New Protection', a rational system of legislation and institutions that would dispel class antagonism and allow all to share in the bounties of progress.[18] Educational reformers sought to overhaul tradition-bound curricula, offering 'New Education' as the means of building better citizens and a stronger nation.[19] A progressive faith in the ameliorative power of the state gave the nation-builders confidence in their own ability to create something new and better.

'Awake! Arise! The wings of dawn Are beating at the Gates of Day': George Essex Evans' ode had orginally begun with the words 'Awake! Awake!', but it was changed at

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14 Stephen Kern, *The culture of time and space, 1880-1918*, Harvard University Press, Cambridge, Mass, 1983.
15 Michael Roe, *Nine Australian progressives: vitalism in bourgeois social thought, 1890-1960*, University of Queensland Press, St. Lucia, 1984, pp. 1-21.
16 Irving, *To constitute a nation*, pp. 36, 212-3.
17 Quote in Bob Birrell, *Federation: the secret story*, Duffy & Snellgrove, Sydney, 2001, p. 174. For more on Brown, see Roe *Nine Australian progressives*, ch. 2.
18 JA La Nauze, *Alfred Deakin - a biography*, 2 vols, vol. 2, Melbourne University Press, Melbourne, 1965, pp. 410-13; Stuart Macintyre, *1901-1942: The succeeding age, Oxford history of Australia*, vol. 4, Oxford University Press, Melbourne, 1986, pp. 102-4.
19 Macintyre, *The succeeding age*, pp. 108-9

the suggestion of Alfred Deakin.[20] To the feeling of promise and renewal, Deakin added a sense of action— 'Arise!' The newness of the Commonwealth was not merely to be found in the contrast with Europe or in a catalogue of potentialities, it was something to be made, a challenge to be met.

## Dreaming of a new world

The war was nearing its end in 1918 when the Australian war correspondent, CEW Bean, took a break from the carnage to rest, to write and to think.[21] Bean had been at Gallipoli from beginning to end. He had followed the Australian infantry through the muddy battlefields of France and Belgium. After four years of horror, sixty thousand young Australians dead, Bean began to wonder what good might come of it. 'What were they fighting for?', he asked. To keep the world free, of course, to make Australia safe, yet more than this, Bean argued, the men of the AIF wanted to make Australia 'a great and good country— yes, the greatest and best country in the world'.[22]

But the dead had left the task unfinished, they 'will not return to help make up the country which they loved and longed for', Bean reflected sadly. The future had now passed into the hands of Australia's young people. 'Unless the results of this war are to be thrown away, you have to take up the work which was only begun at Anzac and Pozières', he told them, 'You have to fight it'. The brains, the courage, the character of young Australians would make the nation 'clean, great and strong': 'even if you have to build up between you a great big broom and bundle all of us poor, musty old cobwebs of the previous generation into the sea'. Emerging from the darkness of war, Australia brimmed with youth, vigour and promise— 'a country still to make'.[23]

The contrast between 'old world wrecks' and young Australia was intensified by war. While Europe gravely pondered an end to progress, Australians revelled in a newfound

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20 Hirst, *The sentimental nation*, pp. 23-4.
21 KS Inglis, *CE W Bean, Australian historian, John Murtagh Macrossan Lecture, 1969*, University of Queensland Press, St Lucia, 1970, p. 19.
22 Charles Edwin Woodrow Bean, *In your hands, Australians*, Cassell and Company, London, 1919, pp. 8-9.
23 *ibid.*, pp. 10-18.

sense of nationhood. In 1914, RR Garran imagined a flood of immigrants from Europe, 'weary of the ravages and desolation of war', seeking out 'new scenes, new skies'.[24] HS Gullett, who served as a war correspondent in Palestine, proudly proclaimed that Australia's fighting men were the most persuasive advertisement for any intending immigrant. 'Think of his qualities as a fighter, of his exceptional physique, ...of his sheer happiness', he implored the people of Great Britain, 'ask yourselves whether the land which has bred this happy, highly paid, well-educated young manhood is likely to be a good land or a bad land for you'. Would they prefer to stay in 'old, crowded country', or seek a new life in a 'great, young land'.[25]

But Australia was not untouched. 'We ourselves have changed', noted Garran in 1919, 'the mighty upheaval has shaken us all out of our old grooves and upset all our comfortable formulas'. Garran, who as the nation's first public servant had contributed much to the nation building dreams of early governments, pondered 'Australia's new outlook'. 'We are asking ourselves what can be done to bring good out of this great evil', he continued, 'we are talking and dreaming of a new world, but the world we see around us is a world laid in ruins'. Garran surveyed Australia's resources and responsibilties, and looked to the League of Nations to forestall future conflict. But 'the most urgent task for Australia', he argued, was 'to secure peace within', for 'the deadliest and wickedest of all wars is the class war'.[26]

Like many other liberal intellectuals, Garran was alarmed by increasing union militancy in the latter years of the war. Industrial unrest added to bitterness awakened by the conscription debate to leave the nation divided and uneasy. For idealists such as Garran and the 'secular evangelists' of the Workers' Educational Association, the solution lay in the development of a new consensus.[27] Any 'new world', Garran argued, had to be founded upon 'mutual goodwill and good understanding' between all classes.[28] HW

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24 Robert Randolph Garran, 'Australia after the war', *Australia To-Day*, no. 10, 1915, p. 47.
25 HS Gullett, 'The Empire's capacious continent', *Australia To-Day*, no. 15, 1920, p. 37.
26 Robert Randolph Garran, 'Australia's new outlook', *Australia To-Day*, no. 15, 1920, pp. 131-137.
27 Tim Rowse, *Australian liberalism and national character*, Kibble Books, Malmsbury, Victoria, 1978, pp. 43-76.
28 Garran, 'Australia's new outlook', p. 137.

Gepp, General Manager of the Electrolytic Zinc Company, agreed, arguing that the best memorial to Australia's war dead would be an 'industrial system... based upon and guided by the laws of humanity and mutual esteem and understanding'.[29] 'The old order must be changed for a new', Gepp asserted.[30]

Australia faced a challenging task, but it was one that could be approached with confidence. 'Our hope lies in the remarkable increase of the tendencies to unity and peace long at work in society', Meredith Atkinson, President of the WEA, offered reassuringly in his book *The new social order*.[31] The 'new order' promised a dramatic shift in social and political life, and yet the overall trend was evolutionary rather than revolutionary. 'It has been the programme of civilisation from the outset', Garran noted.[32] It was the path of progress.

The outlines of the new world reflected the lingering preoccupations of Australian liberals, but the disruptions of war added a sense of urgency and relevance. War brought opportunities to reformers, recognised WEA stalwart GV Portus, for the 'rank and file' became 'willing to listen to new evangels'.[33] Indeed, the dream of something better appeared to play a crucial role in maintaining a country's morale.[34] As the nations of the world entered into battle once more, political leaders sought to bolster public support by focusing on aims and ideals. Returning from the UK in 1941, Prime Minister Menzies rallied the nation behind an 'unlimited war effort', proclaiming that victory would enable 'humane men in every country to set about the building of a new way of life'. 'I am not looking for a restoration of old privileges and old possessions', he continued, 'there must be no looking back to what was in many ways an unjust state of

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29 HW Gepp, 'Australia self-contained', *Science and Industry*, vol. 1, no. 4, August 1919, p. 225.
30 HW Gepp, 'Australia self-contained', *Science and Industry*, vol. 1, no. 3, July 1919, p. 147.
31 Meredith Atkinson, *The new social order - a study of post-war reconstruction*, Workers' Educational Association of Australia, Melbourne, 1919, p. 4.
32 Garran, 'Australia's new outlook', p. 137.
33 GV Portus, *Happy highways*, Melbourne University Press, Melbourne, 1953, p. 172.
34 SJ Butlin, and CB Schedvin, *War Economy, 1942-1945*, vol. 4, *Australia in the war of 1939-1945, series 4 (civil)*, Australian War Memorial, Canberra, 1977, p. 625; Stephen Alomes, 'The 1930's background to Post-war reconstruction', paper presented at the Post-war reconstruction seminar, Australian National University, 31 August - 4 September 1981, pp. 29-31; Herbert Cole Coombs, *Trial balance: issues of my working life*, Sun Books, Melbourne, 1983, p. 22-4.

society'.[35] Even as the war continued to escalate, talk turned to the possibilities of reconstruction.

The idea of social transformation was pursued with vigor by the incoming Labor government. Memories of the Great Depression were strong, fuelling resolve to avoid past mistakes, to ensure that promises of a better life did not evaporate in an atmosphere of postwar inertia.[36] A Ministry of Post-War Reconstruction was established early in 1943, and plans were drawn for a 'new social order' built around the guarantee of full employment. The failures and disappointments of ages gone were no excuse for cynicism or inaction, Lloyd Ross, the Ministry's Director of Public Relations, argued against those who 'think Spirit of Progress is only the name of a railway train'. Change was coming, must come: 'The New Order is not a substitute for a calendar-date'; not another name for another post-war period'.[37]

Reconstruction also appealed to a growing cadre of experts and planners committed to the reforming power of rational thought and the importance of intellectual leadership. Like their forbears in the WEA, the planners imagined a 'new order' sustained by cooperation and consensus.[38] HC Coombs, the Director-General of Postwar Reconstruction, noted that while the nation faced 'enormously difficult problems of transition', the people remained 'anxious for change and willing to be inspired into social unity for a common purpose'.[39] The 'confusion and flexibility' engendered by war provided 'an opportunity to promote economic and social development'. 'Opportunities for dramatic steps forward occur but rarely in the lives of men', Coombs added.[40]

What kind of world was coming? What did it mean to talk of a 'new social order'? 'One hears these questions everywhere in the Army', noted Padre Watts of the AIF, 'in

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35 Quoted in Paul Hasluck, *The government and the people, 1939-1941, Australia in the war of 1939-1945, series 4 (civil)*, vol. 1, Australian War Memorial, Canberra, 1952, p. 364.
36 Andrew Spaull, *John Dedman: a most unexpected Labor man*, Hyland House, Melbourne, 1998, ch. 5.
37 Lloyd Ross, 'A new social order', in DAS Campbell (ed.), *Post-war reconstruction in Australia*, Australasian Publishing Company, Sydney, 1944, pp. 192-3.
38 Rowse, *Australian liberalism and national character*, ch. 4.
39 Herbert Cole Coombs, 'The economic aftermath of war', in DAS Campbell (ed.), *Post-war reconstruction in Australia*, Sydney, Australasian Publishing Company, 1944, p. 78.
40 *ibid*, p. 98.

Education Service lectures, in religious gatherings, in conversations in tents and around camp fires'.[41] The future was not the sole preserve of politicians and bureaucrats. Even as the government pursued its plans for reconstruction, 'new orders' of every size and make were forged from hope and longing. For some the 'new order' could only be realised by communist upheaval, others sought a return to Christian values. The 'Our New Order Association' was founded in Sydney to safeguard democracy and press for social security, while Stanley F Allen, chartered accountant, found the basis of the 'new order' in the principles of the Social Credit Movement.[42] Poets, too, began to ponder the shape of the coming world. JL Gordon issued a series of poems under the title 'Towards a New Order': 'The old world hurtles down to doom', he wrote, but 'into a new world, of their own making' the people would arise.[43] As demands for reform proliferated, Rosen and Goldfinch of the Domain Intellectual and Debating Society posted their own unique set of demands. Two-up would be legalised under their 'New Social Order', the working day would be four hours long, and beer would be free.[44]

'Who will build a New Order?' asked John Murphy on behalf of 'Middle Class electors'. The greatest obstacle to 'progressive social and industrial legislation', Murphy argued, was the 'Junta controlled Party politician' who put class before nation. Fortunately though, 'the spirit of the real Australia was awakening', a spirit which was not interested in the extremes of the political spectrum, but in cooperation and understanding. The 'New Order', Murphy insisted, could only be achieved by cultivating this 'new political outlook'.[45] His 'Middle Class Party' was one of a large number of new parties and independent candidates that contested the 1943 election, indicating both an upsurge in idealism and a dissatisfaction with the divisiveness of the party system.[46] Common

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[41] Padre G Stuart Watts, *The digger, the Church and the New Social Order*, FH Johnston, Sydney, 1945, p. 9.
[42] IR Stenning, *Postwar reconstruction for our new order*, Our New Order Association, Sydney, 1942; Stanley F Allen, *The new order - Why? What? How?*, Sydney, 1941.
[43] JL Gordon, 'The present situation', in *Towards a New Order: Ten poems 1938-1940*, Sydney, 1941.
[44] Rosen, and Goldfinch, *Time marches on*, Sydney, 1942.
[45] John G Murphy, *Who will build a new order?*, Sydney, 1943.
[46] Paul Hasluck, *The government and the people, 1942-1945, Australia in the war of 1939-1945, series 4 (civil)*, Australian War Memorial, Canberra, 1970, p. 366.

among many would-be reformers was a desire for the continuation of the wartime sense of unity and purpose.

CEW Bean was amongst them. Bean had achieved much in the intervening years. His twelve volume *Official History of Australia in the War of 1914-1918* was complete. The memorial of which he dreamed, a record of Australia's spirit and sacrifice, had been built in Canberra. But the years had also brought disillusion and disappointment. What had become of the 'fine aspirations', the commitments given on behalf of Australia's war dead?[47] Instead of making a nation, 'we kept our ideals to ourselves and left our country and its future to the political machines', he noted bitterly.[48] But now, after depression and disunity, in the midst of another war, there was a new chance for this 'still-young land'. 'Last time, also, we were fighting for a new world, and we are going to get it this time, at all costs', Bean affirmed.[49]

The new world that arrived on 6 August 1945 was not quite what anyone expected. But neither was it wholly unprecedented. The disjunction between the old world and the new, the feeling of dramatic change, the challenge to respond to the demands of the future, were all familiar and well-rehearsed. Dreams of a new age, a new order, a new world, were resilient features of modern thought. Calls for unity and cooperation were recycled into demands for world government, or into desperate hopes for a new spirit of peace. The prospect of regeneration echoed in visions of an atomic utopia. The church, politicians, intellectuals and ideologues continued to clamour for public attention, pushing their solutions, jostling as always for allegiance and authority.

In 1942, a government advisory committee met to consider the problem of national morale. The committee, which included CEW Bean, was concerned by the 'de-idealisation' of the war and urged greater emphasis on war aims and ideals rather than on immediate threats to personal security. But there was also a danger, the committee noted, that 'recent catastrophic events' might lead people to believe that they were 'in

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47 Charles Edwin Woodrow Bean, *War aims of a plain Australian*, Angus & Robertson, Sydney, 1943, p.2.
48 *ibid*, p. 3.
49 *ibid*, p. 1.

the presence of the unfolding of some... historic process before which they are helpless'. The public had to be reassured that the war effort was itself 'in the nature of a historic mission', that the processes at work were 'operating for the fulfillment of their own civilisation and not for its destruction'.[50] Dreams of a new order could help reconcile the realities of war with the assumption of progress. Just as the atomic crossroads seemed to offer the chance to change direction, so the blueprints of a new age encouraged confidence in the malleability of history, in the mastery of progress. 'We have an opportunity', HC Coombs confidently proclaimed, 'to bring within the field of human decision changes which up to now have been brought about by the blind forces of history'.[51].

## Awakening the earth

There was no sound except for the 'sighing squelch of the camel pads' and 'an occasional creak of cordage' as Ion Idriess and his Aboriginal guide continued westwards towards Lake Eyre. Sand ridges and barren river beds stretched ahead, framing an oddly appropriate scene. Here he was, Idriess reflected, aboard 'an ancient animal', accompanied by 'the last living son of prehistoric man', 'riding down into a dead lake, into a dead world'. Everything felt old and lifeless as they trekked on, deep into the continent's 'Dead Heart'.[52]

The bones of a diprotodon protruded from a dried river bank. Elsewhere Idriess found the petrified remains of what might have been a giant kangaroo. Was that the skull of a 'gigantic crocodile', he saw, or the remains of an 'enormous bird'? 'Just here and there', Idriess observed, 'in some exposed place where mud had turned to stone, these monsters of the past were in part preserved'. Indeed, all over the 'Dead Heart' was evidence of ancient life, he argued: 'the story in stone, in fossils, in opalized remains... tells us plainly of vast waters, of forests, of teeming life where now is aridity or desert'.

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50 'Report of Committee on Civilian Morale made under direction of the Prime Minister', April 1942, NAA: A1608/1, AK 29/1/2. See also Tim Rowse, 'The people and their experts: a war-inspired civics for HC Coombs', *Labour History*, no. 74, May 1998, pp. 72-3.
51 Coombs, 'The economic aftermath of war', p. 99.
52 Ion L Idriess, *The great boomerang*, Angus & Robertson, Sydney, 1941, p. 188.

These remains of animals long dead were more than curiosities, they offered proof that 'the land itself is good land', hope that the 'Dead Heart' itself could be revived.[53] All that was needed was water.

Idriess recounted his journey in *The Great Boomerang*, arguing for a massive engineering scheme that would revive the arid centre by turning coastal waters inland. It was a book about the hardships of a dry land, and the possibility of redemption though the life-giving properties of water. You only had to take the book 'within five yards of a lettuce', a reviewer in the *Bulletin* remarked, 'and its sad heart beats again'.[54] The idea that Australia's desert regions could be made to bloom was hardly new. In *Australia Unlimited*, EJ Brady had memorably argued that the 'Dead Heart of Australia' was 'in reality a Red Heart, destined one day to pulsate with life'.[55] He returned to the topic in a series of articles in the *Australasian* in 1937, describing the wonders that could be wrought by irrigation: 'this sandy waste needs only moisture to convert it into hotbeds of growth'.[56]

Evidence for the regenerative possibilities of water was found in the ability of the land to recover from drought. An article in *Australia To-Day* entitled 'Recuperative Australia— the most responsive of all lands' sought to reassure prospective immigrants. While drought brought many difficulties, it was inevitably followed by a miraculous burst of fertility: 'within two days of the first welcome drops the wonderful land shows the enduring stockman a blush of green, herald of the great transformation that never fails to astound the oldest and toughest of those who have seen many dry spells'. 'The awakening of the surface of the earth after a drought', the article maintained, was 'much like the coming of spring in a cold country'.[57]

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53 *ibid*, pp. 190-4.
54 'Water, water everywhere', *Bulletin*, vol. 63, no. 3232, 21 January 1942, p. 2.
55 Brady, *Australia unlimited*, p. 630.
56 Edwin James Brady, '"I's" for Australia! - Irrigation and immigration', *Australasian*, 21 August 1937, p. 5.
57 HM Somer, 'Recuperative Australia', *Australia To-Day*, no. 11, 1 November 1915, p. 39.

Growing knowledge of Australia's ancient past added another dimension to the prospect of regeneration. The long dreamt of inland sea had been a reality once, and might be again. In the mirror of deep time, Idriess could see an image of future possibilities. JJC Bradfield, the engineer who designed the Sydney Harbour Bridge, was similarly inspired. Introducing his own scheme for 'rejuvenating inland Australia', Bradfield offered a brief sketch of Australian history beginning 1,600 million years in the past. 'Dense rainforest' had once lined the rivers of inland Australia, he explained, and 'terrifying herds' of giant wombats had grazed on the 'rich vegetation' that covered most of the continent. 'In bygone ages', Bradfield concluded, 'Australia was well watered by magnificent streams'.[58] Why not again?

The Bradfield Scheme was a slightly more modest enterprise than Idriess's 'Great Boomerang', but shared the same principles. Floodwaters that had previously 'run to waste' in the coastal regions of northern Australia would be diverted inland. While the diversion would require massive tunnels, dams and pipelines, everything else was waiting and ready as it had been for thousands, if not millions of years. Dried river beds, empty lakes and fertile soils just needed water to begin the process of regeneration. 'This is not my Plan', Idriess asserted, 'it is nature's': 'Nature had the Plan working in the days of the diprotodon; its structure lies there ready to be used again'.[59]

The schemes gained support in the early 1940s, buoyed no doubt by the spirit of reconstruction. Writing to Prime Minister Curtin in support of the Bradfield scheme, WEM Abbott argued that Australia may have been 'saved from the Japanese' only to be lost 'to the growing menace of drought'.[60] The North Queensland Local Authorities Association referred the Prime Minister to fossil evidence of past fertility, and warned of the growing threat of soil erosion.[61] Likewise, Michael Sawtell decried government inaction in the face of looming disaster. Bradfield's 'great live-giving proposal' was being

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58 JJC Bradfield, 'Rejuvenating inland Australia', *Walkabout*, vol. 7, no. 9, 1 July 1941, pp. 7-8; JJC Bradfield, 'Restoring Australia's parched lands', *Australian Quarterly*, vol. 14, no. 1, March 1942, pp. 27-8.
59 Idriess, *The great boomerang*, p. 213.
60 Letter from WEM Abbott to John Curtin, 22 November 1944, NAA: A9816/4, 1943/664 Part 1.
61 Letter from North Queensland Local Authorities Association to FM Forde (Prime Minister), 6 July 1945, NAA: A9816/4, 1943/664 Part 1.

ignored, he raged, and all the while 'the great dust bowl... is steadily and victoriously moving east'.[62] Idriess, too, was gravely worried by the effects of soil erosion, manifest in the ever-widening 'dust bowl'. 'Nature for centuries had battled hard and had succeeded in keeping the Dead Heart from becoming a desert', he argued, 'but man has upset the balance'.[63] Overstocking, land clearing and rabbits had done their damage, now it was time to repair and replenish. Water would restore the balance and create 'a new Australia'.[64]

Of course there were critics aplenty eager to dampen the hopes of the water schemers. The costs were prohibitive, the benefits uncertain, the science misleading.[65] Australia's supposedly fertile soils were increasingly recognised to be tired and worn out. But dreams of regeneration were not easily dismissed. The Bradfield Scheme has its supporters still, and the 2002 drought brought yet another chorus of 'turn the rivers inland'.[66] Even as the Chifley government formally dismissed the scheme in 1946, it was beginning to plan a massive engineering project to divert the waters of the Snowy River. The Snowy Mountains Scheme combined the totemic power of water with the confidence of the Atomic Age. Not quite the 'Great Boomerang', but drawing upon the same spirit of transformation and rebirth.

Atomic energy brought possibilities of its own. Mark Oliphant wondered in 1947 whether this new source of power might offer 'a solution to Australia's water problem'. Salt water from the sea or bores could conceivably be distilled using atomic energy to provide the basis for a large scale irrigation project.[67] More generally, though, the

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62 Letter from Michael Sawtell to Prime Minister, 4 December 1946, NAA: A9816/4, 1943/664 Part 1.
63 Idriess, *The great boomerang*, p. 166.
64 *ibid.*, pp. 204-6, 236-7.
65 See for example: G W Leeper, 'Restoring Australia's parched lands - A comment', *Australian Quarterly*, vol. 14, no. 2, June 1942, pp. 50-52; JD Lang, 'Australia's water resources', *Walkabout*, vol. 13, no. 3, 1 January 1947, pp. 6-20.
66 For some recent comments on the Bradfield scheme see Tim Sherratt, 'A climate for a nation', part of the *Federation and meteorology* web resource, Austehc, 2001, <http://www.austehc.unimelb.edu.au/fam/0003.html>. For 2002 debate relating to 'drought proofing' see *Weekend Australian*, 12 October 2002, p. 7.
67 Marcus Laurence Elwin Oliphant, 'Australia could use atomic power in 10 years', *SMH*, 26 March 1947, p. 2. Ten years later Oliphant suggested fusion-powered reactors might provide the answer to Australia's water problem, *SMH*, 27 January 1958, p. 1.

Atomic Age strengthened belief in the power of science to transform nature, to overcome the obstacles that had beleaguered humankind for generations. The potential for dramatic developments in agricultural production was further highlighted by CSIRO's spate of successes. The introduction of myxamotosis had curbed the rabbit plagues, research into trace elements was opening new lands for development, and rainmakers had taken to the clouds pursuing the dreams of drought-wearied farmers.

'To speak of "Australia Unlimited" in terms of Australian agriculture 20 years ago would have been considered frankly laughable', explained Ian Clunies Ross, CSIRO Chairman, in the *Sydney Morning Herald*'s 1957 'Australia Unlimited' supplement. The 'uncertainty of rainfall' and the 'poverty of our soils' seemed to impose clear limitations on development, he continued. But things had changed. The article was illustrated with a series of photographs from the AMP Society's development project near Keith in South Australia. Here, Clunies Ross explained, 'poor, almost worthless soil' had been 'transformed to fertile pasture' by the addition of trace elements.[68] The work of Australian researchers, he commented elsewhere, had demonstrated that 'millions of acres of virtually worthless "desert" soils' could be developed.[69] 'Today we are making, not marring, the countryside', he argued, 'making good soil deficiencies, raising fertility, and increasing productivity'.[70] It was a 'revolutionary change in the outlook of Australian agriculture'.[71]

And so it seemed the deserts might bloom at last. Waste lands would be reclaimed, tired soils reinvigorated, the continent reborn into an age of scientific achievement. The possibilities of regeneration continued to inspire hopes of a land transformed, of a

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68 Ian Clunies Ross, 'Science, research lift farming output', in 'Australia unlimited' supplement, *Sydney Morning Herald*, 19 June 1957, p. 28. For more on the AMP Society's project in SA, see: FS Feely, 'Science conquers the sands', *Walkabout*, vol. 15, no. 4, 1 April 1949, pp. 34-37; Henry C James, 'Food from the desert', *Walkabout*, vol. 18, no. 5, 1 May 1952, pp. 13-16; Michael Batten, 'This land was desolate', *Walkabout*, vol. 24, no. 12, 1 December 1958, pp. 11-14; Libby Robin, *Defending the Little Desert: the rise of ecological consciousness in Australia*, Melbourne University Press, Melbourne, 1998, pp. 11-13.
69 Ian Clunies Ross, 'The role of science and technology', *Canberra Comments*, vol. 13, no. 3, 15 March 1959, p. 1.
70 Ian Clunies Ross, 'Some problems of Australia's scientific development', *Welcome*, vol. 4, no. 11, August 1958, p. 11.
71 Clunies Ross, 'The role of science and technology', p. 2.

world where problems could be resolved, failures redeemed. The future could be liberated from the deadening grip of the past. 'It is as though we were seeing Australia for the first time', Clunies Ross remarked, ' seeing it not as a hard, difficult and drought stricken country as so often in the past...but as a country which only waits upon the vigour and determination of its people to make real the vision of a brighter era than any which have preceded it.'[72] Progress was as ever to be found in the journey from old to new

## A contrast as wide as the world

Working as a drover and cattleman across much of the Australian inland, Michael Sawtell became convinced of the land's potential for development. With the 'zeal of a prophet', the *Sunday Herald* reported in 1952, Sawtell had been 'stumping Australia for years trying to convert his countrymen to a new belief in the empty territories'.[73] But in the postwar world, apathy and ignorance were not the only obstacles to hinder his crusade. In 1946, Sawtell participated in a debate on the development of the Woomera rocket range, broadcast by the ABC. 'I am against this evil business of bombs over Australia', he began. Sawtell was worried about the effects on Aboriginal people, but he also opposed the plan because 'it engenders in the minds of city-dwelling Australians that Australia, this blessed plot...is fit for nothing better than a bomb alley'.[74]

Much to Sawtell's horror, the government was beginning to realise that Australia's 'vast empty wastes' might indeed play a crucial role in the nation's future. Not as a home for farmers, but as a testing ground for rockets and bombs, and as a supplier of the raw materials that would fuel the Atomic Age. As preparations were being finalised for the first British atomic bomb test to be conducted on the Australian mainland, the *Sunday Herald* pondered the intriguing turn of events by which an 'arid plain in northern South Australia' should be the focus of such a momentous event. 'Paradoxically', the editorial

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[72] Ian Clunies Ross, 'The place of science in agriculture in Australia', *Country Hour Journal*, vol. 4, no. 11, November 1953, p. 4.
[73] 'They believe in their country', in 'Development supplement', *Sunday Herald*, 17 August 1952, p. 13
[74] Nation's Forum of the Air, *Should Australia be used as a bomb alley for rockets?*, Australian Broadcasting Commission, Sydney, 1946, pp. 7-8.

noted, 'the very poverty of these areas in surface resources has made them valuable in the atomic field, either as a storehouse of uranium riches, or as the kind of land where experiments can be most safely conducted'.[75] At last Australia's troublesome interior seemed to have a purpose, a destiny. The atomic tests, argued the *Herald*, 'gave the dead heart of Australia a significance in world affairs that could not have been dreamed of until 1945'.[76]

A new story of rebirth and renewal was taking shape. 'It was silent country', wrote Ivan Southall of the Woomera rocket range, 'it was dead country'. 'Once there had been forests, diprotodon as large as rhinos', but the 'primeval lushness' had vanished, leaving a harsh, 'sterile' land in its place. Other than a few hardy settlers, it had remained empty. But now, the qualities that made it so forbidding were exactly those demanded by defence scientists. Suddenly, the land seemed more a blessing than a burden. 'Here it was', Southall enthused, 'one of the greatest stretches of uninhabited wasteland on earth, created by God specifically for rockets'.[77]

In this grand saga of fulfilment, it was not the land's latent fertility that was stressed, but its lifelessness. These were barren wastelands, alien and inhospitable, of no use for anything else. In 1951, an article in *Walkabout* rhapsodised about a romantically beautiful' group of islands off Australia's north west coast. The Monte Bello Islands were a 'marine paradise', the article continued, that might one day become a 'great holiday resort'.[78] Within a year, the islands were named as the site of Britain's first atomic bomb test, and described by officials as 'barren and fairly flat', home to nothing but 'a few birds and small animals'.[79] Winston Churchill amused the British parliament by reporting that the only inhabitants of the island were 'some lizards, two sea eagles and what looked like a canary sitting on a perch'.[80] An amateur naturalist with the British

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[75] *Sunday Herald*, 4 October 1953, p. 2
[76] *Herald*, 15 October 1953, p. 4
[77] Ivan Southall, *Woomera*, Angus & Robertson, Sydney, 1962, pp. 2-3.
[78] Trevor Tuckfield, 'The Monte Bello Islands', *Walkabout*, vol. 17, no. 8, 1 August 1951, pp. 33-4.
[79] *CPD*, vol. 217, 4 June 1952, p. 1374.
[80] Quoted in Robert Milliken, *No conceivable injury: the story of Britain and Australia's atomic cover-up*, Penguin, Melbourne, 1986, p. 33.

scientific team was later to catalogue more than 400 species of plants and animals on the islands, including a number that were wholly new to science.[81]

Scenes of hopeless desolation overwhelmed journalists surveying the mainland test sites. The Woomera rocket range was located in 'one of the world's loneliest and most arid regions', the *Adelaide Advertiser* reported, 'no trees grow there'.[82] This 'unnocupied wasteland', was according to *Walkabout*'s correspondent, 'a land of no rivers'. It was 'a harsh landscape stretching to infinity', whose 'dryness and sterility' had deterred pastoralists and defied explorers.[83] 'All around us was the gibber country', wrote Warren Denning from the Emu Field test site, 'I could see no sign of life...it seemed that all nature had deserted this baleful place whose real fruits lay in death and horror'.[84] Enlisted by the government to write a series of background articles on the Maralinga site, TAG Hungerford described a land for which 'no conceivable use could ever be found or suggested'. Only through the needs of the Atomic Age had such useless tracts had been 'endowed with a purpose'.[85]

The discovery of uranium amidst the continent's 'empty wastes' brought further possibilities for redemption. Opening the Rum Jungle uranium mine in 1954, Prime Minister Menzies declared it 'something of a miracle'. 'Not long ago', he continued, the Northern Territory had seemed 'almost worthless': 'But the history of Australia is the history of converting people from despair to hope and from hope to achievement'. With the discovery of uranium, the north seemed destined to host 'one of the great communities of Australia'[86] Paul Hasluck, the Minister for Territories, agreed, arguing that uranium would help 'transform the Northern Territory' from a 'land of large cattle stations and arid wastelands' to 'a land of inland towns thriving on mineral

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81 Margaret Gowing, *Independence and deterrence: Britain and atomic energy, 1945-1952*, 2 vols., vol. 2, Macmillan, London, 1974, p. 478.
82 *Adelaide Advertiser*, 30 June 1948, p. 2.
83 Charles H Holmes, 'Half-way round the world to test atomic weapons', *Walkabout*, vol. 18, no. 7, 1 July 1952, p. 14.
84 Warren Denning, 'Where the big bomb was exploded', *Walkabout*, vol. 20, no. 2, 1 February 1954, p. 12.
85 TAG Hungerford, 'The pay-off at Maralinga', NAA: R6456/3, R030/085.
86 *SMH*, 18 September 1954, p. 3.

production'.[87] The area 'so long disparagingly called "the dead heart" may prove to be the richest in this vast continent', one article concluded.

But even as the land was waking to the call of bombs, rockets and magic metals, its original inhabitants were lapsing, it seemed, into a final, deathly slumber. Dr Charles Duguid, founder of the Ernabella Mission, was alarmed to find that rockets fired from the Woomera range were expected to pass over a number of Aboriginal reserves. He was angered too by plans to establish observation posts in remote areas still occupied by Aborigines living in their tribal state.[88] Duguid was joined in his outrage by many concerned citizens, including the anthropologist Donald Thomson, who argued that Woomera would 'spell final doom for the aborigines of that region'.[89] The risk was not so much from the rockets themselves, but from the inevitable disruption to Aboriginal life and custom. 'Experience shows that if the aborigines are submitted to the contacts of white civilisation they are destroyed', observed Clive Turnbull in support of the protest movement.[90] Progress offered no prospect of coexistence, the gap was just too great. Native Patrol Officers were appointed by government in a half-hearted attempt to manage the confrontation between old and new, and as development of the range proceeded, the controversy faded.[91] But just as Len Beadell had pondered the ironies of his 'Aboriginal Stonehenge', so the contrast between the fading remnants of Aboriginal life and the dramatic onslaught of the Atomic Age encouraged reflection upon the pace of change and the fate of civilisation.

'Alongside these modern atomic developments on the fringes of the wastelands Stone Age man affords a contrast as wide as the world', commented Charles Holmes in *Walkabout*. Although he might watch the rockets soar skywards, Holmes continued, an Aboriginal 'could never understand... he was witnessing the birth of a new era'.[92]

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87 Quoted in "Uranium fever" in Australia', *New Commonwealth*, vol. 24, 15 September 1952, p. 295.
88 The controversy is described in Peter Morton, *Fire across the desert: Woomera and the Anglo-Australian Joint Project 1946-1980*, AGPS, Canberra, 1989, ch. 5.
89 Donald F Thomson, 'Rockets will doom aborigines', *Herald*, 11 October 1946, p. 4.
90 *Herald*, 29 March 1947, p. 4.
91 For a description of the work of the native patrol officers see: Morton, *Fire across the desert*, ch. 6; Milliken, *No conceivable injury*, pp. 94-108.
92 Holmes, 'Half-way round the world to test atomic weapons', pp. 14-15.

Another correspondent observed that while the 'near-naked Pinjinjarra [sic] aborigines' went about their daily lives and traded 'spears and woomeras to adorn the walls of the mess huts', they weren't 'very interested in the rocket range'. 'Few of them have heard of the atom bomb', he added.[93] Aboriginal people were innocents in an age of cataclysmic significance. Their supposed naivety appealed to a world beset by the challenges of progress. But such innocence could be sustained only in a culture disconnected from the flow of history. It had no future. Just as western civilisation had to confront the implications of the bomb, so Aboriginal society had to adapt or die. As journalists watched the cloud of dust and gas rise from the first atomic test at Emu Field, someone suggested it had taken the shape of 'an aboriginal warrior's face'. It was 'as though some primitive spirit from the dead heart of Australia had taken momentary charge of the blast', the *Herald* reported.[94] But perhaps in this ghostly echo there was a warning too— progress could not be denied.

Lingering remnants of Aboriginal culture contributed also to a sense of the land's antiquity. Children living at Woomera raided nearby sites for fossils and Aboriginal artefacts, 'feeling a sense of awe at their age'. 'Everywhere the incredible age of this country seemed to dominate one's consciousness, a former resident recalled, 'the children grew up in two contrasting worlds— the modern world of rocketry inside the village and the ancient land outside'.[95] In this oldest of lands the drama of progress was played out with compelling clarity. Surrounded by 'the antediluvian animals of Australia', Alan Moorehead watched as supersonic rockets were launched from the 'benighted plain' into 'realms where only pure mathematics can follow'. 'It is this conjunction of the infinitely primitive past and the infinitely fantastic future that makes Woomera so strange and stimulating a place', he mused.[96]

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[93] John Paton, 'Woomera - The most expensive area in Australia', *Trade Digest*, vol. 3, no. 2, June 1952, p. 20.
[94] *Herald*, 15 October 1953, p. 1, see also photo on p. 3. Len Beadell recalls that the press's discovery of this image in the cloud was the result of a joke by one of the test personnel, see *Blast the bush*, pp. 210-11.
[95] Former resident quoted in Morton, *Fire across the desert*, p. 235.
[96] Alan Moorehead, *Rum Jungle*, Hamish Hamilton, London, 1953, p. 90.

The contrast was emphasised by the establishment of new townships, transplanted visions of Australian suburbia equipped with almost every convenience. Woomera seemed particularly 'odd', commented the Herald, because 'there among the gibbers and dust' has grown 'the most modern town in Australia'.[97] In a land 'almost as old as anything on earth', George Farwell was similarly delighted to discover Mary Kathleen, 'the most modern little town I have seen anywhere in Australia'. Constructed to house miners working uranium deposits near Mt Isa, Mary Kathleen had transformed what was once 'virtually desert land, supporting no life at all,' into 'a garden suburb for 1,100 people'.[98] The feeling of new life and new activity was expressed not only in the broad streets, well-tended gardens, and neat, modern-styled houses, but in the 'well-dressed young mothers and lovely children'.[99] Indeed, a special bus was commissioned to carry Woomera's 70 expectant mothers to their regular medical check-ups.[100] 'Children run about everywhere', remarked Alan Moorehead as a set of twins was born in the local hospital, and 'the girls seemed much prettier'.[101] As scientists boldly raised their missiles skywards, Australia's barren wastes became fertile once more.

The Atomic Age bestowed a vision of regeneration based not on water, but on power—the power to secure a nation's defences, to transform industrial development, perhaps even to reach the moon. But progress itself was still to be found in the resurrection of dead lands and worn-out hopes, in the reinvigoration of spirit and destiny, in the embrace of change, in the triumph of new over old. The inland might never be restored to its primeval lushness, but new life would come. Uranium had changed the pace of existence in the Northern Territory, one writer observed, 'something urgent seems to have crept into the way of life'.[102] Another argued that it would give 'the economic life of the Territory the transfusion of new blood it needs'.[103] The bomb would shatter the

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[97] *Herald*, 15 March 1952, p. 13.
[98] George Farwell, '"Mary K": model town in the spinifex', *Walkabout*, vol. 24, no. 5, 1 May 1958, pp. 11-13.
[99] *Herald*, 15 March 1952, p. 13.
[100] *ibid.*
[101] Alan Moorehead, 'The sky's the limit at Woomera', *Herald*, 9 July 1952, p. 4.
[102] Ross Annabell, 'Rum Jungle', *Exports of Australia*, vol. 8, no. 6, April-May 1954, p. 15.
[103] William Prehn, 'Australia's atomic future', *Pacific Neighbours*, vol. 9, no. 2, 1954, p. 20.

'inland silence that remained unbroken for ages', suggested the *Sunday Herald*, while Warren Denning observed that in the aftermath of the blast even the 'poverty-ridden' mulga scrub seemed 'green and lush and full of the bright good things of the earth'.[104] As Len Beadell set out to find a location for the first mainland atomic test, he pondered his reponsibility: 'to think that for the first time the mulga country site somewhere yet to be found was to come to life in the blinding flash of an atomic explosion'.[105]

## Modern man looks towards the stars

Regeneration might come not only to the land, but to its people. As evolutionary ideas took hold in the late nineteenth century it seemed that the human species itself might be capable of further adaptation and improvement. A nation's inheritance could be found in its biology as well as its geographical possessions; its progress measured not just in the life and works of its citizens, but in the vigour of its race. Such beliefs found expression in the idea of the 'coming man', a new 'type' supposedly being created at the nexus of European civilisation and Australian environment. The 'coming man' combined masculine virtues of courage, initiative and mateship, with a sense of youth and destiny. In his hands he held the future of his race, in his heart the dream of a strong Australia, pure and white.[106]

'For a nation to be strong the best life is a country life', asserted CEW Bean.[107] The chronicler of the Anzac legend observed the characteristics of the 'coming man' in the young Australians fighting on the battlefields of Gallipoli, France and Belgium. They were characteristics born of the land, the air, the fields and the forests. Soldiers who came from 'big crowded cities' tended to be 'little, white-faced, stunted, narrow-chested men', Bean argued, not like the big, healthy Australians with their love of sports and outdoor adventure.[108] However, sturdy Anzac warriors were not bred solely on fresh air

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104 *Sunday Herald*, 4 October 1953, p. 2; Denning, 'Where the big bomb was exploded', p. 13.
105 Beadell, *Blast the bush*, p. 8.
106 White, *Inventing Australia*, ch. 5.
107 Bean, *In your hands Australia*, p. 22.
108 *ibid.* For more on the supposed benefits of frontier life, see Brigid Hains, *The ice and the inland: Mawson, Flynn and the myth of the frontier*, Melbourne University Press, Melbourne, 2002, ch. 5.

and freedom, they needed the hardships and disappointments of rural life to temper their endurance. 'It is the difficulties of our country that have made our character— not its ease', Bean noted.[109] 'The Australian is always fighting', he commented elsewhere, fighting droughts, fire, nature itself, had made the Australian 'as fine a fighting man as exists'.[110] The land had created a race of heroes; the hardships of the bush had 'hammered out of the old stock a new man'.[111]

Frontier life was a test of character and physique. For all her bounties, EJ Brady admitted, Australia challenged her would-be settlers with 'a series of physical and climatic paradoxes'. The continent's 'ancient lineage forbids the familiarity of the unworthy', he argued, its 'paradoxes and difficulties' demanded 'mental and bodily activity' to overcome. Through workings of evolution, this 'strenuous environment' would produce an 'enduring type' to conquer the land and secure 'the future of European civilisation in the Southern Hemisphere'.[112] But the frontier was also a place of uncertainty and contradiction, where dreams of progress met the brutal realities of failure. Nature at its most wild and primitive could forge the race anew, but it could also eat away at civilisation, draining the will and dragging the race back along the evolutionary scale.[113] In lonely country north of the Simpson Desert, Ion Idriess heard the tale of an 'educated, cultured' and 'fine-looking' man who suddenly decided to live with the local Aborigines. It was an 'unexplainable reversion', a rejection of progress. While 'modern man looks towards the stars', Idriess observed, 'our man looked back down to the primal depths'.[114]

Even as the new nation celebrated the emergence of an Australian 'type' to carry it forth in achievement and renown, it was haunted still by the possibility of degeneration. Asia pressed oppressively near upon a continent whose north seemed alien and unhealthy.

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109 Bean, *In your hands Australia*, p. 92.
110 Quoted in White, *Inventing Australia*, p. 126.
111 *ibid.*
112 Brady, *Australia unlimited*, p. 636.
113 For a discussion of frontier anxieties and the possibility of degeneration see: Hains, *The ice and the inland*, ch. 6; Tom Griffiths, *Hunters and collectors: the antiquarian imagination in Australia*, Cambridge University Press, Cambridge, 1996, pp. 186-92.
114 Idriess, *The great boomerang*, p. 27.

Droughts repelled the advance of settlement, while the 'remnants' of a 'primitive', 'Stone Age' culture wandered the land in disquieting counterpoint. Sprawling cities spawned disease and poverty, and the rise of class conflict threatened the very notion of unity. Beset by threats and potential crises, progressives sought to marshal the resources of a modern, scientific state against the possibility of degeneration. Legislators erected racial barriers to preserve the integrity of white Australia, and called medical scientists into battle against tropical disease. Town planners argued the benefits of decentralisation and imagined healthy cities, full of space, light and life. Reformers pursued the betterment of public health and hygiene, while educators and sociologists charted the course of social evolution in an attempt to foster moral and intellectual fulfilment. A strong, healthy and vital race could not be guaranteed through the workings of nature alone. The future Australian had to be shaped and nurtured.[115]

'We can improve or degenerate... we must do one or the other, as it is impossible for us to remain always as we are', the *Australasian Manufacturer* quoted approvingly from the work of business writer Herbert Casson. 'No human being has ever been found who was not improvable', the extract continued, ' mentally, most of us are the merest beginnings, compared with what we might be'.[116] In the early decades of the twentieth century, progressive reformers sought to find the means to release an individual's potential, to unlock the vital energies of a nation, and strive onwards to greater heights of cooperation and efficiency. Indeed, efficiency was their ultimate aim, an efficiency measured not just in improvement or adjustment, but in transcendence. Efficiency promised to banish the spectre of degeneration by enabling the full expression of a nation's resources and capacities. 'National efficiency', proclaimed FW Hagelthorne the

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115 For more on the progressive reform movement see Roe, *Nine Australian progressives*. For a discussion of Australian fears of Asia and tropical climates and disease, see: David Walker, *Anxious nation: Australia and the rise of Asia 1850-1939*, University of Queensland Press, St Lucia, 1999; Warwick Anderson, 'Geography, race and nation: remapping 'tropical' Australia, 1890-1930', *Historical Records of Australian Science*, vol. 11, no. 4, 1997, pp. 457-68.

116 'The law of progress in business and men', *Australasian Manufacturer*, vol. 4, no. 184, 11 October 1919, pp. 26-7.

Victorian Minister of Public Works, connotes 'above all... that our people shall be men and women of the highest rank as human beings'.[117]

'True efficiency', argued the *Australasian Manufacturer*, required 'persistent training and patient effort from childhood to manhood, ...from the cradle to the grave'.[118] This was perhaps a rather conservative prescription as many efficiency advocates looked beyond childhood to the key moment of conception. The influence of eugenics was keenly felt throughout the progressive movement as reformers sought means to engineer a stronger, more resilient populace. With the comparative influence of environment and heredity still uncertain, solutions ranged from improved sanitation and nutrition, through to plans for the sterilisation of the 'unfit'.[119] Leadership, it was assumed, would come from the professional middle-classes, backed by the power of the state. Emboldened by science, and energised by a sense of racial destiny, experts pronounced upon the ideal citizen, the ideal mother, and the ideal home. Efficiency demanded babies conceived in wedlock by worthy, responsible parents, born under the close supervision of the medical profession, and raised according to the regimens of 'mothercraft' specialists.[120] Modern methods would make modern men and women, heirs to a new world of progress.

The problem with utopias, argued Jane Clunies Ross in 1942, was their insistence on 'the importance of the intelligence and rationality of mankind'.[121] Progressive reformers sought to manufacture a modern citizenry through consensus and self-discipline: they assumed that people would, on the whole, recognise what was best for themselves and

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117 F Hagelthorn, 'Introduction', in F Hagelthorn (ed.), *National Efficiency*, Victorian Railways Institute, Melbourne, 1915, pp. 1-2.

118 'The need of scientific thinking', *Australasian Manufacturer*, vol. 1, no. 31, 28 October 1916, p. 9.

119 On eugenics in Australia, see: C L Bacchi, 'The Nature-Nurture Debate in Australia, 1900-1914', *Historical Studies*, vol. 19, no. 75, 1980, pp. 199-212; Stephen Garton, 'Sound minds and healthy bodies: reconsidering eugenics in Australia, 1914-1940', *Australian Historical Studies*, vol. 26, no. 102, 1994, pp. 163-81; and the papers in Martin Crotty, John Germov, and Grant Rodwell (eds), *'A Race for a place: eugenics, Darwinism and social thought and practice in Australia, Proceedings of the history & sociology of eugenics*, Faculty of Arts & Social Science, University of Newcastle, Newcastle, 2000.

120 Kerreen Reiger, *The disenchantment of home: modernising the Australian family 1880-1940*, Oxford University Press, Melbourne, 1985.

121 Jane Clunies Ross, 'O, brave new social order!', *Australian Quarterly*, vol. 14, no. 4, December 1942, p. 83.

the nation, and respond accordingly. It was the only rational thing to do. In the 1940s, as a new generation of reformers pondered the challenges of postwar reconstruction, they looked with hope not to the possibilities of rational persuasion, but to the power of psychology, the mass media and public relations.[122] The minds of the people had to be won to the cause by strategically planned interventions. As the Committee on Civilian Morale underlined in its report to the Curtin government, 'it is impossible to run a planned economy on a laissez-faire psychology'.[123]

Emphasis shifted from healthy bodies to healthy minds, from the prospect of self-realisation to the need for psychological adjustment. The meaning of any 'new social order' would be greatly clarified, Jane Clunies Ross suggested, 'if people could realise that the world is not unhappy but there are many unhappy people in it'. A 'psychologist's utopia', she continued, would be free of any such 'misfits'. Instead, 'psychologically trained parents' would raise children to be 'fearless, confident, independent in thought and deed, socially at ease and willing to co-operate'.[124] The new order could not be built with old minds. Science answered the call once more with a range of modern therapeutic techniques, ranging from psychoanalysis to psychosurgery. The most radical of these, pre-frontal leucotomy, surgically severed the brains frontal lobes. First performed in Australia during the Second World War, leucotomies gained in popularity through the late 1940s and '50s, and were used to treat a variety of seemingly 'hopeless mental cases', including schizophrenia, anxiety, and depression.[125] The results were often dramatic. The patient 'may emerge from the theatre a completely different person', reported the *Sunday Herald*, 'his old personality can vanish... his former self may have gone'.[126]

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122 Rowse, *Australian liberalism and national character*, pp. 147-76.
123 'Report of the Committee on Civilian Morale made under direction of the Prime Minister', 4 April 1942, NAA: A1608/1, AK 29/1/2.
124 Jane Clunies Ross, 'O, brave new social order!', p. 85.
125 'Brain surgery is last resort for the insane', *SMH*, 17 September 1952, p. 2; Milton Lewis, *Managing madness: psychiatry and society in Australia 1788-1980*, AGPS, Canberra, 1988, pp. 67-9.
126 'Changing a human brain', *Sunday Herald*, 8 June 1952, p. 7.

The atomic bomb, Albert Einstein famously remarked, had 'changed everything but our way of thinking'. The release of atomic energy confronted the world with a 'supreme moral and intellectual test'.[127] Humankind had to demonstrate that the 'vast powers' of atomic energy were not 'in the hands of moral and physical pygmies', argued the *Age*: 'Unless man can control his own impulses and use the powers of science for beneficent purposes, his life becomes a brutish affair'.[128] The new age demanded a 'change of heart'. What was needed, suggested zoologist WJ Dakin, was 'a rebirth in education and morality'.[129] His colleague at the University of Sydney, Sir Henry Barraclough, also pondered this 'vitally urgent' problem. 'The secrets within the mind and spirit of man are more subtle, more difficult to unravel, and immensely more important than any hidden in the atom', the engineer reflected. A 'new engineering' was necessary 'to design and operate the social machinery', and to overhaul 'our defective educational and cultural equipment'.[130]

In his poem 'Atomic bomb', Ernest Briggs wondered whether the world would succumb to 'a new brutality' or be uplifted by 'a new surge / of the regenerated spirit that shall bring / the revelation of a new nobility'.[131] The need for spiritual regeneration was vigorously proclaimed by a number of church leaders who saw the bomb as evidence that 'the world's mind is outrunning its conscience'. 'We shall have to match the huge forces released by this discovery with man's inner forces of wisdom and judgment', commented the Moderator of the Presbyterian Church in Queensland.[132] Reason alone could not control the headlong rush of science, asserted the Rev. Alan Walker, humanity's only hope for salvation lay 'in a new release of world spiritual energy'.[133] But the idea that the Church could revive a failing social structure and instill a new sense of purpose in people and nation had arisen much earlier in response to the

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[127] *Herald*, 13 August 1945, p. 4.
[128] *Age*, 8 August 1945, p. 2.
[129] *Listener-In*, vol. 21, no. 36, 1-7 September 1945, p. 6.
[130] *SMH*, 16 November 1945, p. 2.
[131] Ernest Briggs, 'Atomic bomb', *Meanjin*, vol. 4, no. 3, Spring 1945, p. 175.
[132] *SMH*, 10 August 1945, p. 5.
[133] *Listener-In*, vol. 21, no. 36, 1-7 September 1945, p. 6.

Great Depression.[134] Christian notions of regeneration also shaped discussion of the 'new social order' that was expected to emerge from the war. In 1941, the theologian Samuel Angus considered the problems of 'Man and the new order'. The 'new world with its kaleidoscopic changes will demand *new hearts* as well as new opinions and new forms of social cohesion', he suggested, the new order had to made 'not *around* us, but *within* us'.[135]

Similarly, there had been warnings for many years that the progress of science had outpaced humanity's capacity for moral judgment. In 1931, the physicist TH Laby noted that 'science has greatly increased man's power for good and evil, and the future of mankind depends on the use to which that power is put'.[136] Reflecting on Laby's comments, the *Sydney Morning Herald* invoked a familiar image: 'We resemble small children who have broken into a carpenter's shed and have been playing with sharp tools'.[137] From the plans of the progressives to the architects of the new social order, progress could be measured in the human capacity for development and improvement. Old habits, old ways of thinking, would pass as modern men and women strode forward to meet the dawning of the new age. The destruction of Hiroshima inspired cartoonists to portray humanity as a baby playing recklessly with its new toy, the atomic bomb. As Australians pondered the image, they were reminded that progress was about growing up.

## The wonder appliance of the atomic age

Standing at the crossroads signpost in the middle of the 'Herald Atomic Age and Industrial Exhibition', thirteen year-old Phyllis Nicholls symbolised the destiny of humankind. The people of the world were as children before the terrible power of the bomb. The inexorable advance of scientific progress called men and women to leave behind their ancient fears and prejudices, the brutish simplicities that had served from

134 Alomes, 'The 1930's background to Post-war reconstruction', pp. 29-31.
135 Samuel Angus, *Man and the new order*, Angus & Robertson, Sydney, 1941, pp. 28, 70.
136 *SMH*, 19 August 1931, p. 12.
137 *SMH*, 22 August 1931, p. 12.

the infancy of civilisation. But as Phyllis looked about the exhibition, from the scale model of Hiroshima to the working demonstration of an atomic pile, progress beckoned her on in an altogether different direction. Beyond the story of the atom, were a range of industrial exhibits where manufacturers displayed their latest wares. There was Kix fly spray, proudly boasting to have the strongest DDT formulation available— 'Flies know the Atomic Age is here when Kix hits them'. Further on, the Toycraft company offered 'atom power toys (any little atom can push them along)', Healing revealed 'the greatest refrigerator advance in years', and Repco welcomed visitors to 'a new automotive era'. While visitors pondered their grave responsibilities, they were reassured that science was working to make their lives more happy and healthy, that progress was as close as the corner shop. 'Science was never more justified', proclaimed one beverage manufacturer, 'than in the long and patient researches which produced "Ovaltine"'.[138]

Phyllis's introduction to the wonders of the Atomic Age took place in Melbourne's Exhibition Buildings, first opened in 1880 for the grand International Exhibition. Then, amidst a marvellous array of products from the world's greatest industrial powers, the colonies displayed evidence of their own enterprise and ability— a pyramid of biscuits from Victoria, a slab of coal from NSW. It was a moment for the colonists to reflect on their achievements to date, and to imagine the glorious future ahead. It was an exhibition of confidence, of self-belief, and of destiny.[139] In 1923, as the Australian Natives' Association opened an exhibition of 'Australian products and manufactures', the *Australasian Manufacturer* noted that the Exhibition Buildings had hosted 'recurring demonstrations of a similar nature' since the 1880s. Each exhibition marked 'a great advance over its predecessors as regards quality and variety of exhibits', the article commented, 'constituting, therefore, so many milestones on the path of our national progress'.[140]

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138 Advertisements for the industrial exhibitors were included in the souvenir booklet, *The Herald Atomic Age and Industrial Exhibition*, Herald & Weekly Times, Meboume, 1948.
139 Graeme Davison, *The rise and fall of marvellous Melbourne*, Melbourne University Press, Melbourne, 1981, pp. 1-6.
140 'A.N.A. Exhibition of Australian products & manufactures', *Australasian Manufacturer*, vol. 7, no. 359, 17 February 1923, p. 13.

The 'educational value' of the 1923 exhibition was judged to be higher that that of its predecessors. Like the 'All Australian' exhibition held in Sydney the previous year, the ANA exhibition was intended to foster a sense of pride and confidence in the work of Australian manufacturers.[141] The nation's dreams of industrial development were unlikely to be realised unless consumers were prepared to buy Australian-made goods. Through their purchases, ordinary Australians could strengthen their nation and force the pace of progress. The exhibition, therefore, offered practical instruction in patriotism and civic duty. But more than this, argued the *Australasian Manufacturer*, it was 'good and wise and necessary' to introduce young people to 'the real greatness of industry', to 'enjoy the romance... associated with all the works of man'.[142]

However, it was the romance of technology that increasingly thrilled the crowds as motor shows and electrical displays became annual features in the 1920s and '30s. The first Electrical and Radio Exhibition was held in Sydney in 1926, and by 1930 it had expanded dramatically, featuring more than fifty exhibitors across 16,000 square feet of floor space.[143] 'No other exhibition can be so full of marvellous things as this', enthused the *Sydney Mail*, 'electricity is still the marvel of the age— the magic power'.[144] Most remarkably, perhaps, this 'magic power' was poised to transform not just nation and industry, but the home itself. 'The most important development of electricity in the future will unquestionably be applied to the home', argued the *Australasian Manfacturer* in 1923. In an age of miraculous progress, the home represented 'a survival of barbarism', the editorial continued, 'it is not nearly as clean as it ought to be'. Electricity promised to 'eliminate practically all unnecessary work', while making the tasks that remained 'a pleasure'. A 'revolution' in cooking was inevitable, and dish-washers and vacuum cleaners would sanitise 'to perfection'. Domestic life would be 'saner, cleaner, and, consequently, healthier and happier'.[145]

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141 'The "All-Australian Manufactures" exhibition', *Australasian Manufacturer*, vol. 7, no. 343, 28 October 1922, p. 11.
142 'The A.N.A. Exhibition - a revelation of what Australia can do', *Australasian Manufacturer*, vol. 7, no. 357, 3 February 1923, p. 10.
143 *SMH*, 26 March 1930, p. 9.
144 *Sydney Mail*, 2 April 1930, p. 20.
145 'The coming age of electricity', *Australasian Manufacturer*, vol. 8, no. 377, 23 June 1923, pp. 9-10.

The Sydney Electrical and Radio Exhibition displayed and demonstrated nearly 150 electrical appliances, ranging from waffle-makers to lawn mowers. Visitors were encouraged to consider the ease of life in a 'completely electrified home'.[146] It was a beguiling vision that lingered on in a variety of guises. The *Sydney Morning Herald*'s 1955 'Refrigeration feature' reported the comments of Noel Felton, a whitegoods manufacturer, on the development of 'mechanised homes'. Appliances once considered luxuries had become necessities, he argued, as the 'modern housewife' sought 'a better and easier way of life'. Australians were, as a result, 'happier, healthier' and had 'more leisure than their parents and grandparents'.[147]

But the modern home brought with it the challenge of keeping up. To fully benefit from the wonders of a 'mechanised home', householders were advised to keep abreast of the newest features and designs. Noel Felton noted with satisfaction that Australians were beginning to emulate the 'ordinary American' who 'keeps right up to date and will use only the latest and best type of electrical appliance'.[148] The habits of consumers started to change in the 1920s, with the growth of local manufacturing and the emergence of the advertising industry. The development of new materials and appliances, the availability of processed foods, and the expansion of new suburbs, all contributed to a 'cult of home and garden' that was to flourish in the 1950s and beyond.[149] Increasingly privatised, the urban family surrendered its remaining productive functions and embraced the pleasures of consumption.

An advertisement published in the *Australian Women's Weekly* in 1956 shows a typical nuclear family barely able to contain their joy as they survey the symbols of modern life through a shop window. Toasters, irons, kettles, radios and vacuum cleaners all promise delight and fulfilment. 'May 13th is Mothers Day', readers are reminded, and of course

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146 *Sydney Mail*, 2 April 1930, p. 20.
147 *SMH*, 29 April 1955, p. 10.
148 *ibid.*
149 Macintyre, *1901-1942: The succeeding age*, pp. 217-21; Stephen Alomes, Mark Dober, and Hellier Donna, 'The social context of postwar conservatism', in Ann Curthoys and John Merritt (eds), *Australia's first Cold War*, George Allen & Unwin, Sydney, 1984, pp. 3-5.

'it's so satisfying to give Hotpoint'.[150] Ownership of the most up to date consumer desirables infused domestic life with a buzz of excitement, Helen Harbour, a suburban housewife in the 1950s, organised regular celebrations of her new acquisitions.[151] It was a trend gently satirised by the *Current Affairs Bulletin*, suggesting that the average family might soon be unable to afford 'both a healthy mind and a healthy body', such was the growing list of appliances deemed essential to modern living: 'A Dishmaster, Wipemaster, Mixmaster, Icemaster, Skymaster, Panmaster, Sleepmaster, Musicmaster, Mousemaster, etc, etc'.[152]

Just as exhibitors at the 'Herald Atomic Age and Industrial Exhibition' sought to invest their products with some of the revolutionary force attributed to the bomb, so advertisers commonly invoked the prestige of science to promote their latest products. Westinghouse advertised its refrigerators as bearing 'the same name that produced *the world's first Atomic-powered submarine*', while the Blendor-Mix was claimed to be 'the wonder appliance of the Atomic Age'.[153] Appliances were 'styled for tomorrow', or 'scientifically accurate', and even the Sunbeam Mixmaster was declared to operate at 'scientifically correct speeds'.[154] Through their purchases, consumers were encouraged to participate in the new age of science, to feel that they were in the vanguard of change.[155]

There is something rather familiar in advertisements for the 1923 Electrical and Radio Exhibition that reminded the public 'no home is a real home without radio'.[156] The 'electrified home', like the 'mechanised home' or the 'automated home', was not merely a place of residence, it was a way of living, a way of enjoying the benefits of progress. Now we plan our 'networked homes', 'smart homes', where our appliances talk to each other, monitor our habits and anticipate our needs. But the aspirations remain the same. Developments in technology continue to shape our expectations of domestic life, to

150 *Australian Womens Weekly*, 9 May 1956, p. 27.
151 Pam Rehak, 'Helen Harbour: housewife of the 1950s', in Marilyn Lake and Farley Kelly (eds), *Double time: women in Victoria, 150 years*, Penguin, Melbourne, 1985, p. 420.
152 JLJ Wilson, 'The family', *Current Affairs Bulletin*, vol. 13, no. 5, December 1953, p. 78.
153 *Australian Womens Weekly*, 28 October 1953, p. 52; 6 May 1953, p. 27.
154 *Australian Womens Weekly*, 23 September 1950, p. 75; 3 March 1951, p. 53; 14 September 1955, p. 65.
155 Alomes, 'The social context of postwar conservatism', pp. 6-7.
156 *SMH*, 26 March 1930, p. 9.

define the meaning of a 'modern home' and a 'modern family'. Then as now, we are encouraged to believe that progress can be bought off the shelf, that new appliances offer new lives, and that old problems and conflicts can be discarded like worn-out washing machines.

## Beyond our sort of memory

Imagine yourself some 5,000 years hence, travelling a land once known as 'South Australia'. Something catches your eye— a strange glassy substance protruding from the earth. It seems out of place, unnatural. 'How did it get here?', you wonder. You begin to scrabble about in the dust, looking for clues. You find a few twisted pieces of metal, and... what's this? Some of the colour is still visible despite the deterioration and there seems to be— yes it must be— writing. Writing in some ancient, unfamiliar language. A sign of some sort, a label? 'What was this place?', you ask, 'who were these people?' You try to imagine their customs, their rituals, and begin to muse, 'What would they make of the world today?'

Some weeks later, traces of plutonium are found in your system.

A Senate estimates committee in May 2000 questioned staff of the Australian Radiation Protection and Nuclear Safety Agency (ARPANSA) about the 'clean-up' of the atomic test site at Maralinga. Large areas of land, it was admitted, would be uninhabitable for 24,000 years.[157] As Len Beadell pondered his 'Aboriginal Stonehenge', he was engaged upon a mission that would create a monument equally as lasting, whose meaning to generations far removed would be equally mysterious.

With the entire span of European occupation measuring a mere two hundred years, the task of communicating the atomic test site's dangers to generations 24,000 years into the future was admittedly problematic. The Senate committee was informed that there were warning signs around the perimeter, though the ARPANSA staff readily conceded that

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[157] Senate, Community Affairs Legislation Committee, Australian Radiation Protection and Nuclear Safety Agency, 2 May 2000, p. 37; see also Phillip Coorey, 'Dreamtime push for Maralinga', *Adelaide Advertiser*, 3 May 2000, p. 2.

these were unlikely to last the distance. And even if they did, who would be able to read them? Geoff Williams of ARPANSA suggested that recordkeeping was the key, and pointed to the oral traditions of Aboriginal people as a means of preserving knowledge about the sites: 'I think they have records going back beyond our sort of memory, do they not? They have their own way of recording things'. He thought that with expert guidance the region's Aboriginal inhabitants would be able to incorporate appropriate warnings into their oral 'tradition'.[158]

And so, 5,000 years in the future, perhaps it would be the descendants of a supposed 'Stone Age' people, whose very presence seemed so at odds with the atomic test program, who would help you understand the significance of your deadly discovery. Through them you might learn of the dangerous follies of a careless, short-sighted people. A people who stole the land, poisoned it, and gave it back. A people obsessed with progress.

Already the atomic tests seem long in the past. The motivations of those who so willingly sacrificed the land and its people are difficult to recapture. New replaces old in an endless succession of forgetting and denial, as we seek to escape our past and push our problems ahead, ever further into the future. In the contrast of old and new we find the substance of our ambitions, the source our confidence, the meaning of our pride. We create an image of ourselves as bold revolutionaries, breaking with a past that can never be revisited or reclaimed. In the contrast of old and new, progress gleams inevitable and unyielding.

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158 *ibid.*

# 4 Anzac brains

The Gallipoli campaign was over. On the 22 December 1915, Australians learnt of the successful withdrawal of Australian troops from the Turkish peninsula. Buoyed by the news, Prime Minister Billy Hughes strode into a luncheon at the University of Melbourne like 'a prize fighter', ebullient and combative, determined to meet the German menace on every front.[1] Hughes was near the height of his confidence and power. He had replaced Andrew Fisher as head of the Labor government in October, and, under the provisions of the War Precautions Act, ruled the nation almost by decree. The 'best way to govern Australia', Hughes remarked, was to have the Solicitor General, Robert Garran, 'at his elbow, with a fountain pen and a blank sheet of paper, and the War Precautions Act'.[2] Within a few weeks, Hughes was to embark upon a triumphant return to his birthplace, England, where his 'fiery speeches' would attract the attention of press and politicians alike.[3]

Sir John Madden, Chancellor of the University of Melbourne, presided over the valedictory luncheon, lauding the Prime Minister's dedication and resolve. He would arrive in England 'as the most distinguished man who had ever left Australia', Madden proclaimed, 'the bearer of the glory won by Australian soldiers'.[4] But there was more than mere flattery on the minds of this distinguished gathering. Moves were afoot for the coordination of scientific research across the country. FW Hagelthorne, national efficiency enthusiast and minister in the Victorian government, had been successfully lobbying the other states, but where did the Prime Minister stand? A few days before the luncheon, Hughes had met with WA Osborne, the University's professor of physiology, to discuss possible research schemes. Although Hughes was generally enthusiastic about the need for Federal action, Osborne left the meeting unsure of the Prime Minister's priorities. The luncheon was hastily arranged to give Hughes the

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[1] Sir George Currie, and John Graham, *The origins of CSIRO: Science and the Commonwealth Government 1901-1926*, CSIRO, Melbourne, 1966, p. 30

[2] Quoted in Stuart Macintyre, *1901-1942: The succeeding age, Oxford history of Australia*, vol. 4, Oxford University Press, Melbourne, 1986, p. 162.

[3] *ibid*, p. 162.

[4] *Argus*, 23 December 1915, p. 10.

opportunity to air his views before the Professorial Board.[5] It was a meeting that would chart the future of the nation's scientific research effort.

'An attempt was being made to formulate a scheme by which the advancement of science could be put to its best use', Madden informed the gathering of academics, educators and politicians, 'the war should be a signal to them to use the brains which they possessed to quite as good a purpose as... the Germans'.[6] Hagelthorn, Osborne and others spoke in support, stressing the national significance of scientific research, especially in time of war. Finally it was the Prime Minister's turn. This 'was not a party question', he began, 'it was a question of Australia Unlimited as a business concern'. 'There was now seething in the cauldron of this great war all the possibilities of a great and high civilisation', Hughes continued, and 'the idea of a national research laboratory was the corner-stone of the edifice'. As the applause subsided, Hughes affirmed the economic importance of research and promised 'immediate action to lay the foundations' of a national institute. Questioned further, he delighted his audience, and surprised his Cabinet colleagues, by suggesting that the government would be prepared to invest £500,000 in such a scheme. Even at such a price, he insisted, 'they would still be getting value for every penny'.[7]

Gallipoli had confirmed the strength and courage of Australia's manhood, but the postwar world would demand more of its people. The 'making of the future Australian and the Australian nation' would require the 'use of brain', argued CEW Bean.[8] The energy and inventiveness demonstrated by the AIF had to be channelled into research. 'It is up to the State (that is to say all of us)', Bean insisted, 'to see that the laboratories and research departments exist... into which our youngsters can throw their Australian enthusiasm, and where they can use their brains as much as they desire for the service of

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[5] These developments are described in detail by Currie and Graham, *The origins of CSIRO*, ch. 2.
[6] *Argus*, 23 December 1915, p. 10.
[7] *ibid.*
[8] Charles Edwin Woodrow Bean, *In your hands, Australians*, Cassell and Company, London, 1919, p. 37.

their country'.[9] Anzac brawn had won honour in war, Anzac brain would win progress from peace.

From the late nineteenth century, British public scientists had been arguing for government support of science, pointing with alarm and envy at the technological development of countries such as Germany and Japan.[10] Science was assumed to be essential to the nation's strength and resilience, to its ability to maintain a steady rate of progress. The assumption was rarely challenged in the twentieth century, as war, economic change, and rapid technological development all heightened fears that Australia might be left behind in the manic, global rush. From plans to tap the nation's 'brainpower', to visions of a 'clever country', from attempts to harness the bushman's innate talent for invention, through to reverent incantations of the power of 'innovation', many attempts have been made to use the spark of science to jump-start the engine of national destiny. And many have failed.

The Anzac, of course, was both soldier and symbol. His wartime deeds became the framework upon which fragments of identity and meaning were stitched; a patchwork figure of masculine virtues and racial imaginings, held up to the world as the very image of Australian life and hope. But what of Anzac brains? The portrait of science as a source of wealth and power just waiting to be turned upon the needs of the nation, brings together concepts of improvement, enlightenment, expertise and inspiration. Science offers to solve the nation's most pressing problems, to raise the quality of its cultural life, to improve the character of its democracy, and to provide symbols of unity and achievement. The Anzac brain, like the Anzac spirit, offers a compelling image of what we might be. The answer to national progress seems so simple and beguiling, just hook up the connection between science and state and push the button.

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9 *ibid.*, p. 84.
10 Frank M Turner, 'Public Science in Britain', *Isis*, vol. 71, no. 259, 1980, pp. 589-608.

## The true ideal of federation

'At this late hour of sitting I cannot expect to make very much progress with this motion', explained Sir John Quick to the House of Representatives, 'but inasmuch as I have had to consent to its postponement on several occasions, I now desire to take the opportunity to advance it as much as possible... '.[11] It was June 1901, and the Commonwealth parliament was not yet two months old. Newly knighted for his contribution to Federation, and the author, with Robert Garran, of the authoritative *Annotated Constitution of the Australian Commonwealth*, Quick had achieved success through determined self-improvement.[12] Education had been his means of advancement, carrying him from the mines of Bendigo to a notable career in law. Now, at the height of his career, he similarly sought to bring knowledge to bear upon the development of the youthful Australian nation. With the business of government barely begun, Quick's motion, introduced so impatiently, argued for the establishment of a 'National Department of Agriculture and Productive Industries' based largely 'upon scientific knowledge'.[13]

The idea of creating a national department or bureau to foster agricultural improvement was emblematic of the creeds of 'new liberalism' or 'progressivism', which began to emerge in the late nineteenth century. [14] Traditional *laissez faire* policies seemed increasingly impotent in the face of growing threats to social cohesion and unparalleled opportunities for accelerated development. New liberals sought to wield the power of the state to claim progress as their own, to enrich the character of their citizens, and to ensure the prosperity of their nation. As Isaac Isaacs argued in support of Quick's motion: 'All this paraphernalia... is only the gold lace of the Constitution, unless we can

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[11] *CPD*, vol. 2, 28 June 1901, p. 1827.
[12] Michele Maslunka, 'Quick, Sir John (1852-1932)', in Geoffrey Serle (ed.), *Australian dictionary of biography*, Melbourne University Press, Melbourne, 1988, pp. 316-7; John Quick, and Robert Randolph Garran, *The annotated constitution of the Australian Commonwealth*, reprint of 1901 ed., Legal Books, Sydney, 1995.
[13] *CPD*, vol. 2, 28 June 1901, p. 1828.
[14] Michael Roe, *Nine Australian progressives: vitalism in bourgeois social thought, 1890-1960*, St. Lucia, University of Queensland Press, 1984, pp. 1-20; Tim Rowse, *Australian liberalism and national character*, Malmsbury, Victoria, Kibble Books, 1978, pp. 38-9

make of it an engine for the promotion of the material, moral, and social welfare of the people'.[15]

The influence of new liberalism was strong within protectionist ranks, and Quick counted amongst his parliamentary supporters Alfred Deakin, Isaacs, and the member for Darling Downs, William Henry Groom.[16] Groom, in particular, had good reason to believe in the possibilities of improvement. In 1849 he arrived in Australia a convict, found guilty of theft at the age of just thirteen. A little more than fifty years later, he was a successful businessman and politician, elected to the nation's first parliament after lengthy service to the Queensland colonial legislature.[17] From petty thief to founding father, he had remade himself. It was an experience that shaped his political philosophy and fed his hopes for reform. Improvement could be won by the determined labour of an individual, but it was up to the state, Groom believed, to smooth any obstacles, to ease the burden.

Groom was dedicated to his rural constituency, and believed the nation's future could be best assured by trusting in the virtues of the small landholder. Confident, too, in the bounties of science, Groom's campaign for a federal seat drew particular attention to the need for a Commonwealth department of agriculture to arm his imagined yeoman brigades with the latest scientific knowledge.[18] Science promised to improve the land and the lives of those who worked it. But while preparing to speak in support of Quick's motion Groom became ill. Within a few weeks he was dead. Both his cause and his seat in parliament passed to his son, Littleton Ernest Groom.[19]

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15 *CPD*, vol. 2, 12 July 1901, p. 2507

16 *CPD*, vol. 2, 28 June 1901, p. 1827.

17 DB Waterson, 'Groom, William Henry (1833-1901)', in Douglas Pike (ed.), *Australian Dictionary of Biography*, Melbourne University Press, Melbourne, 1972, pp. 304-5; David Carment, 'The making of an Australian liberal : The political education of Littleton Groom, 1867-1905', *Journal of the Royal Australian Historical Society*, vol. 62, no. 4, March 1977, pp. 233-4.

18 Jessie Groom (ed.), *Nation building in Australia : The life and work of Sir Littleton Ernest Groom*, Angus and Robertson, Sydney, 1941, p. 16.

19 For biographical details of Littleton Groom, see: David Carment, 'Groom, Sir Littleton Ernest', in Bede Nairn and Geoffrey Serle (eds), *Australian Dictionary of Biography*, Melbourne University Press, Melbourne, 1983, pp. 130-1; Carment, 'The making of an Australian liberal'; David Carment, 'Australian liberal: a political biography of Sir Littleton Groom, 1867-1936', PhD, Australian National University, 1975; Jessie Groom (ed.), *Nation building in Australia*.

Littleton Groom embodied much of the spirit of new liberalism, or 'progressive liberalism', as he termed it. 'I want to see the individual and individuality developed to the full', Groom argued, 'and wherever I can see that the State... can be used for the purpose of doing good to the people as a whole, then I believe in the State exercising its powers accordingly'.[20] In the by-election following his father's death, Groom declared himself an 'accredited Bartonian', proud to be associated with 'leaders of liberal thought' like Kingston and Deakin. He campaigned strongly in the cause of White Australia and economic protection, arguing that policies such as these would enable the government to 'elevate' its people, 'so that they can be the enlightened citizens of a great nation'.[21] These were not merely defensive measures. Groom wanted to preserve what was best in the race and character of his people, but also to create an environment in which such traits could flourish into a vigorous and responsible nationhood.

Protection exemplified the type of 'positive legislation' necessary to secure Australia's strength and independence. While proponents of the laissez-faire, or 'let-slide', policy meekly demurred, 'Leave our resources alone; they will be developed some day, somehow', protectionists, Groom fiercely proclaimed, were determined to 'develop our own country and make use of our materials and commodities'.[22] 'Australia's latent talent and capacity must be encouraged', he insisted, not merely by imposing tariffs, but by constructing a 'complete system' of institutions and legislation.[23] 'Direct agencies' had to be established throughout society to 'assist the people in various paths of life', to develop their skills and knowledge, to enable them to seize opportunities for advancement. 'Essential' amongst such agencies, Groom maintained, was 'a national Department of Agriculture'.[24]

'Agriculture is, year by year, becoming more of a scientific pursuit', Groom observed in 1907, 'every invention and scientific discovery is being applied more and more to the

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[20] *Toowoomba Chronicle*, 21 Nov 1906.
[21] *Toowoomba Chronicle*, 29 August 1901. See also David Carment, 'The making of an Australian liberal', pp. 239-40.
[22] *Toowoomba Chronicle*, 21 November 1906, p. 8.
[23] *Toowoomba Chronicle*, 15 November 1906.
[24] *Toowoomba Chronicle*, 29 August 1901.

purposes of production'.[25] Science pointed the way to new crops, new methods, new weapons to arm a sustained assault on the continent's 'empty' wastes. But the existing trickle of knowledge from laboratory to farm was hardly enough to fuel a conquering army. Government action was necessary to free up the flow: to identify problems, to coordinate research, to keep landholders abreast of the latest theories and techniques. Groom looked with admiration to the United States. There the government 'considered it was their duty' to go to the isolated farm worker with information and support. As a result, the US Department of Agriculture had worked 'immense wonders', lifting agriculture 'out of its ordinary humdrum existence'.[26] Australia had to do the same.[27]

Groom imagined a cooperative system that expressed 'the true ideal of federation'.[28] The new commonwealth agency would work with existing state departments for the benefit of primary producers, for the progress of the nation. It was a matter of 'common sense' that promised considerable gains in 'economy and efficiency'.[29] State departments would continue with their educational activities and field trials, while the federal body would coordinate statistical, meteorological and scientific information, and engage 'men of the highest scientific attainment' to lead the nation's research effort.[30] Agriculture was beset with 'continental problems', Groom argued, beleaguered by pests and diseases that had 'no respect for the border lines marked on our maps'.[31] It was, therefore, the Commonwealth's responsibility to take up the scientific challenge and frame an effective national response. The states, however, were not quite so sure.

Groom finally had the chance to act upon his vision in 1905, appointed Minister of Home Affairs in Deakin's liberal protectionist government. But for all his passion, the

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[25] *CPD*, vol. 36, 23 July 1907, p. 778.

[26] *Toowoomba Chronicle*, 29 August 1901.

[27] Groom's efforts to establish a Bureau of Agriculture are described in Currie and Graham, *The origins of CSIRO*, pp. 1-7.

[28] *Toowoomba Chronicle*, 10 December 1903.

[29] Littleton Groom, *Nation building in Australia: the work of the second Deakin administration, 1905-1908*, Protectionist Association of Victoria, Melbourne, 1908, p. 9.

[30] Littleton Groom, *Australian Bureau of Agriculture: memorandum on the establishment of*, Parl. paper no. 194, Canberra, 1908.

[31] *Toowoomba Chronicle*, 10 December 1903.

constitutional position remained unclear, and precipitous action might simply have entrenched hostilities between the Commonwealth and the states. Groom, therefore, adopted a more patient approach, describing the proposed department as a 'concern of gradual growth'.[32] Instead of launching a frontal attack, the Deakin government began to annex adjacent territories, exercising the Commonwealth's undisputed powers in areas such as meteorology, statistics, quarantine, exports and bounties.[33]

This was not merely practical politics. Groom rarely spoke of an agricultural department in isolation. Just as protection itself was imagined as an integrated system, so the application of science to agriculture demanded a series of interlocking institutions and legislative controls, performing various regulatory, research and educational functions. How could a department of agriculture foster land settlement without a detailed knowledge of climate, without a statistical analysis of land use, or without the power to protect producers from foreign pests and diseases? Groom established the Bureau of Census and Statistics and the Bureau of Meteorology, exerting Commonwealth control over areas he knew to be within the purview of the much-admired US Department of Agriculture. These were 'steps' towards the achievement of his broader vision, components in a grand scheme of nation building that reflected progressive enthusiasm for rational planning, coordination and efficiency.[34] His ultimate aim was not to create another government department, but to find the most effective means by which the power of science could be harnessed to the cause of national progress.

In 1908, Groom prepared a detailed memorandum outlining the scope and powers of the proposed Australian Bureau of Agriculture, but before a bill could be presented, the government fell.[35] The liberal protectionists were forced into an uneasy 'fusion' with the free-traders, as the heyday of progressive legislation came to its anti-climactic end. Groom's bill was finally introduced in 1909, and again in 1913.[36] Both times it met with

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32 *Toowoomba Chronicle*, 15 November1906.
33 These various developments are described in Littleton Groom, *Nation building in Australia*. See also: J A La Nauze, *Alfred Deakin - a biography*, vol. 2, Melbourne University Press, Melbourne, 1965, p. 408.
34 *Toowoomba Chronicle*, 15 November 1906.
35 Littleton Groom, *Australian Bureau of Agriculture*.
36 *CPD*, vol. 50, 3 August 1909, pp. 1919-29; vol. 70, 5 September 1913, pp. 931-5.

considerable opposition, from the government side as well as from Labor, mainly due to concerns about interference with, and duplication of, the work of existing state agricultural agencies.

And so the matter remained, until Billy Hughes made his swaggering entry into the University of Melbourne's valedictory luncheon. His flamboyant commitment to the idea of a National Laboratory reinvigorated hopes for the systematic application of science to Australia's primary industries. An Advisory Council was quickly formed and, after several years of prevarication and compromise, legislation was introduced for the establishment of a Commonwealth Institute of Science and Industry. Appropriately, it fell to Littleton Groom, now a Minister in Hughes' Nationalist government, to introduce the bill into the House of Representatives in 1919. 'The object of this Bill', he explained, 'is to establish in Australia an institution which will assist to bring scientific knowledge, information and experience to bear upon the practical development of production and manufacture'.[37] Was there an air of weary familiarity as Groom urged his colleagues to favour a measure 'too long delayed'?[38] In any case, he could not resist reviewing the ill-fated history of the national department of agriculture. He recalled Quick's motion, his father's advocacy, and his own attempts to give legislative form to their hopes and dreams. 'The subject is not altogether a new one', Groom wryly noted.[39]

## An ideal education

On 23 March 1887, before a large and appreciative audience, the University of Melbourne's newly-appointed professor of chemistry delivered his inaugural address. David Orme Masson was an energetic young Scot whose skill with language reflected his family's literary connections. His father was professor of rhetoric and English literature at Edinburgh University, while his mother grew up in a wealthy household, surrounded by poets and writers. In a confident and wide-ranging address, Masson

[37] *CPD*, vol. 89, 7 August 1919, p. 11371.
[38] *ibid*, p. 11380.
[39] *ibid*, p. 11372-3.

surveyed the relationship between chemistry and industry, reviewed the history of his discipline, and reflected upon the role of the university. He made his ambitions clear. He would not be satisfied with mere technical training, instead he aimed to establish 'a school of chemistry', a school that was 'permeated with the atmosphere of research'.[40] Amongst the audience, a fair-haired law student listened with interest. Littleton Ernest Groom began to ponder the connection between science and society.

Littleton Groom had arrived from Toowoomba in 1886 to study arts and law.[41] It was an exciting time. 'Marvellous Melbourne' was in the grip of a land boom, and was reimagining itself as a sophisticated metropolis, a centre of economic and intellectual life.[42] In the parliament and the press, liberals like Alfred Deakin and Charles Pearson were fomenting a tide of social and educational reform. The University, too, was changing. Pearson led a move against the tradition-bound Council, securing the admission of women, and pushing for new chairs in science. After several attempts, he guided a University Reform Bill through parliament in 1881, finally breaking the grip of the conservatives and opening the way for continued evolution.[43]

Groom revelled in the feeling of optimism and opportunity. His scholastic attainments were creditable, but it was his contribution to the broader life of the university that drew particular praise. 'We have never had a student who has shown more public spirit', the Master of Ormond College wrote glowingly to Groom's father.[44] Both within the college and as Secretary of the University Union, Groom laboured tirelessly, organising lectures, debates and social occasions, encouraging his fellow students to take an active interest in each other's work. He was supported by Masson, who drew on his recent experience in Edinburgh to help the students take control of the moribund Melbourne Union.[45]

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[40] Len Weickhardt, *Masson of Melbourne: the life and times of David Orme Masson*, Royal Australian Chemical Institute, Melbourne, 1989, pp. 32-4. See ch. 1 for family details.
[41] Carment, 'The making of an Australian liberal', p. 235.
[42] Davison, *Marvellous Melbourne*.
[43] John Tregenza, *Professor of democracy: the life of Charles Henry Pearson 1830-1894*, Melbourne University Press, Melbourne, 1968, pp. 128-30, 169-70.
[44] John MacFarland to WH Groom, quoted in Jessie Groom (ed.), *Nation building in Australia*, p. 7.
[45] Jessie Groom (ed.), *Nation building in Australia*, p. 8-10.

Both Masson and Groom believed that a university should be more than a place of instruction, it should foster a vibrant intellectual life. As Groom argued in a student paper he founded and edited, 'The University has social functions to perform which are as important as those of book learning'.[46] Groom imagined a community enriched by ideas, interchange and cooperation, a community bound by 'university sentiment'.[47] It was an image that would echo through his later attempts at nation-building. Australia, like the university, should uphold the value of education and improvement, it should foster cooperation and civility, it should cultivate a national sentiment to unite and inspire its people.

Groom's real passion was for literature, but true to his own exhortation to imbibe of knowledge in all its forms and flavours, he became increasingly intrigued by the possibilities of science. His arrival at university had coincided not only with the appointment of Masson to the chemistry chair, but also with passing of regulations for the Bachelor of Science degree.[48] Changes were afoot, as the sciences gradually won a more prominent role within the institution. Increased government funding for science and technology, prompted perhaps by Pearson's persistent advocacy, enabled the construction of new laboratory facilities.[49] Masson's hopes of encouraging original research were further bolstered by the appointment of two more young and enthusiastic scientists: Walter Baldwin Spencer to the biology chair in 1887, and Thomas Ranken Lyle to natural philosophy in 1889.[50]

The Melbourne science professors did much to inculcate a spirit of scientific research within University walls, yet they were also keen to demonstrate its value beyond. Until 1927, the Commonwealth government was headquartered in Melbourne, providing the public-spirited academics with an unprecedented opportunity to exert an influence upon

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46 Quoted in Carment, 'The making of an Australian liberal', p. 236.
47 *ibid.*
48 Weickhardt, *Masson of Melbourne*, p. 38.
49 Tregenza, *Professor of democracy*, p. 207.
50 Weickhardt, *Masson of Melbourne*, pp. 38-9. For more on Baldwin Spencer and Lyle, see: DJ Mulvaney, and JH Calaby, *'So Much That is New': Baldwin Spencer 1860-1929*, Melbourne University Press, Melbourne, 1985; RW Home, 'Sir Thomas Ranken Lyle (1860-1944)', in Bede Nairn and Geoffrey Serle (eds), *Australian Dictionary of Biography*, Melbourne University Press, Melbourne, 1986, pp. 172-4.

the development of the youthful nation. In 1909, a meeting of the science professors determined to offer their services to the country 'in connection with some work of investigation of especial Australasian interest'.[51] The Deakin government was in the process of introducing legislation for the Commonwealth takeover of the Northern Territory, with none other than Littleton Groom leading the fight.[52] The scientists suggested they might organise an expedition to gather much needed data about conditions in the north. After some delays and confusion, Baldwin Spencer and the newly-appointed professor of veterinary pathology, JA Gilruth, led a party northwards in a well-publicised attempt to bring the power of science to bear upon the nation's troublesome frontier. Both Spencer and Gilruth would later take up posts in the Territory's administration.[53]

Masson played a prominent role in Hughes' plans for a national laboratory, steering the Advisory Committee towards the eventual establishment of the Commonwealth Institute of Science and Industry. When the failing Institute was itself reconstituted in 1926, Masson lent his expertise once more, aiding in the creation of the Council for Scientific and Industrial Research (CSIR).[54] Notably, it was Masson's former student and successor to the chair of chemistry, David Rivett, who was to lead the new organisation upon its successful mission.[55] Highlighting, perhaps, the interconnections between science and politics in early twentieth century Melbourne, Rivett was married to Alfred Deakin's daughter, Stella.

While at university, Groom helped organise public lectures by the three new professors under the auspices of the Ormond College Literary and Debating Society. Reports of

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51 Letter from Baldwin Spencer to Alfred Deakin, 24 June 1909, Deakin papers, NLA: MS1540, series 15. See also, Mulvaney and Calaby, *So Much That is New*, p. 265.
52 Groom moved the second reading of the Northern Territory Acceptance Bill and prepared a detailed memorandum on the Northern Territory: *CPD*, 30 July 1909, vol. 50, pp. 1878-1894; *Northern Territory, Memorandum prepared under the direction of the Hon. L.E. Groom, in connexion with the Bill for the acceptance of the Northern Territory*, Parl. Paper no. 20, Canberra, 1909.
53 Mulvaney & Calaby, *So Much That is New*, pp. 264-72.
54 Weickhardt, *Masson of Melbourne*, pp. 77-84, 115-8, 135-46; Currie and Graham, *The origins of CSIRO*.
55 For information on Rivett and his involvement in CSIR, see: Rohan Rivett, *David Rivett: fighter for Australian science*, RD Rivett, Melbourne, 1972; CB Schedvin, *Shaping science and industry: a history of Australia's Council for Scientific and Industrial Research, 1926-49*, Allen & Unwin, Sydney, 1987.

each lecture he dutifully pasted in his cuttings book, along with articles on history, law, education and of course, his great love, poetry.[56] But what of the connections between the disciplines? How did they contribute to the general good? What of truth? An article by John Morley on the study of literature piqued his interest with its description of the different kinds of knowledge necessary for a healthy society. Groom underlined a section on the commercial importance of scientific and technical education, and also a passage on the 'business' of literature which, Morley argued, concerned 'the enlargement of the moral vision'.[57] In another clipping, the Victorian government's agricultural chemist, AN Pearson, argued that science and poetry, in combination, could reveal the 'truths of nature'.[58] There was a balance to be made: Groom was attempting to fit together the components of a good life and a good society. Science had an important part to play, but only within a broader realm of learning that included religion, literature, art and law. Together they offered the young, liberal reformer a basis for action that would guide him through life.

Central to the cultivation of knowledge and the improvement of society was the university. In a copy of Masson's inaugural address, Groom highlighted the professor's plea: 'But science must grow— new knowledge must be made; and where shall this growth occur if not in our highest seats of learning— the universities'.[59] Returning home from the hallowed halls, Groom felt Queensland to be suffering 'an immense loss' in having no university of its own.[60] In typical style, he threw himself into the cause, becoming one of the main organisers of the Queensland University Movement.[61] But what was required was not a university 'of the old mould'. Rather he suggested something more along American lines, 'not merely teaching polite learning and the fine

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[56] Cuttings Book Volume 1, March 1886-April 1887; Scrapbook, Volume 2, April 1887 - , Groom papers, NLA: MS236, series 6, items 1-3.
[57] 'Mr John Morley on the Study of Literature', Scrapbook, Volume 2, April 1887 - , Groom papers, NLA: MS236, series 6, item 3.
[58] AN Pearson, 'The Nature and Province of Science', Scrapbook, Volume 2, April 1887 - , Groom papers, NLA: MS236, series 6, item 3
[59] 'Professor Masson's Inaugural Lecture – The Scope and Aims of Chemical Science', Cuttings Book Volume 1, March 1886-April 1887, Groom papers, NLA: MS236, series 6, items 1.
[60] *Toowoomba Chronicle*, 5 November 1906, p. 3.
[61] Jessie Groom (ed.), *Nation building in Australia*, pp. 10-11.

arts, but also to advance scientific instruction'. Universities, Groom argued before the Darling Downs Teachers' Association in 1906, were 'elevating and edifying organisations that were calculated to mould men's souls'. However, modern universities were also 'now necessities to the well being of... nations'. They were institutions in which 'agriculture, industry, arts and sciences' were accepted to be just as important as 'the absorption of Latin and Greek'.[62]

In the course of his lecture, Groom stressed the commercial advantages to be gained from a modern system of scientific and technical instruction, quoting, as was the fashion, the success of Germany in 'wedding science to manufacture'.[63] However, as evident from his undergraduate days, Groom's interest in science was never narrowly utilitarian. As with other turn-of-the-century liberals, he sought an elusive balance: balance between the individual and the social, between ideals and practice. Scientific and technical education were essential for future prosperity, but education was concerned more broadly with the 'health, advancement and expansion' of the 'human mind'. As a student Groom had pondered the relationship between science and literature, between learning and action: it was a balance, he realised, to be made within the life of an individual, as within the life of the nation. Groom quoted the Victorian Director of Education, Frank Tate, in arguing that an 'ideal education' resulted in 'complete self-realisation', a combination of physical fitness, mental fitness and moral fitness. 'Citizens were not complete without honourable characters', argued Groom, and 'so it was with national life', he concluded, both 'industrial and intellectual capacities must be developed'.[64]

A few days later, Groom had another opportunity to reflect on the links between science, education and national progress, when he opened the Science Section of Toowoomba's Austral Festival. While the occasion and the assembled exhibits directed the attention of the local citizenry towards important matters of 'practical utility',

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62 *Toowoomba Chronicle*, 5 November 1906, p. 3
63 *ibid.*
64 *ibid.*

Groom began his speech by declaring that science was worthy of encouragement for the 'delight and pleasure' to be found 'in the original investigation of the laws of Nature'. Moreover, he reminded his audience that science had a broadly educative role, for 'habits of scientific thought were invaluable' in the proper workings of a democratic nation. The application of such 'scientific principles' to practical ends, he continued, offered great benefits to the whole of humanity. Based upon the evidence of the exhibits displayed about him, he believed visitors 'would experience a real thrill of patriotic pride' in the contributions being made by young Australians to this important endeavour.[65] Science offered both enlightenment and inventions, pleasure and pride, individual growth and national progress.

## In their country, by their country, for their country and the world

Canberra was in the grip of a heatwave, the longest in its recorded history. After two weeks of hot weather, the temperature once again topped the century, as 800 visitors swarmed into town for the opening of the 1939 congress of the Australian and New Zealand Association for the Advancement of Science (ANZAAS). All accommodation was booked; delegates were billeted to homes in Canberra and Queanbeyan, and some of the more adventurous took to camping, creating 'a miniature scientists' settlement' on the banks of the Molonglo River. As well as the heat, visitors grappled with the city's unusual layout. 'Even members of the geography and astronomical sections lost their bearings', reported the Canberra Times.[66] But despite the difficulties, the ANZAAS invasion was a 'signal event' in the history of 'the world's youngest capital city'.[67] Science had come to the nation's new heart.

ANZAAS was celebrating its jubilee, having been founded in 1888 as the Australasian Association for the Advancement of Science (AAAS).[68] With the sesquicentenary of

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65 'The Austral', *Toowoomba Chronicle*, 7 November 1906, p. 3
66 *Canberra Times*, 11 January 1939, p. 4.
67 'Science and people', *Canberra Times*, 11 January 1939, p. 4.
68 The founding of AAAS is described in Roy MacLeod, 'Organising science under the Southern Cross', in Roy MacLeod (ed.), *The commonwealth of science: ANZAAS and the scientific enterprise in Australasia, 1888-1988*, Oxford University Press, Melbourne, 1988, pp. 19-39.

European settlement recently past, the 1939 meeting was a time to reflect on the achievements of both science and nation. In keeping with the occasion, it was a historian, Ernest Scott, who rose to deliver the Association's presidential address. Scott traversed the history of Australian science from Cook and Dampier, through to the recent successes of the Council of Scientific and Industrial Research (CSIR). Across the span of years he detected a welcome change in attitudes towards science. In recent times there was, he noted, 'a keener desire to make use of the trained man of science' than ever before. This change brought promise of even greater advance, for 'the future of Australia' was, Scott argued, 'bound up with the progress of science'.[69]

But dreams of progress were clouded by the memory of depression and the possibility of war. Opening the congress, the Governor-General, Lord Gowrie, struck a sombre note, recounting the horrors of the Great War, and pondering the inability of nations to settle their differences by anything other than 'wholesale international slaughter'. Science had greatly increased humanity's capacity for destruction, he argued, but 'political mentality had not kept pace'. Action was needed to ensure that the fruits of science were 'utilised for the benefit and not the destruction of mankind'.[70] It was a timely speech, as ANZAAS was, for the first time, hosting a forum on the social dimensions of science. While the congress celebrated Australia's achievements, it was hoping also to chart a new relationship between science and the state.

The AAAS was established in 1888 to draw the activities of isolated colonial outposts into a lively community of scientific interchange and ideas, one that would encourage original research and foster public interest and support. While the colonies remained bogged on the road to political federation, science simply forged ahead. The AAAS provided 'splendid evidence of the true spirit of Federation', proclaimed the *Hobart*

[69] Ernest Scott, 'The history of Australian science', *Report of the 24th meeting of the Australian and New Zealand Association for the Advancement of Science*, Canberra, 1939, pp. 1-16.
[70] *Canberra Times*, 12 January 1939, p. 2.

*Mercury*, 'Science can do for itself... without much fuss or delay, what politicians are unable to accomplish with infinite talk and delay'.[71]

Scientists enjoyed the collegiality of 'federated' science, but even after the achievement of nationhood, they seemed reluctant to speculate on how science might be made truly 'federal'.[72] Although the AAAS established research committees to explore issues of topical import, and made periodic recommendations to government, there was little attempt to define a national research agenda, or to develop new federal institutions. As Littleton Groom found to his frustration, science remained the province of the states, and it was progressive enthusiasts, rather than scientists, who fought to apply it to the needs of the nation.

Progressive reformers looked to science and technology to overhaul the minds and methods of a failing system. Many scientists were amongst them, possessed of a vitalist spark that inspired their quest for truth and affirmed their belief in the liberating power of rational thought.[73] But amongst the tensions and contradictions inherent in progressivism was a tendency to assert the importance of applied or practical knowledge over purely theoretical research. While scientists were eager to portray science as the wellspring of national prosperity, they were wary of focusing too much on practical outcomes lest they undermine their own research ambitions. No AAAS meeting was complete without a hearty avowal of the value of 'pure' research. 'It is a popular idea that any applied science pays, while a pure science does not', argued the geologist, Edgeworth David, in his 1904 presidential address, 'that is a pernicious fallacy fatal to the true interests of national progress'.[74] What was self-evident to scientists was

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71 *Hobart Mercury*, 6 January 1892, quoted in Roy MacLeod, 'From imperial to national science', in Roy MacLeod (ed.), *The commonwealth of science: ANZAAS and the scientific enterprise in Australasia, 1888-1988*, Oxford University Press, Melbourne, 1988, pp. 40-72.

72 For a discussion of 'federated' and 'federal' science and developments in the early twentieth century see Roy MacLeod, 'Science, progressivism and practical idealism: reflections on efficient imperialism and federal science in Australia 1895-1915', *Scientia Canadensis*, vol. 13, no. 1, 1994, pp. 7-26. See also MacLeod, 'From imperial to national science'.

73 MacLeod, 'Science, progressivism and practical idealism'.

74 TW Edgeworth David, 'The aims and ideals of Australasian science', *Report of the 10th meeting of the Australasian Association for the Advancement of Science*, Dunedin, 1904, p. 8.

potentially confusing to the public, muddying the role of science in the design for nation building.

Education offered safer ground for scientists wishing to stake a claim on the national stage. 'The advance of education should be our grandest ideal', Edgeworth David announced.[75] The improvement of science teaching was deemed essential if Australia was not to be dwarfed by the burgeoning industrial and military might of countries like Germany and Japan. David quoted Norman Lockyer's influential 1903 address to the British Association for the Advancement of Science (BAAS), entitled, 'The influence of brain-power on history'.[76] In a play upon AT Mahan's imperialist primer The influence of sea power upon history, Lockyer argued that to keep pace with Germany Britain needed more than battleships, it needed new universities to train its people in the ways of science. But if Great Britain lagged behind Germany, then Australia trailed by further still. The neglect of science teaching imperiled the nation's future.

Improved facilities for higher education were necessary but not sufficient. Science had to extend its reach through the schools, through society. David drew from George Knibbs' report on primary education in NSW to argue 'it is requisite that the people as a whole should have some idea of the significance of science for daily life and ordinary avocations'. Such learning had to begin at primary school, under the guidance of specially-trained teachers. 'The child properly taught the elements of science', Knibbs argued, 'has a far more intelligent outlook upon the world and a better understanding of its present activity than he has where the subject is neglected'.[77] Both the message and method of science were important in building an educated citizenry. Scientific habits of experiment and observation developed character as well as understanding. Bringing his address to a final, lyrical crescendo, David invoked the ideals of science: science wanted 'every man in this world... to learn well that he might live well; to learn by experiment rather than wholly through the experience of others, so that he may be self-reliant and

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[75] *ibid*, p. 30.
[76] *ibid*, p. 33-4.
[77] *ibid*, p. 35-7.

think for himself'. 'Thinking of this kind brings discovery', David concluded, 'and the discoveries of science uplift humanity'.[78]

But could science serve both the cause of humanity and the needs of the nation? Orme Masson pondered this question in 1911, addressing the AAAS congress in Sydney. 'It is often said that science knows no nationality', he noted, but this did not mean that the scientific worker was 'so inhuman a thing as to be devoid of national sentiment and find in it no inspiration for his special calling'. Truth itself was universal, 'a principle unassailable', but great men like Pasteur, Kelvin and Huxley were 'moved by the love of their country as well as of science'. Masson looked proudly to the example of the AAAS's own parent organisation, the British Association for the Advancement of Science. The BAAS was composed of British workers 'determined that scientific progress should be made in their country, by their country, for their country and the world'.[79]

AAAS delegates had especial cause to be mindful of their British forbears, for, as Masson explained, the BAAS was coming. Much to the excitement of the Australian scientific community, the British Association was planning one of its periodical treks to the dominions; first Canada, then South Africa, and now at last— Australia! With the generous support of state and federal governments, the British scientists were to descend upon the nation in 1914, travelling from state to state in a scientific road show that would, Masson presumed, 'prove a great event in the history of Imperial unity'.[80] The BAAS visit offered Australians the chance to contemplate their growing cultural maturity, their 'scientific coming of age', all the while basking in the comforting paternalism of the imperial connection. Edgeworth David, elected once more to the presidency of the AAAS, hoped that Australian scientists would be 'strengthened and

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[78] *ibid.*, p. 43.
[79] David Orme Masson, 'Inaugural address', *Report of the 13th meeting of the Australasian Association for the Advancement of Science*, Sydney, 1911, pp. 2-3.
[80] *ibid.*, pp. 5. For more on the BAAS visit see: Peter Robertson, 'Coming of age: the British Association in Australia, 1914', *Australian Physicist*, vol. 17, 1980, pp. 23-7; Rosaleen Love, 'The Science Show of 1914: the British Association meets in Australia', *This Australia*, vol. 4, no. 1, 1984, pp. 12-16.

confirmed' in their work and ideals, reaffirmed through the 'inspiration which comes alone from personal contact with master minds'.[81]

Australia's scientific workers imagined themselves as 'soldiers in the army of science under the Southern Cross', pledged to the service of truth, nation, and empire.[82] Their achievements reflected the inexorable advance of knowledge, the pride of the young Commonwealth, and the glorious destiny of the British race. And yet, science's contribution to Australian nationhood was expressed most clearly not in the steady march of a conquering army, but in the dazzling heroics of a few. Amongst the most prominent was geologist Douglas Mawson, who returned from a harrowing Antarctic campaign early in 1914. Mawson had studied under Edgeworth David, and the two had accompanied Ernest Shackleton to the icy south in 1907. But Mawson was determined to exert Australia's presence in the vast southern continent, and with the assistance of the AAAS, had raised funds for a new expedition— an Australian expedition.[83] As Mawson's party prepared to set sail in November 1911, the *Argus* declared the enterprise a 'landmark in the upward path which Australia is treading towards a fuller and broader national life'.[84]

The people of Adelaide gloried in their hero's return. Large gatherings were held at the university and the town hall, where the Governor-General led assorted dignitaries in round upon round of enthusiastic acclamation. Masson, who had chaired the AAAS Antarctic committee, was amongst the speakers, representing his association in the absence of Edgeworth David. Joining him on stage was the Commonwealth Minister for Trade and Customs, his old friend, Littleton Groom. The people of Australia, Groom proclaimed to the cheering crowd, were glad to know that their country 'had played her part in continuing the record of splendid achievements of the race from which they had sprung'. Mawson's efforts had made it clear that Australia would not 'lag

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81 TW Edgeworth David, 'Presidential address', *Report of the 14th meeting of the Australasian Association for the Advancement of Science*, Melbourne, 1913, p. xcii.
82 *ibid.*, p. xci.
83 Weickhardt, *Masson of Melbourne*, pp. 63-7.
84 Quoted in Brigid Hains, *The ice and the inland: Mawson, Flynn and the myth of the frontier*, Melbourne University Press, Melbourne, 2002, p. 44.

behind other nations in the great matter of scientific investigation', Groom continued, and his heroism had proved that 'the British race was not yet effeminate'.[85] Australia was taking up the responsibilities of nationhood, carrying the mission of science, race and empire onwards into the most desolate and forbidding lands on earth.

But soon there were battlegrounds aplenty, as war called scientists to the cause of empire, to the defence of the nation. Although he was in his fifties, Edgeworth David headed for the Western Front with a corps of miners and engineers.[86] Mawson was keen for active service, but was diverted into technical liaison and munitions production.[87] Thousands of chemists and engineers journeyed to Britain to bolster the mother country's industrial capacity, David Rivett amongst them.[88] The prophesies of public scientists like Huxley and Lockyer seemed to find fulfilment, as the empire's brainpower was mobilised to meet the looming crisis.

When the AAAS finally regrouped in 1921, much had changed. 'Never in the whole history of the world', remarked he retiring president, Edgeworth David, 'had the vast value of science as a means of national defence been so incontestably demonstrated as in the recent war'.[89] Delegates pondered the lessons of their recent experience in a special forum on the wartime application of chemical and physical science. Chemists may not have won the war, Norman Wilsmore, the University of Western Australia's chemistry professor, modestly declared, but without their efforts Britain 'inevitably would have lost it'.[90] David Rivett described his experience as a process manager in a factory producing the explosive amatol. The work was successful, he observed, 'only because those in charge possessed sound training in the higher branches of chemical

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85 *Adelaide Advertiser*, 3 March 1914, p. 11.
86 TG Vallance, and DF Branagan, 'David, Sir Tannatt William Edgeworth (1858-1934)', in Bede Nairn and Geoffrey Serle (eds), *Australian Dictionary of Biography*, Melbourne University Press, Melbourne, 1981, pp. 218-21.
87 Roy MacLeod, '"Full of honour and gain to science": munitions production, technical intelligence and the wartime career of Sir Douglas Mawson, FRS', *Historical Records of Australian Science*, vol. 7, no. 2, June 1988, pp. 189-201.
88 Roy MacLeod, 'The 'Arsenal' in the Strand: Australian chemists in the British munitions effort, 1916-1919', *Annals of Science*, vol. 46, 1989, pp. 45-67; Rohan Rivett, *David Rivett*, pp. 58-62.
89 *Age*, 11 January 1921, p. 4.
90 *Age*, 12 January 1921, p. 6.

activity'.[91] The implications were clear, in peace time as in war, a coordinated system of scientific training and research was, in Edgeworth David's words, a form of 'national insurance'.[92]

Without doubt, the organisation of science was a 'vital question', Baldwin Spencer noted in his presidential address, and already there were some welcome signs of progress. Before the war, the AAAS had stood alone on the national scene, but now there were three bodies devoted to the pursuit of science: the AAAS, the Australian National Research Council (ANRC), and the long-delayed Commonwealth Institute of Science and Industry.[93] The ANRC was established to liaise with the International Research Council, but it was hoped that it might take a broader role in promoting research and representing the interests and beliefs of scientists.[94] TH Laby, the Melbourne physicist, wanted more, arguing for an organisation that united the country's scientific workers, an organisation with prestige and standing whose opinions would carry weight with government. Laby, in his typically far-sighted but abrasive manner, also inveighed against the the newly-minted Institute of Science and Industry, arguing that it suffered from 'political control'.[95]

Laby was right to be concerned. The Institute, under the directorship of George Knibbs, was starved of funds and unable to initiate a significant research program. It was replaced in 1926 with the Council for Scientific and Industrial Research (CSIR).[96] The ANRC continued on, but failed to find an authoritative voice. As scientists gathered in the heat of Canberra for the 1939 congress, the question of how science might best contribute to the needs of the nation was as problematic as ever.

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91 *Age*, 12 January 1921, p. 6; *Argus*, 12 January 1921, p. 9.
92 *Age*, 11 January 1921, p. 4.
93 Walter Baldwin Spencer, 'Presidential address', *Report of the 15th meeting of the Australasian Association for the Advancement of Science*, Melbourne, 1921, p. lv.
94 A P Elkin, 'The Australian National Research Council', *Australian Journal of Science*, vol. 16, no. 6, 21 June 1954, pp. 203-211.
95 *Age*, 13 January 1921, p. 6; *Argus*, 13 January 1921, p. 7.
96 Currie and Graham, *The origins of CSIRO*, chs 6 & 7.

Scientists worldwide had responded to the disillusionment bred of the Great Depression by questioning the way in which scientific knowledge was deployed throughout society. Science promised wealth, leisure, fulfilment and happiness, but it seemed more often to add to world's conflict and misery. Who was to blame? To rebuild trust and confidence, scientists began to wonder whether they should play a more active role within society, not just as researchers, but as planners, teachers, experts, even as leaders.[97] In August 1938, the first edition of the *Australian Journal of Science* carried an article by OU Vonwiller, professor of physics at the University of Sydney, that surveyed 'The social relations of science'. Scientists were beginning to realise that their 'duty' to society went beyond the simple 'acquisition of knowledge', Vonwiller argued, they 'must insist on being heard when policies are formulated'.[98] An editorial in the next edition took up the topic, and noted that a discussion was being organised for the ANZAAS congress in Canberra, the following January.[99]

Young scientists, like Jack Legge, approached the meeting with a sense of expectation, driving to Canberra through smoke and cinders, as hundreds of bushfires raged across eastern Australia.[100] The discussion on the social relations of science promised new directions for the scientific community, new opportunities to be heard, the chance to make a difference. But the date, 13 January 1939, would not mark a new beginning, instead it would be remembered as a day of brutal triumph for an old and deadly scourge. It was 'Black Friday', the day when the bushfires reached their terrifying peak, in a season that saw 1.4 million hectares of Victoria burnt and 71 lives lost.[101] Nature

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97 See for example: Gary Werskey, *The visible college: a collective biography of British scientists and socialists of the 1930s*, London, Free Association Books, 1988. On the influence of such ideas in Australia see: Jean Moran, 'Scientists in the political and public arena: a social-intellectual history of the Australian Association of Scientific Workers', MPhil, Griffith University, 1983, pp. 30-7; Ron Johnston, 'Social responsibility of science: the social mirror of science', in Roy MacLeod (ed.), *The commonwealth of science: ANZAAS and the scientific enterprise in Australasia, 1888-1988*, Oxford University Press, Melbourne, 1988, pp. 308-25.

98 OU Vonwiller, 'The social relations of science', *Australian Journal of Science*, vol. 1, no. 1, August 1938, pp. 30-32.

99 'Science and society', *Australian Journal of Science*, vol. 2, no. 2, August 1939, pp. 15-16.

100 Moran, 'Scientists in the political and public arena', p. 39.

101 Tom Griffiths, *Secrets of the forest: discovering history in Melbourne's ash range*, Allen & Unwin, Sydney, 1992, p. 45.

mocked the scientists' pretensions, unleashing its unbowed fury on a day, that Stephen Pyne suggests, 'sucked 150 years of settlement into a colossal maelstrom of fire'.[102]

There were fewer sparks at ANZAAS. The discussion on the social relations of science began well as David Rivett, Chief Executive of CSIR, argued forcefully that 'men of science should play a huge part in the adaptation of their own work to ensure the health, physical and mental, of the race'. Rivett provocatively noted the lack of scientific credentials amongst members of the nation's parliament, and suggested that scientists could most effectively address 'the problem of Science and Society' by 'getting right into the legislative and administrative arenas'.[103] But there was little response to Rivett's call to arms, as most speakers merely read from their prepared contributions. In the end, the feeling was 'one of disappointment', reported Vonwiller.[104] Few practical ideas were raised, and no clear direction was charted.

Just as the establishment of the AAAS seemed to herald the coming of Federation, so the supposed connection between the advance of science and the development of nationhood emboldened scientists to believe that their own efforts and expertise held the key to national destiny. But there was no simple formula to represent the relationship between science and progress. Despite frequent calls for efficiency and organisation, the contribution of science to the ambitions of nationhood was expressed more through the achievements of individuals than through the construction of programs and policies. Delegates disappointed by the discussion on science and society at the 1939 congress, were invited the following Tuesday to attend the unveiling of a memorial to William Farrer, a foundation member of the Association. Through the improvements he had made to Australian wheat varieties, the assembled crowd was told, Farrer had proved himself 'a truly great man of science and a citizen'.[105]

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102 Stephen J Pyne, *Burning bush: a fire history of Australia*, Allen & Unwin, Sydney, 1992, p. 309.
103 'Science and society - Summary of some of the contributions to the discussion held by the ANZAAS during its meeting at Canberra', *Australian Journal of Science*, vol. 1, no. 4, February 1939, pp. 116-7.
104 OU Vonwiller, 'The discussion on science and society: Afterthoughts', *Australian Journal of Science*, vol. 1, no. 4, February 1939, p. 119.
105 *Canberra Times*, 17 January 1939, p. 3.

## For the service of science and the credit of Australia

Four relays of pallbearers were needed to carry the coffin half a mile along the rocky, winding path to the gravesite atop Mount Stromlo. Standing in the drizzling rain, more than 150 mourners watched as the remains of Walter Geoffrey Duffield were interred beneath a large she-oak.[106] The site had been carefully chosen. Close by were the first buildings of the Commonwealth Solar Observatory (CSO), founded by Duffield only a few years earlier.[107] But the gravesite also looked out over the growing city of Canberra, a city whose civic and cultural life had been greatly enriched by the efforts of Duffield and his wife, Doris. Duffield had been 'a great believer in the capital', the *Canberra Times* reported, and 'one of the best known figures in Canberra'.[108] He would be remembered, the newspaper maintained, as 'the very antithesis of the scientists which fiction often portrays', for rather than being isolated and indifferent to the needs of society, 'no man in Canberra was closer to his fellow man in thought and deed than the citizen who has passed on'.[109]

The gravesite was consecrated by the Bishop of Goulburn, who recalled a similar occasion some fourteen years ago. After being killed by a sniper at Gallipoli, the commander of the first AIF, General William Bridges, had been laid to rest on Mount Pleasant overlooking the military college he had established at Duntroon. 'In the one grave... they had a great soldier who had given his life in defence of his country', the Bishop noted, 'whilst here they had a distinguished scientist who had devoted his life in pursuit of information for the guidance and benefit of those seeking to develop the country'.[110] The two gravesites were as sentinels overlooking the growth of the capital, securing the promise of nationhood. To Bridges' spirit of courage and endurance, Duffield added a thirst for knowledge, a vision of progress.

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106 *Canberra Times*, 6 August 1929, p. 1.
107 For biographical details see CW Allen, 'Duffield, Walter Geoffrey (1879-1929)', in Bede Nairn and Geoffrey Serle (eds), *Australian Dictionary of Biography*, Melbourne University Press, Melbourne, 1981, pp. 351.
108 *Canberra Times*, 2 August 1929, p. 1.
109 *Canberra Times*, 6 August 1929, p. 4.
110 *Canberra Times*, 6 August 1929, p. 4.

Both the military college and the observatory traced their origins to the capital's earliest days, back before the city was planned, before its name was fixed. In September 1911, a temporary observatory was set up on Mount Stromlo to test the site's suitability for scientific purposes.[111] Although Duffield was not directly involved in these early operations, he was already at work behind the scenes, gathering political and financial support for the project. His was a saga of scientific entrepeneuralism, a carefully managed campaign that blended imperial hopes and national needs, idealism and pragmatism; a campaign that would, after twenty years, finally deliver his observatory.[112] Duffield arrived in Canberra in 1924 to launch the CSO. He died just five years later, his research program barely begun.

Duffield became interested in the study of the sun in 1905 while he was a research student in England. An international program of observation and collaboration was gathering momentum, and Duffield recognised that a solar observatory in Australia, his home, could make a significant contribution to the global research effort. For the next few years he busily gathered support for his proposal from a range of scientific organisations, including the Royal Society and the BAAS. Although his initial approach to the Australian government was unsuccessful, he journeyed home in December 1908 to enlist the AAAS and to continue his lobbying in person. Perhaps the high point of his crusade came in October 1909, when the Governor-General led a barrage of speakers arguing the case for a solar observatory before a public meeting in the Melbourne Town Hall.[113] The press responded enthusiastically, with the *Argus* insisting that Australia should take up this 'duty to mankind' both 'for the prestige of our country' as well as for potential benefits 'of a more practical and utilitarian character'. Knowledge of the sun promised a greater understanding of 'weather conditions and climatic variations'.[114]

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111 Pietro Baracchi, 'Progress report of the Mount Stromlo Observatory', 30 June 1913, NAA: A1/15, 18/6038.

112 Rosaleen Love, 'Science and government in Australia, 1905-14: Geoffrey Duffield and the foundation of the Commonwealth Solar Observatory', *Historical Records of Australian Science*, vol. 6, no. 2, 1985, pp. 171-88; Raymond Haynes, Roslynn Haynes, David Malin, and Richard McGee, *Explorers of the southern sky: a history of Australian astronomy*, Cambridge University Press, Cambridge, 1996, pp. 152-8.

113 Details of Duffield's lobbying are provided by Love, 'Science and government in Australia, 1905-14'.

114 *Argus*, 29 October 1909, p. 6; see also, *Age*, 29 October 1909, p. 6.

Duffield also managed to earn the favour of Alfred Deakin, who, in June 1909, became Prime Minister for the third time. Deakin developed a personal and continuing interest in the project, attracted perhaps by the combination of intellectual obligation, imperial duty and national self-interest.[115] 'The Commonwealth ought to do its share in this matter', he told parliament in November, noting that his government was prepared to maintain a solar observatory 'for the sake of science and Australian meteorology'.[116] But the turbulent politics of the era complicated Duffield's task. Deakin was out of office within twelve months, and while the incoming Labor government established the temporary observatory on Mount Stromlo, they were less enthusiastic about committing to Duffield's scheme.

The BAAS tour of Australia in 1914 provided Duffield with the opportunity to press his case. He assembled a stellar cast of scientific notables to wait upon the unfortunate Prime Minister, Joseph Cook.[117] And just in case the weight of scientific authority could not carry the day alone, the delegation also included Cook's former leader, Alfred Deakin. The Prime Minister was outgunned. 'I am inclined to think we cannot over-estimate the value of the inquiry you are suggesting today', Cook admitted, 'If I can, with these war obligations, spare a little money for this purpose, you may depend upon it I will do so'.[118] His conversion to the cause was encouraged within Cabinet by Littleton Groom, whom the Acting-Secretary of Home Affairs noted was 'very active in [the] matter'.[119] The Commonwealth moved immediately to accept a number of instruments provided through Duffield by private donors, though war delayed further action.[120] Reporting on the delegation, the *Argus* saw a link between science and the nation's call to arms: 'Just as it is our pride to do our duty in matters militant when the

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115 Love, 'Science and government in Australia, 1905-14', p. 185.
116 *CPD*, 4 November 1909, vol. 53, p. 5333.
117 A transcript of the meeting lists those attending as: Professor Dyson, Astronomer Royal; Professor Turner, International Bureau of Solar Research; Professor Abbot, Director of the Astro-Physical Observatory at the Smithsonian Institute; Professor Masson; Sir Oliver Lodge; and Mr Alfred Deakin. 'Proposed solar observatory – Transcript of notes of deputation which waited on the Prime Minister..., Tuesday, 18th August, 1914', NAA: A1/15, 18/6038
118 *ibid.*
119 Letter from WD Bingle (Acting Secretary, Home Affairs) to Colonel David Miller (Administrator, Federal Territory), 22 August 1914, NAA: A 202, 1914/3272.
120 Letter from Joseph Cook (Prime Minister) to WG Duffield, 20 August 1914, NAA: A 202, 1914/3272.

Empire calls, so should it be our pride to do our duty when the world calls us to labour for the advancement of human knowledge'.[121]

Duffield's victory was confirmed in 1923, when the government announced it was proceeding with construction of a solar observatory on Mount Stromlo.[122] There were those, however, who had hoped for something more. The Commonwealth Meteorologist, HA Hunt, immediately wrote to the secretary of the department to remind him of the 'original proposals' regarding the Mount Stromlo site.[123] As early as 1909, Hunt had suggested that the seat of government should include a scientific compound, incorporating a 'meteorological research observatory', as well as 'other observatories for Astronomy, Solar Physics and Geodesy'. A single, shared location that encouraged cooperation 'would tend to the breeding of a virile scientific community', Hunt maintained, and 'would place the scientific results obtained to the practical and economic use of the public at the earliest possible moment'.[124] Mount Stromlo, he hoped, would be the focus of the nation's research effort, the source of its scientific renown.

Hunt, of course, was determined that his own, young organisation would not be left behind by any government commitment to the solar observatory. But he was not alone in his belief that the national capital should boast a centre of scientific achievement. The site on Mount Stromlo was selected early in 1910 by a committee that included Hunt, Pietro Baracchi, Victoria's State Astronomer, and Charles Robert Scrivener, the District Surveyor.[125] They set about their task with a dual purpose, to find a suitable setting for 'the Astronomical and other Scientific Observatories', and to determine thereby the 'Initial Meridian'— the starting point for all surveys in the Federal Territory and,

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121 *Argus*, 18 August 1914, p. 8.
122 'Establishment of solar observatory at Federal Capital', press release, 17 April 1923, NAA: A 202, 1914/3272.
123 Letter from HA Hunt (Commonwealth Meteorologist) to Secretary, Home and Territories, 2 May 1923, NAA: A 202, 1914/3272.
124 Memorandum by HA Hunt (Commonwealth Meteorologist) for Minister, Home Affairs, 28 March 1911, NAA: A1/15, 18/6038.
125 'Preliminary report of the committee appointed to select a site within the Federal Territory suitable for the location of Astronomical and other scientific observatories', NAA: A1/15, 18/6038.

ultimately, the Commonwealth.[126] The centre of science would be aligned with the centre of cartographic possession, brought together on a mountaintop to survey the entire nation. Baracchi reported that a 'solitary tree' on the highest point of Mount Stromlo had been specially marked: 'I trust that through this spot will pass in due course the Prime Meridian of the Commonwealth, and that around it will be clustered all other Government institutions for the service of Science and the credit of Australia'.[127]

David Miller, Secretary of the Department of Home Affairs, took a keen interest in plans for the site. He was concerned, like Hunt, that too eager a commitment to Duffield's scheme might limit the Commonwealth's options. In September 1912, he advised the government against accepting Duffield's offer of instruments, arguing that the organisation of the 'Scientific Observatories' should 'be left in the hands of those who... may at some future date be appointed to take charge of them.' The Department, he insisted, should have an 'absolutely free hand'.[128]

Miller was a Boer War veteran, who ruled his public service dominion in a strict and vigorous fashion. He was intimately involved with the development of Canberra, and, in 1912, became one of its first residents, taking up the post of Administrator of the Federal Capital Territory.[129] Miller's hopes for the growth of the capital were reflected in his opinions on the use of the Mount Stromlo site. He reported to the Minister in 1914 that an 'Astronomical Observatory' had been included in plans for the seat of government 'for reasons scientific, educational and national'. With the advice of the world's leading astronomers, this new Commonwealth Observatory would be equipped to pursue 'the highest and most important aims of modern Astronomical Research'. But it would do more. Miller argued that the observatory should have the resources to 'serve the popular or national in addition to the scientific purpose'. It was to be a symbol of Australian pride and aspirations, an embodiment of the national ideal. 'I believe that the

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126 Letter from CR Scrivener to Secretary, Home Affairs, 11 January 1910, NAA: A1/15, 18/6038.
127 Letter from Pietro Baracchi to Secretary, Home Affairs, 27 March 1911, NAA: A1/15, 18/6038.
128 Copy of memo by David Miller (Secretary, Home Affairs), 25 September 1912, NAA: A202, 1914/3272.
129 Peter Harrison, 'Miller, David (1857-1934)', in Bede Nairn and Geoffrey Serle (eds), *Australian Dictionary of Biography*, Melbourne University Press, Melbourne, 1986, pp. 505-6.

people of the Commonwealth will not be content with a purely practical observatory', Miller argued, 'they will demand more— consequently I hold that this institution will eventually be created on an elaborate scale in which its great instruments would be named with the great instruments of the world'.[130]

The establishment of the Commonwealth Solar Observatory was not just a reward for Duffield's initiative and persistence, it was also an expression of the idea that Canberra, the nation's capital, should be a centre of culture and learning— home to science and the arts, as well as politics. This vision of Canberra was generously endowed by the anatomist William Colin MacKenzie, who in 1923 offered the Commonwealth his extensive collection of preserved specimens of Australian fauna as the basis of a 'National Museum of Australian Zoology' to be constructed in the capital.[131] The 'donation of such a gift at a time when our fauna is rapidly becoming extinct', noted Senator Pearce, 'constitutes an act of practical patriotism the merit of which it would be hard to over-estimate'.[132]

MacKenzie's specimens were a vital record of an animal population that seemed doomed to oblivion. 'The animals', MacKenzie gravely warned, 'are rapidly following the fate of the Tasmanian aboriginal nation, which was completely obliterated by the white man'. But if they could not be saved, the animals could at least be preserved. It was a national responsibility to ensure that a representative collection was maintained. 'We hold these animals and the specimens in the Museum in trust for the rest of the world as well as for future generations of Australians', MacKenzie proclaimed, for they 'will not have the privilege of seeing them in their native state'.

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130 Memo from David Miller (Admistrator, FCT) for Minister of Home Affairs, 25 March 1914, NAA: A1/15, 18/6038.

131 For biographical details see Monica MacCallum, 'MacKenzie, Sir William Colin (1877-1938)', in Bede Nairn and Geoffrey Serle (eds), *Australian Dictionary of Biography*, Melbourne University Press, Melbourne, 1986, pp. 306-8. For plans to establish a 'National Museum' see: Ian McShane, 'Building a National Museum of Australia: a history', *Public History Review*, vol. 7, 1998, pp. 75-88; Libby Robin, 'Collections and the nation: science, history and the National Museum of Australia', *Historical Records of Australian Science*, vol. 14, no. 3, 2003, pp. 251-89.

132 *CPD*, 16 August 1923, vol. 105, p. 2839. See also, letter from SM Bruce (Prime Minister) to WC MacKenzie, 22 August 1923, NAA: A457/1, E553/1.

The new institution, finally opened in 1930 as the Australian Institute of Anatomy, was not, however, 'a Museum in the ordinary sense of the word'. Rather than being 'a place for sight-seers', it was 'a place where research work will be carried out on basic principles affecting the future of the human race'.[133] MacKenzie firmly believed that the anatomy of Australia's 'primitive' fauna, held vital insights into the functioning of the human body.[134] He envisaged an active research centre, attracting scientists from around the world. His institute would arm the nation with 'a powerful weapon, not only in fighting disease, ...but also in maintaining and improving the general efficiency of the human body'.[135]

The Australian Institute of Anatomy was also an expression of Canberra's destiny. 'It is hoped that Canberra will be not merely the Washington of Australia', MacKenzie noted, 'but the Oxford'. The Institute could be regarded 'as the first unit' of a 'National University of Australia', in a city which MacKenzie hoped 'will later become the great centre of medical research in the Pacific', as well as 'the cultural centre of the Commonwealth'.[136] Canberra developed rapidly in the late 1920s, with science playing a prominent role in defining the national ideal. As well as Solar Observatory, an Australian Forestry School was opened in 1927, and CSIR began construction of two laboratories at the foot of Black Mountain. At an Institution of Engineers conference in 1928, Prime Minister Bruce urged 'all great, national organisations of art, science and industry' to hold their deliberations in the capital, for 'here above all places they would be able to visualise national problems in a truly national spirit'.[137]

MacKenzie moved to Canberra with his specimens, acting, without salary, as the Institute's Director. Like Duffield, he was an active contributor to the cultural life of the capital, and his 'imposing building' was made available to a range of community organisations, from the Canberra University College to the Canberra Repertory

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133 'National Museum of Australian Zoology', note for Cabinet, NAA: A431, 1959/450.
134 See for example: William Colin MacKenzie, 'Functional anatomy and medical practice', *Medical Journal of Australia*, 6 October 1928, pp. 422-30.
135 WC MacKenzie to JE Fenton (Acting Prime Minister), 5 November 1930, NAA: A2644, 70.
136 'Australian Institute of Anatomy', NAA: A2644, 70.
137 *Canberra Times*, 7 February 1928, p. 1.

Society.[138] When queried by departmental officials, MacKenzie replied that the Institute's lecture theatre had been built 'to forward anything of a cultural nature in the National Capital'.[139] But while the Institute contributed much to the local community, its research program foundered. Comparative anatomy had lost its sense of promise, and the medical world moved on. The nation was left with a collection of uncertain purpose, containing a number of animals who steadfastly refused to become extinct. The Institute of Anatomy increasingly became 'a place for sight-seers', with the displays of zoological, medical and anthropological specimens proving so popular with tourists that the Institute was eventually forced to open on weekends and public holidays.[140]

MacKenzie's vision brought together past and future. The fading remnants of Australia's fauna promised new realms of exploration and achievement; Canberra itself would be steadily raised from sheep farm to cultural centrepiece. In a building deliberately designed to be 'monumental', MacKenzie sought to anchor his hopes of future greatness in a celebration of science's heroic past.[141] Glowering from the walls of the entrance hall and one of the galleries, face masks of 'distinguished men' who had 'advanced the cause of medical science' were mounted like prize specimens.[142] Amidst the dissected animals, severed limbs, and Aboriginal skeletons, the evolution of science itself was exhibited for the edification of visitors. Upon his death in 1938, MacKenzie himself was added to the collection. His ashes were set within the building behind a plaque that borrowed Christopher Wren's famous epitaph: 'If you seek his monument, look around'. Like Duffield on the mountaintop, MacKenzie was bound in death to his own creation. An institution conceived of national ambition, an institution that

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138 'Australian Institute of Anatomy', NAA: A2644, 70. For details of organisations using the Institute's building see: NAA: A1928, 695/3 Section 2; NAA: A2644/1, 20/1.

139 WC MacKenzie to Director-General of Health, 26 May 1933, NAA: A1928, 695/3 Section 2.

140 The question of opening hours was raised a number of times until they were finally extended in 1938, see: NAA A659/1, 45/1/2167; NAA: A 1928, 695/3 Section 2; NAA: A 1928, 695/3 Section 3.

141 Early designs of the building were deemed to be insufficiently monumental for the site and the purpose, see, for example, memo from JH Butters to Minister, Home and Territories, NAA: 431/1, 1959/450.

142 WC MacKenzie to Neilson Hancock, 18 February 1936, NAA: A2645/1, 50/1/7 Part 1. For a list of the subjects, see draft notes, 'The face masks at the Australian Institute of Anatomy - "Let us now praise famous men"', NAA: A2645/1, 50/1/7 Part 1.

promised to lift the nation's capital to the heights of scientific preeminence, lived on as a memorial to a kindly, generous man whose dreams remained ever out of reach.

## A shrine for investigators

When Littleton Groom rose to speak on the budget in October 1936, he had been in the House of Representatives for 33 years. Amongst those present, only his friend and former leader, Billy Hughes, had been there longer. They were the last survivors of the nation's inaugural parliament, a living link to the era of Federation. And it was one of the legacies of Federation that Groom was seeking to address— the future of the capital.

Groom's passion for education remained undimmed across the years; still he sought in knowledge and learning a key to the nation's destiny. 'It is impossible for any one to contemplate a national capital of a great country like Australia without its having a university', Groom remarked a few months earlier, 'with all the scientific institutions being developed in the environs of Canberra, it will, undoubtedly, in future be a great cultural centre for the Commonwealth'.[143] Canberra needed a university. The establishment of the capital as an important seat of learning was one of Groom's 'dearest dreams', and it was this topic he returned to in what would be his last substantial contribution to parliament.[144] Canberra needed a university, he reiterated in the budget debate, but a university that was 'entirely different' to those in the state capitals. What Canberra needed, what Australia needed, was 'a university whose activities will be devoted mainly to research'.[145]

The idea of a national university brought together two of Groom's abiding preoccupations, the expansion of education, and the growth of the capital. 'Were there no provision in the Constitution for the establishment of a Federal Capital', Groom told a luncheon in 1921, 'I am satisfied that the force of public opinion in Australia would

143 *CPD*, vol. 151, 16 September 1936, p.154.
144 Jessie Groom (ed.), *Nation building in Australia*, p. 154, 236.
145 *CPD*, 13 October 1936, vol. 151, pp. 1033-4.

necessitate its establishment'.[146] Groom imagined the capital as an expression of national unity, an embodiment of the federal ideal. When state and federal governments clashed over the proposed location of the new city in 1905, Groom reminded his colleagues that they were 'deciding a very momentous question'. The capital, he maintained, would be 'a source of inspiration of the true Federal feeling'. Canberra was not merely to be the home of lawmakers and bureaucrats, nor was it just another city. Canberra, Groom argued, would enrich the public's understanding of Federation, bringing 'a higher national sentiment' to bear on civic life and duty. This new city 'would stand apart' from others, representing not just Australia's system of government, but 'the national life' itself.[147]

In 1927, as parliament assembled for the first time in the new capital, it was Groom who presided over the House of Representatives from the elaborately-carved Speaker's chair. The city was growing, the ideal was taking shape. The period of rapid development that culminated in the opening of Parliament House had been initiated, in part, by Groom himself, as Minister for Works and Railways in the Hughes government. Now, having smoothed the transfer of parliament and its staff, Groom could enjoy a sense of fulfilment and the promise of greatness.[148] Accepting the Speaker's chair as a gift from the Empire Parliamentary Association, Groom acknowledged Australia's proud British heritage, but added, 'we are a new country facing new conditions, necessarily taking a new outlook on things'.[149] Canberra was a city of the future, a living symbol of national progress.

From early in its planning, it was assumed that the capital would be graced with a university of its own. But it was only in the 1920s, when Canberra became home to a swelling horde of public servants, that the matter received detailed attention.[150] Striding

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146 Littleton Groom, *Work at the Federal Capital: address delivered by Hon. Littleton E Groom at the National Club Luncheon on Monday, 29 August, 1921*, Canberra, 1921. p.1.
147 'The necessity for Canberra', *Federal Capital Pioneer Magazine*, 20 July 1927, p. 17.
148 For Groom's interest and association with Canberra, see Jessie Groom (ed.), *Nation building in Australia*.
149 Quoted in Jessie Groom (ed.), *Nation building in Australia*, p.188.
150 Milton Lewis, 'Canberra as a cultural centre: the aspirations of the Canberra University Movement 1927-1945', *Journal of the Royal Australian Historical Society*, vol. 65, part 1, June 1979, pp. 59-64; SG Foster,

to the fore was Robert Randolph Garran, secretary of the Attorney-General's department, and perhaps 'the greatest of all Commonwealth Public Servants'.[151] Garran was a cultivated man with wide literary interests and an 'unrivalled knowledge of the Constitution'.[152] As one of the architects of Federation, Garran shared with Groom a belief that the capital was an 'integrating factor', a 'symbol and emblem of Australian nationality'. Canberra was blessed with 'unlimited possibilities', he argued, not as a commercial centre, but as 'a city of light and learning'; a city that would 'absorb the cultural ideas of all Australia and radiate them back over the whole Commonwealth'. A university would provide the 'finishing touch', confirming Canberra at the centre of the nation's pride and aspiration.[153]

Garran led the University Association of Canberra, arguing both for an institution that would meet the educational needs of the city's growing population, and for something 'distinctly different'— a *national* university that would focus upon 'post-graduate research and specialised higher study in subjects of outstanding national significance'.[154] Early progress was made on the first of these aims with the establishment of the Canberra University College in 1930. A great 'research university', however, could not be conjured so readily, despite the support of scientists such as David Rivett, who believed that 'a shrine for investigators' would bring benefit both to capital and country.[155]

In 1934, Garran chaired 'an enthusiastic public meeting' that declared the 'time was ripe' for the creation of a 'National University' in Canberra. The promotion of 'national unity' was a recurrent theme as speakers proclaimed that only through the founding of an institution dedicated to the pursuit of knowledge could Canberra 'fulfil its true national character'. A deputation was raised to impress upon Prime Minister, Joseph

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and Margaret M Varghese, *The making of the Australian National University, 1946-1996*, Sydney, Allen & Unwin, 1996, pp. 4-9.

151 Quoted in RS Parker, 'Garran, Sir Robert Randolph (1867-1957)', in Bede Nairn and Geoffrey Serle (eds), *Australian Dictionary of Biography*, Melbourne University Press, Melbourne, 1981, pp. 622-5.

152 *ibid.*

153 Sir Robert Garran, 'A National University at Canberra', *Australian Quarterly*, no. 27, September 1935, p. 15.

154 *ibid.*, pp. 9,13.

155 Quoted in Lewis, 'Canberra as a cultural centre', p. 62. See also: T H Laby, 'A university for the Commonwealth', *Australian Quarterly*, no. 1, March 1929, pp. 32-42.

Lyons, the 'prime necessity' of such an undertaking.[156] Garran's former minister, Littleton Groom, introduced the group, emphasising the importance of their mission, but Lyons predictably cited the government's 'financial difficulties', and merely offered to investigate further.[157]

Garran continued to lobby, without success, until war sharpened the focus once more on the link between knowledge and nationhood. The bright young bureaucrats busy drafting plans for postwar reconstruction began to ponder the Commonwealth's role in education.[158] People needed help adjusting to the rapid pace of change; the success of any 'new order' would hinge upon the health and resilience of the national mind. 'It will be a difficult and dangerous matter', warned the Committee on National Morale, 'for the Government to confine its activities to economic and social questions from now on, and ignore the educational problem'.[159] This renewed interest in education also reflected the postwar planners' confidence in the power of knowledge to transform society. Commonwealth action in higher education would affirm the authority of expertise; it would enable the process of planning to evolve in sophistication and effectiveness. At this convergence of ideas about knowledge, society, and intellectual leadership, a national university suddenly emerged as a critical component in Australia's future progress. 'The concept of the National University was an expression of the optimism of the times', explained HC Coombs.[160]

In October 1949, Robert Garran revelled in a 'dream come true', as the foundation stones of the Australian National University were finally laid in place. Canberra would at last be home to a 'community of scholars', Garran remarked, 'and I look forward to their presence broadening the outlook of our citizens, our Parliament, our

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156 *Canberra Times*, 10 October 1934, pp. 1-2.
157 'Establishment of national university in Canberra: notes of deputation which waited on the Prime Minister on 28 November, 1934', NAA: A461/7 J340/1/7 Part 1.
158 Foster and Varghese, *The making of the Australian National University*, pp. 10-19; HC Coombs, *Trial balance: issues of my working life*, Sun Books, Melbourne, 1983,pp. 198-200; Tim Rowse, *Nugget Coombs: a reforming life*, Cambridge University Press, Cambridge, 2002, pp. 172-3.
159 'Report with recommendations on morale and the Commonwealth's activities in the field of education', 27 September 1943, NAA: A1608/1, AK 29/1/2.
160 Coombs, *Trial Balance*, p. 199

Administrators'.[161] As Garran had planned twenty years earlier, this was to be a new kind of university, concentrating on research and postgraduate training. Its facilities would be 'equal to the world's best', proclaimed JJ Dedman, the Minister for Postwar Reconstruction, and would 'attract the best brains the nation can produce'.[162] But not all was as Garran had envisaged, for recent 'world events' had taken a hand in the design of the new institution. He had imagined a modest beginning, with research confined to the 'social sciences and Pacific and Oriental studies'. The war, however, had adjusted the nation's priorities, compelling the government to embark upon a more ambitious project, with 'special emphasis on physical and medical research'.[163]

Physics had been almost an afterthought, first included in plans for the national university at the urging of Richard Woolley, Duffield's successor as Director of the Commonwealth Solar Observatory, and HC Coombs' sometime flatmate.[164] Doubt lingered as to whether the government could afford research in such an expensive discipline, but then, as Woolley recalled, 'the atom bomb went off'.[165] Atomic physics suddenly held the world in thrall, and scientists associated with the bomb, such as the Australian-born physicist Mark Oliphant, became instant celebrities. Oliphant was at his beguiling best when he met with Coombs and Chifley to discuss the impact of atomic energy on the postwar world. Convinced by the physicist's argument that Australia could not risk being left behind in this history-making quest, Chifley assured Coombs that if Oliphant could be won for Canberra, the government would find the funds.[166]

From afterthought to acclamation, Australia's proposed entry into the realm of atomic physics quickly came to dominate public interest in the new university. Oliphant and

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161 'Australian National University, address by Sir Robert Garran on the occasion of the laying of the first foundation stones of the university', 24 October 1949, NAA: A461/7, J340/1/7 Part 1. See also: *Canberra Times*, 25 October 1949, p. 2.
162 'Opening of National University, speech made by the Minister for Post War Reconstruction', NAA: A461/7, J340/1/7 Part 1.
163 'Australian National University, address by Sir Robert Garran on the occasion of the laying of the first foundation stones of the university', 24 October 1949, NAA: A461/7, J340/1/7 Part 1.
164 Coombs, *Trial Balance*, p. 199; Rowse, *Nugget Coombs*, p. 173.
165 Richard Woolley, 'Mount Stromlo Observatory', *Records of the Australian Academy of Science*, vol. 1, no. 3, September 1968, p. 56.
166 Coombs, *Trial balance*, pp. 81-3; Foster and Varghese, *The making of the Australian National University*, pp. 20-1.

another eminent expatriate, Howard Florey, wielded immense influence at the planning table and in the press. They were the 'atom bomb and penicillin men', Australians who had proved themselves at the highest levels of scientific achievement; patriotic Australians who were working with the government to ensure their homeland was equipped to benefit from the onward march of science.[167] Oliphant, Donald Horne reported, was 'one of the key men of the Atomic Age'— a modest and determined scientist with a talent for 'the salesmanship of ideas'.[168] He was bringing to Canberra, not only his plans for fundamental research into the nature of matter, but 'the world's largest "atom buster"'.[169] Australia was promised the biggest and the best.

The National University, Dedman asserted at the inaugural ceremony, was evidence of the government's determination 'that the development of Australia will forge ahead with the backing of all the physical, intellectual and scientific resources we can muster'.[170] The postwar planners expected the university to play a major role in their 'peaceful revolution'. Its flow of 'intellectual energy' would power the forces of change; its innovative research programs would ensure that science was made to 'serve humanitarian purposes as forcefully as it had served those of mass destruction'.[171] It was a utilitarian vision fashioned from the ideals of science, the ambitions of nationhood, and the history of federalism. 'I am proud to have the opportunity of taking part in this ceremony', Robert Garran concluded, 'which dedicates Australia, and this city, to the pursuit of knowledge, truth, and wisdom'.[172]

## To speak with authority for science as a whole

The year 1951 marked the jubilee of Federation. It was also the year that the Australian National University conferred its first degree. Eighty-four year old Robert Garran,

167 *Herald*, 2 October 1946, p. 11.
168 *Daily Telegraph*, 14 January 1947, p. 6.
169 *Daily Telegraph*, 15 July 1949, p. 9.
170 'Opening of National University, speech made by the Minister for Post War Reconstruction', NAA: A461/7, J340/1/7 Part 1.
171 Coombs, *Trial balance*, p. 200.
172 'Australian National University, address by Sir Robert Garran on the occasion of the laying of the first foundation stones of the university', 24 October 1949, NAA: A461/7, J340/1/7 Part 1.

veteran of the Federation campaign, was awarded an honorary LLD.[173] He became the first graduate of the institution for which he had so long hoped and argued.

As a further contribution to the jubilee celebrations, the ANU organised two high profile seminars, bringing together eminent thinkers from Australia and overseas. One seminar examined the practice of federalism itself, while the other was intended to 'review the growth, organisation, achievements and status of scientists in Australia', and to develop 'an overall pattern of future scientific policy'.[174] It was, Vice-Chancellor DB Copland suggested, 'entirely appropriate' that the ANU should host such a scientific stocktake. 'As a national University sponsored by the Commonwealth', he explained, 'its objective must be not only to pursue its own studies and researches, but to provide facilities for the discussion of common problems among all scientists, and to promote the maximum degree of co-ordination of scientific endeavour'.[175]

The 'Science in Australia' seminar was organised by Mark Oliphant, Director of the university's Research School of Physical Sciences. Oliphant had left Australia in 1927 as a promising research student, returning more than twenty years later as a world-class scientist and conquering hero. He flourished in the fabled realms of the Cavendish Laboratory at Cambridge, journeying with Ernest Rutherford into the mysterious heart of the atom. During the war, Oliphant played a significant role in the development of the allies' most secret and powerful weapons, radar and the atomic bomb. In the years that followed, he became a frequent contributor to public debate, a passionate opponent of the use of the atomic bomb, an adviser to government, a leader of the scientific community, and perhaps the country's best known scientist.[176]

173 Parker, 'Garran, Sir Robert Randolph (1867-1957)', p. 624.
174 *Canberra Times*, 24 July 1951, p. 4.
175 DB Copland, 'Foreword', in MLE Oliphant (ed.), *Science in Australia*, FW Cheshire, Melbourne, 1952, p. i.
176 For Oliphant's biographical details see Stewart Cockburn, and David Ellyard, *Oliphant: the life and times of Sir Mark Oliphant*, Axiom Books, Adelaide, 1981.

Oliphant introduced the seminar's published proceedings by reaffirming the value of science to a country beset with 'problems in agriculture and land utilisation'.[177] The benefits of applied science seemed obvious, manifest in the many achievements of CSIR and its successor, CSIRO. But if Australia was to overcome its inherent difficulties, to progress at a rate commensurate with the advanced nations of the world, it had to move beyond a narrowly utilitarian framework and develop a 'research outlook'.[178] Oliphant surveyed a fragmented and discordant community, where financially starved university scientists looked with envy upon the resources available to their colleagues in CSIRO. A new funding model was essential, as was a renewed attempt 'to weld the scattered scientific effort in Australia into a corporate whole, with a common purpose and spirit'.[179]

Questions of organisation and influence continued to bedevil the nation's scientists as they pondered once again their role in Australian society. Their desire for unity, for a single voice in the forum of national affairs, had been expressed through such bodies as AAAS/ANZAAS and the ANRC, but still they found it difficult to make themselves heard. The outbreak of war in 1939 offered science another chance to seize a prominent role in the consolidation of national strength and self-reliance. Entering the conflict as an eager supporting player, science stole the show with its dramatic finale over Hiroshima, and burst upon the postwar world with renewed confidence and authority.[180] But in a world struck with the horror of the bomb, descending into ideological division and fear, science's very success brought new dangers, new failures.

At the 1939 ANZAAS meeting, discussions on the social relations of science had been inconclusive, disappointing. But scientists keen to turn their skills and knowledge to the remaking of society quickly regrouped, and within a few months had founded a new

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177 'Introduction', in MLE Oliphant (ed.), *Science in Australia*, FW Cheshire, Melbourne, 1952, p. v. The introduction is unsigned, but seems almost certainly to have been written by Oliphant.
178 *ibid*, p. viii.
179 *ibid*, p. vii-viii.
180 The effect of the war upon the development of Australian science is discussed in RW Home, 'Science on service, 1939-1945', in RW Home (ed.), *Australian science in the making*, Cambridge University Press, Cambridge, 1988, pp. 220-51.

organisation.[181] The Australian Association of Scientific Workers (AASW) aimed 'to secure the wider application of science and the scientific method for the welfare of society, and to promote the interests of science'.[182] It would 'unite the interests of all progressively minded scientists', ensuring that science was 'more fully and effectively recognized in government, in industry and in education'.[183] The AASW brought a sense of activism and energy to the pompous truisms of ANZAAS orators. The oft-recited ideals of science were given a political edge, sharpened against a socialist critique that influenced many young scientists in the 1930s.

Even before it had been formally constituted, the AASW hosted public discussions on 'the contribution of the scientific worker to defence' and the 'nature of science teaching'.[184] Education, it was argued, should instill an appreciation of the scientific method and a desire for accurate information in the activities of daily life. These were important lessons both for scientists and citizens. The organisation of scientific effort was another well-worn theme given added urgency and relevance. With the onset of war, the AASW launched a vigorous campaign, urging the government to mobilise the country's scientific resources. Meanwhile specialist sub-committees gave frustrated scientists the opportunity to lend their skills to the nation's pressing needs.[185]

But amidst the chaos and destruction of war, it was the hope of an emerging 'new order' that entranced the idealists of the AASW. Properly planned and controlled, the processes of postwar reconstruction could recreate Australia along scientific lines. Science would work to the benefit of all, its influence reflected in a more intelligent, more prosperous, more just society. Conferences on 'the planning of science' were organised in several states, as the AASW sought to find a place within the government's

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[181] Moran, 'Scientists in the political and public arena', ch. 2.
[182] 'Science and society', *Australian Journal of Science*, vol. 2, no. 2, August 1939, p. 15.
[183] 'Australian Association of Scientific Workers, New South Wales Branch', *Australian Journal of Science*, vol. 2, no. 3, December 1939, p. 95.
[184] 'Science and defence - Australian Association of Scientific Workers', *Australian Journal of Science*, vol. 2, no. 2, October 1939, pp. 40-43; 'Australian Association of Scientific Workers, the nature of science teaching in schools', *Australian Journal of Science*, vol. 2, no. 3, December 1939, pp. 90-1.
[185] Moran, 'Scientists in the political and public arena', ch. 3.

planning machinery.[186] However, the scientists' unswerving conviction seemed to unnerve even the intellectual vanguard in the Ministry of Post-War Reconstruction. An internal minute to the Director, HC Coombs, canvassed various jobs that might safely be allotted to the AASW, warning of their 'eagerness to make political judgements'. 'It should be made clear', the note continued, 'that the argument cannot be accepted that the scientific worker by his peculiar training is alone capable of making rational political judgements'.[187]

The political certainties of the AASW, its passion for planning and hopes for the democratic control of science, alienated many within the scientific community, and aroused the suspicions of some outside. The atomic bomb revealed all too clearly the value of science to the modern state, but it raised new doubts about loyalty and trust. In a world whose very existence seemed to depend upon close control of the 'atomic secret', those who argued for the freedom of scientific exchange appeared foolish at best, perhaps even dangerous. Reports of 'atomic spies' fuelled Cold War hysteria, as conservative politicians looked for communists behind every laboratory bench.[188] The AASW was an easy target for allegations of communist control, and membership began to dwindle as scientists ducked for cover against the hail of anti-communist invective and innuendo. In 1948, the decision was made to dissolve the organisation.[189]

Noticeably absent from the proceedings of the 'Science in Australia' seminar was any mention of the AASW. It was an experiment best forgotten. Instead, the seminar charted a course away from the excesses of 'planning'. Speakers unfavourably contrasted Australia's faith in 'the ability of boards and committees to decide the direction of scientific advance' with the American policy 'of backing the man with ideas and proved

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186 *ibid*, pp. 148-68.
187 'The association of scientific workers', minute by WH Lockwood for HC Coombs (Director, PWR), 13 March 1943, NAA: A9816, 43/1052.
188 Jean Buckley-Moran, 'Australian scientists and the Cold War', in Brian Martin, C.M. Ann Baker, Clyde Manwell and Cedric Pugh (eds), *Intellectual suppression: Australian case histories, analysis and responses*, Angus & Robertson, Sydney, 1986, pp. 11-23; Phillip Deery, 'Scientific freedom and postwar politics: Australia, 1945-55', *Historical Records of Australian Science*, vol. 13, no. 1, June 2000, pp. 1-18.
189 Moran, 'Scientists in the political and public arena', pp. 227-30.

achievement'.[190] Burdened with a permanent, ageing staff, government laboratories risked becoming sterile. Universities, on the other hand, promoted greater autonomy and creativity, their research efforts stimulated by a 'continual flow of fertile young brains'.[191] Unsurprisingly perhaps, the ideal research environment looked a lot like the ANU.

Greater autonomy, however, need not entail isolation. Oliphant noted that scientists were 'developing a growing awareness of the social problems' engendered by their work.[192] But rather than planning to remake society, he suggested that scientists could best serve their country by providing a source of impartial advice and expertise. There was a pact to be made between science and the nation. 'The man of science must be prepared to place his knowledge at the disposal of his Government', Oliphant maintained, but the Government must be willing to encourage the scientist by providing 'an atmosphere... where scientific work can flourish'.[193]

The seminar concluded with a discussion of 'scientific policy' in which Oliphant revealed his plans for 'revivifying' the 'spirit of science' in Australia. What was needed was a symbol of unity and coherence, a new organisation that represented the pinnacle of scientific achievement— a national academy of science. With membership confined to the nation's most eminent scientists, such a body would be able 'to speak with authority for science as a whole'. It would have the 'necessary prestige' to gain a hearing in the halls of political power, to influence public debate.[194] Whereas the AASW imagined that all scientific workers might have a say in the framing the nation's research agenda, Oliphant proposed governance by a self-elected elite. Unity would come not through participation, but through leadership.

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190 Oliphant (ed.), *Science in Australia*, p. ix, 165.
191 *ibid*, p. ix.
192 *ibid*, p. xv.
193 *ibid*, pp. xxiv-xxv.
194 *ibid*, pp. 163-7; Frank Fenner (ed.), *The Australian Academy of Science: the first forty years*, Australian Academy of Science, Canberra, 1995, pp. 9-10.

The 'Science in Australia' seminar was closed to the media. It was an unfortunate decision, argued the *Sydney Morning Herald*, at a time when the public felt 'overwhelmed by science'. Increased specialisation coupled with the unremitting flood of discovery and invention had opened a 'great gulf' between 'the scientist and the ordinary citizen'.[195] What was needed was more communication, not less. Forty years earlier, the newspaper had urged a similar course upon scientists attending the AAAS congress.[196] Forty years earlier, Orme Masson had addressed the congress, pondering the best means of cultivating the 'scientific spirit', urging that work on 'practical problems' should not overshadow the 'search for truth', and arguing for greater encouragement of research within the universities.[197] In the pursuit of progress, science found itself returning endlessly to the problems of its past.

## A great beginning

Prime Minister Robert Menzies pushed the big black button and stirred the reactor into life. 'This is a very historic occasion for Australia', Menzies proclaimed at the official opening of the Lucas Heights Research Establishment in April 1958, 'because we are opening an establishment that is related to something so new in the world'.[198] Lucas Heights was a prominent stop on Menzies' tour of development opportunities, selling the 'Australia Unlimited' message to public, business and investors.[199] The reactor and associated research facilities would enable the Australian Atomic Energy Commission (AAEC) to keep 'abreast of scientific research and scientific discovery', and to train rising generations of scientists in the needs and opportunities of the Atomic Age. Their inauguration marked 'an epoch in history', Menzies proudly noted, providing the nation with 'a great beginning'.[200]

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195 *SMH*, 28 July 1951, p. 2.
196 *SMH*, 9 January 1911, p. 8.
197 Masson, 'Presidential address', p. 5.
198 *SMH*, 19 April 1958, p. 1; 'Prime Minister starts Lucas Heights Reactor', *Atomic Energy*, vol. 1, no. 3, June 1958, pp. 4-5. See also 'Australia's first reactor', *Commonwealth Today*, no. 60, pp. 18-19.
199 Marian Simms, *A Liberal nation: the Liberal Party and Australian politics*, Hale & Iremonger, Sydney, 1982, p. 58.
200 'Prime Minister starts Lucas Heights Reactor', p. 5.

Yet another beginning, yet another button pushed. The switch is flicked, the lever is pulled and the engine of national progress is fuelled with another shot of science. Perhaps we will remember the twentieth century as the 'push button age', not merely for our intoxicating obsession with gadgets, but for our fervent belief that science provided an easy cure for the nation's besetting ills. Once we had the settings right, we just had to push the button, and away we would go.

'We all now generally admit', commented John Quick in 1901, 'that every industry which hopes to succeed must be equipped with the results of the latest scientific investigations and discoveries'.[201] His assessment was rarely questioned across the next hundred years, even as arguments raged over the best means of facilitating delivery. Science's contribution to the cause of national progress seems so obvious, so fundamental, and yet our efforts to channel the flow have so often ended in disappointment.

The AAEC was expected to provide the knowledge and experience necessary for the development of atomic power in Australia. But even as Menzies' fleshy digit was heading for the button, the economic benefits were beginning to look hazy. Australia's fossil fuel reserves were larger than previously imagined, and atomic energy seemed prohibitively expensive in comparison. In any case, the US 'Atoms for peace' program had freed up access to reactor technology. Why bother going through the costly business of designing and building your own reactors when you could buy them off the shelf from Westinghouse? The AAEC limped on, seeking its mission elsewhere.[202]

ANZAAS, too, found itself left behind. After years of faithful service it was deserted by the scientific community in favour of more specialised gatherings.[203] The Australian Academy of Science was duly established and continues to pronounce from a lofty height on behalf of an ageing elite. But it has failed to capture the attention of policy

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201 *CPD*, vol. 2, 28 June 1901, p. 1830.
202 Alice Cawte, *Atomic Australia: 1944-1990*, New South Wales University Press, Sydney, 1992, ch. 6; Ann Mozley Moyal, 'The Australian Atomic Energy Commission: a case study in Australian science and government', *Search*, vol. 6, no. 9, September 1975, pp. 365-384.
203 RW Home, 'Australian science and its public', *Australian Cultural History*, no. 7, 1988, pp. 86-103.

makers, who instead have looked for enlightenment to their own byzantine network of advisers and committees.[204] At the ANU, Oliphant's 'atom smasher' failed to power up.[205] The Institute of Anatomy is remembered by generations of schoolchildren as the home of Phar Lap's heart. Mount Stromlo has proved a worthy home to the nation's astronomical ambitions. But even as this chapter was being written, bushfires roared across the mountaintop, devastating what the Prime Minister described as a 'national icon'. Amongst the buildings lost was the first, 'temporary' observatory, built to test the site in 1911.[206]

But this is not intended as a catalogue of failure and loss. We have seen how progress recasts history as a simple journey onwards, each step another victory of new over old. We lose a sense of connection, familiarity, we miss the subtleties of change, the ironies of existence, and instead we gain a misplaced confidence in our ability to know better, to do better, to be better. And so, like Ernest Scott at the ANZAAS jubilee, we can chart stages in the development of Australian science, observing in recent times the rise of a 'more enlightened spirit'.[207] We can, like Mark Oliphant at the 'Science in Australia' seminar, reflect on the hardships of scientific pioneers, struggling in a land that had yet to nurture a 'research outlook'.[208] Or we might, like Geoffrey Serle, find in the growth of scientific institutions evidence of the nation's cultural 'coming-of-age'.[209] Such stories bear us onward to a moment of fulfillment or challenge, a moment in which to celebrate our achievements, or to ponder our responsibilities.

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204 Ron Johnston, and Jean Buckley, 'The shaping of contemporary scientific institutions', in RW Home (ed.), *Australian science in the making*, Cambrige University Press, Cambridge, 1988, pp. 374-398; Ann Mozley Moyal, 'The Australian Academy of Science: the anatomy of a scientific elite. Part I (History and sociology)', *Search*, vol. 11, no. 7, 1980, pp. 231-8; and Part II (Relations with government), *Search*, vol. 11, no. 8, 1980, pp. 281-8.

205 Cockburn and Ellyard, *Oliphant*, ch. 17; Foster and Varghese, *The making of the Australian National University*, pp. 254-9.

206 'Transcript of the Prime Minister, the Hon John Howard MP, Doorstop interview, Mount Stromlo, Canberra', 21 January 2003, on PM's website at <http://www.pm.gov.au/news/interviews/2003/interview2079.htm>.

207 Scott, 'The history of Australian science', pp. 14-16.

208 Olpihant (ed.), *Science in Australia*, p. viii

209 Geoffrey Serle, *From deserts the prophets come: the creative spirit in Australia 1788-1972*, Heinemann, Melbourne, 1973., pp. 149-50.

We can imagine a tale of the nation's scientific effort in which Groom's travails are a prelude to the successful operations of CSIR/O. Perhaps in myxomatosis we can find the zenith of his ambitions. But should we note that CSIR's transformation into CSIRO came after a torrent of criticism and abuse, questioning the organisation's willingness to keep safe the nation's secrets?[210] Should we also add that the attacks were led by Artie Fadden, leader of the Country Party, and heir to Groom's long-held seat in the Darling Downs? Littleton Groom had 'set an objective for Australians', remarked Fadden upon his entry into parliament, 'that they should accept their civic responsibilities and always aim at rendering service to their fellow countrymen'.[211] Was Groom's example embedded both in the CSIR and in the minds of those bent upon its humiliation? The path of progress becomes less clear.

It is in the asides of history, the parallels, the connections, and the coincidences, that we can find the space to ponder alternatives. Instead of taking for granted the push-button power of science, we can explore the different ways in which the connection between science and nation is imagined and built. In Hughes' bravado, in Groom's life mission, in the struggle for Stromlo, in the rhetoric of AAAS, in the dream of a national university, and in Oliphant's elitism, we find intermingled ideals of improvement, enlightenment, expertise and inspiration. Values change and priorities shift, the connection between science and nation is always contested, always changing. There is no button.

Neither is science merely waiting to be turned on the problems of state. It has to be made. Not in laboratories, but communities. Not in test tubes, but in brains. The vignettes herein show how the meaning of science and its contribution to progress is to be found in the relationship between the individual and society. Groom imagined that national progress would come by arming the citizenry with knowledge, while Oliphant looked to intellectual leaders to forge Australia's future. Edgeworth David sought advancement in the individual's quest for truth, while the AASW believed in setting

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210 See Chapter 7.

211 *CPD*, 17 June 1937, vol. 153, p. 35.

plans based on the people's hopes and needs. For Billy Hughes the business of 'Australia Unlimited' was in easing the burden on farmer or worker, while Menzies paraded unlimited opportunities for business investment and expansion. Science could provide an expression of unity, a sense of national aspiration or achievement to unite the people in a vigorous, constructive, federal democracy. Or it could threaten revolution, both for good and for ill, demanding special handling by an elite corps of planners, priests and prophets.

It will not be long before the bugles sound and Anzac brains once more are set upon their march into the future. Once again, we will rediscover the critical role of science in the nation's health and wealth, in its destiny. New plans will emerge, new funding models, new targets, new partnerships— yet another 'great beginning'. But just as we have learnt to question the relevance of the Anzac ideal to issues of identity and belonging, so we might ponder the meanings implicit in the latest parade of Anzac brains. To Groom it was probably obvious, but now it seems obscured by layers of expertise and indifference— in the connections we build between science and nation is reflected an image of the people we want to be.

'That voice that bridged the years is silent in death', Billy Hughes sadly observed, 'that figure, so familiar, quiet, unassuming, full of human kindness... has joined the shades'. In November 1936, Hughes farewelled Littleton Groom, 'My friend, the friend of all of us, has gone, and we shall see him no more!'. Hughes mourned 'an upright and honourable man', who put principle before party and 'stood boldly for the rights and privileges of the great masses of the people'.[212] The last link to the nation-building dreams of Barton and Deakin had been broken, Hughes was left alone to remember how it had all begun. However, the final word in parliament's tribute came not from Hughes, but from a relative newcomer. 'He struck one who came recently into this Parliament as an old-fashioned man', remarked Robert Menzies, 'even his speech had about it something of the old-fashioned flavour of an earlier parliamentary time'. And

212 *CPD*, 10 November 1936, vol. 152, pp. 1624-6.

yet, Menzies added, this 'old-fashioned Christian gentleman' maintained 'a most modern interest in every problem'.[213]

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213 *CPD*, 10 November 1936, vol. 152, pp. 1629.

# 5 Practical knowledge

The 'sharp, cruel teeth' of Rex the Alsatian were ready to tear into any who dared intrude upon the mysteries of Stanton Farm. Located somewhere in the Dandenongs, east of Melbourne, the farm seemed run-down, disused almost— except for the barn. There, two young men were working in secret upon 'a sleek, crimson-coloured aircraft' of unusual design. The wings seemed too small, and the engines were missing, and yet this streamlined craft conveyed an 'overwhelming sense of power and speed'. More rocket than airplane, this was 'the most amazing aircraft of our time'— the *Firefly*.[1]

The designer and builder of this remarkable craft was Simon Black, hero of a series of children's books written by Ivan Southall in the 1950s. Simon Black was an inventive genius, who combined his work as a motor mechanic with daring deeds in defence of country and empire. Together with Rex and his trusty navigator, Alan Grant, Simon piloted the *Firefly* above and beyond the frontiers of Australian imagining: into space, into Antarctica, even into China.

The Simon Black books were squarely fixed within the genre of boys' adventure fiction, jostling with the likes of Biggles and Mettle in a manly contest of derring-do.[2] But there were other influences as well. Like his fictional hero, Southall served in the RAAF during the war, an experience reflected in Simon's aerobatic exploits. Simon was, Southall later admitted, a 'super me'.[3] The design of the *Firefly* obviously drew upon wartime developments in rocketry, although the image of the lone inventor manufacturing revolutionary marvels in his backyard shed was hardly new. As Andrew Ross notes, 'the erector-set-inspired amateur inventor' was a popular figure in the science fiction of the thirties, even as the growing domination of large corporate laboratories consigned the technological whiz-kid to economic obsolescence. The 'inventor's autonomy over the creative use of gadgetry', Ross argues, 'was an attractive alternative to the feeling of loss of mastery over technology to the new corporate

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[1] Ivan Southall, *Meet Simon Black*, Sydney, Angus & Robertson, 1950.
[2] Stella Lees, and June Senyard, 'Cold War, hot books: an analysis of boys' adventure books published during the 1950s', *Journal of Australian Studies*, no. 13, November 1983, pp. 3-17.
[3] Quoted in *ibid*., p. 15.

technostructure'.[4] The adventures of Simon Black might have offered similar comfort as fifties Australia pursued rapid industrialisation, embracing the power of global capitalism.

But there was a familiarity too in the image of the frontier hero, lending his ingenuity and practical nous to the needs of national progress. Adaptability and improvisation were believed to run strongly through the Australian national character, bred of the hardship and isolation of bush life.[5] Simon Black represented the inventive Australian, the make-do bushman. Even as science was transforming the world, leaping beyond the ken of ordinary mortals, an Australian tinkering in his dilapidated bush shed could build a rocket plane to startle the experts. The resilient myth of the inventor-hero challenged the burgeoning authority of science, reasserting the value of experience over theory, practical knowledge over academic research.

On his very first mission, Simon Black rockets to the rescue of science when an eminent geologist, Stanley Castleton, mysteriously disappears in darkest New Guinea. Castleton, it is eventually revealed, ran afoul of evildoers while investigating a 'luminous green fluid' that might be 'one of the most important revelations in the spheres of medical science and nuclear research'. After the requisite number of scrapes and surprises, Simon, Rex and Alan emerge triumphant, piloting the thankful scientist back to civilisation. As the *Firefly* nears home, Castleton sadly muses that while 'lives of adventure still stretched ahead' for Simon and Alan, he was too old and tired to continue. The scientist's time was done, it was for men like Simon, men of action, to tackle new challenges, new dangers: 'Young men fought with fists and guns and endless enthusiasm; Stanley Castleton fought with his mind'.[6] Even in the Atomic Age, it seemed the hopes of Australia rested with the sturdy virtues of the practical man.

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[4] Andrew Ross, *Strange weather: culture, science and technology in the age of limits*, London, Verso, 1991, pp. 125-7.
[5] Russel Ward, *The Australian legend*, paperback ed., Melbourne, Oxford University Press, 1974, pp. 87-8.
[6] Southall, *Meet Simon Black*, p. 205.

## A plaything for unpractical academicians

Littleton Groom's introduction of the Institute of Science and Industry Bill displayed a 'supercilious authority' the *Age* adjudged in August 1919. The acting Attorney-General, it continued, 'seemed to regard questions about the probable cost of the gigantic official scheme as an intrusion upon ministerial privilege'.[7] For Groom, the Institute represented the fulfillment of a long-held dream, but to the *Age* it was merely another of Billy Hughes' expensive follies. Conceived in haste, without adequate consultation or a proper consideration of cost, the scheme was stamped with Hughes' arrogance and conceit. It was a triumph for the 'official mind' rather than for science, an unnecessary bureaucratic edifice, designed not to encourage discovery and invention, but to reward government cronies with 'fat billets'.[8] What was needed, the *Age* concluded, was 'a fresh beginning, characterised by direct simplicity and common sense'.[9]

Hughes was not the only target of the newspaper's vitriol. Implicated too in this 'midsummer fantasy' were 'University professors' and 'theorists' who had seized upon Hughes' enthusiasm to advance their own ambitions. Consumed by visions of 'palatial laboratories and high salaries', they had devised a scheme that offered little but 'the germs of innumerable lectures and recondite discussions', with 'great opportunities for the instruction of the proverbial grandmother in the art of sucking the historic egg'.[10] 'Practical men', the *Age* reported, were doubtful that the Institute would 'be anything but a waste of money and a plaything for unpractical academicians'[11] How could the public have confidence in such an undertaking when the 'best salaries' were apparently reserved for 'remarkably brilliant University men, who can hardly have seen the inside of a factory'?[12] Leading debate on the bill in the upper house, Senator Russell urged his colleagues 'not to regard it as a fanciful experiment to give a few professors a job'. But

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[7] *Age*, 8 August 1919, p. 6.
[8] *Age*, 17 January 1916, p. 8.
[9] *Age*, 8 August 1919, p. 6.
[10] *Age*, 30 March 1920, p. 6
[11] *Age*, 19 January 1916, p. 11.
[12] *Age*, 27 September 1918, p. 6.

his plea was lost upon the *Age*, duly reporting his comments under the sub-heading 'JOBS FOR PROFESSORS'.[13]

The Institute was too expensive, it infringed upon the activities of the states, and it was to be run by self-interested scientists incapable of understanding the practical needs of industry. From 1916 to 1920, the *Age* continued its attack, losing no opportunity to ridicule the activities of the nascent organisation. Reviewing the Advisory Council's work in 1918, the newspaper noted that 'every little committee has its account of harmless pottering in laboratories', but the nation was yet to made 'a penny's worth of profit out of the whole business'. After two years of investigation, the Council's 'main discovery' was that 'it had not had enough money to spend upon itself'.[14]

The *Age*'s editorial assault was bolstered by a series of satirical articles purporting to describe a tour of the grand 'marble palace' that housed the National Laboratory. In the articles, a reporter is guided in the mysterious ways of science by 'the Professor', who spends much time 'looking anxiously over the rims of his round spectacles', talking slowly to the befuddled layman. In a laboratory dedicated to blowfly research, the Professor proudly explains how they have approached the problem 'with perfectly empty— I should say with perfectly open— minds'. As none of the scientists are 'hampered by any previous knowledge of blow-flies', they have charted a rather novel course, aiming not to kill the pest, but to turn its energy 'to commercial account'. 'You know that science has harnessed lightning', the Professor boldly exclaims, 'Well, sir, science is now going to harness the blow-fly'. Of course, the investigations were likely to be expensive and prolonged, and might entail some improvements in the basic design of the blowfly itself, but the project offered a fine example of the laboratory's 'severely practical' approach to issues of national progress. An insect-powered future for Australia![15]

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13 *CPD*, 27 September 1918, vol. 86, p. 6460; *Age*, 28 September 1918, p. 13.
14 *Age*, 30 September 1918, p. 6.
15 'Little chats with scientists – No. I, the blowfly', *Age*, 15 October 1918, p. 6; see also, 'Little chats with scientists – No. II, machine made', 18 October 1918, p. 8.

Other newspapers declared their support for the Institute, though they too stressed the importance of a practical orientation.[16] When the Institute's bill was finally presented, it suffered rough handling in both houses of parliament before being withdrawn in 1919. It was reintroduced in a modified form almost a year later, and, after further struggle, was finally passed.[17] Critics from both sides of politics followed the *Age*'s lead. 'It is being said outside that the Institute is to consist merely of University professors and other theorists', claimed Frank Tudor, leader of the Labor opposition. Tudor objected to the creation of a 'huge spending machine' that had thus far shown 'no evidence of practical work'. 'If this Institute has unlimited money to spend', he warned, 'there will be research in every direction'.[18] Tudor had been a member of Hughes' cabinet when the Advisory Council was formed in 1916, however, the split over conscription had left them on opposite sides of the house.[19] The tension of recent political realignments undoubtedly complicated the bill's passage, as did Hughes' divisive style, but there was more than party politics fuelling the distrust.

The question of what constitutes an appropriate mix of theory and practice, of 'pure' and 'applied' research, is one that continues to provoke controversy. Most would agree that some sort of balance is required between the immediate needs of industry and nation, and the long term cultural benefits instilled by the pursuit of knowledge. And yet, the terms 'academic' and 'theorist' have hardly shed their pejorative nuance. Seemingly obscure research topics still provide a source of amusement for commentators on the trail of waste or inefficiency. As governments look to the private sector to top up dwindling research budgets, pure research seems increasingly marginalised. Funding flows towards targets and priorities rather than curiosity or imagination. More than a century later, many researchers would rally behind HC Russell's defiant proclamation at the very first AAAS congress in 1888. 'This

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[16] For example: *Argus*, 22 January 1916; *SMH*, 8 January 1916, p. 16.
[17] Sir George Currie, and John Graham, *The origins of CSIRO: Science and the Commonwealth Government 1901-1926*, CSIRO, Melbourne, 1966, pp. 85-104.
[18] *CPD*, 13 August 1919, vol. 89, pp. 11536-42.
[19] Janet McCalman, 'Tudor, Francis Gwynne (1866-1922)', in John Ritchie (ed.), *Australian Dictionary of Biography*, Melbourne University Press, Melbourne, 1990, pp. 281-2.

Association', he announced, 'stands as a protest against the shortsighted and utilitarian policy of those who would cultivate only what they characteristically call the bread and butter sciences'.[20]

But the enemies of science are not always easy to identify. In 1906, Littleton Groom introduced legislation to exercise the Commonwealth's constitutional powers in the field of meteorology. The Constitution had linked meteorology with astronomy, however, Groom's bill proposed government action only in regard to the former. Meteorology dealt 'with practical questions affecting everyday life', he explained, it was of immediate value to the developing nation.[21] Once again, it seemed, 'bread and butter science' was to be blessed with the favour of policy makers. But in fact, Groom was following a course of action recommended by the Board of Visitors to the Victorian state observatory. There were obvious gains to be made by coordinating meteorological work, that did not seem to apply to astronomy.[22] While debate on the bill rehearsed familiar distinctions between the 'abstract speculations' of astronomers and the practical skill of meteorologists, such stereotypes masked complex questions of policy and priority.[23]

In their account of CSIR's origins, Currie and Graham ponder the 'true meaning' of 'the contempt for the scientist and respect for the practical man' expressed so vigorously across party lines.[24] It was a contempt that fed upon the imagined virtues of a frontier people, a people used to doing, not thinking. It was a contempt that expressed a suspicion of intellectual achievement, a distrust of overgrown poppies. Historians and cultural commentators remind us frequently of Australia's anti-intellectual bias. The history of science itself is often portrayed as a long struggle against utilitarian prejudice.

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[20] Quoted in Roy MacLeod, 'From imperial to national science', in Roy MacLeod (ed.), *The commonwealth of science: ANZAAS and the scientific enterprise in Australasia, 1888-1988*, Oxford University Press, Melbourne, 1988, p. 41.

[21] *CPD*, vol. 32, 1 August 1906, p. 2139.

[22] For more on efforts to coordinate meteorology in Australia see R W Home, and K T Livingston, 'Science and technology in the story of Australian federation: The case of meteorology, 1876-1908', *Historical Records of Australian Science*, vol. 10, no. 2, 1994, pp. 109-127.

[23] *CPD*, vol. 32, 1 August 1906, p. 2150.

[24] Currie and Graham, *The origins of CSIRO*, p. 86.

However, as we gather our forces to rejoin the fray, we might reflect that in our self-righteous determination lurks an image of progress that is equally monolithic. It is knowledge itself that promises to counter society's 'shortsighted and utilitarian' impulses: a broader understanding, a deeper appreciation, an expansion of the nation's intellectual horizons. Progress is to be found in the march of enlightenment, in the conquest of ignorance itself.

## To inspire and stimulate a science sense

EJ Brady claimed Hugh Cleland McKay as one of his 'intellectual "finds"'. McKay was 'a modest genius' who made a 'brilliant' contribution to Brady's short-lived journal, the *Native Companion*.[25] He was an iconoclast and inventor, a critic of contemporary poetry, and a passionate devotee of science. McKay was also one of Australia's first specialist science journalists.

Unlike many of his bohemian contemporaries, McKay found inspiration more in science than art. Science fuelled his rebellion against the shallow certainties of bourgeois existence. It gave him the confidence to reject religion, and roused him against the mystic anthropocentrism that dominated Australian verse.[26] He called on poets to look 'not upon the Universe through the eyes of Man, but upon Man through the eyes of the Universe'.[27] 'Science', he wrote in the *Lone Hand*, 'has created a new heaven and a new earth which still await a singer'.[28] The challenge was not easily met. McKay struggled to publish his serious verse, though his humorous ditties and speculative fiction found a regular audience. At times he supplemented the meagre earnings of a literary life by working as a pharmacist, but he always returned to writing. In the 1920s he became the science writer for *Smith's Weekly*, and began delivering a stream of witty, informative and

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[25] Edwin James Brady, 'Life's highway - extracts (continued)', *Southerly*, vol. 16, no. 2, 1955, p. 108.
[26] Peter Kirkpatrick, '"His name is not in *Who's Who in Australia*": the life and some of the opinions of "a modest genius", Hugh McKay', *Southerly*, no. 2, June 1990, pp. 222-239; David Walker, *Dream and disillusion: a search for Australian cultural identity*, ANU Press, Canberra, 1976, pp. 22-3.
[27] Hugh Cleland McKay, 'The forgotten universe', *Native Companion*, vol. 2, no. 3, 1 October 1907, p. 164.
[28] Quoted in Kirkpatrick, '"His name is not in *Who's Who in Australia*"', p. 234.

often insightful articles. Thirty years later, nearing the age of eighty, he was still reporting on the latest scientific discoveries for readers of the *Daily Telegraph*.

Recent decades have seen the rise of 'science communication' as both a profession and an academic discipline. The pace and complexity of modern science, its dramatic effects on the fabric of daily life, and its implications for future social and economic development have all brought added emphasis upon the 'public awareness of science'. Research institutions now trumpet 'breakthroughs' by the score in an unyielding barrage of publicity bites; consultants advise on 'sexy' science, reeducating practitioners in the ways of the media savvy; festivals and exhibitions celebrate the nation's scientific maturity in a boisterous cavalcade of self-promotion and triviality. Science, it seems, is more concerned than ever before to make itself know to the ordinary punter.

In all the commotion it is easy to lose sight of the modest efforts of Hugh McKay. It is easy to forget that for a hundred years AAAS/ANZAAS struggled to bring science to the attention of a fickle public, or that organisations like the WEA and the AASW developed educational programs to package science for the people. Those who believe science communication began with Robyn Williams overlook the immense popularity of Crosbie Morrison, whose musings on science and natural history reached a huge audience in print and on radio.[29] And what of the horde of public-spirited scientists, people like Edgeworth David, WA Osborne, and Kerr Grant who contributed regularly to public debate. 'We want to make science popular', JH Maiden, an AAAS stalwart, told the *Argus* in 1921, 'and in a way to teach them what they owe to it'.[30] And yet governments now fund initiatives to 'promote an understanding of what science and technology can do for us' with nary a backward glance.

Scientists have long been troubled by the public's obsession with meaningless diversions. At the 1904 AAAS congress, Edgeworth David called for a frontal assault against the shallow enthusiasms of popular opinion. 'It should', he declared, 'be one of

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[29] For more on Morrison, see Graham Pizzey, *Crosbie Morrison: voice of nature*, Victoria Press, Melbourne, 1992.

[30] *Argus*, 12 January 1921, p. 8.

the aims of this Association to discover and destroy the microbe of sporting mania'. Sport itself promoted health and exercise, but Australia's 'worship' of 'the wood and the leather' was evidence of a culture out of balance, David maintained, a nation whose values had gone awry.[31] The scientist laboured without support or recognition in the service of humanity, noted the Lord Mayor of Sydney in his toast to 'science' at the 1932 congress, 'yet a man could come along, sing a funny song and make a funny face, and earn immeasurably greater pecuniary rewards and greater fame'.[32] Such complaints ring familiar, repeated many times across the years. Even Prime Minister John Howard, a self-confessed 'cricket tragic', called upon Australians in 2001 to 'exhibit the same passion for scientific performance, scientific achievement, and scientific excellence that we exhibit in relation to our sporting achievements'.[33]

The nation was afflicted with a dangerous imbalance that could only be remedied, David argued, by the 'creation of a healthier state of public opinion'.[34] The people of Australia did not understand that science was the engine of industry, the safeguard of health; they had not been exposed to the power and wonder of scientific inquiry. To be restored to well-being, the public mind had to be dosed with a liberal application of the 'scientific spirit'. The *Australasian Manufacturer* offered a similar diagnosis, pressing for the cultivation of 'a general scientific atmosphere' that would surely nudge public opinion 'in favour of the generous endowment of scientific research'.[35] While at the 1928 AAAS congress, RH Cambage reasserted the association's desire 'to inspire and stimulate a science sense in the public mind'.[36] The Australian people, R Greig-Smith proclaimed

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31 TW Edgeworth David, 'The aims and ideals of Australasian science', *Report of the 10th meeting of the Australasian Association for the Advancement of Science*, Dunedin, 1904, p. 40.
32 *Argus*, 18 August 1932, p. 8
33 'Transcript of the Prime Minister, the Hon John Howard MP, Prime Minister's Award for Science', 25 September 2001, <http://www.pm.gov.au/news/speeches/2001/speech1268.htm>.
34 David, 'The aims and ideals of Australasian science', p. 42.
35 'Science for the people – a suggestion', *Australasian Manufacturer*, 26 January 1918, p. 7.
36 RH Cambage, 'Presidential address', *Report of the 19th meeting of the Australasian Association for the Advancement of Science*, Hobart, 1928, p. 7.

before the Royal Society of NSW, had to be 'trained to acknowledge that we are working not only for the scientific but also for the common good'.[37] But how?

'The love and appreciation of science cannot be produced in a day', noted *the Australasian Manufacturer*, 'it must be evolved, and the evolution must commence at the school'.[38] A comprehensive system of science education was essential in bringing about 'the scientific enlightenment of the nation'. Greig-Smith looked with admiration upon the churches' ability to indoctrinate the young, suggesting that 'principles of science' should be absorbed by the nation's youth 'after the manner of a faith'.[39] But education was a slow business, and action was needed immediately to counter Australia's dangerous neglect. The *Australasian Manufacturer* suggested that a series of 'popular scientific lectures' in all the towns and suburbs of Australia would encourage people to develop 'as keen an appreciation of the importance of scientific culture as they now have of the importance of reading and writing'.[40]

Whatever the solution, it was clear that scientists themselves must take a leading role. 'We scientists must endeavour to alter our ways, Greig-Smith urged, 'It will not do to follow the methods of the past and be contented with the publication of our work in the scientific journals of our societies'.[41] Mark Oliphant reached a similar conclusion after the 'Science and Australia' symposium in 1951, commenting that while it was not easy 'to express the results of scientific research in simple language', it was 'essential to dispel the feeling... that scientists belong to some masonic clique'.[42] Scientists had to 'get into the limelight', to demonstrate the value of their labours, to raise science in the esteem and affection of all Australians.[43]

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37 R Greig-Smith, 'Presidential address', *Journal and Proceedings of the Royal Society of NSW*, vol. 50, 1916, p. 10.
38 'Science for the people - a suggestion', *Australasian Manufacturer*, vol. 2, no. 95, 26 January 1918, p. 7.
39 Greig-Smith, 'Presidential address', p. 15.
40 'Science for the people – a suggestion'.
41 Greig-Smith, 'Presidential address', p. 10.
42 MLE Oliphant (ed.), *Science in Australia*, FW Cheshire, Melbourne, 1952, p. xxvi.
43 Greig-Smith, 'Presidential address', p. 10.

Scientists also had to learn to use the power of the press to their advantage. As early as 1916, Greig-Smith was outlining the characteristics of the 'scientific journalist' to serve as intermediary between science and the people. The learned proceedings of scientific bodies should be 'done up for public consumption', he argued, but this was difficult for a man of science, who was 'too scientific and exact' for the task. The 'scientific journalist' offered a 'happy medium', combining the accuracy of the scientist with the popular touch of the conventional journalist. 'I should like to see a short scientific article, so attractively written', Greig-Smith mused, 'that when placed in the daily papers beside the report of a football match or of a prize fight, the public would read it first'.[44]

A few years later, the changing relationship between science and the press was examined in *Science and Industry*, the newly established journal of the Institute of Science and Industry. Until recently, it noted, there was some doubt as to whether 'any merely popular intermediary between the scientific investigator and the public was even desireable'. But as science moved from the laboratory to the factory, it became clear that the press had an important role to play in 'imbuing the people with that scientific spirit without which no nation can achieve eminence or success'. The application of science to the purposes of national progress could only succeed if the 'aloofness' that separated the scientist from the public was broken down. The scientist, 'even at the cost of some repugnant self exploitation', had to 'make himself understood and respected by the Democracy'. While the public had to look beyond familiar stereotypes that portrayed the scientist as an 'an impractical dreamer, lacking in those qualities which go to make the successful businessman'. The scientist and the public could learn to understand each other through the pages of daily press. 'If science... is to stand firm and strong', the article concluded, 'it is necessary that the publicity side should be developed equally with the other phases'.[45]

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[44] *ibid.*, pp. 14-17.
[45] GL (Gerald Lightfoot), 'Science, the press, and the public', *Science and Industry*, vol. 1, no. 7, November 1919, pp. 385-8.

Buffeted by criticism in parliament and the press, the Institute endeavoured to put its principles to work. Hoping 'to permeate the community with a higher appreciation of the value of scientific direction in industry', the Executive Committee initiated a scheme to supply leading newspapers with 'semi-popular' articles detailing a range of 'scientific industrial problems'.[46] From prickly pear to power alcohol, the people of Australia would discover the obstacles in the path of progress, and learn of science's brave efforts to surmount them. 'We cannot fail to reach the conclusion', noted one article surveying the challenges of the postwar world, 'that our lack of appreciation of all that science... could have conferred upon us lies at the root of many present difficulties'.[47]

The planned reintroduction of the Institute's bill in 1920 prompted further action. A 'Propaganda Committee' was established to mobilise public and political support. Detailed statements on the work of the Institute were prepared and disseminated through Parliament and the press.[48] Members of the State Advisory committees were dragooned to lobby their local newspapers, though as Professor Rennie in Adelaide forlornly noted, 'it is somewhat difficult to get newspapers to publish anything not connected with sport'.[49] The Propaganda Committee's statements would, it was suggested, 'fully inform' people of the 'true state of affairs'. They would 'enable the community to form some idea' of the enormous need for scientific research, and would cause 'thoughtful men to reflect upon the enormous advantages which a permanent research organisation... could confer upon the community'. Truth would clear the way of 'ignorant and unscrupulous criticism'.[50]

Science had 'taught men to be fearless in the pursuit of truth', declared Edgeworth David at the 1904 AAAS congress; it drew to itself 'men of every shade of thought who

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[46] Letter from Executive Committee, Advisory Council of Science and Industry, to publishers, 2 November 1917, NAA: A8510/1, item 80/2.
[47] 'The promotion of scientific and industrial research – post-war developments in Australia and other countries', December 1917, NAA: A8510/1, item 80/2.
[48] For examples and correspondence see NAA: A8510/1, item 3/5/4.
[49] Letter from EH Rennie to (?) EN Robertson, no date (June 1920), NAA: A8510/1, item 3/5/4
[50] Letter from Acting- Secretary, Executive Committee, Advisory Council of Science and Industry, to Professor EH Rennie, 9 June 1920, NAA: A8510/1, item 3/5/4.

love the truth'.[51] As scientists pondered the most effective means of communicating with the unenlightened masses, they were comforted at least by the knowledge that truth was on their side. Their task was not to manipulate, or cajole, but to educate and inform. 'Scientific spirit' was not to be found in a mere expression of favouritism; it was not like following a sporting team, or swearing allegiance to a political party. The aim of the scientific journalist, the science teacher, or the learned science professor addressing a public gathering, was not to add to the clamour of modern life, or compete with the noisy distractions of popular entertainment. Their aim was to instill a more rigorous sense of value, to light a path through the trivialities and diversions, to set their audience upon a quest for truth.

A little knowledge, it seemed, could work a miraculous transformation. Cooked up in a suitably tasty form, science could awaken the public's sense of responsibility and meaning. It could enrich their understanding, restore their balance. It could complete them. The neglect of science which so threatened the nation's future was not deliberate or malicious, it reflected a lack of understanding, an intellectual immaturity, an inability to grasp the truth. The suspicions and stereotypes manifest in debate surrounding the Institute of Science and Industry were likewise a product of ignorance, rather than avowal. It was ignorance that hindered the development of science, ignorance that stood in the path of national achievement. But ignorance could be cured. For what was progress if not the steady conquest of ignorance by enlightenment?

The *Australasian Manufacturer* observed opposition to the Institute of Science and Industry with mounting anger and dismay. It criticised the *Age*'s 'wretched drivel' and despaired at the 'childish character' of parliamentary debate. An 'utterly inadequate appreciation of science' within the community had, it argued, 'given us legislators who regard scientific investigation as a subject for inane jocularity'.[52] But for all the bluster and innuendo, it was not science itself that was under attack. As one senator noted,

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51 David, 'The aims and ideals of Australasian science', p. 43.
52 'A shallow critic', *Australasian Manufacturer*, .vol. 3, no. 132, 12 October 1918, p. 9; 'Democracy and science', *Australasian Manufacturer*, vol. 3, no. 133, 19 October 1918, p. 9.

'every one of the opponents of this bill has prefaced his remarks by a declaration that he is not opposed to science'.[53] Arthur Rodgers, the member for Wannon, had spoken strongly in support of the Bureau of Agriculture, but was concerned by the lack of practical advice in framing the new Institute's program. He was saddened also that Groom seemed to regard 'everybody who speaks against the Bill' as 'opposed to the blessings of science'. It was duty, he claimed, that compelled him to speak, not ignorance or objection.[54]

Likewise the *Age* imagined itself in the role of faithful defender, protecting the 'sacred name' of science against those who would debase it for their own grubby ends.[55] 'Neither Parliament nor the public needs to regaled with trite and wearisome homilies on the value of scientific research', the newspaper complained, 'that much may be taken for granted'. However, supporters of the Institute were seeking to portray legitimate critics as 'enemies of science and education, who prefer barbaric darkness to enlightened progress'. That was nothing but a 'political fudge', it claimed, unjustified and unworthy.[56]

So did the *Age* mask its ignorance with feigned indignation? The newspaper's editor, Frederick Schuler was a well-read, thoughtful man, who counted eminent scientists such as Baldwin Spencer and William Sutherland amongst his friends.[57] But how could one who had imbibed of the scientific spirit foster attacks upon the character and credentials of well-respected men of science? The principles of scientific enlightenment, of progress itself, seemed to allow no such complexity— ignorance would yield to knowledge, suspicion would be dispelled by truth.

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[53] *CPD*, vol. 86, 17 October 1918, p. 7009.
[54] *CPD*, vol. 89, 20 August 1919, p. 11747.
[55] *Age*, 15 August 1919, p. 6.
[56] *Age*, 8 August 1919, p. 6.
[57] John Hurst, 'Schuler, Gottlieb Federich Henry (1854-1926)', in Geoffrey Serle (ed.), *Australian dictionary of biography*, Melbourne University Press, Melbourne, 1988, pp. 539-40.

But the 'ignorant' mind is never as empty as it seems, and truth is rarely as pure as we imagine.[58] Debate on the Institute of Science and Industry swept beyond the bounds of political recrimination to ponder the nature of science. It was not philosophy perhaps, nor even science policy, but the questions were profound enough: questions about the control of research, about the role of individual creativity, about the way knowledge itself is created. The arguments on both sides were often crude and opportunistic, drawing on stereotypes and simplifications. But what language was there to argue the implications of science that did not resolve itself into a battle between ignorance and enlightenment, darkness and light?

Whether through disappointment, disillusion, or a life of heavy drinking, Hugh McKay became increasingly withdrawn, hiding behind 'an almost impenetrable armour of sardonic nihilism'.[59] One *Smith's Weekly* colleague remembered that he 'sometimes wearied of everything and everybody and retired into a beery twilight from which his harsh voice might be heard addressing humanity as 'Insects! All insects! Insects all!'[60] Through the eyes of the universe, man was insignificant. What of ambition? What of hope? McKay was a pioneer of science journalism, but he failed as a 'singer' of revelation and discovery. He was a 'modest genius' who 'disparaged himself' even as he introduced an unsuspecting audience to some of the myriad possibilities of science. 'His name is not in *Who's Who in Australia*', Brady remarked, perhaps by way of an epitaph.[61]

The romantic allure of 'scientific spirit' may have given way to instrumental appeals for 'awareness' and 'understanding', but attempts to reach a sceptical, disillusioned or disinterested public continue. The Australian people, it seems, are still reluctant to pay science its rightful dues. And so the quest continues on, an endless campaign to breach

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[58] The constructed nature of 'ignorance' in interactions between science and the 'public' is receiving some attention from sociologists, see, for example, the papers in Alan Irwin, and Brian Wynne (eds), *Misunderstanding science?: the public reconstruction of science and technology*, Cambridge University Press, Cambridge, 1996.

[59] Quoted in Kirkpatrick, '"His name is not in *Who's Who in Australia*"', p. 235.

[60] *ibid.*, p. 238.

[61] Edwin James Brady, 'Life's highway - extracts (continued)', *Southerly*, vol. 16, no. 2, 1955, p. 108.

the walls of public ignorance, to find a crack, a flaw, that will yield to the pressure of truth. Might we find a 'singer' yet, a voice to be heard above the noise of battle?

## Not the time for dreamers

In January 2003, the Federation of Australian Scientific and Technological Societies (FASTS) launched a campaign 'to end the use of the word "boffin" in media headlines'. The word 'bordered on the offensive for many scientists', explained FASTS president Chris Fell, 'it conjures up images of weird old men in flapping lab coats, pouring strange chemicals into test tubes'.[62] Not the kind of image likely to attract young students.

Physicist David Martyn was also concerned about the effect of negative images on the recruitment of young people to science. 'It is only when the current popular conception of the scientist as a soulless and dangerously unpredictable robot is replaced by the human reality', he argued in 1956, 'that adequate numbers of young men and women will come forward to fill our dangerously depleted ranks'.[63] Elsewhere Martyn suggested that television programs and comic strips should feature scientists as heroes, rather than villains, in order to attract children to science. 'The scientist is always mad, or wants to blow people up', he noted of the current crop of children's entertainment.[64] But the 'human reality' was not always attractive. Martyn was an embittered and sometimes obsessional man, whose hatreds coloured his scientific dealings. His latter years were consumed by depression, fed by his fear of an impending environmental catastrophe. No heroes came to the rescue. David Martyn committed suicide in 1970, while serving as president of the Australian Academy of Science.[65]

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62 'Science plea: drop "boffin"', media release issued by FASTS, 20 January 2003, <http://www.fasts.org/site/releases03/ten_top_rel_2003.htm>.
63 *SMH*, 21 January 1956, p. 2.
64 *SMH*, 24 January 1958, p. 4.
65 RW Home, 'David Forbes Martyn (1906-1970)', in John Ritchie (ed.), *Australian Dictionary of Biography*, Melbourne University Press, Melbourne, 2000, pp. 320-2; JH Piddington, and MLE Oliphant, 'David Forbes Martyn 1906-1970', *Records of the Australian Academy of Science*, vol. 2, no. 2, 1971, pp. 47-60.

'Boffins' were first identified during the Second World War, working in the 'backroom' on war-winning weapons such as radar and the bomb.[66] But scientific stereotypes have infested popular culture for much longer.[67] 'The average idea of a scientist is a bespectacled old gentleman with long hair', commented JH Maiden at the 1921 AAAS congress, 'but I think we are pretty normal'.[68] AAAS gatherings, in particular, provided press and public with a chance to test Maiden's hypothesis by observing the habits and markings of the scientific family. Reporting on the 1911 congress, one journalist attempted to build his own taxonomy of scientific types. The 'David type', he noted, was 'thin and keen with peering eyes and bird-like appearance', quite unlike 'the Masson type of calm stolidity', and of course there was the familiar 'Liversidge type... so absorbed in his work, that he cares nothing for and forgets all else'.[69]

Remarkably though, many observers found that scientists did exhibit a number of human traits. They were not 'terrifying', noticed the *Sun* in 1935, nor were they all 'grim men scientifically determined to tear apart the last speck of the atom' — some were even women![70] A correspondent for the *Sydney Mail* quickly surveyed the prevalence of grey hair to disprove the 'popular superstition' that the majority of scientists were old. Nor were they predominantly 'untidy fellows'. Indeed, one professor, 'with tie and handkerchief of the same hue and pattern', was 'the very glass of fashion'.[71] But he was from Sydney, of course.

Every well-meaning denial merely brought the 'spectacled and bald-headed personage of advanced years' once again to the fore of public expectation.[72] In literature, too, he was a familiar foil, often at odds with the character of Australian bush life. Banjo Paterson relayed the cautionary tale of 'the great Professor Brown', well-known for his 'Treatise

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[66] Robert A Jones, 'The Boffin: a stereotype of scientists in post-war British films (1945-1970)', *Public Understanding of Science*, vol. 6, 1997, pp. 31-48.
[67] For a survey of scientific stereotypes see Roslynn D Haynes, *From Faust to Strangelove: representations of the scientist in Western literature*, Johns Hopkins University Press, Baltimore, 1994.
[68] *Argus*, 12 January 1921, p. 8.
[69] *SMH*, 10 January 1911, p.7
[70] *Sun News Pictorial*, 17 January 1935, p. 7; 18 January 1935, p. 4.
[71] Observer, 'Among the economists', *Sydney Mail*, 24 August 1932, p. 9.
[72] *SMH*, 14 January 1911, p. 12.

on the Morals of the Red-eyed Bulldog Ant'. Leading the 'Ladies' Science Circle' on a ramble through the countryside, Professor Brown chances upon an 'old selector' and remarks on his intention 'To investigate your flora / Which I hear is very choice'. Unfortunately 'Flora' happens to be the name of the selector's daughter, and the confrontation ends with the angry stockwhip-wielding father chasing Professor Brown and his party into the bush. As night falls and the dingoes howl, the Ladies Science Circle is lost and, presumably, doomed: 'For the hapless old Professor / Hasn't sense to guide 'em back'.[73] Scientists, explained Jasby in the *Bulletin*, 'publish theories and formulae, quote figures and facts that the ordinary man is unable to refute, and speak a jargon which no one else can understand'.[74]

Common scientific stereotypes were not always negative. The 'boffin', at least initially, commanded respect and admiration; scientists were eccentric but determined individuals, wholly dedicated to the war effort.[75] Perhaps a campaign to 'bring back the boffin' as portrayed in stirring wartime sagas such as 'The Dam Busters' would do more to attract young people than attempts to blot the lab coat from our memory. Even the absent-minded duffer could be regarded with a certain amount of affection. But such images also drew upon deep cultural currents, dredging up fears and anxieties, warnings of the dangers of prideful curiosity and forbidden knowledge, expressed most clearly in a host of instructive fables from Pandora to Faust and Frankenstein.[76]

The tendency of scientists to describe their calling in transcendent, almost mystical, terms, did nothing to distance them from this ancient, disturbing lineage. Delivering the Presidential Address to the 1902 AAAS congress, Captain FW Hutton drew from the font of Baconian tradition, affirming that the devotee of pure science was 'helping to solve the riddle of the Universe'.[77] This sacred quest was conducted, not in a spirit of

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[73] AB (Banjo) Paterson, 'Investigating Flora', *Bulletin*, vol. 20, no. 1034, 9 December 1899.
[74] Jasby, 'Peeps at the professions: 15 - The scientist', *Bulletin*, vol. 55, no. 2860, 5 December 1934, p. 25.
[75] Jones, 'The Boffin', pp. 34-40.
[76] Haynes, *From Faust to Strangelove*. See also Spencer Weart, *Nuclear fear: a history of images*, Harvard University Press, Cambridge, Massachusetts, 1988.
[77] Captain FW Hutton, 'Presidential address', *Report of the 9th meeting of the Australasian Association for the Advancement of Science*, Hobart, 1902, pp. 1-3.

pride or arrogance, CO Burge told the Royal Society of NSW, but in 'reverent wonderment'. The true scientist must cultivate 'the spirit of a little child', he added, 'if he is to coax from the great powers of nature their inmost secrets'.[78] Edgeworth David agreed, arguing that 'science expects every man in this world to learn in the simple way that a child learns the great lessons of the universe'.[79] Curiosity was thus invested with a sense of innocence and purity; it was, Orme Masson declared, the 'elementary quickening of the universal spirit that seeks to soar into the unknown'.[80]

Nor was the scientist apparently much interested in earthly rewards or recognition. He 'cares little for the opinion of the world', observed Greig-Smith, 'and lives entirely in his work'.[81] 'Scientists who love their science place it above money', FM Gellatly confirmed in *Science and Industry*, 'the reward of the investigator was not necessarily expressed in the augmentation of his banking account'.[82] Edgeworth David emphasised that the scientist was driven by 'the glamour of the unknown', and did not desire payment 'beyond the irreducible minimum for satisfying simple needs'.[83] Such homilies offered instruction in the scientist's life of service and duty, but they also emphasised the gulf that separated the man of science from the concerns of the everyday world.

An apparent lack of interest in money was hardly a useful selling point as scientists sought to demonstrate their value in fostering industrial innovation and efficiency. Nor would a public, repeatedly warned of the importance of science in modern warfare, be reassured by the thought that such knowledge was in the hands of zealots aspiring to a life of childlike simplicity. Surely devotion could lead to obsession. Might not the unswerving quest for enlightenment blind the scientist to the needs of the nation? As debate on the Institute of Science and Industry commenced, the question was not so

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78 CO Burge, 'Presidential address', *Journal and Proceedings of the Royal Society of NSW*, vol. 39, 1905, p. 19.
79 David, 'The aims and ideals of Australasian science', p. 43.
80 David Orme Masson, 'Inaugural address', *Report of the 13th meeting of the Australasian Association for the Advancement of Science*, Sydney, 1911, p. 6.
81 Greig-Smith, 'Presidential address', p. 10.
82 Francis Mephan Gellatly, 'Foreword', *Science and Industry*, vol. 1, no. 1, May 1919, p. 2.
83 TW Edgeworth David, 'Presidential address', *Report of the 14th meeting of the Australasian Association for the Advancement of Science*, Melbourne, 1913, p. xci.

much whether science could contribute to the task of national progress, but rather who was best qualified to direct its application. Could scientists be trusted with the task?

Billy Hughes himself had doubts. In July 1917, he met with the Advisory Council for the first time since its establishment. He apologised for his lack of attentiveness, but then added 'although some of you live in those quiet back-waters of science where everything goes very well, I have been otherwise engaged'. In his meeting with the Council and in earlier discussions with the Executive Committee, Hughes argued forcefully that it would be impossible to find scientists with the necessary business and organising abilities to direct the Institute. He began quizzing Council members on what was meant by their recommendation that two of the three directors should be appointed 'on account of scientific attainments and wide experience'. Most scientists, he suggested, had no knowledge of 'affairs'. Where could you find such a 'happy blend'? Which was more important— 'the scientist or the man of affairs?' 'We have got to make this succeed', Hughes asserted, ' and we shall not make it succeed by putting science on a pedestal— to be held inviolate, beyond criticism, as she is now'.[84]

Hughes's concerns were echoed by many in parliament. Even supporters of the Institute, such as Senator Pratten, urged the government to make 'practical' appointments, arguing that it was ' not the time for dreamers'. 'We hope that in this Institute they will not be looking for the philosopher's stone or the elixir of life', he added, 'but will come down to the consideration of the practical wants of the nation'.[85] WO Archibald declared that the Institute had no need of men 'with a tremendous lot of letters at the end of their names— men who are so wonderful that it is difficult to get near them and learn whether or not they really know anything'.[86] While Arthur Rodgers argued that the 'best financial results' could not be expected from such an undertaking

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84 'Meeting of Commonwealth Advisory Council of Science and Industry, 9 July 1917', NAA: AA1964/52/1, item 6. See also Currie and Graham, *The origins of CSIRO*, pp. 66-72.
85 *CPD*, vol. 86, 2 October 1918, p. 6527.
86 *CPD*, vol. 89, 13 August 1919, p. 11562.

'when the full control rests with a body of men with professorial minds'.[87] Science was too important to be left in the hands of scientists.

The attacks in parliament were rarely personal, aimed broadly at 'faddists', 'theorists', 'academicians' and 'university professors'. However, one scientist, John Anderson Gilruth, attracted particular criticism when rumours began to fly of his impending appointment to the Institute. Gilruth was a veterinary pathologist who accompanied Baldwin Spencer on a scientific survey of the Northern Territory in 1911.[88] He returned proclaiming the north's 'enormous and almost unlimited' possibilities, inspiring a hopeful government to enlist him as Administrator.[89] Gilruth's veterinary training and knowledge of agriculture, the *Argus* suggested, 'specially fitted' him to succeed in this 'stupendous and arduous task'.[90] The development of the north would proceed at last under skilled, scientific direction.

Unfortunately, Gilruth's training did little to prepare him for the political complexities of the position. His authoritarian style and antipathy towards union preference fomented ill will amongst the residents of Darwin. In December 1918, tensions reached their peak in the 'Darwin Rebellion', when an angry mob took to the streets demanding Gilruth's resignation. He was recalled by the government a few months later.[91] Suggestions that Gilruth might be afforded a position with the Institute as something of a consolation for the loss of his well-paid NT berth, outraged Labor members. It was evidence not only that the aims of science were being perverted by patronage, but also that the government was to place the Institute in the hands of scientific men lacking in experience and judgement. 'Dr Gilruth', WG Higgs remarked in the Institute debate, 'is

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87 *CPD*, vol. 89, 26 September 1919, p. 12767.

88 See chapter 4 for the background to this survey. For biographical details, see: Ian Clunies Ross, *John Anderson Gilruth: The influence of his life and work on the development of the livestock industries of the Commonwealth, The John Murtagh Macrossan Memorial Lectures for 1954*, University of Queensland Press, Brisbane, 1956; Alan Powell, 'Gilruth, John Anderson (1871-1937)', in Bede Nairn and Geoffrey Serle (eds), *Australian dictionary of biography*, Melbourne University Press, Melbourne, 1983, pp. 17-19.

89 *Report of the Preliminary Scientific Expedition to the Northern Territory*, Department of External Affairs, Commonwealth of Australia, Melbourne, 1912, p. 31. For details and arrangements surrounding Gilruth's appointment see NAA: A1/15, 30/6111.

90 *Argus*, 16 February 1912.

91 Powell, 'Gilruth, John Anderson (1871-1937)'; HI Jensen, 'The Darwin Rebellion', *Labour History*, no. 11, November 1966, pp. 3-13.

better able to handle horses than he is to handle men'.[92] Gilruth's scientific abilities were not in question, but the 'lamentable failure' of his Darwin administration proved that book learning and laboratory skill were no substitute for practical wisdom.[93] Gilruth had left the safety of science to trespass upon the realm of politics.

Confined within their natural habitat, scientists could be afforded respect, their eccentricities observed with polite amusement and perhaps affection. But once they ventured beyond the walls of academe, and sought to pronounce upon the ways of the world, they were exposed to public scrutiny and criticism. The *Age* congratulated a number of speakers at the 1935 ANZAAS congress for addressing matters of public interest. It was, however, disappointed that in tackling the supposed deficiencies of the nation's political and economic systems the scientists had not shown themselves to be 'more original, more constructive'. Was the 'scientific attitude upon politics' to be expressed merely in 'caustic sneers' or 'derisively cynical' asides? Scientists had suggested that if they were in control of the nation's affairs they would organise a systematic 'attack on human problems'. But where were their plans, the newspaper inquired, 'no hindrances are being placed in the way of the scientists indicating what they would do'. Instead of 'practical, constructive' suggestions, they offered 'childish' criticisms and shallow carping that seemed 'at variance with what should be the calm spirit of science'.[94]

The 1951 'Science in Australia' symposium provoked similar concerns from the *Canberra Times*. In the glare of the bomb, scientists gained new authority and prestige, but the risks of transgression were also heightened. The assembled 'galaxy of scientists', the newspaper noted, might usefully be reminded 'how undesireable it is for specialists in some leading branches of science to imagine that their ability to harness potent natural forces qualifies them automatically also for untrained and dangerous meddling with political and international affairs'.[95] At a time of ideological conflict, scientists had to be

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[92] *CPD*, 13 August 1919, vol. 89, p. 11550.
[93] *CPD*, 15 August 1919, vol. 89, p. 11646.
[94] *Age*, 21 January 1935, p. 8.
[95] *Canberra Times*, 25 July 1951, p. 4.

reminded that their first loyalty was to their nation. Naïve pronouncements upon the necessity of international cooperation and the freedom of research only demonstrated the inability of scientists to grasp the deadly reality of the communist threat. David Rivett's moderate urgings on behalf of a science unhindered by political control singled him out for special attention in parliament.[96] 'I am not implying that Sir David Rivett is a Communist', EJ Harrison declared in 1949, as the Liberal-Country Party coalition continued its raucous scare campaign, but 'I understand the attitude of scientists and the academic mind'. 'Scientists, from their lofty mental pinnacle, consider that research discoveries should be made available to other nations', he concluded, 'but the Government must take a more practical view'.[97]

Scientists who, by innocence or arrogance, presumed to privilege the pursuit of science above the earnest strivings of the unenlightened, only encouraged hostility and suspicion. In a public lecture in 1915, WA Osborne contrasted science's innate 'truthfulness' with that demonstrated in politics, business, or even, after some prompting from the audience, religion.[98] The *Argus*, normally a keen science sympathiser, took umbrage at Osborne's conceit. 'It is always hard for the specialist to avoid the error of over-emphasising the reach and importance of his own particular form of knowledge or activity', it began. Science was certainly essential to society's continued progress, but Osborne had been overwhelmed by hubris in claiming for it 'a supreme right to the homage of mankind'. Furthermore, although a certain 'innate conservatism' did slow the acceptance of scientific ideas, there was no hostility towards science in the Australian community. However, the editorial warned, 'hostility may be provoked... if scientists are mistaken enough to assert that science is the only channel of truth'.[99]

Even the most eminent of scientists could be disciplined for overstepping the boundaries of acceptable behaviour. Mark Oliphant's comment to a management

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96 See chapter 7.
97 *CPD*, 16 March 1949, vol. 201, p. 1554.
98 *Argus*, 22 November 1915, p. 10.
99 *Argus*, 27 November 1915, p. 18.

conference in 1951, that sheep were 'the curse of Australia', brought angry demands for him to 'stick to atoms'.[100] 'Has ever a scientist made a less scientific statement... ?', asked one correspondent, 'No doubt it would be good stuff for a publicist, but surely not for a man of science'.[101] Oliphant's bold challenge to accepted verities recalled the attempts of geographer, Griffith Taylor, to puncture the overblown optimism of 'Australia unlimited'. Taylor is remembered as a martyr and prophet for daring to chart the climatic limits of Australian development against the outraged denials of popular opinion.[102] Amidst widespread condemnation, Taylor championed the scientific study of settlement over the efforts of the 'haphazard observer', who 'forecasted the future in terms which expressed merely his illogical hopes'.[103]

But Taylor's crusade against ignorance and irresponsibility, was complicated by his own ambitions. He was a young scientist in a hurry, keen to win for his discipline a major share in the process of 'nation-planning'.[104] His innovative use of diagrams and comparative statistics offered a simple assessment of Australia's options, but his continental-scale appraisal abandoned local experience to the dust of the 'hopeless' deserts that sat heavily at the nation's heart.[105] Taylor was confident and combative, eager for publicity, and ready to drive deluded 'boosters' before the sharpened steel of science. It was not a strategy of gentle persuasion or inclusion; nothing short of victory would suffice.

It is easy to cast Taylor as the brave defender of science struggling with an anti-intellectual culture unwilling to give up its dreams of continental conquest. And yet, the

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100 *Argus*, 9 March 1951, p. 1; *Herald*, 9 March 1951, p. 5.
101 *Herald*, 9 March 1951, p. 5.
102 Joseph Michael Powell, *Griffith Taylor and 'Australia Unlimited', The John Murtagh Macrossan Memorial Lecture, 1992*, University of Queensland Press, Brisbane, 1992.
103 *SMH*, 12 May 1924, p. 8.
104 Thomas Griffith Taylor, 'Geography and national problems', *Report of the 16th meeting of the Australasian Association for the Advancement of Science*, Wellington, 1923, p. 440.
105 For Taylor's use of 'Griffograms' see David R Oldroyd, 'Griffith Taylor and his views on race, environment, and settlement, and the peopling of Australia', in D F Branagan and G H McNally (eds), *Useful and curious geological enquiries beyond the world: Pacific-Asia historical themes. The 19th International INHIGEO Symposium*, International Commission on the History of Geological Sciences (INHIGEO), Sydney, 1994, pp. 251-274. For the tension between continental and local appraisals see Powell, *Griffith Taylor and 'Australia Unlimited'*, p. 40.

'boosters' could equally claim to march beneath the banner of enlightenment. Many, like EJ Brady, looked to science to solve the problems that slowed the expansion of settlement into Australia's 'empty wastes'. After the miraculous discoveries of recent decades, after endless reminders from scientists that it was knowledge that fuelled the engine of national progress, why shouldn't the 'boosters' have felt optimistic? 'Is it beyond the bounds of hope', the *Sydney Morning Herald* pleaded in response to one of Taylor's sorties, 'that the advance of science in directions unsuspected to-day may eventually render the settlement of these idle lands a practical proposition?'[106] Who should be believed? Taylor offered detailed arguments, but received little public support from within the scientific community.[107] Only twenty years earlier, Taylor's mentor, Edgeworth David, had highlighted the latent fertility of large tracts of semi-arid land as 'very encouraging for the future'.[108] Where was the truth?

Taylor compounded his provocation by suggesting that white settlement was unlikely to thrive in tropical climates, and by favouring intermarriage with the Chinese as an alternative to the doomed White Australia policy.[109] He was lambasted by *Smith's Weekly* as 'counsel for the yellow streak', in an article that defended the benefits of racial purity against any 'piebald human cocktail' that Taylor could conceive. But the article, under the byline 'HCM', was mainly concerned with Taylor's over-reliance on recent American theories of climatology; theories that amounted to little more than 'a amusing bit of special pleading for their own pneumonia and blizzards'. America was no bastion of culture, no home of science. 'The mass of the nation is merely a dollar-making machine', the article asserted, 'and her only use for science is as a stepping-stone to "inventions" out of which money can be made'.[110] 'HCM' was undoubtedly Hugh Cleland McKay, and his argument was not with science, but with failings of scientists who promoted

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106 *SMH*, 21 May 1924, p. 12.

107 Powell, *Griffith Taylor and 'Australia Unlimited'*, pp. 26-7.

108 David, 'The aims and ideals of Australasian science', p. 28.

109 David Walker, *Anxious nation: Australia and the rise of Asia 1850-1939*, University of Queensland Press, St Lucia, 1999. pp. 192-4; Oldroyd, 'Griffith Taylor and his views on race, environment, and settlement, and the peopling of Australia'.

110 HCM (HC McKay), 'The man of the week - Counsel for the yellow streak', *Smith's Weekly*, 14 July 1923, p. 2.

fashionable theories without testing them against local conditions. For the errant Taylor, McKay prescribed 'a "walk" through the Territory, a yarn with the local settlers and with the Institute of Tropical Medicine'.

Recent years have brought attempts to celebrate Australia's 'tall poppies', to recognise scientific 'heroes' long neglected by a culture blinkered by its anti-intellectual and utilitarian prejudices. But in the images of scientists played out in public debate there is no simple rejection of science, no denial of its role in progress. A distrust of scientists does not necessarily imply a distrust of science. As scientists venture into public debate, their perceived foibles provide an opening to consider the nature of scientific authority and the limits of participation. Whose knowledge counts?

## All our inventive and improvising genius

Cla Allen waited anxiously for news from home. The world was at war, but he and his colleague Arthur Higgs were far removed in South Africa, preparing to observe the 1940 solar eclipse. 'I am afraid I still feel I am wasting time here and would very much prefer to be doing something towards "the nation's war effort"', a worried Higgs wrote to Richard Woolley, director of the Commonwealth Solar Observatory (CSO), 'when I come back I shall be champing at the bit to jump into something useful'.[111] Allen was more cautious. He was keen to be involved in war-related work, but was worried about the effect on his young family. Would he have to move? Would they be able to stay with him? What would become of the observatory itself? Woolley had originally intended to join Higgs and Allen in South Africa, and his non-arrival had set them wondering whether he had decided to join up.[112]

Finally, a letter from Woolley arrived explaining that 'the utilization of scientific workers' was 'at last being organised'. The CSO was to go 'into questions of the design of optical instruments for war purposes', and the two astronomers were reassured that

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[111] Letter from AJ Higgs to RvdR Woolley, 28 July 1940, NAA: A9103, item 4.
[112] Letter from CW Allen to RvdR Woolley, 26 July 1940, NAA: A9103, item 4.

there would be 'something definite' for them to do upon their return.[113] Higgs was pleased to learn that 'useful' work would be waiting, while Allen was relieved that he would be able to remain at Stromlo with his family 'without feeling that I am shirking my duty'.[114] 'I have been having visions of either joining up or perhaps being sent somewhere else', he confessed to Woolley.[115] In his diary he recorded a dream in which he was 'making love to Hitler's girlfriend— a dangerous game'.[116]

Richard van der Reit Woolley had been appointed director of the CSO less than a year earlier. At the age of just 33, he had arrived in Australia direct from Cambridge, determined to breathe new life into the observatory which had languished without a permanent head since Duffield's death in 1929.[117] Cla Allen enthusiastically noted in his diary that Woolley intended 'to make the CSO an observatory of which the Empire can be proud'.[118] The fall of France, however, had ended hopes that the observatory's redevelopment might proceed unhindered. Woolley, the son of a naval officer, quickly made it known that he was 'extremely anxious to do something to help the war effort'.[119] But what?

A number of organisations were urging the government to mobilise the nation's scientific resources against the rising menace, but few offered concrete proposals.[120] 'There has been the inevitably large amount of drawing up lists of so-called scientific workers and laboratories', David Rivett wrote to a friend in England, 'it all seems to end

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113 Letter from RvdR Woolley to AJHiggs, 17 July 1940, NAA: A9103, item 4.
114 Letter from AJ Higgs to RvdR Woolley, 21 August 1940; letter from CW Allen to RvdR Woolley, 29 August 1940, NAA: A9103, item 4.
115 Letter from CW Allen to RvdR Woolley, 29 August 1940, NAA: A9103, item 4.
116 CW Allen, diary entry, 19 July 1940, vol. 17, CW Allen papers, NLA: MS7360.
117 For biographical details see William McCrea, 'Richard van der Reit Woolley', *Historical Records of Australian Science*, vol. 7, no. 3, 1988, pp. 315-45. For the history of the observatory during the Woolley era see: SCB Gascoigne, 'Astrophysics at Mount Stromlo: the Woolley era', *Proceedings of the Astronomical Society of Australia*, vol. 5, no. 4, 1984, pp. 597-605; SCB Gascoigne, 'Bok, Woolley and Australian astronomy', *Historical Records of Australian Science*, vol. 9, no. 2, 1992, pp. 119-26; Richard Woolley, 'Mount Stromlo Observatory', *Records of the Australian Academy of Science*, vol. 1, no. 3, September 1968, pp. 53-7.
118 Diary entry, 5 December 1939, vol. 16, CW Allen papers, NLA: MS7360.
119 Letter from JA Carrodus (Secretary, Interior) to OU Vonwiller, 1 July 1940, NAA: A427/1, G1941/7.
120 RW Home, 'Science on service, 1939-1945', in RW Home (ed.), *Australian science in the making*, Cambridge University Press, Cambridge, 1988, pp. 220-51.

in polite thanks and the pigeon-hole'.[121] Under Rivett's direction, CSIR was undergoing a major reorientation to meet the needs of the looming crisis. But university researchers wanted their own slice of the action. 'Many of the older men grumble', Rivett noted, 'because, perforce, they are not handed out nice little problems in their own particular lines, and prophesy that the Government's neglect of science will mean the destruction of the Empire'.[122] Keen to give substance to their own familiar rhetoric, scientists stood ready to turn their intellectual powers upon the nation's salvation, if only they could work out how.

Hugh McKay was also pondering the connection between science and war. In November 1939, he published an article examining the military importance of optical equipment, such as binoculars, periscopes and rangefinders. The glass lens, he argued, was 'the giant's eye of modern mechanised warfare, without which armies would be practically blind'. Remarking that Australia was 'entirely dependent on overseas countries for these vital supplies', he asked whether the nation should produce 'its own optical glass'.[123] Several months later munitions planners were forced to consider that very question as Australia pushed ahead with the local production of artillery. Just as guns were starting to roll off the production line it was realised that the gunsights promised from Great Britain were not coming. What was to be done? As McKay had noted, there was no precision optical industry in Australia able to fill the gap. Where could expert advice be found? 'You want physicists?', the Director of Ordnance Production, Laurence Hartnett was told, 'we've got half a dozen of them roaring around, dying to do something to help, but no one's been able to use them'.[124] The nation's need met the scientists' desire as the Optical Munitions Panel (OMP) was formed to supervise the development of optical instruments for Australia's armed forces.[125]

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121 Quoted in *ibid.*, p. 235.
122 *ibid.*
123 Hugh Cleland McKay, 'Magic eyes of war and peace', *Smith's Weekly*, 18 November 1939, p. 13.
124 Laurence Hartnett, *Big wheels and little wheels*, Lansdowne Press, Melbourne, 1964, pp. 121-2.
125 For details of the work of the OMP see: JS Rogers, 'The history of the Scientific Instruments and Optical Panel', unpublished typescript, NAA: MP730/11, item 12; HC Bolton, 'JJ McNeill and the

Richard Woolley was one of the first to be appointed to the OMP, and by the time of their initial meeting was 'working fifteen and seventeen hours a day— Sundays included' on the problem. 'Enthusiasm like this', Hartnett remarked, 'I think is worth an awful lot to Australia'.[126] The minutes of the meeting record that Woolley 'agreed to set up his place and direct it solely to optical work'.[127] The CSO had found itself an important wartime role, bringing dramatic changes to the small community atop Mount Stromlo. At first the observatory concentrated on optical design, adapting British plans to meet local needs and materials. But from the beginning, Woolley believed it was important to gather the experience and facilities necessary to 'actually make lenses'.[128] With a functioning optical workshop, the observatory would be able to test its designs, study manufacturing techniques, and train new workers for industry. New staff were needed, along with new skills and new equipment.

'On Stromlo there have been many changes in personelle [sic] and especially in work and outlook', a bewildered Cla Allen noted in his diary upon his return in November 1940.[129] 'I have yet to fit myself into the scheme', he added after discussions with Woolley, 'and it is not quite obvious how to do it'.[130] In the difficult years since Duffield's death, Allen's research into the solar spectrum had brought the observatory international praise.[131] But what did that count for now?

While Allen was trying to find his way, recent additions to the observatory's staff were leading the process of reorganisation. Woolley had been lucky to gain the services of Francis Lord, a Czech refugee who had studied optics in Paris. Lord was one of the few

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development of optical research in Australia', *Historical Records of Australian Science*, vol. 5, no. 4, 1983, pp. 55-70; HC Bolton, 'Optical instruments in Australia in the 1939-1945 war: successes and lost opportunities', *Australian Physicist*, vol. 27, no. 3, March 1990, pp. 31-43; DP Mellor, *The role of science and industry, Australia in the war of 1939-1945, Series 4 (civil)*, vol. 5, Australian War Memorial, Canberra, 1958, ch. 12.

126 Letter from LJ Hartnett to Essington-Lewis, 17 July 1940, NAA: MP730/11, item 16.

127 Minutes of the Optical Munitions Panel, 23 July 1940, NAA: MP1472/4, box 1/1.

128 Letter from RvdR Woolley to FS Daley (Controller, Ordnance Production Directorate), 8 August 1940, NAA: MP392/9, Box 3 – Optical Panel.

129 CW Allen, diary entry, 16 November 1940, CW Allen Papers, NLA: MS7360.

130 CW Allen, diary entry,18 November 1940, CW Allen Papers, NLA: MS7360.

131 Raymond Haynes, Roslynn Haynes, David Malin, and Richard McGee, *Explorers of the southern sky: a history of Australian astronomy*, Cambridge University Press, Cambridge, 1996, pp. 158-9.

people in Australia to have experience in the manufacture of precision optics, and he advised Woolley on what was 'required from the actual workshop point of view'.[132] Lord was assisted by SJ Elwin, a lecturer in manual arts and amateur astronomer, whom Woolley had discovered at the Sydney Teachers' College. Elwin had 'himself computed and made a 6" objective', demonstrating the self-taught skills which made him a valuable addition to the optical team.[133] 'Hundreds of experiments were tried' in the early stages as workshop staff sought to develop 'techniques which could be understood quickly and applied by novices'.[134] Methods and machines were improvised through determined, hands-on effort. Within a year, the CSO was producing lenses, prisms and trained optical workers.

For Cla Allen it was a time of disappointment and frustration as he grappled with the practical demands of optical manufacture. 'The only variety at work is made by the mistakes I make and their consequent difficulty', he noted in January 1941, 'except for that I just go on making lenses'.[135] Each day brought 'the usual ups and downs with scratches and other troubles'.[136] 'I sometimes feel depressed with the results which I haven't time to perfect', he admitted a few months later.[137] Eventually Allen gained some relief from the daily grind, when he was asked to monitor sunspot activity as part of an effort to improve radio communications.[138] But the optical work continued to grow, as the observatory stretched its staff and skills until it was able to handle all aspects of the manufacturing process, from design to testing. New tasks brought new problems, new failures, and Allen began to question Woolley's judgement on the CSO's capacity. His tendency to 'underestimate... the work involved in everything' was, Allen remarked in his diary, 'something of an embarrassment'.[139]

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132 Letter from RvdR Woolley to FS Daley (Controller, OPD), 8 August 1940, NAA:MP392/9, Box 3,Optical Panel.
133 'Report by Dr RvdR Woolley on Optical Designs', NAA: MP1472/4, Box 1/1 (Meetings 1-8).
134 'Report on optical munitions from the Commonwealth Solar Observatory', 13 February 1942, NAA: MP1472/4, Box 1/2 (Meetings 9-13).
135 CW Allen, diary entry, 30 January 1941, CW Allen Papers, NLA: MS7360.
136 CW Allen, diary entry, 26 March 1941, CW Allen Papers, NLA: MS7360.
137 CW Allen, diary entry, 10 March 1941, CW Allen Papers, NLA: MS7360.
138 Mellor, *The role of science and industry*, pp. 507-8.
139 CW Allen, diary entry, 5 February 1943, CW Allen Papers, NLA: MS7360.

Where Allen was cautious and self-critical, Woolley was expansive and optimistic. The war provided an opportunity to forge alliances, to bring science to the attention of government and military. In March 1942, Woolley took up the post of Chief Executive Officer with the Army Inventions Directorate (AID). While continuing to supervise the CSO, he was now changed with the daunting task of tapping 'Australia's undoubted reserves of inventive genius'.[140] It was hardly a glamorous job. Previous attempts to deal with the public's enthusiastic outpouring of war-winning ideas had either drowned beneath the flood of innovation, or withered from lack of resources and commitment. A conference held to consider problems with the AID's predecessor, the Central Inventions Board, stalled when it was realised that 'none of its members felt there was any real need for the existence of the board'.[141] The only justification in the minds of many was political convenience— the government and the military needed a way to fob off determined crackpots.

Laurence Hartnett, however, firmly believed in the promise of backyard genius. The man who would become known for his quixotic pursuit of a truly Australian car, provided hopeful inventors with an unofficial 'home from home' in his Ordnance Production Directorate.[142] With political pressure mounting over the treatment of inventions such as the Owen gun, Hartnett proposed a new organisation with its own staff and resources, one that would not only assess public submissions, but would actively encourage inventors to respond to the needs of the military. The threat of Japanese invasion brought added urgency, and in January 1942 the Minister for the Army, Frank Forde, convened another conference, declaring, 'very definitely, an Inventions Board is wanted'. Such an organisation should 'not only "tap" the worth-while element in the stream of inventions', Forde proclaimed, it should 'positively and

140 *Canberra Times*, 3 August 1942, p. 2.
141 Mellor, *The role of science and industry*, p. 642
142 AS Fitzpatrick, 'Inventions in war – Record of the origin, growth and achievement of the Army Inventions Directorate in the war period. March 1942-September 1945', unpublished manuscript, AWM: 54, 435/1/6, p. 15.

actively encourage and energise Australian inventive genius'. Hartnett's vision won the day and he was appointed to chair the new Army Inventions Directorate.[143]

It was comforting, in a time of peril, to believe that the adaptability bred of Australian bush life could be harnessed to the cause of national security. With the onset of the Pacific War, Forde noted, Australia would become increasingly isolated from the world, beset by shortages 'needing all our inventive and improvising genius to overcome'.[144] Australians had conquered isolation before, they had learned to make-do in the face of hardships and shortages, surely the legendary spirit of invention would not fail them now. Hartnett, the shrewd car salesman, recognised that the AID had an important role in maintaining public morale. It provided an outlet for 'the public's pent-up desire to do something to help', a means of preventing their frustrations spiralling downwards to despair.[145] Ordinary men and women, worried and fearful, could contribute their ideas to the AID and feel they were making a direct, practical contribution to the war effort.

The AID received 21,645 submissions ranging from perpetual motion machines and bullet-proof paint, through to ideas for ridding kitchens of cockroaches, and a recipe for 'fish liver vitamin bread'. The register of submissions itself reflects the progress of the war, with a surge in anti-submarine devices following the midget sub attacks on Sydney, and counters to flying bombs and suicide planes proliferating as the conflict neared its end.[146] Only 127 inventions were finally accepted for development. An improved signalling mirror and a bullet-proof radiator, were not perhaps war-winning weapons, but the savings in money and lives afforded by such innovations were, in DP Mellor's view, 'sufficient to justify the directorate's existence'.[147]

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143 *ibid.*, pp. 15-23. See also: Hartnett, *Big wheels and little wheels*, pp. 139-46; Mellor, *The role of science and industry*, ch. 27.

144 Quoted in AS Fitzpatrick, 'Inventions in war – Record of the origin, growth and achievement of the Army Inventions Directorate in the war period. March 1942-September 1945', unpublished manuscript, AWM: 54, 435/1/6, p. 19

145 Hartnett, *Big wheels and little wheels*, p. 140.

146 For a complete register of inventions submitted see NAA: MP1164/12, vols 1-3. See also Mellor, *The role of science and industry*, p. 647

147 Mellor, *The role of science and industry*, p. 653.

The AID's 'creed' was, according to Hartnett, based on a number of fundamental principles. It recognised that 'science, new ideas, devices and inventions play an extremely important part' in modern warfare'. It accepted that the fighting forces themselves understood best the needs and practicalities of such innovations, but devoutly maintained that 'there is no monopoly of new ideas, novel equipment, new devices or improvements to existing equipment, as such thoughts can emanate from virtually any person'. Hartnett was determined that all submissions would be received in a positive and encouraging manner. 'Many instances are on record', he argued, 'where a person has submitted several quite irrational and unsound submissions, yet by careful handling has brought forward an extremely effective new device or invention'.[148] This was not always easy. As the unpublished history of the AID wryly records, 'to preserve friendly relations with inventors, too keen an appreciation of the humorous aspect of any invention was unwise'.[149]

But Hartnett's creed was itself constrained by practicality. A newspaper article on the AID urged all potential inventors not to hesitate 'for fear of being called a crack-pot'. After all 'many a scientific and technical development was "crack-pot" when it first appeared'. However, it added, 'it is advisable to stick to your own field of knowledge as far as possible'.[150] The AID soon focused its advertising on technical and trade journals, assuming that useful inventions were most likely to come from people with at least some specialist knowledge. Posters were distributed to universities and technical colleges, and AID staff delivered 'workshop lectures' in munitions factories.[151] What made an inventor? Hartnett remained attached to the idea of innate genius, to nationalistic visions of Australian ingenuity, but in practice the AID sought an appropriate mix of creativity and technical expertise.

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148 'Inventions Directorate or Army', notes by LJ Hartnett, 25 May 1942, AWM: 54, 435/3/3.

149 AS Fitzpatrick, 'Inventions in war – Record of the origin, growth and achievement of the Army Inventions Directorate in the war period. March 1942-September 1945', unpublished manuscript, AWM: 54, 435/1/6., p. 80.

150 *Canberra Times*, 3 August 1942, p. 2.

151 AS Fitzpatrick, 'Inventions in war – Record of the origin, growth and achievement of the Army Inventions Directorate in the war period. March 1942-September 1945', unpublished manuscript, AWM: 54, 435/1/6, pp. 43-6.

At the end of the war, the directors of the AID met to consider the organisation's future. Hartnett had no doubt such a body could play a vital role in peacetime development. 'Australia is a young nation', he reminded the meeting, 'abounding in national problems and challenges' that could be readily 'answered by inventions'. Moreover, the constant circulation of ideas would bestow a psychological advantage upon the nation, stimulating the people's 'exercise of ingenuity' and furthering the 'technological advancement of the country'.[152] A peacetime inventions organisation would give people confidence to face the problems of the future, to grasp the possibilities of progress.

Woolley, however, drew a different conclusion, 'I think our experience in this war has shown that not enough first class work is done here'. Australia's over-reliance on outside sources of expertise had been the cause of many of its wartime difficulties. What the nation needed was not the broad scale cultivation of popular ingenuity, but deliberate investment in its scientific resources. 'I do not think a country, however small, can afford to be without its scientific workers', he added, 'we should do everything we can in this country to encourage first class work and fundamental work of any nature'.[153] Kerr Grant, professor of physics at the University of Adelaide, strongly agreed. 'Scientific knowledge is absolutely basic in war and in peace', he insisted, 'and unless it is developed there is always the risk that a nation will commence to fight the next war with the weapons of the last'.[154] With news of the atomic bomb barely a month old, this was indeed a terrifying prospect. 'What use were bows and arrows and spears in the face of firearms?', Kerr Grant asked, 'to-day what use are tanks, guns and battleships?'[155]

The bomb was revealed to the world as the product of pure science, as the endpoint of decades of disinterested research through Einstein, Rutherford and beyond. It was proof of what scientists like Woolley and Grant had been claiming for decades—

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152 Minutes of the AID meeting, 18 September 1945, p. 3, NAA: MP927, A177/1/106 part 3.
153 Verbatim minutes of the AID meeting, 18 September 1945, pp. 18-19, NAA: MP927, A177/1/106 part 2.
154 Minutes of the AID meeting, 18 September 1945, p. 4, NAA: MP927, A177/1/106 part 3.
155 Verbatim minutes of the AID meeting, 18 September 1945, p. 19, NAA: MP927, A177/1/106 part 2.

fundamental research would inevitably yield discoveries of immense practical significance. Inventors brought forth small improvements in equipment and technique, but how could these be measured against the revolutionary significance of the bomb? How could a backyard genius compete against the intellectual and financial might of the Manhattan Project? As DP Mellor attempted to survey the achievements of the AID, he found it increasingly difficult to maintain the distinction between invention and scientific discovery. Most patents, he observed, now emanated 'from well-equipped private or government laboratories or from the drawing boards of large-scale engineering or manufacturing organisations'. The individual inventor seemed to be 'a dying species'.[156]

The AID's unique attempt to harness the creative powers of a nation was not quite a failure, not quite a success. It probably paid for itself, but to many observers its achievements seemed largely political. Woolley himself was grateful for an education in the 'rules of Public Service in-fighting', but showed little interest in continuing the experiment.[157] Instead he sought to use his experience to establish an ongoing consultative structure, linking scientists to the services in peace as well as war. 'I feel I should be wrong to retire', he remarked, 'without making some effort to put into effect what we lacked at the beginning'.[158]

But while the AID laboured over its few modest gains, the optical munitions effort brought dramatic success, acclaimed as 'one of Australia's most spectacular wartime scientific developments'.[159] The determined efforts of Australia's scientists had triumphed over the doomsaying of British experts to supply the nation with urgently needed optical instruments— a stirring saga, an instructive lesson. As Woolley began to plan the CSO's postwar program, he pointed to the 'vital contribution which pure scientists have been able to give to the nation', arguing that this clearly demonstrated 'the utility... of having first-class scientists'. 'The versatility of the pure scientist is of

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156 Mellor, *The role of science and industry*, p. 640.
157 Woolley, 'Mount Stromlo Observatory', p. 54.
158 Verbatim minutes of the AID meeting, 15 November 1944, NAA: MP927, A177/1/106 part 2.
159 *Canberra Times*, 29 January 1945, p. 2.

exceptional national value', he emphasised, illustrated in the creation of an optical munitions industry 'entirely by pure scientists who had no previous manufacturing experience'.[160] What could the nation not achieve with brainpower such as this at the ready? As Australian politicians pondered the difficulties of initiating research into atomic energy, reassuring evidence of the nation's capacity 'to undertake work of this kind' was found in the 'outstanding success which was made of problems of optical munitions by staff of the Commonwealth Observatory at Mount Stromlo'.[161] Not quite the Manhattan Project perhaps, but an example, nonetheless, of the latent power of science.

As Cla Allen and Arthur Higgs waited in South Africa to complete their solar observations, they wondered what sort of 'useful' role they might play in a country consumed by war. Their desire to do 'something' was shared by many, including the thousands who submitted their ideas and inventions to the AID. They too hoped their knowledge might make a practical contribution to the war effort. But what did it mean to be practical? The pure scientists who initiated the optical munitions work, pointed to their broad theoretical training as the source of their versatility. A theoretical education was proved to be of immense practical value. Meanwhile, inventors, drawing on their own experience and responding directly to practical needs, flooded the AID with thousands of useless and irrelevant ideas.

But how confident was Cla Allen of his 'versatility' as he struggled to produce a lens without scratches or pits? How could the scientists' attempts at optical manufacture have succeeded without the industrial experience of Francis Lord? The importance of hands-on experience, the constant trial and error, these were rendered invisible as the supposed 'versatility' of the pure scientist was paraded for public admiration. What did it mean to be practical? The *Canberra Times* could list a mine detector developed through the AID alongside penicillin as evidence of the growing significance of science in war,

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160 RvdR Woolley, 'Post-war reconstruction of the Commonwealth Solar Observatory', memorandum for Secretary, Department of the Interior, 13 May 1943, p. 1, NAA: A431, 47/2068.
161 *Canberra Times*, 11 October 1945, p. 2.

but the sometime prospector who invented the detector was unlikely to be sharing a podium with Howard Florey.[162]

## A broad stream that passed the door of all

The *Australasian Manufacturer* 'unblushingly' confessed to be 'a paper with a mission', perhaps 'the greatest mission of modern times'. Established in 1916, the fiercely nationalist journal sought to advance the 'special interests of manufacturers', believing that 'industry in its widest and deepest sense is the foundation of civilisation'. Australia had the necessary 'resources', 'people' and 'brains'; what was needed to ensure its greatness was better organisation, promotion, cooperation, and 'the application of scientific discovery and scientific methods'.[163] The *Australasian Manufacturer* promoted the glories of 'efficiency' and the benefits to be gained from a scientific approach to industrial management. But it also championed a broader appreciation of science, a respect for intellectual development, and a much expanded role for science in education. 'The great aim must be, not a dry-as-dust knowledge of science or sciences', the journal proclaimed, 'but the creation of the scientific habit and the scientific spirit'.[164]

However, if science was to gain rightful appreciation, its practitioners needed to avoid an excess of 'scientific snobbery'. Too often scientists affected an air of indifference towards the practical outcomes of their work, the *Australasian Manufacturer* noted, making it seem that science was 'so lofty a pursuit that the man of science should live among the stars and not soil his fingers with the common earth of everyday life'. Of course, research might not always be directed towards immediate, useful ends, but scientists had to maintain some 'contact with human needs'. Even 'great theorists', the journal argued, 'had practical applications before them like a distant light'.[165]

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162 *Canberra Times*, 16 April 1943, p. 2.
163 'The story of ourselves', *Australasian Manufacturer*, vol. 2, no. 79, 6 October 1917, p. 16. See also: 'What we are and what we stand for', *Australasian Manufacturer*, vol. 1, no. 27, 30 September 1916, p. 4.
164 'More about science in our schools', *Australasian Manufacturer*, vol. 1, no. 35, 25 November 1916, p. 10.
165 'Scientific snobbery', *Australasian Manufacturer*, vol. 2, no. 54, 14 April 1917, p. 13.

Nor did the increasing dominance of scientific method over the 'rule of thumb' mean that 'the despised and supplanted practical man should die quietly without any fuss'. 'The alleged separation between practice and technics', the journal maintained, 'is by no means so valid as the critics would have us suppose'. The practical man and the technician approached problems from different directions, but they were 'complementary, not opposed'.[166] In the same way, science and invention were 'intimately connected', though 'the scientist need not be an inventor, and the inventor need not be a scientist'.[167] Australia's industrial development depended not just on a greater role for science, but on increased cooperation and respect between the scientist, the inventor, the practical man and the technician. Though each was guided by a different creed, they were embarked upon the same noble quest. The knowledge and experience of each should combine to speed the march of progress.[168]

The *Australasian Manufacturer*'s blueprint for intellectual reconciliation, reflected its vision for industrial peace. Just as theory and practice could be brought into alignment, so the destructive antagonism of labour and capital could be banished by a new spirit of cooperation.[169] With the First World War still raging, peace, on all fronts, was essential.

The planned Institute of Science and Industry was welcomed by the *Sydney Morning Herald* in 1916 as a sign that old prejudices were beginning to yield. 'Here in the past a certain amount of mutual suspicion has existed between the pure scientist and the practical man', it observed. Neither was 'free from blame'. The scientist had been apt to believe that it was 'rather beneath his dignity to apply his wisdom to the base purposes of trade', while the practical man 'distrusted the product of the university', holding steadfast to the 'rule of thumb' in spite of advances in science.[170] If the Institute was to succeed, the newspaper concluded, 'barriers of apathy and prejudice' would have to be

166 'The practical man', *Australasian Manufacturer*, vol. 3, no. 153, 8 March 1919, p. 20.
167 'The importance of invention', *Australasian Manufacturer*, vol. 1, no. 49, 10 March 1917, p. 7.
168 For more on the relationship between the practical man and the scientist in this period see Roy MacLeod, 'The 'Practical man': Myth and Methaphor in Anglo-Australian Science', *Australian Cultural History*, no. 8, 1989, pp. 24-49.
169 'The "Australasian Manufacturer" has striven to preach the gospel of cooperation between Capital and Labour', see 'The story of ourselves', *Australasian Manufacturer*, vol. 2, no. 79, 6 October 1917, p. 16.
170 *SMH*, 8 January 1916, p. 16.

broken down. The *Argus* agreed, suggesting that the Institute needed to cultivate a mix of both 'laboratory skill and business ability'. The 'scientist and the business man', it argued, 'should pull together, understand each other, and have patience with each other's point of view'.[171]

But how did one blend experience and theory? Daniel McAlpine, a pioneering plant pathologist, had laboured for many years at the boundary of science and agriculture.[172] While McAlpine applauded any attempt to apply research to the needs of the nation, he was uncomfortable with the idea that the Institute should aim 'to get the man on the land or the manufacturer to follow the teachings of science'. The value of science could not be taken for granted. Instead of being set upon a pedestal for worshipful praise, science had to demonstrate its utility in local conditions. 'There is too much of a tendency to treat the man on the land as if he were a know-nothing, and the scientific man or university don as if he were a know-all', McAlpine remarked. 'The man on the land has usually a fund of local knowledge and experience', he added, and only by 'the blending and harmonious adaptation' of scientific and local knowledge could progress be assured.[173] Impressive titles or university degrees did not always provide an accurate measure of expertise. McAlpine's own lack of formal university qualifications had been questioned the previous year at a royal commission into fruit, vegetables and jam.[174]

The appropriate balance between theory and practice was a topic that provoked much long-winded expostulation as parliament fell upon the Institute's Bill. The rather snide characterisation of scientists as 'mere theorists', or 'learned academicians', did little to further the cause of reconciliation. However, the insistence upon a role for practical knowledge reflects not simply ignorance or mistrust, but a common feeling that there were other ways of knowing that might yet play a part in the nation's progress. James Mathews, the Labor member for Melbourne Ports, sought a place for the ordinary

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171 *Argus*, 22 January 1916, p. 16.
172 Neville H White, 'McAlpine, Daniel (1849-1932)', in Bede Nairn and Geoffrey Serle (eds), *Australian dictionary of biography*, Melbourne University Press, Melbourne, 1986, pp. 193-4.
173 D McAlpine, 'Science and industry – Prime Minister's scheme', *Argus*, 29 January 1916, p. 6.
174 White, 'McAlpine, Daniel (1849-1932)'.

worker in the Institute's operations. Those who laboured daily in the fields or the factories gained a 'special knowledge not possessed by others'. While some praised the businessman as the font of practical wisdom, Matthews argued that there was 'no calling where the man on top understands the details of manufacture so well as those who do the actual work'.[175] If science was to bring improvements to industry, surely it could not ignore experience hard won on the factory floor.

Arthur Rodgers, the member for Wannon, had been a strong supporter of Groom's plans for a Bureau of Agriculture, but he was concerned by the lack of practical advice in framing the Institute's program. 'For scientific research, I am in favour of the most liberal endowments', he insisted, but were scientists to be found only in laboratories or universities? 'As one who is closely associated with primary industries', Rodgers proclaimed, 'I say that in the fields we have some of the best scientists of to-day'. Interrupted while describing research already taking place within the sugar industry, Rodgers responded, 'Does the honorable member assume that there can be no scientific discovery except under Act of Parliament?'[176] Where was knowledge created? How were discoveries made?

Even those who strongly favoured the government's proposal, were unsure how to characterise the nature of science itself. Alexander Hay, from New England, thought the word 'science' tended 'to terrify a great many people' and preferred to use the term 'better methods'.[177] Senator Senior, on the other hand, argued that the distinction between 'pure' and 'applied' science was misleading. 'Science is really the accumulation of facts', he explained, 'and not the deduction of theories from facts'. Once the facts were known, 'the conclusions are just as certain as the conclusions of a syllogism'. Thus, he concluded, there was 'no difference in pure and applied science in the application of those facts'.[178] No doubt his fellow senators were grateful for his words of clarification.

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175 *CPD*, vol. 89, 13 August 1919, p. 11558-9.
176 *CPD*, vol. 89, 20 August 1919, pp. 11747-8.
177 *CPD*, vol. 92, 21 July 1920, p. 2895.
178 *CPD*, vol. 86, 3 October 1913, p. 6590.

Were important scientific discoveries made in the laboratory or the workshop? Did they burst upon the world in a flash of inspiration, or were they, as one member argued, 'the gradual accumulation of minor discoveries, and the steady building up of small improvements'? Did government coordination encourage or inhibit the development of knowledge? Senator Bakhap wondered whether the Institute's director might 'exercise a paralysing influence on the genius of investigators'. 'There is no royal road in science', he added.[179] The *Age* similarly questioned the need for an elaborate bureaucratic structure when it was individual genius that contributed most to scientific advance. The government's scheme was backwards, it argued, establishing 'the institute before discovering the genius'.[180] Others wondered whether there was any real need for new discoveries, when there was so much scientific knowledge that had yet to be applied to the benefit of industry.

Recalling his meeting with Billy Hughes in 1915, WA Osborne noted that the Prime Minister himself seemed to believe 'that science had already in hand an immense store of knowledge ready for instant application'.[181] 'Knowledge', Hughes declared in January 1916, 'was a broad stream which passed the door of all, but few people cared to dip their pannikins in it'. As scientists, businessmen and bureaucrats gathered to draw up plans for the Institute, Hughes expressed his hope that the scheme they devised would 'provide reticulating channels for this stream' of knowledge, carrying it where it was needed.[182] But were scientists merely ditch-diggers in a program of intellectual irrigation? When Hughes met with the Advisory Council in July 1917, he urged them to focus on a limited set of problems that promised early results. 'You have to make good with some of these', he warned, and he was unimpressed when Orme Masson suggested it would be 'misleading' to give the impression that such problems would be solved within six

179 *CPD*, vol. 86, 10 October 1918, p. 6778.
180 *Age*, 17 January 1916, p. 8.
181 Quoted in Currie and Graham, *The origins of CSIRO*, p.29.
182 *Argus*, 6 January 1916, p.8.

months, 'or even the next year'.[183] For Masson, science was concerned with research, for Hughes it was about results.

Scientists promoting the value of research maintained a precarious balance. On the one hand they extolled the revolutionary character of the pursuit of fundamental truth. Pure research brought more than mere improvement or efficiency, it offered whole new ways of thinking, new realms for exploitation and conquest. But on the other hand, they could present no schedule, no timetable for innovation, no guarantee. 'Though pure science pays sooner or later', Edgeworth David admitted, 'it does not necessarily pay at the time'.[184] FM Gellatly urged that the Institute's success should be judged not upon individual cases, 'but in the mass'. 'When a scientific investigation is entered upon no one can say at the beginning what the result will be', he explained, 'or whether there will be any valuable result at all'. On average, however, there was no doubt that science would 'pay handsomely'.[185]

In 1959, Mark Oliphant likened support for science to 'support for a Mount Everest expedition' or 'skilful operations on the Stock Exchange'. 'By and large science advances', he explained, 'but we can never be sure which projects will be the winners'. Nonetheless, he urged, 'we must not be afraid, under any circumstances, of faith in our scientific projects'.[186] In the absence of immediate results or guaranteed outcomes, the public was urged to maintain their faith in the ultimate beneficence of science. Instead of succumbing to the practical man's insistence on the here and now, they were asked to cultivate patience and trust. The utility of science could not be measured on any one farm or factory floor. No snapshot could capture its promise. It was not for the individual to pronounce success or failure, the judgement had to rest with history.

[183] 'Meeting of Commonwealth Advisory Council of Science and Industry, 9 July 1917', NAA: AA1964/52/1, Item 6.
[184] David, 'The aims and ideals of Australasian science', p. 30.
[185] Francis Mephan Gellatly, 'Cost of the Institute', *Science and Industry*, vol. 1, no. 5, September 1919, pp. 258-260.
[186] 'Foundation's fifth anniversary', *The Nucleus*, vol. 5, no. 1, 1959, p. 10.

While the *Australasian Manufacturer* looked forward to the integration of theory and practice, scientists were becoming increasingly more confident of their own special knowledge and abilities. Brailsford Robertson, professor of physiology at the University of Adelaide, dismissed the idea that innovation could spring from the mind of the untrained worker. 'The time has passed', he declared, 'when fundamentally important industrial discoveries can be made by the lazy boy of the factory who ties two parts of a machine together with a piece of string'. 'That day is past', he insisted, 'it is Early Victorian, and it is extinct'.[187] Progress waited upon the 'prepared mind', the mind honed by long years of research training. Experience in the First World War seemed to confirm the benefits of a scientific background. Commenting on management ability within the munitions industry, Norman Wilsmore, the University of Western Australia's chemistry professor, claimed that university-trained chemists had 'stood head and shoulders above all others'.[188] The rigorous methods of research, the unswerving dedication to truth, such characteristics as these empowered the scientist to lead society, not just to serve it.

The *Australasian Manufacturer* called upon a new spirit of cooperation to resolve the conflict of capital and labour. But inequalities of wealth and power could not be smoothed over so easily. Likewise, the scientist and the practical man were separated by more than just prejudice. Whose knowledge measured up on the scales of authority? Who would win control of the future? The boundaries of participation were made and remade in the jostling of theory and practice.

The passage of the Institute of Science and Industry Bill was a mere hiccup in the development of Australian science, maybe worth a few paragraphs in a history of CSIR/O. It provides a useful example of the anti-intellectual flavour of Australian democracy, or perhaps of the slimy depths of political opportunism. But beyond the battle lines and name-calling lies an opportunity to reflect upon the nature of knowledge

187 T Brailsford Robertson, 'Scientific and industrial research in the United States, Canada, and Austalia', *Science and Industry*, vol. 2, no. 3, March 1920, pp. 146.
188 NTM Wilsmore, 'The present position of chemistry and chemists', *Report of the 15th meeting of the Australasian Association for the Advancement of Science*, Melbourne, 1921, p. 38.

itself, to ponder a means of promoting understanding that is not founded in the presumption of ignorance. In the apparent irrelevance of the Institute's critics, we might see our own sense of impotence before the accumulative power of expertise. In their doubts we might find room to question the authority of science without being labelled its enemy. In their 'ignorance' we might recognise our own unease at some of the advances made in the name of progress.

## Rockets in the desert

In the 1960s, Simon Black was left to tinker away in obscurity, as Ivan Southall pioneered a new realism in children's storytelling. But would-be rocketeers found some inspiration still, in Southall's accounts of life and work on the Woomera rocket range. In *Rockets in the desert*, written specifically for children, Southall encourages his young readers to consider a career in rocketry. 'There are jobs for people who love adventure', he notes enthusiastically, 'and for studious people who are not very interested in heroic deeds'. However, the recommendation comes with a warning, for there is 'danger in... impatience'. 'It would be foolish', Southall explains, 'to try to learn about rockets by building one yourself'. 'No!... You must never do it', Woomera's chief scientist exclaims in support, 'If you're interested in rockets, read all you can about them, but be patient'.[189] There was no place for Simon Black in this modern world of science. Rockets were not to be built in barns, but in large government facilities staffed by 'properly trained' scientists. It seemed the time for tinkering was past.

Knowledge is defined in terms of barriers and boundaries. It is wrested from nature, it is staked out along the frontiers of experience, it separates people into initiates and outsiders, it sets the limits of participation and membership. In wrestling over the meaning of practical knowledge we similarly tend to focus on boundaries rather than ambiguity, to seek meaning in contrasts rather than complexity. It is much easier to assume that our enemies are ill-educated, that stupidity hinders the acceptance of our

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189 Ivan Southall, *Rockets in the desert*, Sydney, Angus & Robertson, 1964, pp. 77-8.

own world-changing ideas. We take comfort in the idea of progress as a journey of enlightenment, where ground is claimed and won from society's ignorant rump. But perhaps we should be looking at means of developing understanding that involve, not the annexation of territory, but the encouragement of exchange.

In his grown-up version of the Woomera story, Southall also ends with a warning: not the dangers of playing with rockets, but the dangers of science itself. 'Never before has any weapon presented to men so grave a choice between good and evil', he remarks.[190] Should the research continue? Southall solicits the opinions of scientists, who reflect upon the effectiveness of deterrence and the potential of satellite communication. But these, he observes, are not the most important issues for 'the layman who knows little or nothing of the sometimes extraordinary side-effects of defence science'. No, it is 'the survival of his own family, and the challenge of deep space' that most concern the ordinary man.[191] Can life be sustained on earth? Does life exist in space? For the layman in his ignorance, the question of life was uppermost. What counted as practical knowledge in a world where the progress of science brought ever more effective means of annihilation?

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190 Ivan Southall, *Woomera*, Sydney, Angus & Robertson, 1962, p. 248.
191 Southall, *Woomera*, p. 249.

# 6 Experiments

At 7.00am on 1 July 1946, radio listeners in eastern Australia tuned into a live broadcast, relayed via telephone from the National Broadcasting Company of America. The commentary was barely audible above the static, distorted by strange whines and roars. In the background a metronome ticked off the seconds as the much-anticipated moment approached. Tick. Tick. Tick. Finally the call, 'Bombs away! Bombs away!', and then, from nowhere, a warning: 'Listen world, this is the crossroads'. As the people of Australia readied themselves for another day of work or school, the world's fourth atomic bomb was exploded on the Pacific atoll of Bikini.[1]

Some weeks later, a fifth atomic bomb was detonated, again at Bikini. The blue waters of the atoll's idyllic lagoon erupted skyward with the force of the explosion, signalling a dramatic end to the USA's first peacetime atomic test program. The 'target' for these tests was a fleet of retired American and captured enemy warships, 'manned' by pigs, goats and other animals, some dressed in uniform to test the effectiveness of protective clothing.[2] By blowing up this junkyard menagerie the USA confirmed its status as the world's only atomic power, marking its usual independence celebrations, commented the communist *Tribune*, with an 'outsize in fireworks'.[3] Indeed, while the first three atomic explosions were planned and executed in secrecy, the Bikini atomic tests were conducted amidst well-organized publicity and accompanied by 'all the apparatus of showmanship'.[4] The responsible authority, Joint Task Force One, arranged for extensive media coverage, aiming to make the test program 'the *best*-reported as well as the *most*-reported technical experiment of all time'.[5] Absolutes abounded in descriptions of this

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[1] A recording of the broadcast is available as 'Bikini Atom Bomb Test', Screensound: 7HT Collection, AUDN d16 2051. For details and description see *SMH*, 1 July 1946, p. 1; 2 July 1945, p. 3.
[2] The *Australian Women's Weekly (AWW)* explained that the skin of pigs closely resembled human skin, 29 June 1946, p.17. In fact the fate of the test animals caused one of the major public relations problems for American authorities, see Stephen Hilgartner, Richard C Bell, and Rory O'Connor, *Nukespeak*, Penguin, Harmondsworth, 1982, p.73.
[3] *Tribune*, 2 July 1946, p. 4.
[4] *SMH*, 1 July 1946, p. 2.
[5] Quoted in Hilgarter, Bell and O'Connor, *Nukespeak*, p.73. See also Neil O Hines, *Proving ground: an account of the radiobiological studies in the Pacific, 1946-1961*, University of Washington Press, Seattle, 1962, p. 32.

scientific spectacular, with the chief of the air force photographic crew boasting that the first test would be 'the most photographed event in history'.[6]

Australia was not left out of the 42,000 strong cast of this atomic circus. By virtue of its appointment to the newly-formed United Nations Atomic Energy Commission (UNAEC), Australia was invited to send press and government representatives to observe the tests.[7] SHK Spurgeon, Australia's Naval Attaché in Washington, attended on behalf of the government and the armed services, finding his way into the *Official Pictorial Record* of the tests amidst a group of 'foreign' observers.[8] EW McAlpine, the Editor-in-Chief of Consolidated Press Ltd, was nominated as press observer by the Australian Newspaper Proprietors Association, which undertook to make his coverage available to all media outlets.[9] McAlpine joined 200 or so other journalists from a variety of press agencies, even travelling aboard the 'Atomic Express', a US Navy train that carried journalists and scientists across America on their way to Bikini.[10]

As a result of this massive public relations effort, a steady stream of newspaper articles appeared in the weeks leading up to the tests, detailing some of the preparations and helping to establish a feeling of expectation.[11] On 27 June, an evening lecture on cosmic rays by Melbourne University's professor of physics, Leslie Martin, drew an unexpectedly large crowd of 500 people, overwhelming the 200 seat lecture theatre. This sudden interest in nuclear physics, it was claimed, was 'whetted by the forthcoming atomic bomb test at Bikini Atoll'.[12] 'All the world is waiting for the results of the atomic

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[6] Quoted in, Paul Boyer, *By The Bomb's Early Light: American thought and culture at the dawn of the atomic age*, Pantheon Books, New York, 1985, p.83

[7] 'United States Atomic Bomb Tests on War Vessels', memorandum from the Secretary of Defence to the Minister, 23 May 1946, NAA: A5954, Box 1384/3. The USA invited observers from all of the countries represented on the UNAEC, Hines, *Proving Ground*, p.32. See also: *Argus*, 31 May 1946, p. 2.

[8] The photograph of Spurgeon and others is titled 'The Eyes Have It', Joint Task Force One, The Office of the Historian, *Operation Crossroads - The Official Pictorial Record*, WH Wise & Co., New York, 1946, p. 214.

[9] Memorandum from SS Brown (PM's Department) to the Secretary of External Affairs, 23 May 1946, NAA: A461/2 H341/1/1; *Argus*, 31 May 1946, p. 2.

[10] *SMH*, 11 June 1946, p. 3.

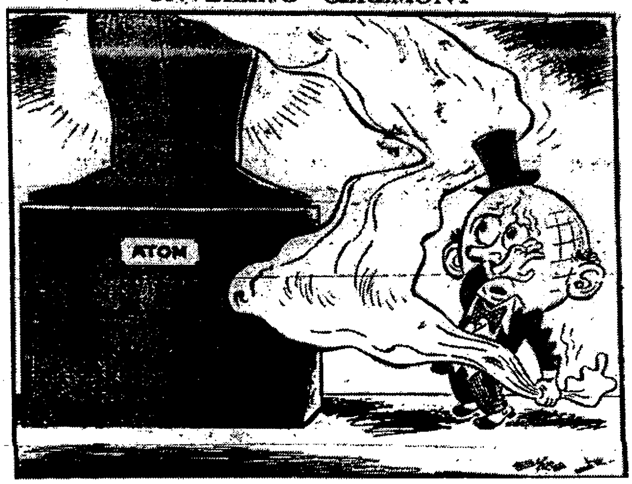
[11] For example: 'How atom bomb test will be recorded', *Age*, 6 May 1946 p. 2; 'Question marks surround atoll in West Pacific', *Age*, 29 May 1946, p. 2; 'Three Australians to see atomic bomb tests', *Argus*, 31 May 1946, p.2; 'Atom bomb tests grimly awaited', *SMH*, 4 June 1946, p. 3; 'Observers leave for Bikini', *SMH*, 11 June 1946, p. 3

[12] *Argus*, 28 June 1946, p. 1.

bomb tests', claimed the *Listener-In*.[13] Even the *Sydney Morning Herald*, which commented in an editorial that the event had been 'heavily dramatised in the American fashion', included a 'Programme for Bikini' which summarised the bomb test as if it was the latest Hollywood epic, listing 'Title', 'Scene', 'Target' and 'Director'.[14]

The publicity barrage helped fashion the tests into an opportunity denied by the suddenness of Hiroshima. A cartoon in the *Sydney Morning Herald* showed the world nervously tugging the cover from a large, gleaming statue, labelled 'ATOM'.[15] Bikini was to provide the Atomic Age with its formal 'Unveiling Ceremony', a chance to bring the inchoate anxieties of the past year into focus. 'It is as though the first, not the fourth atomic bomb were being discharged', the newspaper noted.[16] Just in case there might be any lingering doubts about the event's significance, US authorities labelled it 'Operation Crossroads'. 'Civilization itself literally stands at the crossroads', the Commander of Joint Task Force One usefully explained.[17] Editorial writers eagerly followed suit, finding upon an isolated coral atoll the latest 'crossroads of mankind'. One last chance to mend our ways, to bend the power of science towards survival and not destruction. Or were we all but a bunch of pigs in fancy dress, awaiting our doom aboard a rusty, sinking ship.

UNVEILING CEREMONY




The idea that the detonation of a horrific new weapon could somehow hold hope of future peace and prosperity was best understood by regarding the whole extravaganza as

[13] *Listener-In*, 29 June-5 July 1946, p. 2.
[14] *SMH*, 1 July 1946, p. 1, 2.
[15] *SMH*, 1 July 1946, p. 2.
[16] *SMH*, 1 July 1946, p. 2.
[17] Joint Task Force One, *Operation Crossroads - The Official Pictorial Record*, p. 6.

something more than a mere bomb test— it was an 'experiment'. In the break between the two tests, a group of high-powered American scientists, politicians and military officers, flew into Australia from Bikini to share their thoughts on the crossroads dilemma. The Bikini tests could be justified in terms of 'the human interests of... people everywhere', Senator Salstonall explained to a luncheon gathering, for they were 'entitled to know how atomic energy might be controlled and used for the good of mankind'.[18] 'I prefer to call it an experiment of atomic energy', he added, 'we want it for peace not for war'.[19] Likewise, Karl Compton told physicists in Melbourne that 'the tests could be regarded as well-planned long-range scientific experiments'.[20] As an 'experiment' the bomb tests were destined to play a role in the broader progress of science. They were, newspapers agreed, 'not wholly military in character', but rather 'a further milestone in the advancement of knowledge'.[21]

Experiments are open-ended, they generate new knowledge, their results are never entirely predictable. This is not altogether reassuring when one is experimenting upon weapons capable of mass annihilation, but progress could not be hampered by fear. Progress demanded new knowledge, the conquest of new dangers, but an ongoing program of experimentation required trust.

## A vast laboratory

The continent of Australia was rich in the raw material of scientific endeavour. Everywhere was novelty. 'No country', wrote the naturalist PP King, 'ever produced a more extraordinary assemblage of indigenous productions— no country has proved richer than Australia in every branch of natural history'.[22] There were plants to be pressed, animals to be shot and skinned, as collectors set about transforming this array of biological wonders into the artefacts of scientific study. But European invaders brought more than bottles and pins to hold their specimens in place, they brought a new

[18] *Age*, 16 July 1946, p. 2.
[19] *Argus* 16 July 1946, p. 2.
[20] 'The Bikini atomic bomb trials', *Australian Journal of Science*, vol. 9, no. 2, October 1946, p. 72.
[21] *SMH*, 1 July 1946, p. 2; *Age* 1 July 1946, p. 2.
[22] Quoted in Ann Moyal, *A bright and savage land*, Penguin, Melbourne, 1993, p. 29.

system of classification and nomenclature to embed such novelties firmly within the corpus of science.[23] Collection was just the first stage in a complex system of knowledge production, where ultimate authority usually rested in the scientific centres of Europe. Local naturalists exchanged their specimens for patronage, fuelling the careers of the eminent few who pronounced from afar upon the meaning of antipodean experiments in creation.[24]

By the early years of the twentieth century, other forms of novelty were being observed upon the Australian landscape. Political and social innovations such as female suffrage and industrial arbitration were hailed as intriguing 'experiments' in the very nature of democracy. Australia developed a reputation as a 'social laboratory' where the powers of government and organised labour were being directly employed in the interests of welfare and justice.[25] The labels were not simply metaphors. Much of the reforming energy derived from activist creeds like 'new liberalism' and progressivism, creeds that sought the broader application of scientific methods to problems of human society. Sociologists, as Helen Bourke describes, sought to ensure that the results of these 'experiments' were properly investigated and analysed.[26] 'It has been a standing reproach to the Universities of Australia', remarked W Harrison Moore, professor of law at the University of Melbourne, 'that in a country that is recognised as the greatest laboratory of economic experiment in the world, they have done so little to influence those experiments or to test these results'.[27] Social innovation might yield not only a better life, but a better understanding of society itself.

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[23] Libby Robin, 'Natural history', in Graeme Davison, John Hirst and Stuart Macintyre (eds), *Oxford companion to Australian history*, Oxford University Press, Melbourne, 1998, pp. 461-2; Colin Finney, *To sail beyond the sunset: natural history in Australia, 1699-1829*, Rigby, Adelaide, 1984; Colin Finney, *Paradise revealed: natural history in nineteenth-century Australia*, Museum of Victoria, Melbourne, 1993.

[24] Centre/periphery relationships and systems of imperial exchange have received considerable attention, see, for example, the papers in: Nathan Reingold, and Marc Rothenberg (eds), *Scientific colonialism: a cross-cultural comparison*, Smithsonian Institution Press, Washington, 1987; RW Home, and Sally Gregory Kohlstedt (eds), *International science and national scientific identity*, Kluwer, Dordrecht, 1991.

[25] Francis G Castles, 'Social laboratory', in Graeme Davison, John Hirst and Stuart Macintyre (eds), *Oxford companion to Australian history*, Oxford University Press, Melbourne, 1998, pp. 592-3.

[26] Helen Bourke, 'Sociology and the social sciences in Australia, 1912-1928', *Australian and New Zealand Journal of Sociology*, vol. 17, no. 1, March 1981, pp. 26-35.

[27] Quoted in Bourke, 'Sociology and the social sciences in Australia', p. 27.

Experiments in nation building, however, were not limited to the adjustment of social and political institutions. The progress of Australia was also an experiment in the settlement of land, the experience of climate, and the adjustment of race. The White Australia policy embodied some of the most cherished ideals of the would-be nation builders, but it also demanded a stern test of British manhood. In 1913, Littleton Groom introduced a lecture by Anton Breinl, the director of the Australian Institute of Tropical Medicine. 'Australians had taken upon themselves the task of settling the northern parts of their continent', Groom noted, though 'it had yet to be proved that that was a policy which, according to the laws of nature, could be justified'.[28] Could white civilisation flourish in the tropical north? Were people of British stock able to live and work in the heat and humidity without suffering degeneration and disease?[29]

Breinl surveyed the factors affecting white settlement in the tropics. He noted that conditions were generally more favourable in northern Australia than in other tropical regions, but argued that 'knowledge of the effect of climate was still fragmentary', and that 'careful and detailed research' was necessary before a firm opinion of the nation's prospects could be given. Australia's hopes for 'effective occupation' constituted 'one of the most far-reaching experiments of modern times', Breinl suggested, 'an experiment that certainly justified the application of unlimited effort'.[30] Breinl's successor at the helm of the Institute of Tropical Medicine, Raphael Cilento, similarly described Australia's attempts at settlement of the north as 'a huge, unconscious experiment in acclimatization'.[31] While the precise outcomes of this experiment were unknown, there was growing confidence in the ability of medical science to meet the challenge of public

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[28] *Argus*, 25 November 1913.
[29] For an examination of climatic anxieties see David Walker, *Anxious nation: Australia and the rise of Asia 1850-1939*, University of Queensland Press, St Lucia, 1999, ch. 11; David Walker, 'Climate, civilisation and character in Australia, 1880-1940', *Australian Cultural History*, no. 16, 1998, pp. 77-95; David Walker, 'The curse of the tropics', in Tim Sherratt, Tom Griffiths and Libby Robin (eds), *A change in the weather: climate and culture in Australia*, Halstead Press, Sydney, 2003 (forthcoming); Warwick Anderson, *The cultivation of whiteness: science, health and racial destiny in Australia*, Melbourne University Press, Melbourne, 2002.
[30] *Argus*, 25 November 1913. See also Anton Breinl, 'The influence of climate, diseases and surroundings on the white race living in the tropics', in JW Springthorpe (ed.), *Therapeutics, dietetics and hygiene*, vol. 2, James Little, Melbourne, 1914, p. 996.
[31] Raphael Cilento, *The white man in the tropics: with especial reference to Australia and its dependencies*, Commonwealth of Australia, Department of Health, Melbourne, 1925, p. 9. See also Walker, *Anxious nation*, p. 150.

health.[32] 'Science would come to their aid', Groom confidently predicted, 'the settler would not go out alone, but accompanied by the best scientific brain that could be sent with him'.[33]

Like any other experiment, Australia's development would proceed under scientific direction, learning from its errors, and building on its gains. The difficulties facing the nation, HW Gepp insisted in January 1930, could best be understood by visualising the country as 'a vast laboratory where one of the most virile races on earth is engaged in experimenting with almost unknown resources in an attempt to develop a new tradition of national prosperity and social freedom'.[34] Gepp had been appointed chairman of the Development and Migration Commission, established in 1926 to 'co-ordinate the whole of the developmental activities of Australia'.[35] He was also, gushed *Science and Industry*, 'a brilliant metallurgical chemist, an engineer of considerable attainments, and a leader of men', who had forged a substantial reputation in the successful development of the Electrolytic Zinc plant near Hobart.[36] A strident advocate of scientific methods and 'national efficiency', Gepp actively contributed to the government's efforts to harness science to national goals.[37] 'The settlement and growth of Australia' was, he argued, 'a scientific proposition'.[38]

But if the aims of the experiment seemed clear enough, what of methods and results? As 'daring adventurers' who had 'opened up many avenues of human progress',

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[32] Warwick Anderson, 'Geography, race and nation: remapping "tropical" Australia, 1890-1930', *Historical Records of Australian Science*, vol. 11, no. 4, 1997, pp. 457-68; Warwick Anderson, *The cultivation of whiteness: science, health and racial destiny in Australia*, Melbourne University Press, Melbourne, 2002.
[33] *Argus*, 25 November 1913.
[34] Herbert William Gepp, *Address by HW Gepp at the Sydney Rotary Club, 21st January 1930*, ST Leigh & Co, Sydney, 1930, p. 4.
[35] Quoted in Michael Roe, 'H.W. Gepp: His Qualification as Chairman of the Development and Migration Commission', *Papers and Proceedings: Tasmanian Historical Research Association*, vol. 32, no. 3, September 1985 1985, p. 95. For more on the Commission see Michael Roe, *Australia, Britain and migration*, Cambridge University Press, Cambridge, 1995, chs 4 & 5.
[36] 'Mr HW Gepp, industrial scientist', *Science and Industry*, vol. 1, no. 4, August 1919, p. 247. For more biographical detail see Roe, 'HW Gepp', pp. 95-107.
[37] Gepp's involvement in the Advisory Council on Science and Industry and the creation of CSIR are described in Sir George Currie and John Graham, *The origins of CSIRO: Science and the Commonwealth Government 1901-1926*, CSIRO, Melbourne, 1966, and Roe, 'HW Gepp', pp. 106-7. See also Stuart Macintyre, *1901-1942: The succeeding age, Oxford history of Australia*, vol. 4, Oxford University Press, Melbourne, 1986, pp. 215-6.
[38] HW Gepp, 'Address at the Sydney Rotary Club', p. 4.

Australians had not been inclined towards a careful weighing of options. 'Some of our experiments have been wise and brilliantly successful', Gepp reflected, 'others have been foolish and wasteful'. An honest assessment of the national scorecard revealed that 'when technical, political and social experiments have been made in the true scientific spirit, they have reaped a splendid reward'. On the other hand, Gepp concluded, 'when action had been taken without sufficient forethought, we have gone hopelessly astray'. Australia's bold experiment, 'one of the most courageous spectacles in the modern world', demanded imaginative leadership, detailed planning, and scientific expertise.[39] Gepp might have expected his Commission to help lead the way, but within a few months it was gone, dismantled by the incoming Scullin government.

The establishment of the Woomera rocket range brought a new round of experimentation to Australia, as the inland proved its worth once again as an 'open air laboratory'.[40] 'Australians... have reason to be not a little grateful and proud that this vast scientific project is being so purposefully developed in their desert lands', Charles H Holmes remarked in *Walkabout*.[41] While Woomera's main purpose was to boost the empire's flagging arsenal, its experiments promised new knowledge as well. The rocket range 'will add greatly to our scientific prestige', noted an article in *Aircraft*, 'not to mention the valuable addition to our store of scientific knowledge'.[42] Similarly, the Minister for Supply, Howard Beale, sought to justify a new round of atomic tests at Maralinga by suggesting that they would increase 'our knowledge in connection with the general development of atomic energy'. In particular, he explained, the tests would 'expand our knowledge about the problems of radiation'.[43] With the supposed clean-up of Maralinga continuing to stir controversy, it seems the experiment goes on... and on.

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39 ibid., pp. 4-5.
40 Ivan Southall, *Woomera*, Angus & Robertson, Sydney, 1962, p. 3.
41 Charles H Holmes, 'Half-way round the world to test atomic weapons', *Walkabout*, vol. 18, no. 7, 1 July 1952, p. 15.
42 'Space weapons', *Aircraft*, vol. 26, no. 12, September 1948, p. 44.
43 Howard Beale, 'Why we hold A-tests in Australia', press release, 6 August 1956, NAA: A6456/3 R047/011.

The Australian government certainly expected that the atomic 'experiments' would yield valuable information, though not necessarily through the analysis of scientific data. Hopes that Australia might play a leading role in the Atomic Age were being thwarted by American attempts to lock up the 'atomic secret'. Cooperation with Britain in a project of such significance promised to free the flow of data. But even so, the Menzies government took on its role as willing subordinate without any agreement on scientific participation.[44] Australia provided land and logistical support, Britain did the science. And so, the system of colonial exchange continued, as Australia offered its raw materials in the hope of reflected glory.

## The tree of knowledge

In March 1954, Bikini Atoll was the focus of world attention once more as the USA exploded a massive hydrogen bomb, at least six hundred times more powerful than the bomb that devastated Hiroshima. As humanity sought to comprehend the accelerating horror of the arms race, it was still more disturbing to realise that the power of the explosion had 'completely surprised' the bomb's designers.[45] More than ever, scientists seemed to be experimenting with the future of civilisation itself.

The blast inspired AD Hope to reconsider the fate of Prometheus, the titan who had defied Zeus to bestow the gift of knowledge upon humankind. Shackled still to his rocky prison, Hope's Prometheus 'saw one vast flash to northward blast the plain'. When Hermes appeared shortly after to strike off his chains, Prometheus wondered if Zeus had at last forgiven his transgression. But this was not freedom, Zeus had ordered a new punishment. Mankind had discovered the means of its own destruction, and

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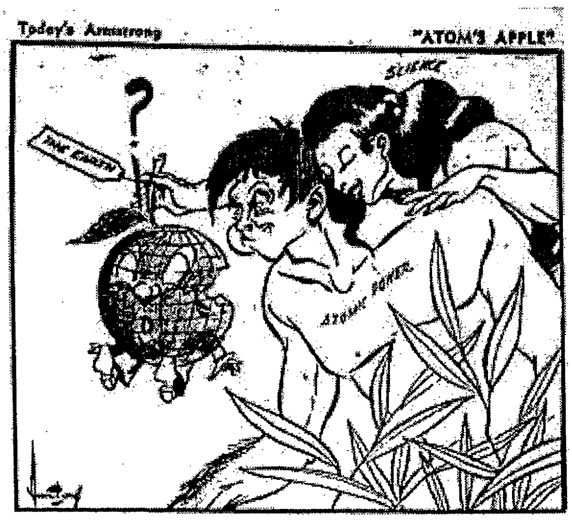
[44] Tim Sherratt, 'A political inconvenience: Australian scientists at the British atomic weapons test, 1952-3', *Historical Records of Australian Science*, vol. 6, no. 2, 1985, pp. 137-52; Tim Sherratt, 'Australian scientists at the British atomic weapons tests', in Robyn Williams (ed.), *Science Show II*, Thomas Nelson, Melbourne, 1986, pp. 216-9. For more on the politics of Australia's atomic ambitions see: Alice Cawte, *Atomic Australia: 1944-1990*, New South Wales University Press, Sydney, 1992; Wayne Reynolds, *Australia's bid for the atomic bomb*, Melbourne University Press, Melbourne, 2000.

[45] *Herald*, 18 March 1954, p. 2.

Prometheus was doomed to scatter the ashes, 'judging that theft of fire from which they died'.[46]

There was no shortage of literary allusions to warn of the dangers of knowledge.[47] A few days after the attack on Hiroshima, the *Sydney Morning Herald* nervously exclaimed that scientists had 'called into being a Frankenstein monster, which, if unfettered, has the power to destroy its creators'.[48] Armstrong's cartoon in the *Argus* retold the story of 'Atom and Eve', with science as the temptress offering an apple-sized earth to the hungry, hulking figure of 'atomic power'.[49] The all-conquering march of science was accompanied by a persistent, nagging fear that knowledge came at a price. The very uncertainty which invested science with its capacity for innovation, also threatened unexpected consequences. What mysterious forces might the quest for knowledge unleash upon an unsuspecting world? The seeker of truth was also at risk, for curiosity could lead to obsession, independence to indifference. The noble journey of discovery could take a darkened turn, leading the scientist away from human values and concerns.[50] As with Faust and Frankenstein, hubris unchecked blazed a path to damnation.




[46] AD Hope, 'Prometheus unbound (Bikini, March 1, 1954)', *Voice*, vol. 3, no. 7, April 1954, p. 21.
[47] See, for example, Roger Shattuck, *Forbidden knowledge: from Prometheus to pornography*, Harcourt Brace & Company, San Diego, 1996.
[48] *SMH*, 9 August 1945, p. 2. See also, *Age*, 29 May 1946, p. 2.
[49] Argus, 8 August 1945, p. 3. For more on images of the bomb in Australian newspapers, see Rodney B James, 'Representation of the Bomb in Australian art and culture, 1945-1959', MA, Monash University, 1990. The use of such allusions is extensively explored in Spencer Weart, *Nuclear fear: a history of images*, Harvard University Press, Cambridge, Massachusetts, 1988.
[50] For various literary manifestations of the 'inhuman', 'impersonal or 'amoral' scientist see Roslynn D Haynes, *From Faust to Strangelove: representations of the scientist in Western literature*, Johns Hopkins University Press, Baltimore, 1994.

The early decades of the twentieth century brought rapid advance in our understanding of the structure of the atom. It was a clear example of science's increasingly triumphant conquest of nature. And yet for all these gains, 'Sirius' noted in the *Sydney Morning Herald*, 'the mystery of it all appears deeper than ever'.[51] The atom had shown 'extraordinary tenacity in holding its secrets' and 'might remain an insoluble mystery for generations to come'.[52] It was only through a 'willingness to incur grave dangers' that physicists had 'raised the veil' from some of its 'internal mysteries'.[53] In this container that seemed 'infinitely little' were locked 'forces of simply astounding magnitude'.[54]

Scientists were forging ahead into worlds unknown, leaving behind the certainties of everyday life to embrace the arcane wonders at the very heart of nature. The 'splitting of the atom' in 1932 was hailed as the fulfilment of the 'alchemists' dream of transmuting matter'.[55] Physics was 'the new alchemy', its secrets available only to the initiated. 'Science has passed beyond the realm of the ordinary man into a world of electrons, quanta, potentials and Hamiltonian functions in which two and two do not necessarily make four', observed the *Argus*, 'the layman can but look on and wonder'.[56]

Long before the bomb, the atom was a realm of power and mystery, luring explorers beyond the limits of conventional reality. Spencer Weart examines such continuities to argue that images attached to atomic energy drew from 'old, autonomous features of our society, our culture, and our psychology'.[57] The technology served as a 'receptacle' for 'universal anxieties and hopes'.[58] Similarly, the physicists' fondness for lifting veils and probing hidden recesses might reflect some of the aggressively masculine traits that have long characterised science's attempt to win domination over a 'nature' imagined as female.[59] The quest for new knowledge recycles the ambitions and anxieties of the past,

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[51] *SMH*, 19 October 1932, p. 9.
[52] *Argus*, 27 March 1934, p. 6; *Argus*, 11 September 1925, p. 11.
[53] *Argus*, 3 June 1924, p. 15; *Argus* 4 September 1920, p. 9.
[54] *Argus* 17 January 1914, p. 18.
[55] *Argus*, 2 May 1932, p. 7; *Argus* 7 May 1932, p. 22.
[56] *Argus* 7 May 1932, p. 22.
[57] Weart, *Nuclear fear*, p. 421.
[58] Weart, *Nuclear fear*, p. 424.
[59] Brian Easlea, *Fathering the unthinkable: masculinity, scientists and the nuclear arms race*, Pluto Press, London, 1983.

but their meanings are reconstituted within specific historical circumstances. This uneasy fascination with the mysteries of the atom may have drawn on 'hidden' fears and desires, however, it was also part of an ongoing discussion about the need for control and the problems of specialisation.

George Knibbs, the first Commonwealth Statistician and director of the Commonwealth Institute of Science and Industry, held a typically progressive faith in the possibilities of perception beyond the material realm.[60] In 1909, he suggested to Littleton Groom that 'besides the mere sense-contents interpreted by the intellect' one should pay heed to the 'subtler perceptions' of the 'subliminal self'.[61] Such perceptions would open new avenues of progress as conventional modes of thought proved inadequate to cope with the rapidly increasing complexity of modern science. What was needed, Knibbs argued in 1927, was to lift 'to a higher plane' the very conception of existence itself. But could humankind keep up with conceptual demands of science? Already, he admitted, man's 'intellectual advance may have outstripped his ethical progress'. 'It may well be', the elderly scientist observed, 'that all higher knowledge may have to be communicated to the high priests of science under a system of stern discipline, as in ancient Egypt and elsewhere'. The progress of science would bring grave new challenges, but, Knibbs concluded 'man has no escape from the consequences of eating from the tree of knowledge'.[62]

While an educated gentleman of the nineteenth century might have been able to keep abreast of developments across a number of scientific fields, his twentieth century counterpart was more likely to be swamped by the sheer pace and volume of research. The *Sydney Morning Herald* wondered whether the amount of knowledge drawn from 'the bottomless well of science' would soon exceed an individual's capacity to learn. 'Though the time available to an individual for the acquisition of knowledge is strictly limited', it

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60 Susan Bambrick, 'Knibbs, Sir George Handley (1858-1929)', in Bede Nairn and Geoffrey Serle (eds), *Australian dictionary of biography*, Melbourne University Press, Melbourne, 1983, pp. 620-1.
61 Letter from GH Knibbs to LE Groom, 5 February 1909, Groom papers, NLA: MS 236, series 1. See also George H Knibbs, 'Science and its service to man', *Report of the 16th meeting of the Australasian Association for the Advancement of Science*, Wellington, 1923, pp. 1-46.
62 GH Knibbs, 'Science and man', letter to the editor, *Argus*, 9 September 1927, p. 17.

noted, 'the demands upon it are ever growing'. It pitied the poor medical student whose studies had recently been extended to six years, adding that 'if scientific discovery is to go on at its present rate the course may soon have to be made seven or eight or ten years'.[63]

But it was not merely the amount of new knowledge that tested humankind's intellectual capacities, it was its content. The inner world of the atom was mysterious enough, without the theory of relativity to disturb familiar concepts of time and space. The hapless amateur, who sought to make sense of Einstein's revolutionary ideas, was deterred by a chorus of learned scientists willingly professing their own befuddlement.[64] 'It is doubtful if anybody in Australia thoroughly understands the theory in all its aspects', admitted the mathematician CE Weatherburn in the *Melbourne University Magazine*. Furthermore, he added, if Einstein was correct then 'only a small percentage of physicists and mathematicians can ever hope to understand the laws of nature'.[65] George Knibbs himself was quoted as finding Einstein's conception 'quite unintelligible'.[66] What hope was there for the layman?

The accelerating rush of knowledge and ideas was transforming science itself. 'The whole tendency of modern science is to the most rigid specialisation', observed the *Sydney Morning Herald* in 1911. The individual scientist was working to gain expertise over an ever-diminishing corner of their discipline. There was danger here, the newspaper warned, for 'the conquests of science' had been 'so complete... so irresistible' that the 'man of science', labouring in his increasingly narrow rut, was 'apt to settle for mere craftsmanship'. If science remained locked within its disciplinary boundaries it would quickly become 'sterile of ideas'. Already, the newspaper argued, the tendency to 'despise generalisers' was a sign of science's 'descent from a religion to a creed'.[67]

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63 *SMH*, 11 August 1934, p. 14.
64 Stanley Goldberg, *Understanding relativity*, Birkhauser, Boston, 1984, p. 235-6.
65 CE Weatherburn, 'On general relativity and gravitation', *Melbourne University Magazine*, vol. 14, October 1920, pp. 128-9.
66 *Argus* 21 January 1926, p. 7. See also EFJ Love's comments, *Argus*, 14 September 1921, p. 3.
67 *SMH*, 9 January 1911, p. 8.

DK Picken, Master of Ormond College, was also worried by science's growing tendency towards isolation. Writing in the *Australian Quarterly*, he noted that once science was removed from 'the main stream of cultured criticism, into the close preserves of the expert', it developed 'a cult something like that of "oral tradition"— passing, not exactly from mouth to mouth, but from mind to mind, by mutual conventions of the initiate (and the elect)'. The outsider was increasingly unwelcome within this secluded preserve, which would inevitably become 'a prison for the thought' of its devoted attendees.[68] For the sake of both science and culture, the abstract realms of modern science had to be open to the scrutiny of critical minds. 'Science should certainly not be the possession of a few', asserted the *Age*, 'that is harmful to the many who are ignorant, and not beneficial to the few who are set apart'.[69]

Even as scientists pondered means of setting the scientific spirit a-moving amongst a seemingly indifferent public, the process of research itself was steadily widening the gulf between them. The unyielding flood of increasingly abstract and specialised knowledge made it more difficult than ever for the public to participate in the assessment of scientific progress. And so it continued. 'Our generation is slightly overwhelmed by science', noted the *Sydney Morning Herald* in 1951, 'it challenges the attention of every citizen almost from the cradle to the grave'. This proliferation had caused 'confusion in the minds of millions of people', confusion which scientists seemed unable to redress. 'Overspecialisation— ... the anxious pursuit of more and more knowledge about less and less' had rendered the scientist unable to envisage his own work in relation to the problems of society'. Consequently, 'a great gulf' threatened 'to divide the scientist and the ordinary citizen'.[70] Education, the newspaper concluded, was necessary on both sides.

The release of atomic energy reinforced both the revolutionary potential of science and its growing separation from human values and experience. Like radio listeners tuned in to the blast from Bikini, the public were but spectators in an experiment to determine

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[68] DK Picken, 'Science and culture', *Australian Quarterly*, vol. 5, no. 19, September 1933, p. 77.
[69] *Age*, 8 January 1916, p.
[70] *SMH*, 28 July 1951, p. 2. See also: *SMH*, 16 August 1952, p. 2; *SMH* 14 January 1956, p. 2.

the fate of civilisation.[71] With scientists claiming dominion over the mysterious 'atomic secret', Knibbs's vision of a strictly-controlled priesthood seemed closer than ever. Knowledge gave scientists authority, but did it win them trust? The gulf that separated science from its public could be measured either in superiority or suspicion. An 1894 poem entitled 'The modern spirit' captured this ambivalence:

> For gain we soar in science high
> With flight that naught can fetter;
> Just as the condor seeks the sky—
> *To view the carrion better.*[72]

## The control of weather

William Wood was worried about the weather. In March 1956, he wrote to Prime Minister Menzies noting that recent poor weather conditions coincided with 'the explosion of a number of Atom bombs in the world'. Had this connection had been properly examined?, he asked. 'As few of us can gauge the consequences of our actions with any certainty', he added, 'why should Atom bomb experiments be likely to behave much differently?'[73]

The reply from the Prime Minister's Department reassured Mr Wood that 'leading International Meteorological opinion' was satisfied that the effect of an atomic explosion was 'comparable only with that of a small isolated storm and could have no important general influence on weather conditions'.[74] Wood, however, was not convinced, and the announcement that a further series of atomic tests was to be held at Maralinga spurred him to write once more. 'What else will this certainly mean for us here', he demanded angrily, 'than that the few days of nice sunshine we are enjoying now will come to an end immediately these confounded tests begin'? There would be 'more weeks of cloudy days, he insisted, more 'blustery, off-quarter winds', as well as

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[71] For the way tests were portrayed and the encouragement of a 'spectator democracy' see Scott Kirsch, 'Watching the bombs go off: photography, nuclear landscapes, and spectator democracy', *Antipode*, vol. 29, no. 3, 1997, pp. 227-55.
[72] PL, 'The modern spirit', *Bulletin*, vol. 14, no. 741, 28 April 1894, p. 15. Emphasis in original.
[73] Letter from William F Wood to Prime Minister, 22 March 1956, NAA: A6456/3, R087/016.
[74] Letter from AS Brown (Secretary PM's Department) to WF Wood, 3 May 1956, NAA: A6456/3, R124/007.

'other signs of serious atmospheric disturbance': 'Do you want to starve us, sir, as very few crops in Australia will now grow in a normal manner?'[75] No further reply was sent.

William Wood was not alone in his fears. As atmospheric testing of both atomic and hydrogen bombs continued throughout the 1950s, many people around the world wondered whether abnormal weather might result.[76] 'Every time an atomic bomb goes off', the *Sydney Morning Herald* noted, 'people get "weather conscious"'.[77] Might not this powerful new force upset the balance of nature? The possibility of human influence upon the weather, however, had been a matter of hopeful conjecture in Australia since the 1860s.[78] As settlers pushed out into regions of ever-lower rainfall, their ambitions were fed by the theory that 'rain follows the plough'. Cultivated soil, it was argued, absorbed rainfall more easily, releasing it slowly back into the atmosphere to create a moister, more hospitable environment. Others argued that it was not the plough, but trees that brought rain. In 1867, the Victorian parliament was advised that a system of forest planting and conservation would lead to 'a more continuous rainfall in districts that are now subject to long and excessive droughts'.[79]

The long drought of the 1890s drained settlers of their confidence that the climate would gradually yield to human endeavour. Instead came efforts to tackle the menace of drought head on, by actually making rain. In perhaps the most celebrated, and probably the most noisy, attempt, Queensland meteorologist Clement Wragge arranged for a battery of six Stiger Vortex guns to be discharged into the skies over Charleville. Having observed the use of the large, funnel-shaped guns to disperse hailstorms over Italian vineyards, Wragge concluded that they might be usefully employed against 'the heavy

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75 Letter from WF Wood to Prime Minister, 11 September 1957, NAA: A6456/3, R124/007.
76 See, for example: 'A-Blast "no effect on weather"', *SMH*, 16 October 1953, p. 1; 'Investigation of European weather', *SMH*, 13 September 1954, p. 1; 'Weather-man's H-bomb theory', *SMH*, 7 April 1955, p. 3; 'The H-bomb and the English summer', *SMH*, 17 September 1958, p. 2. For a history of atmospheric nuclear testing in the 1950s, see Robert Divine, *Blowing on the wind: the nuclear test ban debate, 1954-1960*, Oxford University Press, New York, 1978.
77 'So the weather's been odd! Well those A-bombs… ', *SMH*, 11 July 1956, p. 2.
78 Geoffrey Blainey, *A land half won*, Sun Books, Melbourne, 1983, pp. 348-50; Geoffrey Bolton, *Spoils and spoilers - Australians make their environment, 1788-1980*, George Allen & Unwin, Sydney, 1981, p. 30; Jenny Keating, *The drought walked through: a history of water shortage in Victoria*, Department of Water Resources, Victoria, Melbourne, 1992, pp. 39-40.
79 Quoted in Blainey, *A land half won*, p. 350.

"dry" cloud masses of continental Australia', which 'so often promise rain and then pass away without any precipitation'. Firing a series of rounds into the clouds would 'probably result' in a 'downpour', Wragge suggested. In any case, he added, 'the experiment is *thoroughly worth trying*'.[80]

Wragge's efforts were rewarded with a brief shower of rain and the explosion of two of the guns. Other would-be rainmakers were even less successful. Professor Pepper tried 'tapping the clouds' with a large kite laden with explosives, while Captain Meaburn used a rocket.[81] JB Balsillie, on the other hand, sought to stimulate the clouds using a charged, metal-coated balloon connected to an x-ray tube.[82] In 1944, the *Argus* surveyed Australian attempts at rainmaking, observing that for all these 'interesting experiments', the weather remained 'unconquered'. 'The grim spectre of drought is one of the few enemies which man can see but cannot destroy', it concluded, 'with all his scientific knowledge he is powerless to kill it'.[83]

Optimism was revived only a few years later with news that the CSIR had embarked on a series of 'secret experiments to produce rain'.[84] Soon it was confirmed that dry ice released into clouds from an RAAF Liberator had produced a brief shower.[85] Experiments were in their early stages, the scientists stressed repeatedly as the cloud-seeding program continued, but the growing sense of excitement and expectation was difficult to suppress.[86] At war's end, the CSIR Division of Radiophysics had switched from developing radar systems to investigating the physics of clouds.[87] According to

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80 Clement L Wragge, 'The Stiger Vortex', *Wragge's Australasian Almanac and Weather Guide*, Brisbane, 1902, p. 183. See also Tim Sherratt, 'The weather prophets', part of the *Federation and Meteorology* online resource <http://www.austehc.unimelb.edu.au/fam/0006.html>.

81 'Man cannot yet cause rain - But Australia has seen some interesting experiments in the past', *Argus*, 9 December 1944, Weekend Magazine, p. 2.

82 Rupert S Charlett, 'Will man ever control the weather or the rain?', *Argus*, 4 February 1939, Weekend magazine, p. 9.

83 'Man cannot yet cause rain', p. 2.

84 *SMH*, 25 January 1947, p. 1.

85 *SMH*, 12 February 1947, p. 3.

86 See for example: 'We mean to alter the weather', *SMH*, 7 October 1951, p. 9; 'They "seed" the clouds', SMH, 10 September 1956, Aviation supplement, p. 6; 'Rain – is this the year of the pay off?', *Sunday Herald*, 12 May 1957, p. 27.

87 RW Home, 'Rainmaking in CSIRO: The Science and Politics of Climate Modification', in Tim Sherratt, Tom Griffiths and Libby Robin (eds), *A change in the weather: climate and culture in Australia*, Halstead Press, Sydney, 2003 (forthcoming).

Richard Casey in 1955, the Australian program, inspired by the leadership of EG Bowen, was 'in the forefront of research into weather modification'. 'Within a certain time', he added, 'it will probably be possible to amend the weather pattern in Australia during periods when suitable clouds exist'.[88]

An age-old dream was resurrected amidst a new age of confidence. The recent achievements of science made it seem as if the weather might at last submit to the will of humankind. Edward Teller, not content with giving the world the hydrogen bomb, predicted 'scientific control of the weather' within 10 years. 'Once the laws are known', he argued, 'it will be possible to influence the weather'.[89] The Bureau of Meteorology was rather more cautious in it pronouncements, and was at times concerned by claims attributed to the CSIRO rainmakers.[90] Nonetheless, it was not immune to the swelling sense of power. Speaking on the 50th anniversary of the Commonwealth Meteorological service, its Director, LJ Dwyer, spoke of the possibility of 'tailoring' the weather. Cyclones might be broken up, he suggested, droughts and floods prevented: 'The control of the weather will come in the future when meteorology develops to the stage where engineering can be used'.[91]

Could science forever banish the uncertainties of weather? The *Sydney Morning Herald* reflected on Dwyer's claims, suggesting that 'however smart our tailoring of the weather, there will be loose threads for centuries to come'.[92] 'There is nothing more uncertain than the atmosphere', it added. Even as the CSIRO rainmakers continued their experiments, they were forced to consult with the Attorney-General's Department to determine their responsibility should their efforts prove too successful. Could they be sued for flood damage?[93] While the power of science could not be denied, there remained the possibility that such experiments with nature might have unexpected

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88 *CPD*, vol. HofR 6, 31 May 1955, p.1221.
89 *SMH*, 13 August 1955, p. 3.
90 WJ Gibbs, 'A perspective of Australian meteorology', *Australian Meteorological Magazine*, no. 30, March 1982, p. 6; WJ Gibbs, 'A Very Special Family: Memories of the Bureau of Meteorology 1946 to 1962', *Metarch Papers*, no. 13, May 1999.
91 *SMH*, 6 January 1958, p. 5. See also, 'Science versus cyclone', *Sun-Herald*, 16 December 1956, p. 30.
92 *SMH*, 7 January 1958, p. 2.
93 *SMH*, 24 February 1958, p. 2. For some of the legal problems facing rainmakers see Home, 'Rainmaking in CSIRO'.

consequences. Australia provided ample evidence of how well-meaning attempts at 'improvement' could rebound across generations. Land clearing and overstocking had burdened fragile arid regions with the problem of soil erosion. 'Man has upset the balance of Nature', Ion Idriess observed.[94] The devastating impact of the rabbit, upon both land and economy, offered another illustration, argued HW Gepp, of the 'dangers that await the experiments of mankind in this strange new continent'.[95] The ill-founded assumptions of the present might levy an unbearable cost against future wealth and happiness.

'Modern man is a forest butcher', asserted Hugh McKay in *Smith's Weekly*. His 1923 article surveyed the profligate way in which the world's reserves of timber, oil and coal were being used to fuel the progress of civilisation. For all its technological advancement, McKay insisted, the modern age was still an 'age of trees'. Trees were essential for steel-making, for building, for paper. What would happen if the current 'wasteful destruction' of forests continued unchecked? Would newspapers, like ancient tablets, be printed on 'slabs of clay'? 'The weight of a single copy of the "Herald"... staggers the imagination', he remarked, though it could probably 'be delivered by a travelling crane'. But 'the unhappy denizens of Australia in the future ironless, coalless, treeless age' might be faced with 'a far more serious problem', McKay warned: 'Unchecked by great forests, which restore oxygen to the air by absorbing carbon from the carbon dioxide poured from a million factory chimneys, the dioxide gas would go on accumulating till it precipitated an Age of Heat, similar to that of the prehistoric times of the giant reptiles'. McKay concluded with the disturbing vision of humankind forced to retreat to the poles, wielding 'stone and cement weapons' against 'a sun-darkening horde of winged lizards, already rulers of a new heaven and masters of

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[94] Ion L Idriess, 'Sand: impressions of a large tract of dry country in the interior of Australia', *Walkabout*, vol. 1, no. 11, 1 September 1935, p. 23. See also Ion L Idriess, *The great boomerang*, Angus & Robertson, Sydney, 1941, p. 166, 205-7, discussed in Chapter 3. For a classic account of the problem of soil erosion see Francis Ratcliffe, *Flying fox and drifting sand*, Angus & Robertson, Sydney, 1947, discussed in Tom Griffiths, 'Going with the flow: Flying fox and drifting sand', in Marion Halligan (ed.), *Storykeepers*, Duffy & Snellgrove, Sydney, 2001.

[95] HW Gepp, 'Address at the Sydney Rotary Club', p. 4. See also Eric Rolls, *They all ran wild: the story of pests on the land in Australia*, Angus & Robertson, Sydney, 1969.

a new earth'.[96] The unheeding pursuit of progress might carry humanity back to a world of savagery.

The question of whether Australia's climate might be changing was a regular topic for public debate. Unseasonable bouts of hot or cold weather were sure to provoke renewed speculation, as were the nostalgic reminiscences of a long-lost childhood. Mr Henry Hodgson, aged 78, was in no doubt: 'I say emphatically that the climate has changed, especially the summers'. 'You can do anything with statistics', he continued, 'but no statistics will convince me that the climate has not changed radically'.[97] The summers of Mr Hodgson's youth were hotter, with more thunderstorms, but none of the cold, 'wintry days' of recent years. The main territory in dispute was that of memory. Responding to a similar outcry in 1950, John Hogan, the Deputy Director of the Weather Bureau, explained: 'Old people who complain about changing climate, remember only the peak periods. Looking back over their lives, these periods of exceptional weather merge together like the telephone posts down a long road'.[98] 'Outstanding events' were mistaken for 'normal'.

A similar mismatch between memory and statistics encouraged the public to believe that current conditions were beyond what would normally be expected. 'Almost every person in Melbourne who is not a meteorologist is certain that this is the coldest, wettest and windiest winter that he remembers', reported the *Argus* in 1935. But officers of the Weather Bureau were 'unmoved' by this popular consensus, referring 'unemotionally' to average temperatures and aggregate rainfalls to demonstrate there was nothing abnormal about recent events.[99] So-called 'freak' weather might well be unusual, but it was rarely unprecedented.

The winter of 1956 brought heavy rains and floods to large areas of eastern Australia. Two atomic tests had recently been completed in the Monte Bello Islands, and a further

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96 HC McKay, 'Mankind's last stand', *Smith's Weekly*, 15 September 1923, p. 29.
97 *Argus*, 29 December 1928, p. 15.
98 *SMH*, 1 July 1950, p. 2.
99 'Winter not abnormal', *Argus*, 3 August 1935, p. 21. See also 'Snow in August – Are seasons changing?', *Argus*, 16 August 1932, p. 6.

series was planned for the new test range at Maralinga. Was there a connection? At the government's request, the Bureau of Meteorology and CSIRO prepared a report examining the 'possible weather effects' of atomic explosions, though, once again, it was human memory that seemed most to blame.[100] 'In their view on the weather', the report argued, 'the majority of people have very short memories indeed, and, particularly in periods of distress due either to floods or to droughts, there is an obvious tendency to blame unusual conditions vaguely to some illunderstood cause'. The report examined past rainfall figures to conclude that the current wet period was 'unusual but not unique'. It then summarised the views of eminent meteorologists who all agreed that it was 'unlikely' that atomic or thermonuclear explosions could have any significant effect on the weather. For good measure, the report also cleared CSIRO cloud-seeding experiments in the Snowy Mountains of any responsibility for the recent floods. 'If there were to be the slightest evidence' that the CSIRO 'experiments' were implicated in these events, the report offered reassuringly, 'they would, of course, be discontinued'.[101]

An edited version of the report was published in a number of daily newspapers, attributed to the Minister responsible for CSIRO, Richard Casey.[102] 'Weather men exonerate "the Bomb"', the *Age* announced. The poor old bomb had been made the scapegoat of human insecurity, a victim of the world's flawed memory. Just as 'bad weather' in the period between 1914 and 1918 had been 'wrongly attributed to... wartime bombardments in Europe', so it was 'popular now to blame atomic explosions'.[103] But while the bomb may have been blameless, it was hardly innocent. It was a mechanism whose moment of fulfillment came in the blinding 'light of many suns', in an angry, billowing ferment of fire, wind and dust.[104] It was a weapon that entered public imagination in the form of a forbidding, mushroom-shaped cloud. The

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100 The covering letter from LJ Dwyer (Director of Meteorology) notes that the report was originally put together by FWG White (CEO, CSIRO) using information provided by the Bureau, it was then added to by Bureau staff, 13 July 1956, NAA: A6456/3, R102/001.
101 'Possible weather effects associated with atomic explosion', July 1956, NAA: A6456/3, R102/001.
102 'Weather men exonerate "the bomb"', *Age*, 18 July 1956, p. 2; 'Blame the weather, not the H-bomb', *Daily Telegraph*, 19 July 1956, p. 12.
103 'Weather men exonerate "the bomb"', *Age*, 18 July 1956, p. 2
104 *SMH*, 2 July 1946, p. 3.

bomb may not have effected weather, but in its raw, elemental power it almost *was* weather. 'Maralinga' itself was said to draw its name from an aboriginal word meaning 'thunder'.[105]

Nor, despite Casey's confident case for the bomb's acquittal, was the idea that it might have an effect on the weather particularly far-fetched. Less than a year after Casey's article was published, EG Bowen, the man whose 'genius' Casey proclaimed as the inspiration for the cloud-breaking work of CSIRO's Division of Radiophysics, made a proposal which he thought 'might help settle the question of whether atomic bomb explosions can influence the weather'.[106] Bowen had become interested in the properties of 'freezing nuclei', minute particles of dust or other material that encouraged water droplets in clouds to form ice crystals, and eventually raindrops. He had already proposed the controversial theory that dust from periodic meteor showers might result in heavy falls of rain, so why not the dust thrown up by an atomic explosion?[107] Bowen requested space for equipment and personnel aboard one of the aircraft used to make measurements in the bomb's radioactive plume, but William Penney, the British scientist in charge, was reluctant, 'mainly for security reasons'.[108]

In the 1980s, Bowen's scientific successors in the CSIRO Division of Atmospheric Research considered again the effects of nuclear weapons. This time, however, it was not the possibility of rain they were concerned with, but the possibility that life on earth could be threatened by a 'nuclear winter'.[109] The amount of dust and soot thrown into the atmosphere by a nuclear war would be sufficient, scientists theorised, to block out

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105 Len Beadell, *Blast the bush*, Adelaide, Rigby, 1976, p. x.
106 *CPD*, vol. HofR 6, 31 May 1955, p.1221; letter from EG Bowen to WAS Butement (Chief Scientist, Department of Supply), 24 May 1957, NAA: A6456/3, R87/81.
107 For a discussion of Bowen's research see Home, 'Rainmaking in CSIRO'; for a popular account see HV McKay, 'That rain— is it from space?', *Sunday Telegraph*, 25 March 1956, p. 44.
108 Cable from W Penney to WAS Butement, undated (June 1957), NAA: A6456/3, R87/81.
109 In particular, Barrie Pittock, Principal Research Scientist with the Division, published widely on the atmospheric effects of nuclear war and the nuclear winter scenario. See, for example: A Barrie Pittock, 'The atmospheric effects of nuclear war', in Michael Denborough (ed.), *Australia and nuclear war*, Canberra, Croom Helm Australia, 1983, pp. 136-60; Barrie Pittock, *Beyond darkness: nuclear winter in Australia and New Zealand*, Sun Books, Melbourne, 1987.

the sun and plunge the earth into a freezing hell in which little unprotected life would survive. The weather would certainly take a turn for the worse.

At about the same time, reports began to circulate that Aboriginal people living in the vicinity of the atomic test site at Emu Field had been enveloped by a mysterious 'black mist' after the Totem One explosion in 1953.[110] The mist was said to have left many ill, causing vomiting, diarrhoea, skin irritation, blindness and even death.[111] Ernest Titterton, who had been closely involved in the tests, thought the story was 'laughable'.[112] 'No such thing can possibly occur', he argued on the ABC 'PM' program, 'the radioactive cloud is in fact at 30,000 feet, not at ground level. And it's not black'.[113] The UK Ministry of Defence also dismissed the reports, but initiated further research. Eventually, modelling of the explosion by British scientists demonstrated that by varying particle size and wind conditions they could generate a phenomenon with observable characteristics similar to that of the 'Black mist'.[114] As William Wood had suggested, it was not always easy to judge the consequences of one's actions, even when armed with the confidence of science. The 'Black Mist' showed that the interactions of bomb and weather were more complex than had been supposed. It was a reminder too that the bomb could affect the weather in more insidious ways, for under its influence the wind could become a carrier of death.

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110 The first public report was published in the *Adelaide Advertiser*, 3 May 1980. For an account of the 'Black mist' and its consequences see: Robert Milliken, *No conceivable injury: the story of Britain and Australia's atomic cover-up*, Melbourne, Penguin, 1986, pp. 121ff; *The report of the Royal Commission into British nuclear tests in Australia*, vol. 1, Canberra, Australian Government Publishing Service, 1985, pp. 174-94.

111 The limitations of the Royal Commission approach to resolving the 'truth' and significance of such claims is examined in Heather Goodall, 'Colonialism and catastrophe: contested memories of nuclear testing an measles epidemics at Ernabella', in Kate Darian-Smith and Paula Hamilton (eds), *Memory & history in twentieth century Autralia*, Oxford University Press, Melbourne, 1994, pp. 55-76.

112 Quoted in Milliken, *No conceivable injury*, p. 129.

113 Quoted in *The report of the Royal Commission into British nuclear tests in Australia*, vol. 1, p. 177. A report by the Australian Ionising Radiation Advisory Council also cast doubt on the reports, see Australian Radiation Advisory Council, *British nuclear tests in Australia: a review of operational safety measures and of possible after-effects, AIRAC No. 9*, Canberra, Australian Government Publishing Service, 1983, pp. 45-50.

114 *The report of the Royal Commission into British nuclear tests in Australia*, vol. 1, pp. 179-84.

## The highest scientific authority in Australia

'IT'S TURNED BACK!', exclaimed the headline above a dramatic photograph of the mushroom cloud from the recent atomic bomb test in the Monte Bello Islands. On 21 June 1956, the *Daily Telegraph* reported that the 'deadly cloud' had not dissipated harmlessly over the Indian Ocean as expected, instead it was believed to have 'drifted eastward across northern Australia'.[115] A series of unusual events along the north-west coast had alerted journalists to the fact that the test had not gone wholly to plan. Strange flights by radiological monitoring aircraft, the appearance of air crew wearing protective film badges, and the banning of flights by civil aircraft, all added to the impression that there was 'a "big flap" going on about the whereabouts of the atomic cloud'.[116] Suspicions that westerly winds had blown the cloud inland seemed confirmed when Mr S Stubbs, from the Comet Mine in Marble Bar, reported that after a brief shower of rain his trusty geiger counter had given an air reading of 500, compared to the usual 15. Questions about the cloud's location had 'caused a stir among experts and the general public', the *Age* noted, 'but officials remain silent'.[117]

Once the officials started talking, the situation became even more confusing. Howard Beale, the Minister for Supply, was entertaining a group of newspaper editors at Woomera when rumours that something had gone wrong at Monte Bello began to circulate.[118] Beale's carefully planned attempt to garner media support ahead of the first series of tests at the new Maralinga range in September seemed in danger of falling apart.[119] Fortunately, an enterprising underling closed the Woomera telephone exchange, cutting the journalists off from the outside world while Beale patched together a statement. Unable to contact the Atomic Weapons Test Safety Committee (AWSTC) for information, Beale drew upon data supplied by the Bureau of Meteorology to

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115 *Daily Telegraph*, 21 June 1956, p. 1.
116 *Adelaide Advertiser*, 21 June 1956, p. 1. See also: *Age*, 21 June 1956, p. 1; *Courier-Mail*, 21 June 1956, p. 1.
117 *Age*, 21 June 1956, p. 1.
118 Howard Beale, *This inch of time: memoirs of politics and diplomacy*, Melbourne University Press, Melbourne, 1977, pp. 82-3.
119 A cable from the Department of Supply describing the planned visit noted that 'public opinion in Australia is adverse to atomic tests' and that 'opportunities should be taken to educate the public and acquire a sympathy with future tests', 14 May 1956, NAA: R6456/3, R030/080.

inform the agitated press representatives that there was 'no cause for alarm'.[120] He explained that lower level winds had carried most of radioactive debris out to sea, however, at upper levels 'some cloud containing minute particles has drifted inland, although it is now tending to drift back towards the coast'.[121] The cloud, it seemed, was neither in nor out.

A grumpy Artie Fadden, the acting Prime Minister, was woken at 3.20am the following morning by an intelligence officer with a report from the AWTSC.[122] He informed parliament later that day that the 'distinguished scientists' who served on the committee had assured him that 'the whole operation was carried out without any risk to life or property on the mainland or elsewhere'. Beale had also managed to contact the scientists and was able to confirm that firing conditions were 'ideal'. 'The path of the cloud was followed by plane', he added, 'and last night the cloud was over the sea 100 miles off the north-west coast of Australia'.[123] The cloud had moved once again and was now exactly where it was supposed to have been all along.

The government's pronouncements would have been more convincing were it not for the boom in uranium mining. Like Mr Stubbs in Marble Bar, prospectors searching for the next Rum Jungle or Mary Kathleen used their Geiger counters to test for the spread of radioactive debris. Three days after the blast, Jack Tunney in Kuridala, a small rail centre in north-west Queensland, gained a reading of 2000 from the rain as it fell from his roof.[124] Asked for an opinion, Mark Oliphant declared that 'there did not appear to be any danger' as the levels of radioactivity were still quite low.[125] HC Webster, the professor of physics at the University of Queensland, was less sure. He advised against drinking the water, and suggested any one caught in the rain should take a bath as soon as possible. 'If any of our laboratories developed radioactivity as high as Mr Tunney

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120 *Adelaide Advertiser*, 21 June 1956, p. 1. See also Milliken, *No conceivable injury*, pp. 198-9.
121 *Adelaide Advertiser*, 21 June 1956, p. 1; *Daily Telegraph*, 21 June 1956, p. 1.
122 'A wake-up on atoms', *Adelaide Advertiser*, 22 June 1956, p. 1.
123 *Adelaide Advertiser*, 22 June 1956, p. 1; *Age*, 22 June 1956, p. 3.
124 *Courier-Mail*, 23 June 1956, p. 1; *Age*, 23 June 1956, p. 1; *Daily Telegraph*, 23 June 1956, p. 1.
125 *Courier-Mail*, 23 June 1956, p. 1.

claims', Webster added, 'we would be quite concerned'.[126] The residents of nearby Cloncurry, meanwhile, were 'all praying for fine weather'.[127]

The following week Fadden received a more detailed report from the AWTSC, and declared once again that the Monte Bello test had been carried out 'without risk to life or property'. 'This assurance', Fadden explained, 'has been firmly given to me by the members of the Safety Committee, who are the only persons in a position to judge'. Furthermore, the report confirmed that there was 'no evidence that the cloud... crossed the Australian coast at any time'. Reports of radioactive rainfall were due to 'light particles' that 'diffused in all directions' and were 'carried by the wind at high altitudes like a thick cloud of gas'. Previous tests had shown that such particles travelled around the world in a easterly direction until washed down by rain, but they posed no risk to health.[128] In any case, the Safety Committee insisted, 'quotations of counting rates of radio-activity were quite meaningless unless the experiment was controlled by scientists'.[129]

It was important to know which way the wind was blowing. In October 1953 after the first atomic bomb test at Emu Field, Prime Minister Menzies was questioned on reports that radioactive particles had been detected over Canberra, borne on the winds from the test site in South Australia. 'I am not an authority on meteorology', Menzies replied, but 'the political wind... has been blowing from the Government side to the Opposition side for a long time'. 'Unfortunately', he added, 'it appears to have carried no radio-active particles'.[130] By 1956, however, the wind was beginning to shift. A government memo surveying public attitudes towards the test program noted that 'a very definite change occurred' in 1954.[131] The American H-bomb explosion at Bikini in that year was not only larger than expected, it also showered the crew of a Japanese fishing boat with radioactive ash. The world watched their struggle against radiation sickness with horror.

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126 *Courier-Mail*, 23 June 1956, p. 1 & 3; *Age*, 23 June 1956, p. 1; *Daily Telegraph*, 23 June 1956, p. 1.
127 *Courier-Mail*, 23 June 1956, p. 3
128 'No risk to life from last week's big blast', *Courier-Mail*, 26 June 1956, p. 5.
129 'Counting could be meaningless', *Courier-Mail*, 26 June 1956, p. 5.
130 *CPD*, vol. HofR 1, 20 October 1953, p. 1548.
131 'Press reaction to atomic trials', undated (1956), NAA: A6456/3, R047/011

One of them died.[132] Opposition to the British atomic tests grew as Australians learnt the dangers of fallout.

The NSW civil defence chief arrived home from an overseas briefing in 1955, emphasising 'the need to get our meteorological experts together to give special study to the behaviour of winds at varying altitudes'. 'It is these winds', he continued, 'that move "fall out" material across incredible distances'.[133] While there seemed to be no direct means of combatting the invisible threat of fallout, meteorology could help to measure, and perhaps control, the dangers.

The crucial importance of meteorological expertise was stressed in preparations for the atomic tests at Monte Bello and Maralinga in 1956. In February, the government announced that a new weather station was to be established in the far western desert, enabling scientists 'to obtain the most detailed and accurate meteorological information prior to authorising any tests to be carried out'. The knowledge gained would also be useful, it was claimed, in understanding the continent's high speed, high altitude winds and in 'tracing the movement of potential rain producing air masses'.[134] In fact, early drafts of this press release stressed the station's general benefits to Australia so strongly that British authorities began to wonder why they were paying for it. They offered the Australian government the choice of kicking in some funds or toning down the statement.[135] They chose the latter.

Another press release described how the Bureau of Meteorology was 'linking up a vast network of hundreds of reporting stations' across the region, to gather the data necessary for an accurate forecast of conditions in the Monte Bello Islands. Once technical preparations for the tests were complete, it was up to the meteorologists to satisfy the Safety Committee and the British controllers that suitable conditions 'will

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132 Their story is told in Ralph E Lapp, *The voyage of the Lucky Dragon*, Shakespeare head, London, 1958.
133 *SMH*, 24 December 1955, p.5
134 'Proposed announcement by the Australian Minister for Supply concerning desert meteorological station in connection with Buffalo', undated (1956), NAA: A6456/3, R030/72. See also *Age*, 11 February 1956.
135 Memo from FA O'Connor (Secretary, Supply) for Minister of Supply, undated (1956), NAA: A6456/3, R030/72.

persist for a long enough time to ensure that the "cloud" formed by the explosion of the weapon will drift out over the sea and diffuse harmlessly into the atmosphere'.[136] Australia's safety was guaranteed by the forecasting skill of the meteorologists and the scientific integrity of the Safety Committee.

The Atomic Weapons Test Safety Committee was established by the Australian government in July 1955 as plans proceeded for development of the permanent testing range at Maralinga.[137] The task of the 'eminent scientists' who comprised its membership was 'to ensure no person, livestock, or other property' would 'suffer injury or damage as a result of atomic weapons tests'.[138] As government statements repeated reassuringly, no test could proceed unless the committee was convinced that it was safe to do so. 'Australia's decision is final', agreed William Penney, the British scientist in change of the bomb project, at a press conference organised to help calm growing Australian nervousness.[139]

Five scientists were initially appointed to the Safety Committee, including Titterton, Leslie Martin, and Alan Butement, chief scientist with the Australian Department of Supply. These three had attended the atomic tests at Monte Bello in 1952 and Emu Field in 1953, though purely as observers, with no formal agreement as to their status or participation.[140] The Safety Committee replaced such ad hoc arrangements, and gave Australia an independent voice in the management of the test program. Menzies approved the nominations to the committee, noting that it 'must include members who are sufficiently well known to command confidence as guardians of the public interest'.[141] Thereafter any doubts as to the safety of the tests could be dispelled by

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136 'Meteorological services in atomic weapons tests', press release, 15 February 1956, NAA: A6456/3, R209/4. See also *Adelaide Advertiser*, 16 February 1956, p. 1.
137 Milliken, *No conceivable injury*, pp. 76-9; Lorna Arnold, *A very special relationship: British atomic weapon trials in Australia*, HMSO, London, 1987,pp. 30-1.
138 'Atomic Weapons Tests Safety Committee – radiological background measurements', 3 April 1956, NAA: R6456/3, R030/080.
139 'Summary of statement made by Sir William Penney at joint press conference with the Minister for Supply, the Hon. Howard Beale, QC, MP, on the 14th August, 1956', A6456/3, R030/074. For an outline of Penney's role in the publicity effort see memo from Howard Beale (Minister for Supply) to Secretary (Department of Supply), 9 August 1956, NAA: A6456/3, R030/074.
140 For the circumstances surrounding their attendance see Sherratt, 'A political inconvenience'.
141 Quoted in Milliken, *No conceivable injury*, p. 78.

invoking 'the highest scientific authority in Australia', 'scientific men of high repute and of great patriotism, with a great sense of responsibility and a great scientific knowledge'.[142] Indeed, such was their authority and expertise, that Beale could proclaim their retrospective influence. Shortly after the committee's formation, he announced the test program for 1956, explaining that firing would only take place once the Safety Committee, 'consisting of eminent Australian scientists', had given their approval— 'as in earlier tests'.[143]

But as the cloud from the Monte Bello test set off upon its mysterious journey, the value of such assurances began to be questioned. 'The soothing impression was originally given... that a 'vast network' of meteorological stations would be set up to ensure there was no possibility of a radio-active cloud drifting over Australia', noted the *Sydney Morning Herald*, yet now it seemed there was 'no such guarantee'.[144] The *Age* accepted that there was little risk to life or property, but thought it was a mistake 'to declare with certitude things that cannot be positively known'. 'However well-based pre-detonation weather reports', it remarked, 'much greater advances in meteorology may be necessary before wind strengths at varying heights and their direction can be predicted with accuracy'.[145] The vagueries of wind and weather might yet thwart the predictive power of science.

The winds around the Monte Bello islands were notoriously unreliable. When the British assessed the site prior to the first atomic test in 1952, they concluded that suitable weather conditions were only likely in October. And yet in 1956, they planned explosions for May and June. The timing was determined not by safety, but by the desire to push ahead quickly with development of the H-bomb. At that time of year, winds were predominately from the west and would thus carry fallout directly over the

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142 *CPD*, vol HofR12, 1956, p. 903; CPD, vol, HofR15, 1957, p. 1110.
143 'Plans for tests in 1956 at Monte Bello and Maralinga', press release, 12 September 1955, NAA: A6456/3, R209/4. The 1984 Royal Commission into British Nuclear tests in Australia noted of this press release, 'At best it was ill-informed, at worst it was dishonest', *The report of the Royal Commission into British nuclear tests in Australia*, 2 vols., vol. 2, Australian Government Publishing Service, Canberra, 1985, p. 480.
144 *SMH*, 22 June 1956, p. 2.
145 *Age*, 22 June 1956, p. 2.

mainland. What was needed was a change, a pause in the prevailing westerlies. A Bureau of Meteorology report concluded that over a period of three months there was only likely to be *one* day on which conditions would be suitable for firing.[146] Adding to the difficulty was a lack of detailed knowledge about the interaction of wind and cloud. Whatever the conditions results could be difficult to predict, particularly since British restrictions on information forced the Safety Committee to make its calculations without precise details of the bombs themselves.[147]

The Safety Committee confidently asserted that firing conditions for the second Monte Bello test were 'ideal', even as Geiger counters across northern Australia began to scream in denial. Given the difficulties in predicting the spread of radioactive debris, the possibility of 'ideal conditions' was a convenient fiction that could only be maintained by the creation of an ideal cloud. Instead of delving into the complexities of cloud formation and wind shear, the committee reserved the label 'cloud' for those particles that behaved themselves appropriately by drifting out to sea, while the upper-level particles that headed off towards the mainland were dismissed as an inconsequential side-effect. The certainty with which they pronounced upon the test and its aftermath, masked the difficulties of prediction, the limits of their knowledge, and the political sensitivity of their role.

The Safety Committee was presented as an assertion of Australian sovereignty, a guarantee of safety. It served to reassure a public that was becoming increasingly uncomfortable with Britain's bombs going off in the backyard. Members of the committee 'appreciated the need for indoctrination of the public' and actively contributed to the government's publicity strategy.[148] Titterton was particularly prominent, publishing a series of press articles that explained the need for the tests, and precautions surrounding them.[149] But how compatible were the demands of reassurance

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146 *The report of the Royal Commission into British nuclear tests in Australia*, vol. 1, pp. 233-4.
147 *The report of the Royal Commission into British nuclear tests in Australia*, 2 vols., vol. 2, Australian Government Publishing Service, Canberra, 1985, pp. 478-84.
148 AWTSC, minutes of 10th meeting, 28 July 1956, NAA: A6455/1, RC131 Pt 1.
149 For example: 'Some questions and answers on latest atom tests', *SMH*, 15 May 1956, p. 2; 'Why Australia is preferred as an atom testing site', *SMH*, 16 May 1956, p. 2; 'Tests of nuclear bombs - as a scientists sees them', *SMH*, 24 April 1957, p. 2.

and safety? How independent were the members of the committee? Titterton, Martin and Butement all had strong links with the defence establishment. Titterton had played a significant role in the development of the bomb itself, and had worked closely with many of the scientists on the British team.[150] His allegiance would, in later years, receive careful scrutiny. The British authorities begrudgingly accepted the Safety Committee as part of the price for blowing up bits of Australia, but bound by the insecurities of global politics they provided only a condescending trickle of useful data. While the Australian government claimed the committee could veto any firing in the interests of the nation's safety, no-one, it seemed, bothered to tell the British officer in charge of the Monte Bello tests.[151] And yet, despite this background of compromise, divided loyalties, and political manoeuvering, the Safety Committee sought to gather a worried populace into the soothing embrace of certainty.

'A cloud has been hanging over Australia this week', observed the *Courier Mail*, not the cloud from Monte Bello, but 'a cloud of anxiety and uncertainty; the sort of cloud that sometimes rains panic'. The Australian people, the newspaper argued, generally accepted the need for the tests and the government's assurance of safety. What made them nervous was the feeling that information was being withheld. If their support was to be maintained 'they must be given more knowledge, not less'.[152] The *Age* agreed, noting that there was 'a great danger of unnecessary fear being created through the establishment of an "iron curtain"... surrounding these tests'. Scientists might be 'fully confident of safety to the point of certainty', it argued, 'but it is asking a good deal of human nature to expect the layman to share their confidence without question'. The people needed to be 'clearly informed' of the 'extent of meteorological knowledge' and the 'possibilities of "fall-out" drifting across the continent'. They needed to be told what levels of radioactivity were dangerous, and how these dangers might accumulate.[153] Instead of dispensing a 'smooth confidence that glosses over unknown factors',

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150 Sherratt, 'A political inconvenience', pp. 144-7; Millken, *No conceivable injury*, pp. 64-75
151 *The report of the Royal Commission into British nuclear tests in Australia*, vol. 2, pp. 481-2.
152 *Courier Mail*, 23 June 1956, p. 1.
153 *Age*, 26 June 1956, p. 2.

authorities had to trust the public with enough information to build their own judgements.[154]

How is trust gained and kept? The Safety Committee preached certainty from the heights of scientific authority. They had access to special knowledge and skills, their judgements were informed by a depth of understanding and experience, they were the 'only persons in a position to judge'. And yet, all it took was a recalcitrant cloud and few Geiger counters to seed public trust with the beginnings of doubt. As the radioactive dust settled across the continent, authorities in Britain and Australia wondered whether more effort should have been expended upon education, rather than reassurance. But could a public prone to irrational fancies be trusted with the reality of radioactive contamination? The Safety Committee had no doubt that the risks from the atomic tests were negligible, its task was not simply to protect Australians from fallout, but to protect them from their own fears.

## Unreal nervousness

In 1954, Harold Fry's wife fell seriously ill with heart disease. The following year she developed cancer. Fry and his daughter nursed his ailing wife until she died in 1956. Only then, in the midst of his grief, did he discover that his son, John, living in England, was suffering from Hodgkin's disease. Fry desperately embarked on 'a horror voyage to England by the first available ship', but was too late. John died on 24 June 1956, at the age of just 36.[155]

John Fry was a talented radio engineer who worked on the development of radar in the CSIR Division of Radiophysics from 1941 to 1947. A few months after his death, Harold Fry learnt from one of his son's former colleagues that his was not the only mysterious illness associated with the division. Further investigation convinced him that experimental apparatus used within the radiophysics laboratory had exposed staff to 'dangerous irradiations'. Such 'irradiations' had probably caused his son's disease, and

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[154] *Age*, 22 June 1956, p. 2.
[155] Letter from Fry to FM Burnet, 19 September 1957, NAA: A463/17, 57/3982.

the deaths of at least three others, but who knew the full cost of the division's negligence? In August 1957, Harold Fry wrote to Prime Minister Menzies seeking that these matters be subject to a 'full and open enquiry'.[156]

Fry's concerns were referred by the Prime Minister's Department to CSIRO and the recently established National Radiation Advisory Committee (NRAC). This committee, Fry was informed, had been set up specifically 'to advise the Government on the total problem of ionising radiations'.[157] Headed by Macfarlane Burnet, a respected medical scientist, and comprising 'eminent scientists in the fields of medicine, biology and nuclear physics', it seemed well-qualified to comment upon his son's tragic death. Yet, for all its accumulated scientific wisdom, the committee felt unable to make any judgment on the case.[158] CSIRO made perfunctory inquiries, dismissing any link with John Fry's illness, even though it admitted that some radiophysics staff experimenting with particle accelerators had been unwittingly exposed to dangerous, high-voltage x-rays.[159] CSIRO's suggested response to Harold Fry insisted that his son had not been involved in the x-ray project, nor was he even in the same building. John Fry's work, it was asserted, 'could not involve any conceivable radiation hazard'. There were risks of course in the pursuit of science, for 'research by its very nature of exploring the frontiers of knowledge can involve hazards which are difficult to foresee'. But CSIRO was confident that appropriate precautions were being taken.[160] This draft reply was never sent. Harold Fry heard nothing more for at least two years.

In February 1959, John Fry's widow, Margaret, wrote to Macfarlane Burnet to ask whether his committee had examined the case as originally promised. Suffering from epilepsy, with a six year old child in her care, Margaret Fry wondered whether there was

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156 Letter from Fry to RG Menzies, 27 August 1957, NAA: A6456/3, R069/003.
157 Letter from AS Brown (Secretary, PM's Department) to HW Fry, 18 September 1957, NAA: A463/17, 57/3982.
158 Minutes of the 3rd meeting of NRAC, 6 November 1957, NAA: A6456/3, R069/003.
159 'Draft – Reply proposed by CSIRO', NAA: A6456/3, R069/003. The death of WC Rowe from leukemia was attributed to work on this x-ray project, which was the subject of an extended investigation, see: 'Death of Mr JA Fry', 29 June 1959, NAA: A463/17, 57/3982; 'Report on the work of Mr JA Fry in the Division of Radiophysics, CSIRO', undated (1959), NAA: A463/17, 57/3982; letter from JR Moroney to FM Burnet, 17 October 1957, A6456/3, R198/010.
160 'Draft – Reply proposed by CSIRO', NAA: A6456/3, R069/003.

'any financial provision made for the dependents of men such as my husband who have given their lives in the service of the Commonwealth'. She worried that she would not be able to provide her son with 'the education and home' her husband would have wished.[161] The distinguished members of National Radiation Advisory Committee attempted once again to wash their hands of the matter, informing the anxious widow that questions of compensation were best dealt with by the Prime Minister's Department.[162]

Another round of investigations followed, with CSIRO formulating a more detailed report that confirmed their earlier conclusions.[163] Officials within the Prime Minister's Department accepted their assurance, but a file note confessed to a 'nagging doubt'. NRAC's 'reticence... to have an opinion recorded' was troubling.[164] If the nation's top scientists felt unable to comment, how certain could anyone be that John Fry's death was purely coincidental. 'In a matter of this nature we depend greatly on what the scientists say', an earlier memo remarked, 'but evidently the scientists themselves are not too sure where radiation begins and ends'.[165]

'Atomic energy', Ernest Titterton argued in his book *Facing the atomic future*, 'has been presented in extreme emotional terms'.[166] Both its benefits and dangers had been exaggerated in a way that hindered rational debate. Public understanding of the risks of atomic tests, for example, had been coloured by misinformation, ignorance and fear. Many had come to believe that radioactive contamination resulting from the tests would cause 'gross genetic changes in the population', leading to 'the birth of ill-adapted individuals and "monsters"'. Such misplaced anxieties arose, Titterton maintained, because 'objective scientific statements of the position' did not 'reach the public directly'. Instead of informed opinion, the public were fed 'disturbing and garbled

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161 The letter is transcribed in the minutes of the 13th meeting of NRAC, 30 April 1959, p. 4, NAA: A6456/3, R069/004.
162 Letter from JR Moroney (Secretary, NRAC) to Mrs JA Fry, 23 June 1959, NAA: A463/17, 57/3982.
163 'Report on the work of Mr JA Fry in the Division of Radiophysics, CSIRO', undated (1959), NAA: A463/17, 57/3982.
164 'Note for file', 1 December 1959, NAA: A463/17, 57/3982.
165 'Death of Mr JA Fry', 29 June 1959, NAA: A463/17, 57/3982.
166 Ernest William Titterton, *Facing the Atomic Future*, FW Cheshire, Melbourne, 1956, p. 6.

reports' by the press that were 'only partially understood'. Instead of gaining the benefit of reasoned analysis, the public fell prey to propagandists who exploited their 'fear of unknown factors' to stir opposition to crucial defence experiments.[167] The most pressing need of the 'Atomic Age', Titterton insisted, was a democracy educated in the ways of science.

The National Radiation Advisory Committee was established in 1957 in an attempt to restore some balance to public perception of the hazards associated with ionising radiation. There was a shuffling of physicists aboard the ship of state, as the government streamlined the Atomic Weapons Tests Safety Committee, and appointed two of its former members to the new body. Titterton straddled both. While the Safety Committee retained responsibility for the effects of the atomic tests, the new committee's brief encompassed not just radioactive fallout, but radiation from medical and industrial sources such as x-rays and isotopes. However, the government's priorities were abundantly clear. The 'primary reason' for the committee's formation, chairman Macfarlane Burnet stated at its first meeting, was 'to maintain public confidence that adequate measures were being taken to prevent medical and genetic damage from tests of nuclear weapons carried out in Australia'. There was a 'political requirement' for 'an uninvolved body' to add its authority to the guarantee of public safety.[168]

Burnet was confident that the committee's reputation for independence would be boosted by his own appointment as chairman. There was in the public mind, he argued, a 'traditional' belief that 'medical scientists of repute can be trusted to maintain intellectual integrity' in matters concerned with health and well-being.[169] Burnet had learned the value of public reassurance in 1951, when he and two others had injected themselves with the myxoma virus to prove there was no link between an outbreak of encephalitis and the spread of myxomatosis through rabbit populations along the Murray River. Fears were calmed by this bold 'experiment', an act of scientific theatre.

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167 Titterton, *Facing the Atomic Future*, p. 272.
168 'Minutes of the first meeting of the National Radiation Advisory Committee', 10 June 1957, NAA: A6456/3, R069/003.
169 'Minutes of the first meeting of the National Radiation Advisory Committee', 10 June 1957, NAA: A6456/3, R069/003.

In a similar way, Titterton would, in later years, insist that the safety of the atomic tests was demonstrated by his own good health, claiming that he had received as high a dose of radiation as anyone else involved in the test program

'My existence has been very much that of the scientist in the ivory tower', Burnet modestly explained to his colleagues at the first meeting of the National Radiation Advisory Committee. Always most comfortable at the laboratory bench, the boy from Traralgon was a reluctant leader. While his 'inborn shyness' tended to steer him away from the public spotlight, his achievements in virology and immunology had won him international prominence.[170] The view from his 'ivory tower' swept boldly across Australia's intellectual landscape. Appointed to a variety of government committees from the 1940s onwards, Burnet became interested in the underlying causes of many social problems. In particular, he began to speculate upon the biological roots of war.[171]

In a 1950 *Herald* article, Burnet noted that physicists had been outspoken on threats to the survival of humankind. 'Biologists have had much less to say', he observed, 'but it may be they have even better reason to raise their voices'. Pointing to the creation of 'peck orders' within groups of animals, Burnet argued that it was possible to examine 'problems of conflict' from 'the standpoint of ecology'. By studying the 'establishment and maintenance of dominance orders' many aspects of human behaviour could be explained, the nature of society itself could be better understood, perhaps the threat of war could itself be diminished.[172] Only laughter, Burnet later admitted, refused to submit to the force of biological reduction. Burnet gathered his arguments under the title 'Dominant mammal', though he failed to find a publisher at the time.[173] Reflecting on his efforts some twenty years on, Burnet wondered whether his shyness had contributed to his interest in human ecology: 'a harmless terror of strangers... may have made it

170 For biographical details see Christopher Sexton, *The seeds of time: the life of Sir Macfarlane Burnet*, Oxford University Press, Oxford, 1991.
171 Frank Macfarlane Burnet, *Dominant mammal*, Heinemann, Melbourne, 1970, pp. 2-3.
172 Frank Macfarlane Burnet, 'Biology, not H-bombs may solve our future', *Herald*, 8 February 1950, p. 4.
173 A revised version was published in 1970.

easier for me to stand off and look at human beings as just another species of mammal'.[174]

Burnet expected the National Radiation Advisory Committee to advise government both on measures necessary 'to ensure the health and welfare of the Australian community', and on 'the best way to maintain a balanced appreciation of benefits against dangers'. While the atomic tests provided the most immediate challenge, Burnet hoped that the committee would 'develop an importance for public health altogether more significant than its primary function of maintaining public confidence in Maralinga'.[175] While the 'genetic dangers from ionizing radiation are real', he told Prime Minister Menzies in the letter accepting his appointment as chairman, the 'problem of stating the position clearly and acceptably to the public' was 'difficult'. It might help, he suggested, if the public were made to understand that it was not radiation that posed the greatest threat to 'the health of the "genetic pool" of the community', but the increased power of medical science to keep alive those with 'genetic defects', as well as 'the higher fertility of the unintelligent'.[176] Public fears had to be brought to scale against an objective assessment of risk.

Responding to criticisms of the atomic test at Emu Field in 1953, Menzies confidently asserted 'that no conceivable injury to life, limb or property could emerge from the test'. 'No risk is involved in this matter', he insisted, 'the greatest risk is that we may become inferior in potential military strength to the potential of the enemy'. The 'unreal nervousness' generated by the tests was contrasted against the real threat of communist aggression.[177] Titterton provided a similar assessment, downplaying the dangers associated with fallout, while arguing that 'the degree of risk involved' had to be 'balanced against the great importance of nuclear weapons to the security of nations of the free world'.[178] At a time of ideological conflict, when peace could only be maintained

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174 Burnet, *Dominant mammal*, p. 2.
175 'Minutes of the first meeting of the National Radiation Advisory Committee', 10 June 1957, NAA: A6456/3, R069/003.
176 Letter from FM Burnet to RG Menzies, 24 April 1957, NAA: A6456/3, R069/011.
177 *CPD*, vol. HofR1, 21 October 1953, p. 1610.
178 *SMH*, 9 March 1955, p. 4.

by strength and preparedness, the public's ill-informed anxieties had to be measured against the truly terrifying prospect of global conflict. 'Mankind need not fear nuclear weapon tests', Titterton maintained, 'but it should certainly fear all-out nuclear warfare'.[179]

The destruction of Hiroshima heralded a new age of anxiety. The 'terrifying' power of the bomb tore at ideological fractures, with superpower rivalries descending into a battle for the very survival of humankind.[180] In a country still recovering from the threat of invasion, came visions of a new war: a war from which there could be no escape, no place to hide.[181] Political dangers multiplied as the bombs themselves grew bigger; rockets extended their global reach, and the winds carried their poison into homes, into bodies, into children yet unborn. The world was suffering under 'a highly nervous tension', noted the Argus in 1946, 'at no time has mankind walked in such fear and regarded the future with such apprehension as now'.[182] Almost ten years later, the *Herald* argued that the Atomic Age would not lose its 'atmosphere of dread' until the new force had 'ceased to be a weapon'.[183] A shaken Les Martin admitted to being 'worried' by the development of the H-bomb. Ever since the war, he remarked, 'the whole structure of our lives has been dominated by fear— fear of one another, fear of not getting there before the other fellow'.[184]

Although Ernest Titterton believed that the public's fear of atomic energy was being exaggerated for political purposes, he accepted that 'life in a modern complex civilisation' was 'a tense business'. The pace of change made it difficult for people to find 'emotional plateux' amidst the cascade of 'peaks and chasms'. To save themselves from 'unrealistic despair or equally unrealistic elation', the individual had to strive to understand the true meaning of scientific advance.[185] While the influence of 'fear and

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179 Ernest William Titterton, 'The facts about radio-strontium and risk to life', *SMH*, 25 April 1957, p. 2.
180 *SMH*, 8 August 1945, p. 1.
181 John Murphy, *Imagining the fifties: private sentiment and political culture in Menzies' Australia*, UNSW Press, Sydney, 2000, ch. 7.
182 *Argus*, 22 July 1946, p. 2.
183 *Herald*, 28 December 1955, p. 4.
184 *Herald*, 29 March 1954, p. 2.
185 Titterton, *Facing the atomic future*, pp. 5-6.

superstition' had waned with the 'popularisation of the rational outlook', public perceptions of science were coloured still by ignorance and suspicion. Misunderstanding of science presented 'serious hazards to both science and society', Titterton insisted, 'and we have to take steps to remove the difficulty'.[186] The future of society, democracy, of civilisation itself, rested upon the creation of 'an informed public opinion on the issues of the technological age'. The challenges wrought by scientific progress had to be met by a renewed commitment to education and reason. 'The one hope for survival', Titterton argued, 'is to seek rational solutions to our problems and not be stunned into inertia or muddleheadedness'.[187]

It was a familiar prescription. Reformers had for many decades preached the importance of developing a citizenry conversant with the ideals and methods of science. Progressives, like Littleton Groom or HW Gepp, expected that a scientific approach to the problems of society would banish inefficiency and conflict. Primitive hatreds would whither as enlightenment nourished the minds of all, irrespective of rank or class. Public scientists, like Edgeworth David, invoked the spirit of science to displace the fripperies of modern existence. A respect for knowledge and rational thought would clear indifference and suspicion from the path of national progress. Activists concerned with the social relations of science, such as those involved with the AASW, believed that a well-educated populace gave society the strength to deal with ethical challenges of scientific and technological advance. Fear of the destructive capabilities of science would give way to a profound appreciation of its capacities for improvement. Progress offered an end to fear and prejudice, as the irrational follies of previous generations were discarded in the onward march of knowledge and reason.

But in the imagined triumph of knowledge over fear was embedded a much older struggle. From the time of the ancient Greeks, perhaps from the dawn of consciousness itself, humans have conceived of the mind as a battleground, where reason confronts emotion. 'If the beam of our lives had not one scale of reason to poise another of

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186 'Education for an atomic age. A public lecture delivered in the Australian National University series on Tuesday, May 17th, 1955, by Professor EW Titterton', Titterton papers, Basser Library, MS168, item 4/33.
187 Titterton, *Facing the atomic future*, p. 7.

sensuality', exclaimed Iago in Shakespeare's Othello, 'the blood and baseness of our natures would conduct us to most preposterous conclusions'.[188] The scientific revolution armed reason with a method for distilling knowledge from the morass of mere sensation and feeling, for discovering a truth that was free from the deceits of the heart. Progress was to be found in the pursuit of objectivity, in the separation of fact from opinion made possible by the 'experiment'.

EJ Bunting, the secretary of the Prime Minister's Department, considered that 'it would be appropriate and much more satisfying to the relatives' if CSIRO's report on the Fry case included a comment from the National Radiation Advisory Committee.[189] After all, Harold Fry had been informed that the committee would consider the case. Surely they could offer some words of reassurance. And they did. The sentence, 'Sir Macfarlane Burnet confirmed that there is no known connection between Hodgkin's Disease and exposure to radiation', was added to the five page report.[190]

What was Harold Fry hoping for? What did he expect? Did he want an explanation for his son's death? An apology? As a warning of the dangers of radiation, his son's death might yet have some meaning: through his sacrifice others might be saved. But if there was no cause, no reason, if his son's life was cut short merely by the random occurrence of an ill-understood disease, there was no meaning, no-one to blame, nothing to be done. The 'careful wording' of Burnet's assurance did not exactly close the case, though the evidence assembled by CSIRO was perhaps enough to convince a 'reason-able' man that John Fry's death was not associated with his work.[191] And so the uncertainty surrounding the effects of radiation was replaced by another, bigger uncertainty. The reassurance offered to Harold Fry was that no-one knew why his son had contracted his illness, there was no explanation. It was tragic, it was unfair, it was pointless. What exercise of reason could hope to fill this void of meaning?

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188 William Shakespeare, *Othello*, Act I, Scene 3.
189 Letter from EJ Bunting to FG Nicholls (CSIRO), 14 October 1959, NAA: A463/17, 57/3982.
190 Letter from FG Nicholls (CSIRO) to EJ Bunting (Secretary, PM's Department) 19 November 1959, and the accompanying 'Report on the work of Mr JA Fry in the Division of Radiophysics, CSIRO', NAA: A463/17, 57/3982.
191 'Note for file', 1 December 1959, NAA: A463/17, 57/3982.

Progress is imagined as a bold voyage into the unknown, where knowledge and power are won through the ceaseless pursuit of the new. But while scientists forge ahead, it seems, the public often holds back. In the realm of the unknown loom new threats as well as promises, uncertainty breeds anxiety— is it worth the risk? The march of progress proceeds by trampling any 'unreal nervousness', liberating an oppressed people from the rule of their emotions. While knowledge and reason are the tools of an enlightened people, fear is something that lurks in the darkest recesses of our soul. Like a hungry monster it can be fed and manipulated by unscrupulous agitators, but set free it can grip a society, escalating into hysteria and panic. Fear, like Burnet's 'peck orders', is a legacy of our animal origins. It is something to be studied, perhaps, in the behaviour of chickens or mice; a topic for objective analysis by a scientist whose 'terror of strangers' might enable him to observe the human condition at a safe and comfortable distance.

'Babies will be freaks', screamed a headline in the Melbourne *Truth*. The article reported that 'secret tests by Australian scientists' had 'proved that the effects of radiation will produce freak babies and shocking abnormalities in future generations of human beings'. Its claims were based on the research of a CSIRO scientist which apparently demonstrated how exposure to radiation could produce a range of horrifying abnormalities in test animals.[192] The report was 'not only disturbing but revolting', HAS van den Brenk, a radiotherapist with the Cancer Institute Board, wrote angrily to the National Radiation Advisory Committee. 'It inspires fear in a community', he argued, 'by submitting for public consumption, an uncritical and emotional account of so called "secret" results'.[193] He demanded that the committee take action to correct such misapprehensions, and urged them to investigate means by which press reports on scientific topics could be vetted by appropriate experts. The committee agreed the article could cause 'much unnecessary distress'.[194]

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192 *Melbourne Truth*, 3 May 1958, p. 28.
193 Letter from HAS van den Brenk to Chairman, NRAC, 5 May 1958, NAA: A6456/3, R198/020.
194 Letter from JR Moroney to Secretary, PM's Department, 8 May 1958, NAA: A6456/3, R198/020.

The effects of radiation seemed particularly prone to distortion. Attempts at reassurance struggled not only with the people's ignorance, but with their vulnerability to persistent subconscious fears associated with violation and impurity. Radiation was an invisible poison that threatened to rob humankind of its ability even to procreate. Freak babies, like freak weather, seemed the inevitable consequence of continued interference with nature. Against an objective assessment of risk were projected the anxieties of generations. But this was not, as Titterton imagined it, merely evidence of the continuing need for scientific rationality to cut superstition out of the public mind. It was a battle also over the meaning and implications of uncertainty itself.

Van den Brenk noted in his complaint to the National Radiation Advisory Committee that there was no 'secret' about the fact that ionising radiation could cause birth abnormalities, this had been known since 1906.[195] The question was not if radiation was dangerous, but how much radiation was dangerous. As in the case of the missing Monte Bello cloud, official pronouncements sought to avoid any complexity. William Penney wielded a Geiger counter before Australian journalists to demonstrate that such familiar items as a luminous watch dial yielded counts greater than those observed from fallout.[196] No-one bothered to recall the fate of the 'radium girls', whose jaws rotted away after they used their tongues to sharpen radium-dipped brushes to paint such dials.[197] But the certainty with which scientists pronounced upon the risks of radioactivity was undermined by H-bombs that were bigger than expected, by Japanese fishermen who were unexpectedly irradiated, by radioactive clouds that refused to follow the script. When coupled with the increased specialisation of science, and the mysterious hold of the 'atomic secret', such events contributed to a feeling that information was being withheld, the real risks were not being explained. 'These matters

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195 Letter from HAS van den Brenk to Chairman, NRAC, 5 May 1958, NAA: A6456/3, R198/020.
196 'Joint press conference by the Hon Howard Beale... and Sir William Penney', 14 August 1956, NAA: A6456/3 R030/075.
197 This story is told in Catherine Caulfield, *Multiple exposures: chronicles of the radiation age*, Secker & Warburg, London, 1989, ch. 4.

must be put to an adult people as if they were adults, and not children frightened of the dark', argued the *Sydney Morning Herald*.[198]

Further complicating the assessment was the disturbing tendency of scientists to disagree. 'Nothing is more extraordinary or more maddening', complained the *Sydney Morning Herald*, 'than the continued inability of eminent scientists to make up their minds about the dangers of atomic tests'.[199] Titterton's continued assurances were challenged by John Blatt, a physicist at the University of Sydney. 'The possibility of serious damage, even ultimate disaster for the human race', he argued, 'is by no means as remote as the eager bomb-throwers would have us believe'.[200] The Safety Committee's pronouncements upon the spread and significance of radioactive fallout were also questioned in a bitter struggle with the CSIRO biochemist, Hedley Marston.[201] 'You and I have no means of judging these things for ourselves', a columnist in the *Age* reflected, 'is atomic science so inexact that the advice of recognised experts must range all the way from the rose-colored to the frightening?'[202]

Mrs M Senior found reason for hope amidst such disagreements. Writing to the *Sydney Morning Herald*, she welcomed as 'a mercy' signs that 'scientists, editors and ordinary people' were 'not yet anaesthetised to emotional and moral responses— to basic human instincts for survival'.[203] Fear of radiation was not merely the result of ignorance or superstition, it was a response to a nagging feeling of uncertainty. It was not just that scientists disagreed, or their assurances were undermined, it was also the possibility that the real hazards of radiation might be expressed, not now, but sometime in the future. Proof might be found by generations to come in their growing tally of illness, death and abnormalities. And so the uncertainty surrounding the effects of radiation might be

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198 *SMH*, 23 February 1955, p. 2.
199 *SMH*, 5 June 1957, p. 2.
200 John M Blatt, 'Danger from atom tests is an unknown quantity', *Sydney Morning Herald*, 21 December 1955, p. 2.
201 Roger Cross, *Fallout: Hedley Marston and the British bomb tests in Australia*, Wakefield Press, Adelaide, 2001.
202 *Age*, 25 June 1956, p. 1.
203 *SMH*, 7 June 1957, p. 2.

replaced by another, bigger uncertainty— how could they let it happen? What exercise of reason could hope to fill this void of meaning?

Progress claims the future as its own, as the realm in which the problems of the present will inevitably be solved. This confidence is bought at the cost of the individual's loss of control; change is propelled from outside, by larger forces, more knowledgeable minds, by the expression of reason itself. What is left when this trust is challenged, when uncertainty refuses to die? Faith in progress is replaced by the fear that we may be 'mere experimental objects in a universal laboratory'.[204]

## Human guinea pigs

The second atomic bomb was exploded at Bikini on 25 July 1946. Whereas the first bomb was dropped from an aeroplane, this one was detonated underwater. A 'calm and implacable' voice counted down the seconds as the final moment approached.[205] That voice belonged to Ernest Titterton.

Titterton had been one of the first British scientists to arrive at Los Alamos in 1943 to begin work on the atomic bomb. He was the last to leave in 1947, forced out by US postwar restrictions on the involvement of 'foreign' scientists in atomic research.[206] At Los Alamos, he and his young wife, Peggy, moved into the house next door to Niels Bohr, one of the greatest physicists of the twentieth century.[207] It was perhaps the most exciting time of his life. Still in his twenties, Titterton was working in the midst of the world's scientific elite, struggling against time, against nature itself, to produce a weapon that might end the war and change the world forever.

The destruction of Hiroshima and Nagasaki left Titterton with no moral qualms. As he reflected some forty years later, 200,000 Japanese had died to save millions of allied

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204 *SMH*, 8 March 1955, p. 2.
205 David Bradley, *No place to hide*, University Press of New England, Hanover, 1984, p. 92.
206 Margaret Gowing, *Independence and deterrence: Britain and atomic energy, 1945-1952*, vol. 1, Macmillan, London, 1974, p. 113.
207 JO Newton, 'Ernest William Titterton, 1916-1990', *Historical Records of Australian Science*, vol. 9, no. 2, 1992, pp. 167-188.

soldiers. 'It's a curious way of looking at it', he added, 'but it was a humanitarian act'.[208] The youthful certainty that had inspired his work at Los Alamos never failed him. While others, like Mark Oliphant, were burdened by feelings of guilt and responsibility, Titterton remained a steadfast advocate of the development of atomic weapons. While many expressed doubts about the safety of atomic tests and the effects of fallout, Titterton remained an unequivocal source of calm reassurance. He seemed free of self-doubt and introspection.

In May 1985, Titterton spent four days in the witness box, answering questions before the Royal Commission into British Nuclear Tests in Australia. His assessment of the test program had changed little in thirty years, but the world had become more critical of experts, more sceptical of official assurances. Titterton was typically dismissive of criticism, remarking that while 'the so-called pro nuclear deal in facts... the antis deal in fiction'. Confronted with William Penney's admission that firing conditions might not have been as favourable as stated at the time, he suggested it was the comment of 'a very tired man', who sounded 'very depressed'.[209] Titterton's unbending certainty seemed out of step both with scientific opinion and public expectation. His performance at the Royal Commission offered an all too vivid reminder of the spirit of arrogance and conceit that had enabled the tests to proceed with scant attention to the health of servicemen and Aboriginal people. He cast himself in the role of apologist, and was condemned for it. While the actions of both British and Australian governments were criticised in the Commission's findings, Titterton was singled out for particular note.

In 1987, a serious car accident left Ernest Titterton a quadriplegic. As he lay paralysed in his nursing home bed, surrounded by the elderly and incapacitated, Titterton's powers of rational analysis were brought to bear upon his fate. He became a firm advocate of euthanasia, and held no doubts about the quality of his own life. 'There is no hope and

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208 Quoted in JO Newton, 'Ernest William Titterton, 1916-1990'.
209 Milliken, *No conceivable injury*, pp. 68-70.

the sooner I'm dead and buried the better', was his characteristically blunt assessment. His wish was finally granted in 1990.[210]

The British atomic tests continue to receive attention as new problems emerge with the 'clean-up' of the site and servicemen struggle to win adequate compensation for their suffering. More generally, a growing sense of outrage and horror greets any suggestion that scientists may have involved unwitting human subjects in past experiments. In 1997, it was revealed that Macfarlane Burnet was involved in a series of 'medical experiments' upon orphans in the Broadmeadows Babies' Home. In tests of a vaccine against the herpes virus, 'every healthy child... between seven and ten months of age was selected as a human guinea pig', reported an article in the *Age*.[211] More recently, the Atomic Weapons Test Safety Committee and the National Radiation Advisory Committee have been criticised for their role in a program to monitor levels of strontium 90 in the environment as a result of atomic weapons tests. The committees arranged for bone samples to be collected from the bodies of children and adults. No permission was sought from families, and pathologists were advised to treat the sampling program as 'confidential'.[212] Parents of children who died between 1957 and 1978 were left to wonder what might have become of their children's remains.

We are, many commentators insist, living in a 'risk society', more aware than ever before of the unexpected consequences of scientific and industrial progress. And yet it seems we are more comfortable as victims of scientific arrogance than as active participants in an ongoing program of global experimentation. The community can unite in outrage over the use of 'human guinea pigs', but is slower to take responsibility for profound environmental impacts that might yield an unprecedented degree of change. Hugh McKay was right to be concerned about the effects of forest clearing upon a warming earth. After many failed attempts, we have discovered at last that it's easy to change the climate, we've been doing it for years. Each day as we drive our car or flick on a light we

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[210] JO Newton, 'Ernest William Titterton, 1916-1990'.
[211] *Age*, 9 June 1997, p. 6.
[212] Quoted in Australian Radiation Protection and Nuclear Safety Agency, *Australian strontium 90 testing program, 1957-1978*, ARPANSA, 2001, available at <http://www.arpansa.gov.au/strontium90.htm>.

make yet another contribution to this long-term experiment in atmospheric change. But the possibility that we are our own guinea pigs is more typically met with denial or indifference than a united call for action. We seem unwilling to face our anxieties, hoping instead the progress will once again triumph over any 'unreal nervousness'. We are more attuned to risk, but still we face the future searching desperately for some new certainty that will save us from our fears. Perhaps our only hope of controlling the experiment that progress has delivered is to find a constructive role for our fear, to embrace uncertainty as a means of distributing power and hope.

# 7 Protection

At about 11.30pm on 5 October 1948, a student walking through the grounds of the University of Melbourne noticed a fire in one of the ex-army huts used by the physics department. He raised the alarm, but little could be done to save the building or its contents. The results of two years research into cosmic rays were destroyed, along with much valuable equipment.[1] This was the third fire at the university in the space of just three months, still the chief fire officer believed there to be no suspicious circumstances. Instead he criticised the university for housing such work in a 'highly-inflammable hut'.[2] The wiring in these huts was notoriously bad, and it seemed that this fire had simply been caused by a fault in one of the electrically-driven recording instruments.[3]

In Canberra twenty-four hours later, the Opposition member, WJ Hutchinson, rose to speak on an issue which he believed to be 'of sufficient importance to warrant a reply...even at this late hour'.[4] Hutchinson drew attention to the fire at Melbourne University, and quoted from a newspaper report that claimed that the facilities destroyed 'were used by the CSIR and the university in carrying out vital defence experiments in nuclear physics'. Leslie Martin, the professor of physics and the scientist in charge of the work, was quoted as describing his laboratory as 'the main Commonwealth defence research centre and the only one in Australia undertaking such work'. Given these facts, the fire could be seen in a rather more sinister light. Hutchinson argued that communist fifth columnists were attempting to infiltrate defence research activities around the world, why then was this hut not guarded? Was the fire really an accident or was it sabotage? 'If the laboratory at the University of Melbourne could be burnt down because no-one was on guard', he thundered, 'it was equally possible for the records to have been stolen from the building'.[5]

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[1] *Herald*, 6 October 1948, p.3
[2] *Herald*, 6 October 1948, p.1; *SMH*, 7 October 1948, p.3
[3] *Argus*, 7 October, 1948, p.5
[4] *CPD*, vol.198, 6 October 1948, p. 1317.
[5] *CPD*, vol.198, 6 October 1948, p. 1318.

JJ Dedman, the minister responsible for CSIR, sought to deal with the matter swiftly. It was well known that CSIR was funding research into nuclear physics at the University of Melbourne. Under Martin's direction, this work had been proceeding for a number of years. Only a week before the fire, Dedman had described the research in parliament as comprising 'experiments of a fundamental character' designed to give Australian scientists some experience in the field.[6] Responding to Hutchinson's insinuations, Dedman reminded his parliamentary colleagues of his previous statements, decrying the tendency of the press 'to create the impression that all scientific research in Australia is connected with defence'. In the space of a few minutes, he repeated again and again his one central point: the experiments had 'no connexion whatever with defence', 'no defence significance', they were 'not a defence project at all', involving 'nothing that is secret'. He concluded: 'The experiments, I repeat, have no significance whatever from a defence, or security, point of view'.[7] The matter was closed and the house adjourned.

Closed, that is, until the following day, when HL Anthony resumed the Opposition's attack, claiming that the arrest of 'atomic spies' operating in Canada had revealed that the Soviet Union was desperately seeking to obtain the 'secrets' of the atomic bomb through its espionage network. Australia was not immune to such infiltration, Anthony argued, 'I desire to show that there is a connexion between the Communist organization in Australia and the destruction of a defence laboratory in Melbourne.[8] It seemed more than coincidence that Australia's only atomic research laboratory had gone 'up in smoke'. 'Did the records which it contained go up in smoke?', he asked, or 'were they purloined and was the fire then deliberately started in order to destroy evidence of the theft'? Anthony was worried by a number of similar 'strange events', and went on to recount a bizarre tale of a communist arrested at Brisbane station with a quantity of explosives, apparently on his way to blow-up Mt. Isa.

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[6] *CPD*, vol.198, 30 September 1948, p. 1036.
[7] *CPD*, vol.198, 6 October 1948, p. 1319.
[8] *CPD*, vol.198, 7 October 1948, p. 1332.

Dedman was clearly exasperated, 'The honorable member for Richmond has been indulging in utter drivel', he began.[9] But he could do little else save repeat his assertions of the previous night that the laboratory had no connection with defence work. The following day he attempted to round off the matter by quoting from a statement issued by Martin, who was 'quite sure' that there had been no sabotage. According to Martin, contrary to initial reports, the work was not defence related but simply 'straight-ahead fundamental physics'. Furthermore, 'secret papers could not have been stolen for the simple reason that there were no secret papers there to steal'.[10]

The tone of the Opposition attacks was perhaps best captured by the student newspaper, *Farrago*, which printed a front page expose based on 'usually unreliable sources in Canberra'. The university was 'the scene of a vast plot', the article revealed, 'whose object is said to be the erasure of Western culture from the campus and to compel a reversion to the wilderness of alien barbarism'.[11] However, some of the claims made by the Opposition members were not quite as hysterical as they might at first seem. Dedman was frustrated by their apparent inability to see that research into nuclear physics need not have defence connections. Yet only a week before the fire he had commented in parliament that 'anyone who knows anything of atomic energy must realize that information intended to be used for industrial purposes could also be used for war-like purposes'. 'The uses of atomic energy in peace or in war are so inter-linked', he added, 'that it would be foolish to permit the release of information for only one purpose'.[12]

Martin had argued that he was involved in fundamental physics research, yet later that same month, he was appointed Defence Scientific Adviser and chairman of the Defence Research and Development Policy Committee. He was offered the position specifically 'in view of the great importance of developments in atomic warfare'.[13] The whole

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[9] *CPD*, vol.198, 7 October 1948, p. 1334.
[10] *CPD*, vol.198, 8October 1948, p. 1398.
[11] *Farrago*, 12 October 1948, p. 1.
[12] *CPD*, vol.198, 30 September 1948, p. 1031.
[13] Memo from Sir Frederick Shedden (Secretary) to Minister of Defence, 21 October 1948, NAA: A816, 9/301/163 Part 1.

question of what areas of scientific research were defence related was becoming more and more complicated as the relationship between science and the military underwent wholesale changes in response to the perceived needs of the postwar world. Science had always been seen as being dependent upon the free interchange of ideas, yet the new scientific age, the Atomic Age, had been brought into being by the most highly secret scientific project ever undertaken.

## A choice between the quick and the dead

It was December 1954 and the Royal Commission on Espionage was on the hunt for atomic secrets. In a session closed to the public, lest any dangerous secrets slip, CSIRO physicist George Briggs was questioned about the contents of his safe.[14]

Perhaps better known as the Petrov Commission, the Royal Commission on Espionage was well advanced in its investigations.[15] Gone were the days of high drama when the leader of the Opposition, HV (Doc) Evatt, had clashed heatedly with the commissioners over his allegations of a right-wing conspiracy. The Commission had settled down to a methodical examination of the documents that Vladimir Petrov had handed over upon his defection to ASIO. These documents gave names and brief details of certain individuals whom Soviet intelligence (the MVD) believed to be of potential value. As the Commission itself recognized, to be included in these lists was no evidence of wrong-doing, but still it did not hesitate to call many of those named before the enquiry, opening their private beliefs and associations to public scrutiny.

Included amongst these scraps of information were two references to a 'Don Woods', described as 'Secretary of the adviser of Doctor E. on "Enormaz"'. One of the entries added the words 'of BRIGGS'. 'Woods' was identified as Donald Woodward, technical

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14 For more on Briggs see Tim Sherratt, 'A physicist would be best out of it: George Briggs and the United Nations Atomic Energy Commission', *Voices*, vol. 3, no. 1, 1993, pp. 17-30.
15 For contrasting viewpoints on the 'Petrov affair' see: Robert Manne, *The Petrov affair: politics and espionage*, Pergamon, Sydney, 1987; Nicholas Whitlam, and John Stubbs, *Nest of traitors: the Petrov affair*, Jacaranda Press, Milton, 1974. See also Jack Waterford, 'A Labor myth?', in Ann Curthoys and John Merritt (eds), *Better dead than red*, Allen & Unwin, Sydney, 1986, pp. 99-119.

secretary of CSIRO's Division of Physics, headed by Briggs. But what was 'Enormaz'? Petrov himself had failed to identify the code word, even after the insightful prompting of the deputy director-general of ASIO, GR Richards, who suggested: 'The nearest I can think of ENORMAZ is big'. It was Edvokia Petrov who recognized 'Enormaz' as a special, top-secret code 'used for the MVD interest in the matter of research and testing of the atom bomb in Australia'.[16]

Woodward was called before the commissioners in November and questioned about his former, brief membership of the Communist Party.[17] There was no evidence that he had ever had access to secret information on atomic energy, but the Commission decided to investigate further by calling Briggs to the stand. Woodward, Briggs explained to the learned inquisitors, was responsible for a number of routine tasks within the division, and had no access to confidential information of any sort. He did, however, test 16mm film projectors against government specifications. 'There was no secret in that work?', Mr Justice Philp interrupted. 'Nothing secret whatsoever', Briggs replied reassuringly. The nation's projectors at least were safe from perils of Soviet influence.

After cautioning the witness that the Commission did 'not want any details of secrets at all', WJV Windeyer, the senior counsel, asked Briggs about his own involvement in 'atomic energy questions'. Of particular interest to the inquiry was his stint as scientific adviser to the Australian delegation, originally led by Evatt (the mysterious 'Doctor E.'), to the United Nations Atomic Energy Commission in 1946 and 1947. 'Did you, when you were at any of these conferences', questioned Mr Justice Philp, 'learn any of the secrets of the Western world in relation to nuclear fission?' Briggs admitted that he had taken the opportunity to inspect atomic energy developments in Canada, and that, upon his return, his notes were stored in the division's safe. 'I suppose you had from time to time a certain amount of top secret information in the safe', pressed Windeyer. 'Only a

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[16] See NAA: A6122, 58; *Report of the Royal Commission on Espionage*, 22 August 1955, Sydney, 1955, pp. 138-139, 219-220.

[17] Royal Commission on Espionage, *Official Transcript of Proceedings*, 11 November 1954, Sydney, 1955, pp.2813-2826.

small amount', Briggs replied, 'very little'. 'I am not suggesting it was a large amount', counsel insisted, 'I am only asking what you had in there'.[18]

Eventually the commissioners satisfied themselves that Briggs had gathered few atomic secrets in his work, and that Woodward, in any case, did not have access to the safe in question. Nonetheless, Windeyer suggested that Briggs' evidence should remain confidential for the time being. 'There are so many people', he noted, 'who can misunderstand or misrepresent things or arrive at wrong conclusions'.[19]

The image of the atomic secret meshed ancient fears with superpower ambitions. The bomb was born of science's determined quest to unlock the mysteries of matter. It was a 'miracle of man's mastery over one of the most jealously guarded secrets of nature', the *Argus* proclaimed.[20] Moreover, this revolution had itself been wrought in conditions of 'profound secrecy', part of a massive, sprawling project, finally revealed to a stunned world in the aftermath of Hiroshima. The construction of the bomb layered secret upon secret in a combination that exploded both in public imagination and in the tense, evolving struggle that was to dominate global politics. 'At present this grim weapon is in the hands of nations sworn to the outlawry of war', the *Sydney Morning Herald* observed with relief, 'it is their solemn charge to see that it never enters the armoury of an aggressor'.[21] If the world was to avoid an apocalyptic end, knowledge of the bomb had to be closely guarded, the secret had to be controlled. This new power was, in President Truman's words, a 'sacred trust', delivered for safe-keeping unto the stalwart defenders of democracy.[22]

History, myth and propaganda all encouraged people to believe that a complex feat of engineering could be reduced to a few vital equations, a key insight, a set of blueprints, a handful of deadly secrets. This 'sacred trust' divided the world 'into "Have" and "Have-

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[18] Royal Commission on Espionage, *Official Transcript of Proceedings*, 1 December 1954, Sydney, 1955, pp.2829-2832.
[19] Royal Commission on Espionage, *Official Transcript of Proceedings*, 1 December 1954, p. 2832; *Report of the Royal Commission on Espionage*, pp. 138-9.
[20] *Argus*, 8 August 1945, p. 2.
[21] *SMH*, 9 August 1945, p. 2.
[22] HS Truman, Navy Day address, 27 October 1945.

not" nations'.[23] The information was too dangerous to be shared without controls, but a continued American monopoly could only add to international suspicion and unrest. Hope lay in the establishment of the United Nations Organisation (UNO). Evatt, who had played a significant role in the formulation of the UNO's charter, argued that the atomic bomb 'had made more urgent than ever the establishment of the world organisation for preserving the peace'.[24] Events moved swiftly and, in January 1946, the General Assembly of the UNO unanimously approved the creation of a commission 'to attain the most effective means of entirely eliminating the use of atomic energy for destructive purposes and promoting its widest use for industrial and humanitarian purposes'.[25] The United Nations Atomic Energy Commission held its inaugural meeting on 14 June 1946, with Evatt as chairman.[26]

It was Australia's alphabetical, rather than international, standing that delivered the opportunity to provide the Commission's first chairman. But the Australian government, and Evatt in particular, were keen to play a decisive role in what was regarded as 'one of the most responsible tasks ever placed upon a group of nations'.[27] With George Briggs and Mark Oliphant providing scientific advice, Evatt set about developing strategies that would enable Australia to make the most of its 'special opportunity' to set the UNAEC upon its urgent mission.[28] 'Evatt wants to take a "strong line"— ie. no delay in arriving at decisions', Briggs wrote to his wife Edna from New York, 'hence the need to get over here early'.[29] The Australian delegation drafted a set of policy notes, emphasising that any delay would 'aggravate existing tension between nations' and 'arouse the suspicions of the peoples of the world'.[30] 'The

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23 *SMH*, 21 June 1946, p. 2.
24 *Argus*, 13 August 1945, p. 5.
25 *Yearbook of the United Nations 1946-7*, United Nations, New York, 1947, p. 444.
26 For the history of the UNAEC see Joseph I Lieberman, *The scorpion and the tarantula : the struggle to control atomic weapons, 1945-1949*, Houghton Mifflin Company, Boston, 1970.
27 CPD, vol. 188, 1 August 1946, p. 3485.
28 Cable from Australian Delegation, UN, New York, 'Atomic 10', 14 June 1946, NAA: A816, 3/301/433 Part 1.
29 Letter from George Briggs to Edna Briggs, 27 May 1946, Briggs papers, NLA: MS8255, 4/1.
30 Cable from Australian delegation, UN, New York, 'Atomic 6', 30 May 1946, NAA: A816, 3/301/433 Part l.

problems at issue are of universal significance', the draft argued, 'namely the physical potentialities for mass destruction on the one hand and the great benefits of supply of power and the results of scientific research on the other'.[31]

Australian policy reflected the familiar crossroads choice. Controlling atomic energy meant setting the world safely upon the road to a glorious atom-powered future, while at the same time blocking the path of anyone foolish enough to venture down the road to atomic annihilation. Most participants drew upon this broadly accepted duality. 'We are here today to make a choice between the quick and the dead', announced the leader of the US delegation, Wall Street financier Bernard Baruch, at the Commission's first meeting. 'Behind the black portent of the new Atomic Age', he continued, 'lies a hope which, seized upon with faith, can work our salvation'.[32] The point was underlined by the Bikini atomic bomb tests— 'Operation Crossroads'— which provided an instructive backdrop to the Commission's deliberations. After a month of discussions, the incoming chairman, Alvaro Alberto of Brazil, summarised the challenge ahead: 'there are two different paths we can take for once again the Nations are at the crossroads of destiny'.[33]

Unfortunately, this apparent agreement on the nature of the task facing the Commission was not matched by a corresponding agreement on the best means of achieving it. Despite the urgency that Evatt, as chairman, sought to impart to proceedings, his hope for prompt action was quickly thwarted as a fundamental conflict developed between the US and Soviet positions. Whereas the Baruch plan sought the establishment of a wide-ranging system of inspection and control as a first step in the banning of atomic weapons, the Russian alternative proposed that such weapons be outlawed immediately. The Americans were unwilling to give up their atomic monopoly until sufficient safeguards had been formulated to prevent bombs being made in secret. The Russians did not want to open their laboratories and mines to outside inspection while their

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31 'Draft of Australian observations on the control of atomic energy', 30 May 1946, NAA: A1196, 2/501/266 Part 1.
32 *UNAEC Official Records*, First Meeting, 14 June 1946, p. 4
33 *UNAEC Official Records*, Fifth Meeting, 18 July 1946, p. 73.

superpower rival maintained such a dangerous advantage. Their seemed little room for negotiation.

The Australian delegation remained hopeful nonetheless. Briggs reported that Evatt was 'proving a strong chairman' and that, besides the USA, the Australians were 'presenting more concrete proposals and analysis of the position than anyone else'.[34] The conflict between the American and Russian plans had made progress difficult, but not impossible. Outlining Australia's alternative scheme, Evatt sought to move beyond the fixed positions of the superpowers by reasserting the principles underlying the Commission, by reinforcing the primacy of the choice that confronted the world. Disagreement had centred on the banning of the atomic bomb, but that was only half of the crossroads picture. Evatt argued that the problem of atomic energy had to be treated as 'one integrated whole'. Any working plan for the control of this new energy had to give 'special consideration' to the atom's 'beneficial uses as well as to its destructive power'. Calling on the Commission to 'accelerate all development' of the peaceful application of atomic energy, Evatt reminded the delegates that the crossroads provided an alternative to destruction. If the nations of the world could be coaxed into taking a few steps along the right path, then the positive momentum might help 'create that international trust' that was 'necessary in order to simultaneously remove the dangers and grasp the benefits presented by this new discovery'.[35]

The United Nations Atomic Energy Commission was not, of course, the only suggested means of defusing the bomb's countdown to oblivion. Proponents of world government offered 'one world or none'; religious leaders called for a rebirth of spiritual energy to meet the 'moral test' that confronted humankind; scientists imagined a vital role for themselves in government; and communists saw the bomb as evidence of the

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[34] Letter from Briggs to David Rivett, 5 July 1946, CSIRO Archives: series 3, KA/5/7 and KA/5/12/3. See also cable 'Atomic 21' from the Australian delegation, 12 July 1946, NAA: A816, 3/301/433 Pt. 1. Paul Hasluck offers a more critical assessment of Evatt's forceful style at the UNAEC deliberations in *Diplomatic witness: Australian foreign affairs, 1941-1947*, Melbourne University Press, Melbourne, 1980, pp. 277-80.

[35] UNAEC Official records, Third Meeting, 25 June 1946, p. 55. A copy of this speech was also included in CPD, vol. 188, 1 August 1946, pp. 3489-92.

dangerous distortions forced upon science by an oppressive political system. But whether the answer was to be found in law, religion, political or social change, all agreed the world's options were limited.

Progress was imagined both as a perilous escape and a triumphant journey, as a exercise of denial and an orgy of opportunity. Control over atomic energy was to be gained by emphasising the contrast between the crossroad options, by making the constructive route seem inevitable, the alternative impossible. There was no choice. Religious commentators seeking to understand the implications of the bomb, regularly invoked God's words to Israel, 'I have set before you life and death, blessing and cursing; therefore choose life that you and your descendents may live'. Free will was to be exercised against the threat of punishment. The choice was loaded: an affirmation of faith, rather than an invitation to consider idolatry. Progress, like God, was to be taken for granted, there was no alternative. The future was defined against a backdrop of fear and division. Just what was being controlled, and by whom?

'What was the title of it', asked Mr Justice Owen, the chairman of the Petrov Royal Commission, 'the United Nations— ?' 'Atomic Energy Commission', George Briggs replied.[36] The world's only chance for survival had already faded from public memory. The Atomic Energy Commission had succumbed to its own sense of inevitability, as the world lurched on from crossroads to crossroads. Evatt's attempts to wield atomic energy in the cause of global justice had failed, and as ideological conflict gnawed away at postwar idealism, he struggled to contain his own arrogance and insecurities. The Cold War deepened the contrast between progress and destruction, the threat to existence compounded by an insidious, creeping challenge to Australia's way of life. Control became a issue of national security, rather than international cooperation. 'Those conferences', Owen continued, 'were concerned with ways and means of international control of atomic energy?' 'Yes', Briggs answered. 'For both peace and

[36] Royal Commission on Espionage, *Official Transcript of Proceedings*, 1 December 1954, Sydney, 1955, pp.2829-2830.

war?', interjected Mr Justice Ligertwood. 'Yes', he replied again.[37] And if they had succeeded, the physicist might have wondered, would we now be hunting secrets and spies?

## Girding themselves for the fray

'One has only to turn to the map, and see how unpeopled our northern lands are, to realize the obligation upon us'. In July 1909, Littleton Groom introduced legislation for the Commonwealth takeover of the Northern Territory. The 'emptiness' of Australia's north was a reproach, a failure of responsibility and imagination, that threatened the 'welfare of the Commonwealth'. By taking control of the Northern Territory, the Commonwealth could, Groom argued, begin to meet the obligations of nation, empire and race, and justify its ownership of the continent. Urgent action was demanded in the interests both of progress and security. 'We have in the north a rich, fertile country', Groom continued, 'and no matter what means of communication may be determined in the future, that Territory, as it is today, ... is a menace to the Commonwealth'.[38]

The problem with the Northern Territory was that it remained 'unmanned'. But 'manning' the country was not simply a matter of numbers. What was required, Groom explained, was 'effective' occupation: 'occupation by a people who are applying their energies and industry to developing the resources of the country'.[39] Groom imagined a hardy yeomanry, subduing the land through strength, will and wit. By their efforts, the country's neglected 'wastes' would be redeemed as a place to build homes and families. Science would foster such worthy instincts, with the much hoped for Bureau of Agriculture promising a reinvigorated assault on the vicissitudes of frontier existence. Groom quoted approvingly US President Roosevelt's assessment, that as well as creating wealth, his own department must aim 'to foster agriculture for its social

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37 *ibid.*
38 *CPD* vol. 50, 30 July 1909, pp. 1878-91.
39 *CPD* vol. 50, 30 July 1909, p. 1880

results... to assist in bringing about the best kind of life on the farm for the sake of producing the best kind of men'.[40]

'Effective occupation' of the north would strengthen the nation's moral and practical claim to ownership of the continent. Envious Asian neighbours would no longer be tempted to ponder the attractions of Australia's 'empty' spaces. But if threats arose, 'the best kind of men' would be certain to stand resolute against the invading hordes. A country did not marshal its power by watching soldiers in exercises or drills. The nation's security could best be assured, Groom maintained, by the 'intelligent proprietor of the land defending his own country'. Australia 'did not want a standing army', he added, 'but one constituted by every citizen recognising his own responsibility'.[41] 'Effective occupation' promised not only to develop the continent, but to secure it by breeding a citizen soldiery wedded to the land and its ideals.

This combination of progress and security was crucial to the liberal idea of 'protection'. The imposition of tariffs was clearly defensive, delivering control over the marketplace and a limit on foreign competition. But 'the ideal of protection', Groom argued, was to enrich society, to 'bring about 'a diversity of employment and occupation for all the rising generation'.[42] The talents and abilities of each would be realised in a diverse and decentralised economy that promoted the growth of both individual and nation. Furthermore, by encouraging the 'conservation of our resources' and the 'development of our citizen soldiery', protection would add to the country's strength and self-reliance. An independent Australia, Groom insisted, would be best able to aid the mother country in times of crisis, to take its place amongst the nations of the world.[43] 'Other nations... were girding themselves for the fray', he noted, pointing to the efforts of

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40 *CPD* vol. 50, 3 August 1909, p. 1929

41 *Toowoomba Chronicle*, 21 November 1906, p. 3. For more on 'citizen soldiering' in Australia see Craig Wilcox, *For hearths and homes: citizen soldiering in Australia, 1854-1945*, Allen & Unwin, Sydney, 1998.

42 *Toowoomba Chronicle*, 21 November 1906.

43 *ibid.*

Germany and the USA to equip themselves 'industrially and defensively'. 'Self-protection', with all its possible meanings, was a 'natural instinct'.[44]

Prime Minister Billy Hughes also reflected upon the German example while opening discussions on the idea of a national laboratory in January 1916. Germany's achievements on the battlefield, as well as its 'amazing industrial development', were 'due largely to the fact that the scientist was, if not the captain, at least the pilot of German industry'. Australia had to make a similar effort, he argued, to enlist the power of science in the nation's push for victory, but also 'to meet the conditions which would arise after the war'. Progress would be made both on the battlefields of Europe and the farms and factories of Australia. 'We must rise to this great occasion', Hughes proclaimed, 'turning a frightful calamity into a lasting good'.[45]

The war provided a potent demonstration of the value of self-reliance. Australia could not afford to remain dependent on overseas sources for essential commodities. This was an important lesson, HW Gepp insisted in 1919, for the nation was about to enter upon a 'new war... a war for economic existence'.[46] A 'self-contained' Australia was one that made efficient use of its own resources, one that created new industries, new opportunities, one that drew heavily upon the expertise of science, and one that sought to develop a people who were 'strong in their mutual goodwill and confident in their strength'.[47] A 'self-contained' Australia was ready to meet the challenges both of war and peace.

Progress is an aggressive, expansionary creed. Space and energy are consumed in its constant, hungry search for new sources of wealth and power. But its expression is shaped by threats as well as opportunities, by boundaries as well as horizons. Effective occupation, protection, and self reliance, all promoted development as a means of bolstering the nation's defences against the dangers of a hostile world. Progress was to

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44 *Toowoomba Chronicle*, 15 November 1906, p. 3.
45 *Argus*, 6 January 1916, p. 8.
46 HW Gepp, 'Australia self-contained', *Science and Industry*, vol. 1, no. 3, July 1919, p. 147.
47 HW Gepp, 'Australia self-contained', *Science and Industry*, vol. 1, no. 4, August 1919, p. 225.

be found both in an expansion of the nation's capacities and in the fortification of its boundaries. Progress offered strength: the strength to chart an independent future, free of insecurity and doubt. It was both a proud journey, and an anxious escape.

Science played an increasing role in Australia's dreams of self-reliance. For the first ten years of its existence CSIR tackled the problems of primary industry. But in the 1930s, the lessons of the Depression, coupled with the growth of international tension, redirected attention towards the expansion of manufacturing.[48] CSIR's potential contribution to secondary industry was mapped out in a report to government that stressed both the strategic and economic benefits of greater industrial self-sufficiency. With the prospect of renewed global conflict looming, Australia could not afford to remain dependent on overseas sources for manufactured goods, particularly in critical areas such as engine and aircraft production. By the time that war did indeed arrive, CSIR had established a standards laboratory to support efforts at mass production, and had begun research into aeronautics and lubricants. The combination of defence and development was again reflected in scientific priorities.

In Australia as elsewhere, science was willingly recruited into the war effort.[49] Though as scientists struggled to keep ahead of the latest enemy advance, they might have pondered the escalating horror of technological warfare. Science had contributed much to the efficiency of destruction, rendering obsolete many older forms of defence. The threat which science confronted in its pursuit of war-winning wonders was increasingly of its own making. The world was locked in a cycle of power and vulnerability that seemed to reach its zenith in the obliteration of Hiroshima. The war was won, Allied forces had demonstrated their mastery of a vast new source of power, and the world was suddenly more fragile, more insecure than ever before. Many people questioned whether this could really be progress, but the answer to the perils of the Atomic Age

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[48] C B Schedvin, *Shaping science and industry: a history of Australia's Council for Scientific and Industrial Research, 1926-49*, Allen & Unwin, Sydney, 1987, ch. 5; RW Home, 'Science on service, 1939-1945', in RW Home (ed.), *Australian science in the making*, Cambridge University Press, Cambridge, 1988, pp. 222-7.
[49] Home, 'Science on service'; David Paver Mellor, *The role of science and industry, Australia in the war of 1939-1945, Series 4 (civil)*, vol. 5, Australian War Memorial, Canberra, 1958.

was soon accepted to be more of the same. The genie was out of the bottle, the path from the crossroads stretched ahead, science would continue to offer new sources of strength against the terrors it unwittingly spawned in the name of progress.

In July 1946, JJ Dedman, the Minister for Postwar Reconstruction, introduced legislation to invest the Commonwealth with control over uranium and any other 'raw materials' associated with atomic energy. There was 'a general realization', he told the House, 'that the problem of control of atomic developments and raw materials' was 'one of immediate and inescapable urgency'. Just as the United Nations Atomic Energy Commission was attempting to define 'a practical scheme of international control', so the Commonwealth was acting upon its own responsibility to ensure there were adequate safeguards controlling the use of Australian resources. Power over mining and mineral deposits remained with the states, but this was a matter of 'security'. 'That the national development of atomic energy is inextricably bound up with defence no longer requires to be laboriously demonstrated to anyone', Dedman noted.[50] The Commonwealth's defence powers were clearly established and conveniently elastic. As well as providing grounds for the control of uranium and the later establishment of the Australian Atomic Energy Commission, the defence powers were also invoked in regard to the Snowy Mountains Scheme.[51] Plans for national development offered self-reliance and security.

Dedman hoped, however, that the new legislation would not only serve to protect the nation's interests, but that it would in the future encourage 'rapid expansion' of Australian efforts in the atomic energy field. There was 'something strangely significant', he mused, in the fact that he had, in the current session of parliament, introduced both measures to control atomic energy and legislation to establish the Australian National University. One bill represented 'a broad attempt to ensure public control and development in Australia of potent forces which overshadow our whole future for good

50 *CPD*, vol. 187, 12 July 1946, pp. 2476-7.
51 For a discussion of the elastic nature of the defence powers see RD Lumb, and GA Moens, *The Constitution of the Commonwealth of Australia - Annotated*, 5th ed., Butterworths, Sydney, 1995.

or ill', the other would encourage research in the physical sciences through which atomic energy might be turned 'to men's service rather than their extermination'.[52] The coincidence emphasised the challenge of progress.

Australia was keen not to be left behind at the dawning of the Atomic Age. The prospect of a new, seemingly unlimitable, energy supply was attractive to a country pursuing rapid industrialisation, and as yet unsure of its fossil fuel reserves.[53] While ANU attracted the headlines, CSIR had already initiated a modest program of fundamental research into atomic physics in cooperation with Les Martin at the University of Melbourne.[54] But if Australia was to scale up its efforts, it needed information. Fred White, a member of the CSIR executive, had learned of the difficulties in sharing defence-related information when he led Australia's top secret wartime project to develop radar.[55] Britain, he argued, was only likely to agree to collaboration on atomic development if Australia 'was actively engaged in research'. If no work were in progress, he added, 'there was a tendency to deny access to information on the subject'.[56] Australia's research objectives were thus framed with the hope of courting British favour. Even when the Menzies government created the Australian Atomic Energy Commission to pursue the local development of atomic power, it looked to Britain for ideas and approval, desperate still for a few scraps of information.[57]

Australia suffered the consequences of the USA's atom-powered puffery. Imagining themselves the bearers of a 'sacred trust', the Americans became increasingly reluctant

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52 *CPD*, vol. 187, 12 July 1946, pp. 2476-7.

53 Alice Cawte, *Atomic Australia: 1944-1990*, New South Wales University Press, Sydney, 1992, ch. 2; Tim Sherratt, 'A political inconvenience: Australian scientists at the British atomic weapons test, 1952-3', *Historical Records of Australian Science*, vol. 6, no. 2, 1985, pp. 137-52.

54 See 'Proposal to set up an atomic physics laboratory at the Physics Department, Melbourne University, under the aegis of the Council for Scientific and Industrial Research', 7 February 1945, and related correspondence in CSIRO Archives: series 3, KA5/17/1.

55 HC Minnett, and Rutherford Robertson, 'Frederick William George White', *Historical Records of Australian Science*, vol. 11, no. 2, 1996, pp. 239-58.

56 CSIR Consultative Committee on Nuclear Physics Research, Minutes of first meeting, 26 November 1945, CSIRO Archives: series 3, KA10/2/2. See also Dedman's coments to Cabinet quoted in Cawte, *Atomic Australia*, p. 11.

57 Cawte, *Atomic Australia*, pp. 60-3, 97-101.

to share information, even with their former wartime partners. Australia looked to Britain, Britain looked to the USA, forming an anxious cycle of thwarted ambition, distrust, and misplaced hope. And yet, while it was the bomb that fuelled the prevailing sense of paranoia, it was the military significance of atomic energy that seemed to offer Australia its best chance of sharing the 'secret'. If Australia could prove itself a useful and willing contributor to the defence plans of Britain and the USA, perhaps the information would at last start to flow.[58]

In January 1946, as the USA prepared to flout its atomic monopoly under the guise of 'Operation Crossroads', the Australian naval attaché in Washington suggested that a 'greater share' in the results of the tests might be gained by offering a disused Australian warship to add to the doomed target fleet. As well as providing an interesting comparison of the effects of the bomb on 'Australian workmanship', such an initiative, he noted, would emphasise Australia's 'continued desire to collaborate in a practical way towards post war security'.[59] While the suggestion was not pursued, the idea that Australia might prove itself worthy of atomic secrets by supplying things to blow up seemed a popular one. First at Woomera, then at Monte Bello, Emu Field and Maralinga, Australia sought to buy entry into the atomic club by trading land, safety and sovereignty.

The discovery of ample uranium deposits brought further hopes of cooperation. Needing raw materials to fuel its expanding atomic arsenal, the USA sought an agreement over the supply of uranium from the Rum Jungle mine. Australian authorities pressed for an exchange of technology and information, but in the end were forced to content themselves with the knowledge that Australian uranium would be on the front lines of the battle against communism.[60] The opening of the treatment plant at Rum

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[58] The politics of information have been the major focus of works relating to Australia's nuclear history, see: Cawte, *Atomic Australia*; Sherratt, 'A political inconvenience'; Sherratt, 'A physicist would be best out of it'; Robert Milliken, *No conceivable injury: the story of Britain and Australia's atomic cover-up*, Penguin, Melbourne, 1986; Wayne Reynolds, *Australia's bid for the atomic bomb*, Melbourne University Press, Melbourne, 2000.

[59] Secret cable from Australian legation, Washington to Department of Defence, 19 January 1946, NAA: A5954, box 1384/3.

[60] Cawte, *Atomic Australia*, pp. 49-53.

Jungle in September 1954 was, TAG Hungerford observed, 'a solemn occasion for Australia', placing in the nation's hands 'a source of power and wealth undreamed of a decade ago'. But the event was equally momentous for the whole of the 'free world', as Rum Jungle added to 'the assured supply of the terrible element which now dominates so surely the thought and action of our times'.[61] Speaking at the opening, Prime Minister Menzies stressed that Australia's uranium deposits made it 'a powerful contributor to the defence of the free world'. Eventually, though, 'this phase of insanity' in world history would come to an end, he added, and uranium would bring 'power, light, and the amenities of life to the producers, consumers and housewives of the entire continent'.[62]

Australia was both aiding in the protection of the free world and building the basis for future prosperity, it was securing the nation's defence by strengthening the alliance with its 'great and powerful friends' and seeking information that would enable it to pursue independent atomic development, it was supplying the engines of destruction and imagining the glorious vistas of a world without peril. Development and defence remained entwined as the nation strode out along the path to progress.

Rum Jungle was also celebrated as a victory at last over the 'empty' north. It was, Menzies argued, 'merely the forerunner' of major enterprises that would build in the Northern Territory one of Australia's 'great communities'.[63] Instead of yeoman farmers, it seemed, the north's progress would be won by wage-earners working for large international corporations. Rather than the challenge of taming the land, these new pioneers would be lured by the provision of modern, suburban amenities. Australia's defence would be assured not by a citizen soldiery standing resolute over their own patch of earth, but through the security wrought by the mysterious metal they laboured to extract from the ground.

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61 TAG Hungerford, 'Uranium refinery plant opens at Rum Jungle', *National Development*, no. 9, September 1954, p. 3.
62 *SMH*, 18 September 1954, p. 3. See also: 'Rum Jungle uranium project opened', *Chemical Engineering and Mining Review*, vol. 47, 11 October 1954, pp. 3-6, Cawte, *Atomic Australia*, pp. 80-1.
63 *SMH*, 18 September 1954, p. 3.

## The badge of the outsider

The war, when it came, only lasted for a month, but that was long enough. All life was quickly extinguished in the northern hemisphere, and the clouds of deadly radioactive fallout gradually diffused to shroud the whole globe. For the people of Australia, it was a lingering, drawn out journey to oblivion. Nevil Shute's apocalyptic novel *On the Beach* presented a new threat from the north, something invisible and unstoppable. 'It's going to go on spreading down here, southwards, till it gets to us?', Moira asks, 'And they can't do anything about it?' 'Not a thing', replies Commander Dwight Towers, 'It's just too big a matter for mankind to tackle. We've just got to take it'.[64] All they can do is wait helplessly for their own death. In this final act of surrender the people of Australia are united with the rest of humanity. One world or none.

In 1945, the *Sydney Morning Herald* could find 'no logical reason for setting the atomic weapon apart from other weapons'. The 'swathe of death' it cut was wider, but the 'consequence to the individual victim' was the same. And yet logic seemed somehow inadequate, the newspaper admitted, for 'we know in our hearts that something new and terrible has entered into the lives of nations'.[65] A war fought with atomic weapons would not be like any other war, it would bring 'universal ruin', perhaps the end of civilisation itself. Where diplomacy, conquest, and religion had failed, technology had made the world as one, united in the prospect of Armageddon. Humanity could not avoid the challenge to 'co-operate or perish'.[66]

'I am becoming convinced that the only defence of the world against the threat of atomic warfare is a political defence', declared GV Portus, professor of political science and history at the University of Adelaide. Schemes for international co-operation or control were a useful starting point, but Portus argued that the bomb demanded more. Countries could no longer imagine themselves as independent entities, free to act according to their own desires and ambitions. If the world was to avoid oblivion, it had

64 Nevil Shute, *On the beach*, Heinemann, London, 1957, pp. 39-40.
65 *SMH*, 11 August 1945, p. 2.
66 *SMH*, 9 August 1945, p. 2.

to abandon the 'out of date' concept of 'national sovereignty' altogether.[67] The bomb had obliterated boundaries between energy and matter, between civilian and combatant, now it seemed that the boundaries between nations themselves must yield.

Portus quoted extensively from Albert Einstein, who in the aftermath of Hiroshima became a vocal advocate of the idea of 'world government'.[68] The concept itself was hardly new, but the bomb added a persuasive sense of urgency.[69] In October 1949, the *Sydney Morning Herald* reported that the people of Gosford were to 'do a little soul-searching on behalf of all Australians', by taking part in a pilot poll to gauge support for the principles of a 'World Federal Government'. HN Rhodes, chairman of the NSW division of the World Movement for World Federal Government explained that they aimed 'to create a federal type of world government, elected by the people of the world, and capable of making and enforcing world law in matters likely to provoke war'. The difficulties were enormous, Rhodes admitted, but 'nothing less than what we propose can save the world from catastrophe'.[70]

While the heyday of the world government movement was brief, proponents remained active well into the 1950s. Basil Buller-Murphy, a barrister married to one of Australia's wealthiest and most powerful women, Deborah Buller-Murphy, described himself as the country's most resolute advocate of world federation.[71] Despite his supposed revolutionary leanings, Buller-Murphy remained 'a sturdy devotee of the Crown' and 'an ardent admirer of the Queen'.[72] His concern was less with questions of morality than the importance of the rule of law. 'If the nations want world peace, they must have world

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67 GV Portus, 'The atom bomb and the world', in Kerr Grant and GV Portus (eds), *The atomic age*, United Nations Association, SA Division, Adelaide, 1946, pp. 14-27.

68 Albert Einstein, 'World government or atomic war, says Einstein', *SMH*, 29 October 1945, p. 2. See also Paul Boyer, *By the bomb's early light : American thought and culture at the dawn of the Atomic Age*, Pantheon Books, New York, 1985, pp. 36-45.

69 John F Bantell, 'The origins of the world government movement: the Dublin conference and after', *Research Studies*, vol. 42, no. 1, March 1974, pp. 20--35.

70 *SMH*, 4 October 1949, p. 2. In a letter a few months later, Rhodes reported that 72 per cent of Gosford electors support this approach, *SMH* 31 March 1950, p. 2.

71 Buller-Murphy published a collection of his articles and speeches under the title *Safety of our future: world federation*, Robertson & Mullens, Melbourne, 1957.

72 *Herald*, 28 July 1962.

order', he argued, 'if they want world order they must have world law'.[73] Buller-Murphy's priorities were reflected in the fact that office bearers of his World Federation Society were drawn exclusively from the ranks of Queen's Counsels.[74]

Mark Oliphant was also inclined towards the ideals of world government. In April 1954, four thousand people packed the Sydney Town Hall for a discussion of the 'moral implications of the hydrogen bomb'.[75] Oliphant spoke first, describing the horrific consequences of a conflict involving weapons of 'unlimited destructive power': 'hundreds of millions of people would be killed' and 'humanity would return to the middle ages'. 'The only possible solution', he declared, was 'a world body, world government if you like, to deal with all the problems of international difference'.[76] Oliphant's prescriptions were received enthusiastically by the crowd, and noted carefully by a member of the Australian Security Intelligence Organisation (ASIO), monitoring communist opposition to the hydrogen bomb. The operative's report assessed the overflowing audience as 'evenly divided between the sort of people who generally attend Communist meetings and the type of people who attend symphony concerts'. Oliphant's speech attracted most attention, though the comments of other speakers were also summarised. 'Canon Davidson', it was reported, 'delivered a sermon on good and evil but did not deal with anything of security interest'. Remarking that pamphlets from the World Movement for World Federal Government were distributed, the report noted that 'Professor Oliphant's support of this movement is of interest'.[77] As Oliphant imagined an end to 'problems of international difference', his communist sympathies were being assessed. As world government proponents looked to break down barriers of suspicion and hostility between nations, ASIO's presence was a reminder that the world was more starkly divided perhaps than ever before.

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[73] Buller-Murphy, *Safety of our future*, p. 181.
[74] *ibid*, p. 16. Buller-Murphy, not himself a QC, was given the special position of 'Founder and Honorary Director'.
[75] *Daily Telegraph*, 9 April 1954, p. 12.
[76] *ibid*; MLE Oliphant, 'Peace or destruction', *Voice*, vol. 3, no. 7, April 1954, pp. 12-13. The proceedings of the meeting were included in *Voice* under the heading 'The H-Bomb: a challenge to humanity'.
[77] Memorandum for ASIO Headquarters, 'Agitation against the atomic bomb', 14 April 1954, NAA: A6122/XR1, 216.

In March 1946, Winston Churchill famously declared that an 'iron curtain' had descended across the European continent. The expansion of the 'Soviet sphere' to encompass much of eastern and central Europe was a threat to 'unity', to the very 'safety of the world'. The world was divided geographically and ideologically. Even outside the Soviet bloc, 'fifth columns' were at work furthering the communist agenda, posing 'a growing challenge and peril to Christian civilization'. Strength was the only answer, Churchill asserted, the combined strength of the British and American peoples, expressed in military power, in the development of science and industry, and 'in moral force'. Only then would 'the high roads of the future' be clear.[78] In this new age of oxymorons, war was cold, and the bomb was a weapon of peace.

Australians too were discovering new boundaries and divisions. The mysterious undertakings at Woomera were surrounded by their own 'iron curtain of security'.[79] Woomera was, one visitor observed, 'the most closely guarded, most security-minded town of the Empire'.[80] It was the centre of 'a vast top-secret scientific enterprise', where 'the pursuits of peace and war' seemed 'oddly in harmony'. Woomera was a 'closed town', Ivan Southall explained to his young readers in *Rockets in the desert*, 'it is locked up behind big gates, and at each of these gates policemen are on duty night and day all the year round'. You could not drive through the town, or stop for a look. You could not visit without the permission of a security officer. 'It's the job of the security officer to protect all the secrets that are hidden at Woomera', Southall noted, 'he may let you through the gate if your reason is good enough, but it will have to be a very good reason indeed'.[81]

The question of who was let through the gates was a sensitive one in a town where residents were security screened and 'curiosity' was 'the badge of the outsider (in both

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[78] Winston Churchill, 'Sinews of peace', in Randolph Churchill (ed.), *The sinews of peace: post-war speeches by Winston S Churchill*, Cassell, London, 1948.
[79] *Herald*, 12 October 1953, p. 3.
[80] *Herald*, 15 March 1952, p. 13.
[81] Ivan Southall, *Rockets in the desert*, Angus & Robertson, Sydney, 1964, pp. 3-4.

its meanings)'.[82] In 1953, the *Herald* was aghast to learn that people with known communist affiliations were living and working within the rocket range. In the recent Senate election, it claimed, five votes had been cast in Woomera for an avowedly communist candidate. Despite government assertions that 'known political suspects' had no access to secret information, the newspaper insisted such people should be expelled. 'There is no such thing as a "safe" suspect in a defence area', it argued.[83]

Fears of communist interference in these vital defence experiments were raised even as the range was being constructed in 1947. Opposition warnings of 'communist treachery' seemed justified when the Building Trades Federation recommended a boycott of work at the site.[84] The Labor government was challenged to prove it was willing to take firm action against the mounting communist threat. It responded by passing the *Approved Defence Projects Act*, which not only outlawed the disruption of defence undertakings, but also threatened with punishment anyone who 'by speech or writing advocates or encourages the prevention, hindrance or obstruction' of such projects.[85] Brian Fitzpatrick, secretary of the Australian Council for Civil Liberties, argued that this 'Anti-Sabotage Bill' constituted 'the worst threat to basic democratic rights' that Australia had seen for many years.[86] But the *Age* warned that 'in matters of national defence the foolishness of misguided friends can be as dangerous as the machinations of enemies', and congratulated the government on 'giving the new measure the widest application and buttressing it well with severe penalties'.[87]

In a divided world the maintenance of boundaries was all important. Land was 'prohibited' to prevent incursions by 'tourists, spies, and other troublesome observers'.[88]

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82 *Herald*, 15 March 1952, p. 13. For a description of the security system at Woomera, see Peter Morton, *Fire across the desert: Woomera and the Anglo-Australian Joint Project 1946-1980*, AGPS, Canberra, 1989, ch. 7.
83 *Herald*, 14 August 1953, p. 4.
84 *Age*, 8 March 1947, p. 16. See also Morton, *Fire across the desert*, pp. 117-22
85 Quoted in Morton, *Fire across the desert*, p. 120.
86 Press release entitled 'The Approved Defence Projects Protection Bill', Brian Fitzpatrick papers, NLA: MS4965, series 1c, folder 93. See also, Don Watson, *Brian Fitzpatrick: a radical life*, Hale & Iremonger, Sydney, 1979, pp. 210-1.
87 *Age*, 2 June 1947, p. 2.
88 Ivan Southall, *Woomera*, Angus & Robertson, Sydney, 1962, p. 21.

People were vetted to distinguish friend from foe. Secrets were guarded to protect against 'leakage'. Security was to be ensured by erecting ever stronger barriers around land, people and ideas. As the British prepared to explode their first atomic bomb in 1952, the Menzies government introduced its own legislation to increase Commonwealth control over access to defence related sites.[89] People could be searched and arrested not only for trespassing upon a prohibited area, but even if it was merely believed they were 'about to commit' an offence against the act. 'The penalties provided for offences are severe', admitted the Minister of Defence, 'I make no apology for that'. 'Public interest and curiosity' was being excited by plans for the atomic test. 'Some of this interest may be ascribed to natural inquisitiveness', he commented, 'but some is and will be nefarious'.[90] In the battle of boundaries it mattered which side were you on.

Space and distance, which for so long had seemed to threaten the nation's security, to resist its attempts at progress, now provided an extra barrier against unwelcome attention. The 'vast wastelands' of Australia's interior offered an ideal site for defence developments, 'far removed from the eyes and ears of a potential enemy'.[91] But this recolonisation of the interior brought unsettling reminders of white Australia's unfinished conquest. Doug Nicholls, secretary of the Aborigines' League, called for protest against the rocket range as yet 'another tragic theft' of the land from its 'defenceless' inhabitants. 'Central Australian tribes', he argued, 'had, so far, escaped the fate of aborigines in other parts of Australia, whose only legacy from contact with the white man was loss of their possessions and free way of life'.[92] As Australia championed human rights in the United Nations, it was accused of a 'gross act of injustice to a weaker people who have no voice of their own'. 'It is no use being hypocritical about it', argued Clive Turnbull in the Herald, 'if we say "the rocket range is so important that it is worth destroying the natives for", the world will at least know where we stand, despite all those protestations about the rights of small peoples'. The *Herald*'s editor sought to

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89 This was the *Defence (Special Undertakings) Act 1952*.
90 *CPD*, vol. 217, 4 June 1952, pp. 1375-6.
91 Charles H Holmes, 'Half-way round the world to test atomic weapons', *Walkabout*, vol. 18, no. 7, 1 July 1952, p. 12.
92 *Herald*, 4 October 1946, p. 9.

distance himself from Turnbull's comments, noting that 'logically' his argument would mean 'that the European civilisation in Australia should never have come'.[93]

Woomera stirred activity along frontiers of science, occupation and defence. The experimental program would launch science into new realms of exploration and understanding; Australia's troublesome wastelands would at last be brought to productive account; and the security of the nation, the empire, and the free world itself, would be bulwarked by an expanding arsenal of ever more powerful weapons. Frontiers provide a site for transformation and transcendence, a line of advance where progress exchanges old for new, past for future. But they are also sites of confrontation, where the promise of future achievement faces the fear of past mistakes, where the creative power of modern society is revealed in all its destructive horror, and where the image of strength and self-reliance is undermined by questions of legitimacy and integrity.[94] The compelling contrast between old and new blurs into uncertainty and doubt.

Littleton Groom's yeoman farmers were set to labour not merely for the benefit of nation, but for the welfare of the race. His 1901 election campaign was energised by a detailed and passionate advocacy of the principle of 'White Australia'. Quoting CH Pearson on the dangers of Asian immigration and the threat of racial degeneracy, he warned his electors 'we are not fighting the battle of Australia alone, ... we are fighting the battle of civilised Europe'.[95] It was in the denial of borders, the negation of boundaries, that Australia's dissolution threatened. Racial integrity had to be vigorously maintained along battlefronts both personal and national, moral and martial. 'Can you allow your children to blend their blood with that of the alien races?', Groom asked,

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[93] *Herald*, 29 March 1947, p. 4.
[94] For some of the complexity of the Australian frontier(s) see: Deborah Bird Rose, 'Hard times: an Australian study', in Klaus Neumann, Nicholas Thomas and Hilary Ericksen (eds), *Quicksands: foundational histories in Australia and Aotearoa New Zealand*, UNSW Press, Sydney, 1999, esp. p. 12; Brigid Hains, *The ice and the inland: Mawson, Flynn and the myth of the frontier*, Melbourne University Press, Melbourne, 2002, esp. p. 5, 103, 127-8; Brigid Hains, 'Mawson of the Antarctic, Flynn of the Inland: Progressive heroes on Australia's ecological frontiers', in Tom Griffiths and Libby Robin (eds), *Ecology and empire: Environmental history of settler societies*, Melbourne University Press, Melbourne, 1997, pp. 154-66.
[95] *Toowoomba Chronicle*, 29 August 1901.

'Can you imagine anything more pathetic than sad-looking almond eyes peeping out of the Caucasian faces?'[96]

Degeneration menaced both by a mixing of blood and a denial of natural destiny. Old should yield to new in the fulfilment of progress, as predictably as minute follows minute. But the frontier brought the danger of reversion, the possibility that both body and spirit could be polluted by contact with primitive nature. The flow of destiny could stall as old bled into new, as the boundary between past and future lost its dynamism and clarity. It was a fear that lingered into the Atomic Age, as the latest product of progress paradoxically threatened to reverse the march of civilisation. Mark Oliphant was not alone in believing that an atomic war would drive humanity back to the dark ages or beyond. The bomb also renewed the attack on the integrity of race and heredity. The effects of radioactive fallout might be felt not only in the bodies of the living, but in the illness and deformities of generations unborn.

Fears of infiltration, contamination and degeneration have constantly pricked at the confidence of white Australia. The challenge of nation building has been found not just in the development of land and people, but in the imposition of an effective quarantine regime, and in the battle against 'alien' or tropical diseases.[97] Australia could remain strong and healthy by keeping its borders intact against the perils of a diseased and dangerous world.[98] The metaphors of disease were also employed to awaken people to the insidious threat of communism.[99] Like the Chinese before them, Communists were portrayed as 'vermin' infecting a dangerously innocent Australia. Communism, argued

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[96] *Toowoomba Chronicle*, 29 August 1901. For anxieties relating to the mixing of races, see David Walker, *Anxious nation: Australia and the rise of Asia 1850-1939*, University of Queensland Press, St Lucia, 1999, ch. 14.
[97] Alison Bashford, 'Quarantine and the imagining of the Australian nation', *Health*, vol. 2, no. 4, October 1998, pp. 387-402; see also Walker, *Anxious nation*, ch. 11; Warwick Anderson, 'Geography, race and nation: remapping 'tropical' Australia, 1890-1930', *Historical Records of Australian Science*, vol. 11, no. 4, 1997, pp. 457-68.
[98] For images of a bounded Australia, particularly in relation to communism, see Judith Brett, *Robert Menzies' forgotten people*, Sun, Sydney, 1993, pp. 87-92.
[99] Stephen Alomes, Mark Dober, and Hellier Donna, 'The social context of postwar conservatism', in Ann Curthoys and John Merritt (eds), *Australia's first Cold War*, George Allen & Unwin, Sydney, 1984, pp. 10-11.

EJ Hogan in his book *What's wrong with Australia*, 'is a dangerous sickness and more widespread than any epidemic ever experienced'.[100]

The Cold War pushed Australia's defensive frontiers ever northward, as the concept of 'forward defence' emerged to contain the threat of communism.[101] 'We must, by peaceful means extend the frontiers of the human spirit', Menzies proclaimed, 'We must, by armed strength, defend the geographical frontiers of those nations whose self-government is based upon the freedom of the spirit'.[102] But even as the frontiers of Australian security expanded, so they rebounded inwards, enclosing hearts and minds in an ever tighter grip. Familiar fears of infiltration were revived, as the boundary between friend and enemy became more difficult to draw with certainty.

Progress was understood as a battle between opposites where attempts to negotiate a cooperative peace can only end in weakness and confusion. Boundaries offered protection, maintaining the country's integrity and purpose, but this fragile security was won at the cost of tolerance and diversity. Against a world of threats, we cling to the idea that progress can be ensured by determining who belongs and who doesn't, by erecting barriers to defend the image of who we think we are, by denying the moral ambivalence of our history, and by searching for the certainty to separate right from wrong. The characters in *On the beach* faced Australia's ultimate nightmare. From the north it came, a cloud of death and disease that no defensive barrier could stop. There seemed no reason, no sense, only confusion, anger and resignation.

## Means must be taken to control what men shall know

In March 1947, David Rivett delivered an address entitled 'Science and responsibility' at the annual commencement ceremony of the Canberra University College. Rivett, the much-respected chairman of CSIR, pursued a number of his favourite themes,

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100 Quoted in *ibid*., pp. 10-11.

101 Lachlan Strahan, 'The dread frontier in Australian defence thinking', in Graeme Cheeseman and Robert H. Bruce (eds), *Discourses of danger & dread frontiers : Australian defence and security thinking after the Cold War*, Allen & Unwin, Canberra, 1996, pp. 150-75.

102 Quoted in *ibid*., p. 162.

rhapsodising upon spirit of scientific inquiry, and urging governments not to focus too narrowly on the application of science to industry. The importance of fostering fundamental research in science was always one of Rivett's most passionate credos, a cause inherited from his friend and mentor, Orme Masson. But in the postwar world, the utilitarian bias of government and society was not the most dangerous threat to the health of science. There was a 'cloud', Rivett warned, 'that has been present in a minor degree for a long time but has grown more starkly in recent times'. It was a cloud that threatened to overshadow 'that free-trade in scientific knowledge of all kinds, which has been the glory of these last three hundred years'.[103] It was a cloud of secrecy and mistrust.

Science's increasing integration with the machinery of war had led inevitably to the imposition of secrecy. As it proved its worth on the battlefield, science became too valuable, too dangerous, to be freely exchanged between countries, or even between colleagues. Scientists had accepted such restrictions, expecting their freedom to be restored at conflict's end. But what had happened? Instead of recognising that the freedom to communicate was essential for the healthy development of science, the nations of the world had come to believe that their continued security depended on the maintenance of secrecy. This was a perilous route, Rivett argued, for 'secrecy and integrity in science cannot flourish together'. 'They who preach secrecy for security are false guides', he added, for 'that way lies war'.[104]

Brian Fitzpatrick wrote to congratulate Rivett on his speech. 'I was strongly seized by its opportuneness', he remarked, 'and the importance which attaches to such expressions on your part at this time'.[105] Only weeks before the commencement ceremony, the Opposition had launched an attack in parliament on the security of the Woomera rocket range. JP Abbott drew upon the evidence of spy trials in Canada to suggest that

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103 David Rivett, 'Science and responsibility', *Melbourne University Magazine*, 1947, pp. 9-12.
104 *ibid.*, p. 11
105 Letter from Fitzpatrick to Rivett, 1 May 1947, Fitzpatrick papers, NLA: MS4965, series 1. Fitzpatrick also asked Rivett to become a vice-president of Australian Council for Civil Liberties, letter from Fitzpatrick to Rivett, 23 June 1947, Fitzpatrick papers, NLA: MS4965, series 1.

Australian science was in the grip of an organised network of communist infiltration. He pointed in particular to the communist associations of Donald Mountjoy, who had been recently appointed to the CSIR executive, 'a position where he was capable of doing the greatest possible harm'.[106] Abbott also named a number of supposed communists involved with the Australian Association of Scientific Workers, which was itself mounting a vigorous defence of scientific freedom.[107] Amidst the escalating barrage of innuendo and suspicion, Rivett sought a return to simple truths. 'As a matter of fact', he wrote in reply to Fitzpatrick, 'it all seemed to me so completely obvious and commonplace that I have been astonished at the interest which such tame remarks appear to have aroused'.[108]

Abbott seized upon Rivett's speech as further evidence of CSIR's lax appreciation of the threat to national security. 'Having regard to the fact that Sir David is alleged to have expressed the view that there should be no secrecy among scientists in military research work', he asked Prime Minister Chifley, would the government 'take steps... to ensure that only those officers of the Council be employed on rocket research who dissociate themselves from Sir David's view?'[109] Rivett penned his own reply to the Country Party member, pointing out in a rather genial fashion that his argument had been seriously misrepresented. He did not resile, however, from the looming battle. 'You may not agree with the view that the old freedom is essential if science is to flourish', Rivett remarked, 'in that case we shall differ and insofar as you endeavour to enslave CSIR I shall be obliged to fight you and people holding this reactionary view with all the vigour I possess'.[110]

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[106] *Age*, 8 March 1947, p. 16.
[107] Jean Moran, 'Scientists in the political and public arena: a social-intellectual history of the Australian Association of Scientific Workers', MPhil, Griffith University, 1983, pp. 210-15; Jean Buckley-Moran, 'Australian scientists and the Cold War', in Brian Martin, C.M. Ann Baker, Clyde Manwell and Cedric Pugh (eds), *Intellectual suppression: Australian case histories, analysis and responses*, Angus & Robertson, Sydney, 1986, pp. 11-23.
[108] Rivett to Fitzpatrick, 2 May 1947, Fitzpatrick papers, NLA: MS4965, series 1.
[109] Copy of Abbott's question without notice on 'Guided missiles', 26 March 1947, in NAA: A9778, M13/20/1/15; *Herald*, 26 March 1947, p. 5.
[110] Letter from Rivett to JP Abbott, 31 March 1947, NAA: A9778, M13/20/1/15.

Public hostilities resumed on 30 September the following year, when the Opposition used the estimates debate to portray CSIR as a 'weak link' in the free world's defence. The acting leader, EJ Harrison, set the tone of proceedings by noting that Rivett's opinions on secrecy in science were supported by known communists.[111] Abbott re-entered the fray, quoting extensively from a copy of 'Science and responsibility' that Rivett had kindly sent him. In 'a period almost of war', Abbott argued, this speech 'was a most dangerous one'. Through his careless dismissal of secrecy, Rivett had 'preached, wickedly and wrongly, the most dangerous doctrines to our young scientists', transforming them into potential spies.[112] Such an attitude, Archie Cameron added, was 'as near to treachery as one can get'.[113] Rivett's well-publicised beliefs were paraded as evidence of the urgent need 'to drive fifth columnists and Communists' from the CSIR.[114] A week later, the faulty wiring in the physics laboratory at the University of Melbourne brought yet another round of spot the bogey.

Rivett was defended by Dedman and Chifley, who expressed his disappointment that 'statements of the nature of those made to-day could be made in this Parliament in a debate of this kind'. 'I am convinced', Chifley added, 'that no one is more loyal to Australia, or is more conscious of his country's interests, than is Sir David'.[115] Rivett himself was flooded with messages of support from scientific colleagues around the country.[116] 'One fumes and boils', wrote a CSIR scientist, 'to think that the one person of the calibre necessary to epitomise the true spirit of science should be subjected to such treatment'.[117] In a letter to Dedman, Rivett himself remarked that 'despite great temptation' he would not comment publicly on recent proceedings.[118] However, in January the following year he restated his beliefs more strongly than ever in an article entitled 'Science, secrecy and security'. 'We enter the new year', he wrote, 'after a rather

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111 *CPD*, vol. 198, 30 September 1948, pp. 1028-30.
112 *CPD*, vol. 198, 30 September 1948, pp. 1041-2.
113 *CPD*, vol. 198, 30 September 1948, p. 1045.
114 *CPD*, vol. 198, 30 September 1948, p. 1043.
115 *CPD*, vol. 198, 30 September 1948, p. 1083.
116 Rohan Rivett, *David Rivett: fighter for Australian science*, R D Rivett, Melbourne, 1972, pp. 12-14.
117 Quoted in Rivett, *David Rivett*, p. 12.
118 Letter from Rivett to Dedman, 4 October 1948, Dedman papers, NLA: MS987, series 6.

discreditable political incident at Canberra' in which 'a little group of Parliamentarians saw fit... to use the CSIR as an avenue for pursuit of rather party political ends'. He was unsure whether 'these half-dozen people were ignorant, or stupid, or merely ill-informed', but they had 'blundered badly' and their performance should bring reflection upon 'the subject of morals in public life'.[119]

Rivett's battle, however, was already lost. While the Opposition's attempt to smear him was unjustified, there was growing concern in Australia and overseas about CSIR's security credentials. Only a week before the attack in parliament, Dedman had informed the CSIR executive that American suspicions of Australian security had resulted in the country being 'completely cut off from the flow of military information'. To reassure its nervous allies and break the information embargo, the Australian government had to be seen to be taking 'positive steps... to enforce full security measures'.[120] Although there was no evidence that CSIR had let any secrets slip, plans were already under way to bring the organisation under closer government control.[121] CSIR's secretary, George Cook, wrote to JE Cummins, on 28 September, complaining that 'even now we have not been given a complete picture of what we are up against'. 'Apparently something is wrong with the release of information between the US and the British Commonwealth', he explained, 'I am afraid that in so far as Australia is concerned it looks as if CSIR is going to have to play a role which... looks very much like that of an innocent scapegoat'.[122]

To prove itself worthy of US trust, the Chifley government moved quickly to transfer CSIR's Division of Aeronautics to the Department of Supply, even as more

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119 David Rivett, 'Science, secrecy and security', *Herald*, 20 January 1949, p. 4.
120 FWG White, 'Notes on interview with the Minister in Canberra, Thursday, 23rd September, 1948', 24 September 1948, NAA: A9778, M13/20/1/7. For more on the security embargo see: Frank Cain, 'An aspect of postwar Australian relations with the United Kingdom and the United States: Missiles, spies and disharmony', *Australian Historical Studies*, vol. 23, no. 92, April 1989, pp. 186-202; Wayne Reynolds, *Australia's bid for the atomic bomb*, Melbourne University Press, Melbourne, 2000, ch. 5.
121 Frederick White, 'CSIR to CSIRO - The events of 1948-1949', *Public Administration*, vol. 34, no. 4, December 1975, pp. 282-3; C B Schedvin, *Shaping science and industry: a history of Australia's Council for Scientific and Industrial Research, 1926-49*, Allen & Unwin, Sydney, 1987, pp. 338-9.
122 Letter from GA Cook to JE Cummins, headed 'CSIR and secret work', 28 September 1948, NAA: A9778, M13/20/1/7.

fundamental reforms were being investigated. The possibility that CSIR might be brought under full departmental control was narrowly avoided, but in March 1949 legislation was introduced that changed the role of the executive and brought the organisation within the purview of the Public Service Board.[123] New employees would be security screened and required to take an oath of allegiance.[124] CSIR was transformed into CSIRO, though as Ian Wark, head of the Division of Industrial Chemistry, pithily explained, 'CSIRO=CSIR+0'.[125] Rivett, however, could not reconcile himself to the changes and did not seek appointment to the new executive. He had been planning to retire for some time, but the eventual circumstances left him disappointed, fearful for the future of science.

In October 1948, Dedman told Rivett that while he understood the motives behind his address at the Canberra University College, he 'doubted its expediency'.[126] Abbott accused the scientist of 'living in a world of unreality', while Rivett's hard-line defence of scientific freedom has been portrayed by historians as 'extreme and idealistic'.[127] He was incapable, it seems, of bending to the complex political demands of Cold War Australia. And yet Rivett had helped steer his beloved organisation through all manner of political storms. When he was appointed to the executive of CSIR in 1926, suspicion lingered as to the value of science. The new organisation had to build trust and confidence after the alleged failures of its predecessor the Commonwealth Institute of Science and Industry. It had to demonstrate that science could offer timely support to the process of national development. Rivett always sought a place for pure research, but recognised the need for results. In a sometimes testy partnership with George Julius, chairman of CSIR until 1945, Rivett worked to balance the expectations of public and government against the

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123 White, 'CSIR to CSIRO'; Tim Rowse, *Nugget Coombs: a reforming life*, Cambridge University Press, Cambridge, 2002, pp. 166-72.
124 White, 'CSIR to CSIRO', pp. 290-91; Schedvin, *Shaping science and industry*, p. 346.
125 Quoted in Rivett, *David Rivett*, p. 210.
126 'Notes of talk with Minister at Parliament House, Canberra, at 2pm on Monday, 11 October, 1948', NAA: A9778, M13/20/1/18.
127 *CPD*, vol. 198, 30 September 1948, p. 1042; Morton, *Fire across the desert*, p. 112.

needs of a healthy scientific culture.[128] Like his father-in-law Alfred Deakin, Rivett exemplified the 'practical idealist'.[129]

The struggle continued for twenty years, through cycles of disappointment and opportunity. Just as CSIR seemed to be proving its worth, the Depression forced a savage cut in funding. It was a challenge even to keep the organisation alive. In the mid-1930s, the government's plans for manufacturing brought new responsibilities and powers. But the changes brought pressure upon Rivett's ideals, as he fought to ensure that CSIR would be more than the mere 'handmaiden of industry'.[130] Within the confines of changing political moods, Rivett sought to find space where his scientists could engage in the pursuit of fundamental questions. But the war brought a halt to even these modest efforts, and CSIR turned all its energies upon the needs of the national crisis.[131]

After twenty years of struggle and compromise, Rivett might have been excused for hoping that the end of the war would bring something better. CSIR was bigger and busier than ever before, and the value of science to the modern world seemed impossible to deny. But he knew that nothing could be taken for granted. Delivering the Macrossan Memorial Lectures in 1943, Rivett argued that 'one of the most pathetic results of the growth of National Socialism in Germany has been the deliberate, systematic prostitution... of the whole spirit of Science'.[132] Was Australia so different? Might not this country succumb to similar pressures and temptations? Rivett remained optimistic, but warned, 'our whole attitude as a people towards the freedom of the inquirer, whatever be his line of work, is a matter of vital significance'.[133]

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128 Schedvin, *Shaping science and industry*.
129 For Deakin's 'practical idealism' see Walter Murdoch, *Alfred Deakin - A sketch*, Bookman, Melbourne, 1999, p. 90-2; Roy Macleod discusses 'practical idealism' in Australian science in Roy MacLeod, 'Science, Progressivism and Practical Idealism: Reflections on Efficient Imperialism and Federal Science in Australia 1895-1915', *Scientia Canadensis*, vol. 13, no. 1, 1994, pp. 7-26.
130 David Rivett, *The application of science to industry, the John Murtagh Macrossan Memorial Lectures for 1943*, University of Queensland, Brisbane, 1944, pp. 33-4.
131 Home, 'Science on service'.
132 David Rivett, *The application of science to industry*, p. 44.
133 *ibid.*, p. 45.

Rivett was looking towards a peaceful retirement, but the state of the world threatened to thwart him. In a long letter to a conference on atomic power organised by the Australian Association of Scientific Workers in 1946, he sought to describe what he deemed to be the 'outstanding problem' facing 'people deeply concerned with scientific progress'. There was a fight gathering, he observed, between 'the spirit of science on the one side and the practice of power politics on the other'. 'Almost for the first time in history', he continued, the 'protagonists of power politics' had realised some of the 'immense possibilities' of science, and were 'making every effort to get into their hands, under their direct orders and control, both workers and the results of their scientific work'. For the moment, it seemed, Australia might be spared the excesses of other countries, but there was a responsibility, Rivett insisted, to 'think hard and clearly about these matters'.[134]

Twelve months later, when Rivett delivered his 'Science and responsibility' speech, the influence of power politics was beginning to be felt. His words were not those of a naïve idealist, gesturing towards some vision of scientific utopia. They were the words of a man who, after twenty years' struggling to reconcile the demands of science and nation, saw his gains being lost amidst growing hysteria. They were the words of a proud son, whose father died of a stroke in 1934, seconds after delivering a 'rousing address in defence of freedom of speech' before a large crowd in the Sydney Domain.[135] They were the words of a scientist, nearing retirement, who had given up his own research career to create opportunities for others, only to find those opportunities trampled in a misguided quest for security. What was to be his legacy? In 1951, he reflected that the loss of 'international freedom, intercourse and goodwill' was felt more acutely by the 'older generation', 'forced to recognise that a new generation is growing up in science which has not known the freedom accorded to its predecessors and,

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134 David Rivett, 'Note for the AASW and FSTW Conference on Atomic Power, April 12-14, 1946', *Bulletin of the Australian Assoication of Scientific Workers*, no. 67, April-May 1946.

135 Rohan Rivett, *David Rivett*, pp. 157-8. Albert Rivett was a Congregationalist minister and anti-war activist. See also CB Schedvin, 'Rivett, Albert (1855-1934) and Rivett, Albert Cherbury David (1855-1961)', in Geoffrey Serle (ed.), *Australian Dictionary of Biography*, Melbourne University Press, Melbourne, 1988, pp. 398-401.

maybe, does not miss it'. This loss could not be borne quietly. 'If we are to maintain... the honour, the dignity and the worth to humanity of man's intense and wholly admirable desire to understand Nature', Rivett concluded, 'we must realise as never before what a fight lies ahead of every one of us; a moral fight and a most difficult one'.[136]

It was a question of control. 'In the name of national security', the *Australian Journal of Science* observed, 'a nation's governing group decides that means must be taken to control and direct the man of science and those who have access to his deadly secrets'. But that is only the beginning, for then 'means must be taken to control what men shall know, who shall know it, who shall control those who know, and how they shall be controlled'.[137] The desire to control knowledge and ideas ends in the need to control people. The Chifley government sought to prove itself worthy of the atomic secret by creating legislation that introduced new controls upon the lives and activities of its citizens. First there was the *Approved Defence Projects Protection Act*, then the restructuring of CSIR. Finally, in 1949, at the urging of US and UK authorities, the Australian Security Intelligence Organisation was established to monitor internal threats to the nation's security.[138] The incoming Menzies government improved on Labor's modest efforts, as security was defined ever more strongly as the problem of protecting the nation from its own people. 'Secrecy', Rivett argued, 'can be assured only with the aid of its unpleasant watchdog, suspicion'. Instead of seeking security through 'achievement', the world was succumbing to suspicion, anxiety, and 'witch-hunts'. In Australia, Rivett added pointedly, 'we play our accustomed role of mimic, led by a few shallow "realists" in politics'.[139]

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136 David Rivett, 'Science in Australia', *Australian Journal of Science*, vol. 14, no. 2, 21 October 1951, pp. 33-4.

137 'Science and security', *Australian Journal of Science*, vol. 11, no. 5, 21 April 1949, p. 146.

138 Frank Cain, *The Australian Security Intelligence Organization: an unofficial history*, Spectrum Publications, Richmond, Vic., 1994, p. 30ff; David McKnight, *Australia's spies and their secrets*, Allen & Unwin, Sydney, 1994, pp. 6-48.

139 David Rivett, 'Science, secrecy and security'.

David Rivett was not the only scientist to suffer as Australia followed its powerful friends into the oppressive embrace of secrecy. Tom Kaiser, a young student studying on a CSIR scholarship, was vilified after attending a demonstration in London in 1949. His political activities and his involvement in 'secret' research projects convinced ASIO and the press that he was a potential spy. The new CSIRO executive, keen to demonstrate its commitment to security, dismissed him— though no-one was really sure on what grounds.[140] Eric Burhop, another left-leaning physicist, was trustworthy enough to be employed on the Manhattan Project, but not to take up a position at the University of Adelaide at war's end.[141] But whereas Burhop and Kaiser went on to distinguished careers in Britain, Rivett's battle with secrecy dominated the end of his working life. His achievement in building CSIR, his 'genius for getting things done', these were overshadowed by political opportunism and the dangerous myth of the atomic secret.

For all Rivett's misgivings, CSIRO flourished under its new act. For a period in the 1950s and 60s the organisation finally came close to Rivett's vision, balancing problem solving for industry with a vigorous program of fundamental research.[142] But it is Rivett's replacement, Ian Clunies Ross, the urbane man of affairs, who is most celebrated for his achievement in wedding science to national progress. Rivett's legacy remains troubling for an organisation that in recent decades has been forced to demonstrate its ever closer links with industry. 'What we need to develop amongst ourselves', he argued in 1943, 'is the faith that knowledge is worth seeking and worth getting even though any immediate connection between it and industrial profit is completely invisible'.[143] Such a faith seems more endangered than ever.

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140 Phillip Deery, 'Scientific freedom and postwar politics: Australia, 1945-55', *Historical Records of Australian Science*, vol. 13, no. 1, June 2000, pp. 1-18; Moran, 'Scientists in the political and public arena', pp. 239-42.

141 RW Home, 'Eric Henry Stoneley Burhop (1911-1980)', in John Ritchie (ed.), *Australian Dictionary of Biography*, Melbourne University Press, Melbourne, 1993, pp. 301-2; Moran, 'Scientists in the political and public arena', pp. 243-4.

142 Schedvin, *Shaping science and industry*, p. 361.

143 David Rivett, *The application of science to industry*, pp. 33-4.

In 'Science and responsibility', Rivett noted, in passing, that the honest pursuit of knowledge demanded the acceptance of uncertainty. And yet the term 'agnostic' was often heard as a reproach.[144] He might have added that while society values truth, those who speak in its name are often criticised as 'idealists'. Joel Kovel has argued that the role of the concerned intellectual in modern society is to be found in 'speaking truth to power'.[145] Control is most clearly manifest in physical violence or intimidation. But perhaps it is most effective in making simple truths seem foolish or dangerous, in making people scared to speak, lest they seem naïve, or unrealistic.

## Border protection

'What does a woman want from life?', asked a Liberal Party advertisement some months prior to the 1949 election. Was it socialism, which entailed 'government supervision and direction of every phase of family life', or liberalism, which offered the 'freedom to manage your own family life' as well as 'independence' and 'prosperity'?[146] The integrity of family life was at stake, as it was again a few years later during the Menzies government's campaign to boost defence preparedness in response to the communist menace. 'When Australia is in danger our children are in danger', readers of the *Australian Women's Weekly* were warned, 'in striving to make Australia strong we also make secure the future of the children we love'.[147] Communism was not merely a threat to Australia's political system, it was threat to Australia's way of life, to the family itself.

And yet, while the family seemed besieged by the evils of a dark and sinister world, it was also being celebrated as a renewed source of strength and achievement. After the uncertainties of depression and war, the Australian family appeared to be stabilising, taking on a more modern form. Despite growing concern about divorce, WD Borrie declared in 1953 that the family was statistically safe. The 'majority of Australian couples

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144 David Rivett, 'Science and responsibility', p. 9.
145 Joel Kovel, 'Speaking truth to power', *Meanjin*, vol. 50, no. 4, Summer 1991, pp. 447-62.
146 *Australian Women's Weekly*, 8 October 1949, p. 38. See also Alomes, 'The social context of postwar conservatism', pp. 25-7.
147 *Australian Women's Weekly*, 18 November 1950,p. 67.

who marry still remain together', he claimed, while the trend to smaller families was not a sign of degeneration, but of 'the laudable desire of modern parents to maintain the standards which society now demands of them'.[148] Australians were 'highly family oriented', Margaret Middleton observed, 'their chief ambitions appear to be to buy a house, a car, a television set, and the various other devices of our age'.[149] The modern family was smaller, wealthier, isolated and secure amidst sprawling suburban splendour. It offered a sense of safety, a retreat from outside dangers. 'Men and women who live within the shelter of a stable happy union', argued the *Australian Women's Weekly*, 'are better able than others to face the slings and arrows shot at them from outside'.[150] Increasingly self-absorbed, physically and emotionally detached from its neighbours and kin, this new form of the family was defined by its boundaries. It even had a new name.

The term 'nuclear family' was first used in 1945. It was coined shortly before the bomb was dropped, but the co-opting of physics was quite deliberate. The 'nuclear family' was an 'independent atom', the 'basic social unit in the development of human society'.[151] The term was introduced by George Peter Murdock, whose anthropological research led him to believe that 'a married man and woman and their offspring' was 'the first and most basic' form of the family.[152] Unsurprisingly, perhaps, this natural, most basic form was found to predominate in Western countries such as America and Australia. Moreover, the nuclear family contributed to the health and stability of such societies by performing a number of functions 'fundamental to human social life'.[153] Just as the free world's nuclear might underpinned global security, so the dominance of the nuclear family demonstrated the essential virtues of western culture. As Murdock remarked in an ill-disguised swipe at early Soviet policy: 'no society... has succeeded in finding an

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148 WD Borrie, 'The family', in George Caiger (ed.), *The Australian way of life*, Heinemann, London, 1953, pp. 39-40.
149 Margaret Middleton, 'The Australian family', in RJ Maguire (ed.), *Hemisphere: Asian-Australian viewpoints and ideas*, Cheshire, London, 1964, p. 268.
150 *Australian Women's Weekly*, 11 June 1949, p. 18.
151 George Peter Murdock, *Social structure*, Free Press, New York, 1949, p. 23; Meyer F Nimkoff, 'Trends in family research', *American Journal of Sociology*, vol. 53, 1947-8, p. 480.
152 It was first used in George Peter Murdock, 'The common denominator of cultures', in Ralph Linton (ed.), *The science of man in the world crisis*, Columbia University Press, New York, 1945, pp. 123-142; but developed more fully in Murdock, *Social structure*, ch. 1.
153 Murdock, *Social Structure*, p. 10.

adequate substitute for the nuclear family' and it was 'highly doubtful whether any society ever will succeed in such an attempt, utopian proposals for the abolition of the family to the contrary notwithstanding'.[154] Ultimately, there was no alternative.

The presumed inevitability of the nuclear family meshed with the Cold War policy of containment. The Soviet system was fundamentally flawed and would eventually collapse under the weight of its own contradictions. Democracy, capitalism and the nuclear family would triumphantly take their place. But with the celebration of the nuclear family came a reassertion of gender roles, an emphasis on consumption, and an increased tendency to conservatism and isolation. Just who was being contained, and by what?

Through the prism of the modern family were defined virtue, trust and responsibility. 'A man who is unselfish enough to serve his country should be a good life's partner', declared an advertisement for the Citizen Military Forces.[155] 'You can be proud of the man who is willing to defend you', reassured another.[156] The good family man, surrounded by his loving family and the trappings of a consumer lifestyle, was contrasted with the communist, who served only destruction and chaos. As one NSW parliamentarian commented, 'no communists will be found building their homes but decent Australians are getting a stake in the country'.[157] Progress and security were to be found within the boundaries of the nuclear family, confirmed in their necessity by the contrast between inside and outside, us and them— those who belonged, and those who did not.

In October 2001, government sources reported that refugees seeking entry to Australia by sea had thrown their children overboard in an attempt to force a navy vessel to take them on board. 'I can't imagine how a genuine refugee would ever do that', Prime

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154 *ibid*, p. 11.
155 *Australian Women's Weekly*, 5 May 1951, p.18.
156 *Australian Women's Weekly*, 18 November 1950, p. 67. See also John Murphy, *Imagining the fifties: private sentiment and political culture in Menzies' Australia*, UNSW Press, Sydney, 2000, pp. 37-40.
157 Quoted in Alomes, 'The social context of postwar conservatism', p. 11. See also Murphy, *Imagining the fifties*, p. 137.

Minister Howard responded, 'I certainly don't want people of that type in Australia'.[158] With the terrorist attack on the World Trade Center and a dramatic influx of refugees, 'border protection' became a key issue once more in Australian political life. 'We are... in a new and dangerous part of the world's history', Howard argued in launching his election campaign, Australian security could only be assured by 'having an uncompromising view about the fundamental right of this country to protect its borders'.[159] The 'type' of people who could risk their children's lives were added to terrorists, extremists, and queue-jumpers on a list of those who did not belong. 'We'll decide who comes to this country', the Prime Minister defiantly asserted.

The 2001 election was run and won on the twin themes of border protection and economic prosperity. Progress and security remain tightly bound in the articulation of political priorities. Progress is not just an onward advance, it is an escape from chaos and uncertainty. The possibility of greatness that beckons us on is contrasted against the lurking dangers of degeneration, dissolution and failure. Just like at the crossroads, there is no choice, progress comes equipped with a demonstration of its own inevitability. If not progress, then what? Threat and solution, punishment and reward, the future is neatly packaged and labelled for safe handling and consumption.

In the latest crusade for 'border protection', science has been called to the front lines once more. Seeking to focus the nation's research effort, the Howard government announced four national research priorities in late 2002. These included 'Safeguarding Australia from terrorism, crime, invasive diseases and pests'.[160] As this chapter is being written, the push continues to give ASIO new powers of arrest and detention. A disturbing feeling of familiarity is difficult to avoid. Historian Henry Reynolds has suggested that Australia is 'more fearful now than at any time since the Cold War in the

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158 Radio interview with Jon Faine, 3LO Melbourne, 9 October 2001, transcript at <http://www.pm.gov.au/news/interviews/2001/interview1372.htm>.
159 'Transcript of the Prime Minister, the Hon, John Howard MP, address at the Federal Liberal Party campaign launch, Sydney', 28 October 2001, <http://www.pm.gov.au/news/speeches/2001/speech1311.htm>.
160 Commonwealth Department of Education, Science and Training, 'Safeguarding Australia', <http://www.dest.gov.au/priorities/safeguarding_australia.htm>.

1950s'.[161] Fear, it seems, breeds conservatism and division, a desire for scapegoats and strong leaders. But perhaps it is not fear itself that limits our horizons, but the framework within which it is expressed. Fear emerges from the contrast of us and them, right and wrong, inside and outside, progress and destruction. Might we imagine a future that is no longer constructed out of either/or choices? From the crossroads might we yet strike out cross country, heading overland through places unmapped, enjoying the possibilities, exploring a world without borders?

161 *Weekend Australian*, 7-8 June 2003, p. 20.

# Conclusion

In 1996 the respected scientist and media commentator, Paul Davies, launched an attack against the 'hysterical anti-science tirades' that had become all too common within arts and literary circles. The 'intellectual impotence' of the literati, he argued, was revealed in their tendency to dismiss science as irrelevant to the big questions of existence. Science's 'claim to deal in reality' was simply denied by invoking 'the mantra of cultural relativism'.[1]

Davies' outraged defence of science was, of course, merely one fusillade in a series of skirmishes and sorties that have continued over the past decade or more under labels such as the 'science wars' or the 'culture wars'. In Australia, combatants have rallied to the more familiar 'history wars', but the territory at issue is much the same— the meaning and control of 'truth'. In the context of this thesis, it is also perhaps worth noting that Stuart Macintyre traces the history wars back to the interpretation of the Enola Gay and the atomic bombing of Japan in the Smithsonian Museum.[2] Amongst veterans, curators, politicians, and the public, the meaning of the Atomic Age remains problematic.

The 'history wars' have wrestled over the nature of 'facts', over our ability to pronounce with certainty upon the 'realities' of the past. But those who champion the straightforward correspondence between fact and reality draw much of their confidence from the example of science. In seeking to dispel the influence of political correctness, of fashionable French theorists and black-armband agitators, the defenders of truth are arguing for a history which is more 'scientific' in its methods and results. This is made explicit by Keith Windschuttle, one of the foremost history warriors, in his 1994 book *The killing of history*. Windschuttle devotes a chapter to the defence of the scientific method for, he argues, 'if the fashionable view is correct, and truth and knowledge are really beyond our reach, then we might as well give history away altogether'.[3] The history wars are as much about science as they are about footnotes or facts.

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[1] Paul Davies, 'The arts have lost it', *Australian Magazine*, 19-20 October 1996, pp. 30-1.
[2] Stuart Macintyre, and Anna Clark, *The History Wars*, Melbourne University Press, Melbourne, 2003, p. 9.
[3] Keith Windschuttle, *The killing of history*, Macleay Press, Sydney, 1996, p. 187.

In Paul Davies' angry polemic, as in Keith Windschuttle's truculent defiance, the possibilities of debate are whittled down to a series of clear-cut choices— science versus anti-science, history versus fiction, truth versus relativism. Boundaries and battlelines such as these have echoed throughout this thesis. Boosters have matched up against realists, 'practical men' have taken on 'mere theorists', reason has faced down emotion, enlightenment has battled ignorance. Debates about the nature of science and progress have often been reduced to 'either/or' formulations that defined what we could do, and what we could know, with considerable force and clarity. Both in understanding the past, and imagining the future, our choices, it seems, are limited.

This thesis confronts these limits, exploring complexities too often overlooked in our pursuit of simplistic dichotomies. And so, for example, the archetypical booster , EJ Brady, is portrayed not as someone who ignored the realities of science to promote his dangerous developmentalist fancies, but as a man of contradictions and insecurities, who was passionate about the possibilities of science. Harold Fry's grief is not simply played out against the power of scientific truth. His desire to find a reason for his son's death is examined within the context of uncertainty, within the space between 'knowing' and 'feeling'. David Rivett's idealism is not contrasted against supposed political 'realities'. Instead it is offered as a practical response in a world succumbing to the sway of the 'secret'.

In seeking to blur the boundaries of 'for and against' this thesis seeks to win for itself and its readers some of the space it offers Brady, Fry, Groom and others to find the meaning of science within their own lives, hopes and fears. But in treating the boosters seriously, in pondering the role of emotion in public debate, in questioning the limits of rationality and the nature of ignorance, this thesis is not staking out a position opposed to science. Instead it hopes to capture science in some of its richness and complexity, to explore it as something integral to the fabric of our culture and our lives. This is not anti-science— it's just science, a broader, fuller, more meaningful, more human science.

In 1996, as Paul Davies was despairing of the widening gulf between the arts and the sciences, I was engaged in my own project to work across this cultural 'divide'. The

'Cabinet of Curiosities' engaged a group of artists to respond to themes within the history of Australian science.[4] There were no simple messages, no obvious truths. Interviewed by ABC radio to promote the project, I was asked who I considered to be Australia's most significant scientist. I could have nominated Macfarlane Burnet, Howard Florey or Mark Oliphant, but mindful of his central role in guiding Australian science through some of its most difficult times, while still maintaining his idealism, I chose David Rivett. 'What did he discover?', the interviewer asked. I tried to explain that significance need not be measured in discoveries and breakthroughs, but clearly the interviewer was not impressed. He wanted something simpler— a hero not a human being.

This thesis is motivated by the belief that science is to be found not just in laboratories and learned journals, but in the lives of all. It is something we experience every day— as a source of authority, a creator of novelty, a giver of meaning, a bringer of liberation or oppression. It is part of our culture, part of us. While working, over a number of years, to foster interest in the history of Australian science, I became frustrated by the common assumption that what was needed were more tales of unsung heroes and forgotten pioneers— a garden of tall poppies to be reverently cultivated and admired. Stories about people offer the opportunity to connect— to find in the lives of scientists something familiar, something tragic, something infuriating, something joyful— but only if we treat them as people, and not as instructive icons. The challenge lies not in the recovery of neglected heroes, but in teasing out the points of meaning and connection that can open our experience of science to further reflection and debate. We should seek to understand science through both its possibilities and limits, through what it brings our lives both for good and ill. By exploring our experience of science, we may find new grounds for critique, but we may also find new possibilities for celebration— new ways of enlivening our appreciation that is not based on a parade of mythical pioneers.

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[4] See the Cabinet of Curiosities website <http://www.asap.unimelb.edu.au/cabinet/>.

One of the major contributions of this thesis has been to demonstrate how the history of Australian science can be expanded by pursuing connections, context and complexity— by exploring the *cultural* history of Australian science in the twentieth century. A series of interlocking case-studies have been presented to illustrate how the range of questions asked, and events and sources considered, can be broadened beyond the conventional confines of the discipline.

For example, the supposed conflict between the character of science and the utilitarian enthusiasms of Australian culture has been shown to be more complicated by examining the national building ambitions of progressives like Littleton Groom. The possibilities of science blended with ideas about nationhood and citizenship to create a vision of improvement that was pragmatic in orientation, but idealistic in intent. Moreover, by focusing on the hopes and histories of a slew of 'national' scientific bodies, from the Australasian Association for the Advancement of Science to the Australian National University, the link between science and nation has been revealed to be as much about identity as the best formula for 'application'.

The development of science is often assumed to be marked by the conquest of ignorance. Fear and misunderstanding supposedly give way to an appreciation of science and its wonders. But through a study of debates concerning the supposed characteristics of the Institute of Science and Industry, this thesis has shown that it was not so much the value of science that was at issue, but the boundaries of knowledge and expertise. A survey of attempts at science communication and some common representations of 'the scientist' reinforced the point that the meaning of science itself shifted according to the context of debate. Science and ignorance are themselves historically constructed. Instead of a war of conquest, the history of Australian science is defined by a series of skirmishes and changing allegiances fought upon an unstable terrain.

Atomic testing is a more familiar topic, but it was examined in chapter six not in an attempt to reveal scientific culpability or political manipulation, but to explore some of the consequences of uncertainty. When uncertainty intrudes upon public confidence, scientific rationality is commonly offered as an antidote to the excesses of emotion. And yet, such uncertainty is often of science's own making. We tend to assume that emotion lies outside of the realm of science, but this thesis has sought to examine some of the connections between what we know and what we feel.

Some of the case studies are more familiar than others, but there is much within all that is new. This thesis adds considerably to the history of Australian science through the documentation of little-known events and characters, and by the addition of depth and context to well-worn stories of achievement. More importantly, though, it demonstrates that refusing to take for granted the nature of the boundaries that define 'science' and 'the scientist' does not condemn us, as Paul Davies might have it, to a career of pointless academic onanism. On the contrary, we gain the freedom to develop stories of greater richness and complexity, where the meaning of science is determined not by its epistemological status, but by its place in our lives and culture.

The neglect of the cultural history of Australian science in the twentieth century robs us both of understanding and alternatives. New perspectives on the history of science do not merely enrich our knowledge of the past, they offer us new ways of interacting with science in the present. The possibility of democratising science, of breaking down some of the barriers that prohibit public involvement in the direction of scientific research is a topic of interest in science studies worldwide.[5] But the challenge is also historical and local, encouraging us to reflect on the way such barriers are created and maintained. By examining how scientists have defined themselves in relation to the nation, to the public, to the quest for truth, we can speculate on the roads not taken. We can imagine something different.

However, this thesis has done more than broaden the study of Australian science. It has been explicitly concerned with the way in which the content and authority of science have been enlisted to shape our understanding of progress. Another major contribution of this thesis has been to reveal some of the complexities and contingencies of this thing

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[5] See, for example the contributions to Daniel Lee Kleinman (ed.), *Science, technology, and democracy*, State University of New York Press, Albany, 2000.

we call 'progress'. It is not merely a slogan, or a rallying cry. It is something more than rhetoric and ideology. Progress comprises both ideas and practices— practices of accumulation and disjunction embedded in our experience of time, the familiar contrast between old and new, the way we narrate the life-stories of individuals and nations. Progress invests our lives with a feeling of movement, of journeying, that we cannot easily do without.

The assumption of linearity seems difficult to avoid, but it is not inevitable. Other cultures maintain profoundly different understandings of the relationship between past, present and future. Even within Western society, some argue, it might be possible to build greater awareness of natural rhythms, or to incorporate deep-time perspectives into our appreciation of the here and now.[6] But even such suggestions as these are grounded in the hope that the future might bring a better world. The journey continues.

Could we recast our temporal language to avoid the spatial turn? The point is not necessarily to deny the journey, but to question its assumptions, taking neither the road nor the mileposts for granted. The distances and disjunctions that linearity imposes upon our perception of events are not absolute or immovable. As chapter three demonstrates, the characteristics of the 'new' and the 'old' are not determined by a set of temporal coordinates, rather, we establish their meaning within a cultural web of interactions and associations. Time exists within history, not outside of it.

The links between progress, space and travel were explored in chapter two, focusing, in particular, on the life and work of EJ Brady. The vision of 'Australia Unlimited' is of a triumphant march into the future, where fulfilment is gained through the conquest of Australia's vast spaces. Progress is a journey, ever onwards, where the distances accumulate as a measure of our achievement. The only direction is forwards, the only options are those provided by a series of clearly-labelled turning points. But the ironies

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[6] See, for example, Barbara Adam's work on time politics and time ecology: Barbara Adam, *Time and social theory*, Polity Press, Cambridge, 1990; Barbara Adam, *Timescapes of modernity: the environment and invisible hazards*, Routledge, London, 1998. For an example of attempts to develop deep time perspectives, see the Long Now Foundation, and in particular its plans to construct a 10,000 year clock <http://www.longnow.org/>.

and contradictions of Brady's life point to a different kind of journey. Instead of succumbing to linearity, we can imagine journeys that are as much about returning as about leaving. Instead of calculating our advance through the accumulation of wealth or knowledge, we can imagine journeys which mix remembering and forgetting, regret and hope. Nearing the end of his journey along 'life's highway', Brady denied the power of time, the assumption of linearity: 'I will not grow old', he declared— the advance of years need not rob him of his dreams, he was not obliged to fade into weary acquiescence. Brady's declaration is a reminder that the end of our journeys need not be taken for granted. Through wit, will, hope, and above all imagination, we can create alternatives, we can strike out in directions unmarked.

The idea of reclaiming for our journeys the possibilities of choice has been central both to the aims and the structure of this thesis. Chapter one began with Phyllis at the 'crossroads of destiny', confronted by a choice that would determine the fate of civilisation. But the temporal character of this choice, of the Atomic Age itself, were challenged— assumptions of newness and urgency were shown themselves to have a history. Rather than reflecting the impact of a particular technology, Phyllis's dilemma was revealed to be a product of the way we imagine past and future, the way we understand progress. And so, instead of merely cataloguing the characteristics of a particular 'age', this thesis set about an exploration of a broader landscape traversing realms of science, nationhood, knowledge and identity— not the Atomic Age, but Atomic Wonderland.

Having examined, through its case studies, some of the ironies of Wonderland, this thesis returned, in chapter seven, to the image of the crossroads. In the context of 'protection', in the way we draw boundaries of trust, authority, security and belonging, we see the crossroads as an instrument of obedience. Phyllis's choice was never made. It was never meant to be made. Our passion for neat dichotomies, for 'either/or' formulations, is more about demonising alternatives than offering a chance for change.

And so this thesis has declared neither for or against science; it has championed neither truth nor relativism. It has not sought to nail its epistemological colours to the mast for the sake of trying to keep open questions that are too quickly closed. Instead of seeking a false simplicity it has welcomed the contradictions of narrative. As already stated a number of times in this conclusion, the emphasis of this thesis has been on complexity.

But complexity brings challenges both intellectual and stylistic. After all, the usual form of academic treatise proceeds from the complex to the simple. Contradictions are resolved, order is regained, as argument proceeds confidently towards its preordained conclusion. An appreciation of complexity works against such a neat resolution, encouraging us to leave some threads ungathered, some knots untied. Instead of the comfort and certainty of argument, complexity offers doubts and questions. But even if the conceptual difficulties can be surmounted, the question of how to communicate complexity remains. Historians have begun to explore some of the possibilities of narrative— the use of multiple voices, the reordering of chronology, the subsuming of argument to story— but more experiments are needed. In the context of the 'history wars', the communication of complexity, in a way that engages and does not alienate or confuse, remains the historian's greatest challenge.

This thesis has embarked upon its own experiment. Its contribution to knowledge is that knowledge is partial and fragmentary; that conclusions are meant to be challenged; that certainty can bring a misleading sense of security; that simplicity too often deprives us of new ways of understanding. Questions are more important than answers.

# Abbreviations

The following abbreviations are used in footnotes:

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| CPD | *Commonwealth Parliamentary Debates (Hansard)* |
| NAA | National Archives of Australia |
| NLA | National Library of Australia |
| SMH | *Sydney Morning Herald* |

# Sources • archives

## Australian War Memorial

| AWM54 | **Australian War Memorial** | |
|---|---|---|
| 435/1/6 | [Inventions - General:] Inventions in War - Record of the origin, growth, and achievements of the Army Inventions Directorate in the war period, March 1942 - September 1945 (Feb 1946) | 1946 - 1946 |
| 435/3/3 | [Inventions - War Inventions Award Committee:] File consisting mainly of correspondence between Mr L J Hartnett, Chairman, Inventions Directorate and Maj Gen G A Vasey, development and production of Austen Sub-Machine gun and functions and operation of Inventions Directorate | 1941 - 1942 |

## Basser Library, Australian Academy of Science

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|---|---|
| MS7 | JA Gilruth |
| MS168 | EW Titterton |

## CSIRO Archives

| Series 3 | | |
|---|---|---|
| KA/5/7 | Atomic Energy, CSIRO Research, UN Atomic Energy Commission | 1946-1948 |
| KA/5/12/3 | Atomic Energy, CSIRO Projects, Collaboration with Canada, Reports from Dr Briggs on the Canadian Atomic Energy Project | 1946 |
| KA5/17/1 | Atomic Energy, CSIRO Projects, Co-operationwith Melbourne University, Investigations | 1945-1956 |
| KA10/2/2-1 | Atomic Energy, Committees, Councils, Institutes, Atomic Energy Advisory Committee, Minutes of meetings | 1945-1948 |

## National Archives of Australia

| A1 | **Department of External Affairs / Department of Home and Territories / Department of Home Affairs** | |
|---|---|---|
| 1918/6038 | Establishment of an Astronomical Observatory at Canberra (Mt. Stromlo) | 1910 - 1918 |
| 1930/6111 | Dr. Gilruth. Appt. Administrator N.T. | 1916 - 1930 |
| A202 | **Federal Capital Territory** | |
| 1914/3272 | Solar Observatory | 1911 - 1914 |

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|---|---|---|
| **A427** | **Department of the Interior** | |
| G1941/7 | Optical munitions etc - Members of observatory staff employed on war work | 1940 - 1948 |
| **A431** | **Department of the Interior** | |
| 1947/2068 | Commonwealth Solar Observatory. Post War Reconstruction | 1943 - 1944 |
| 1959/450 | Institute of Anatomy Buildings in Canberra | 1925 - 1936 |
| **A457** | **Prime Minister's Department** | |
| E553/1 | Flora & Fauna. Donation to Commonwealth by Dr. Wm. Colin Mackenzie. (Australian Institute of Anatomical Research) | 1923 - 1923 |
| **A461** | **Prime Minister's Department** | |
| H341/1/1 | Atomic Power and energy - Policy | 1945 - 1949 |
| J340/1/7 Part 1 | Universities: National University Canberra Part 1. | 1926 - 1950 |
| **A463** | **Prime Minister's Department** | |
| 1957/3982 | J A [John Aldous] Fry - Death as a result of radiation | 1957 - 1960 |
| **A659** | **Department of the Interior** | |
| 1943/1/3907 | Australia Unlimited by Brady, E J | 1912 - 1943 |
| 45/1/2167 | Institute of Anatomy - General | 1935 - 1945 |
| **A816** | **Department of Defence** | |
| 3/301/433 Part 1 | Commission for Control of Atomic Energy | 1945 - 1948 |
| 9/301/163 | Establishment & Representation on Defence Research & Development Policy Committees. Part 1 | 1948 - 1957 |
| **A1196** | **Department of Air** | |
| 2/501/266 | Atomic Energy - Control of - Policy 1946 | 1946 - 1946 |
| **A1608** | **Prime Minister's Department** | |
| AK29/1/2 | War Records Committee on National Morale Main File | 1941 - 1945 |
| **A1928** | **Department of Health** | |
| 695/3 Section 2 | Institute of Anatomy General. Section 2 | 1930 - 1938 |
| 695/3 Section 3 | National Museum of Australian Anatomy Australian Institute of Anatomy. Reservation of sites at Canberra & Transfer to Canberra. Section 3 | 1938 - 1946 |
| **A2644** | **Australian Institute of Anatomy** | |
| 20/1 | Administrative arrangements - use of Institute building by outside bodies - lecture theatre etc | 1931 - 1953 |
| 70 | Institute of Anatomy | 1930 - 1953 |

| | | |
|---|---|---|
| **A2645** | **Australian Institute of Anatomy** | |
| 50/1/7 Part 1 | Face masks - famous scientists | 1930 - 1957 |
| **A5954** | **Department of Defence (Shedden Collection)** | |
| 1384/3 | Atomic bomb - tests on warships by United States Navy | 1945 - 1952 |
| **A6122** | **Australian Security Intelligence Organization** | |
| 58 | Royal Commission of Espionage 1954 - 1955 References to "ENORMAZ" i.e. Atomic Tests in Australia | 1954 - 1955 |
| 216 | Communist Party of Australia (CPA) Attitude towards the Atomic Bomb | 1952 - 1955 |
| **A6455** | **Royal Commission into British Nuclear Tests in Australia** | |
| RC131 PART 1 | Department of Supply - AWTSC Minutes of Meetings 1 to 16, 8 July 1955 to 4 January 1956. Presented 7/11/1984 at Melbourne | 1956 - 1957 |
| **A6456** | **Royal Commission into British Nuclear Tests in Australia** | |
| R030/072 | Maralinga - Press Radio Release and Newspaper Cuttings 1956 | 1956 - 1956 |
| R030/074 | Maralinga Press and Publicity | c1950 - c1985 |
| R030/075 | Maralinga Press and Publicity | c1950 - c1985 |
| R030/080 | Maralinga Visit by Press Representatives 1955-1956 | 1955 - 1956 |
| R030/085 | Maralinga - Non-Scientific Press Releases - Mr Hungerford | c1950 - c1985 |
| R047/011 | Press Statements - Atomic Tests in Australia 1955 & 1956 | 1955 - 1956 |
| R069/003 | National Radiation Advisory Committee - Minutes, Agenda & Minutes | c1950 - c1985 |
| R069/004 | NRAC - Meetings, Agenda & Minutes (2) | c1950-c1985 |
| R069/011 | AWTSC - Establishment Membership & Terms of Reference | c1950-c1985 |
| R087/016 | Effect of Atomic Explosions on the Weather | c1950-c1985 |
| R087/081 | CSIRO research into effects on rainfall of atomic explosions | c1950 - c1985 |
| R124/007 | Effect Of Atomic Tests On Weather Conditions General 1956-59 | 1956 - 1959 |
| R102/001 | Atomic explosions on the weather - effect of | c1950 - c1985 |
| R198/010 | NRAC Published & unpublished material-Information for members | c1950 - c1985 |
| R198/020 | NRAC-Statements in the Press brought to the attention of committee | c1950 - c1985 |
| R209/004 | Monte Bello 1956 Tests - Operation Mosaic-Publicity | 1956 - 1956 |

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|---|---|---|
| **A8510** | **Advisory Council of Science and Industry / Commonwealth Institute of Science and Industry** | |
| 3/5/4 | Administration and organization Act of 1920. Science and industry 1920 Act - introduction of Bill publicity. Solicited publicity from press and industrial organisations for support of 1920 Bill. [John Graham] | 1918 - 1920 |
| 80/2 | Advisory Council of Science and Industry. Press matters. | 1916 - 1921 |
| **A9103** | **Commonwealth Solar Observatory** | |
| 4 | 1940 Solar Eclipse | 1940 |
| **A9778** | **Council for Scientific and Industrial Research** | |
| M13/20/1/15 | CSIR - Defence Research Security - key documents file | 1947 - 1949 |
| M13/20/1/7 | CSIR and secret work - correspondence with Mr J E Cummins (Chief Scientific Liaison Officer, UK) and ASRLO Washington | 1948 - 1949 |
| M13/20/1/18 | Canberra - 11 October 1948 - meeting with Minister and related correspondence | 1948 - 1948 |
| **A9816** | **Department of Post-War Reconstruction** | |
| 1943/664 Part 1 | Dr Bradfield's Scheme for Watering Inland Australia | 1944 - 1947 |
| 43/1052 | Australian Association of Scientific Workers. General Correspondence | 1941 - 1946 |
| **AA1964/52/1** | **Advisory Council of Science and Industry** | |
| 6 | Scheme for establishment of permanent Institute , including meeting of Advisory Council with Prime Minister July 17 | 1917 - 1917 |
| **MP392** | **Ordnance Production Directorate** | |
| Bundle 3 | Optical [Munitions] Panel | 1940 - 1940 |
| **MP730** | **J K Jensen** | |
| Item 12 | The History of the Scientific Instruments and Optical Panel, Initially Optical Munitions Panel - J S Rogers, Secretary and Executive Officer, SIOP | 1940 - 1946 |
| Item 16 | History of Scientific Instrument and Optical Panel | 1938 - 1948 |
| **MP927** | **Department of the Army** | |
| A177/1/106 Part 2 | Army Inventions Directorate verbatim minutes 1942-1946 board papers & agenda 1945-1946 Board papers & Agenda 1942-1944 | 1942 - 1946 |
| A177/1/106 Part 3 | Army Inventions - papers minutes and index books | 1942 - 1946 |
| **MP1164/12** | **Army Inventions Directorate** | |
| Vol. 1 | Register of inventors and inventions, nos.1 to 9883 | 1942 - 1943 |

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|---|---|---|
| Vol. 2 | Register of inventors and inventions, nos. 9884 to 18146 | 1943 - 1944 |
| Vol. 3 | Register of inventors and inventions, nos. 18147 to 20380 | 1944 - 1946 |
| **MP1472** | **Department of Munitions** | |
| Box 1/1 | Optical Munitions Panel (OMP) Later Scientific Instruments and Optical Panel (SIOP) - Agenda and Minutes of Meetings - Meetings 1-8 | 1940 - 1941 |

## National Library of Australia

| | |
|---|---|
| MS206 | EJ Brady |
| MS236 | Littleton Groom |
| MS987 | JJ Dedman |
| MS1540 | Alfred Deakin |
| MS4965 | Brian Fitzpatrick |
| MS7360 | CW Allen |

# Sources • publications

## Articles

Adam, Barbara, 'Modern times: the technology connection and its implications for social theory', *Time & Society*, vol. 1, no. 2, 1992, pp. 175-91.

'The "All-Australian Manufactures" exhibition', *Australasian Manufacturer*, vol. 7, no. 343, 28 October 1922, pp. 11-15.

Allen, CW, 'Duffield, Walter Geoffrey (1879-1929)', in Bede Nairn and Geoffrey Serle (eds), *Australian Dictionary of Biography*, Melbourne University Press, Melbourne, 1981, pp. 351.

Alomes, Stephen, 'The 1930's background to Post-war reconstruction', paper presented at the Post-war reconstruction seminar, Australian National University, 31 August - 4 September 1981.

Alomes, Stephen, Mark Dober, and Hellier Donna, 'The social context of postwar conservatism', in Ann Curthoys and John Merritt (eds), *Australia's first Cold War*, George Allen & Unwin, Sydney, 1984, pp. 1-28.

Anderson, Warwick, 'Geography, race and nation: remapping 'tropical' Australia, 1890-1930', *Historical Records of Australian Science*, vol. 11, no. 4, 1997, pp. 457-68.

Annabell, Ross, 'Rum Jungle', *Exports of Australia*, vol. 8, no. 6, April-May 1954, pp. 14-19.

'Atomic power for industry: Australia enters developmental field', *Australasian Manufacturer*, vol. 39, no. 2012, 23 October 1954, pp. 19-20.

'Atomic powered locomotive', *Commonwealth Engineer*, vol. 43, 1 August 1955, pp. 7-8.

'Australian Association of Scientific Workers, the nature of science teaching in schools', *Australian Journal of Science*, vol. 2, no. 3, December 1939, pp. 90-1.

'Australia's flying prospectors', *National Development*, vol. 1, no. 1, October 1952, pp. 23-7.

'Australia's progress exciting', *Australasian Engineer*, 7 August 1958, pp. 93-7.

Bacchi, C L, 'The Nature-Nurture Debate in Australia, 1900-1914', *Historical Studies*, vol. 19, no. 75, 1980, pp. 199-212.

Bambrick, Susan, 'Knibbs, Sir George Handley (1858-1929)', in Bede Nairn and Geoffrey Serle (eds), *Australian dictionary of biography*, Melbourne University Press, Melbourne, 1983, pp. 620-1.

Bankin, E, 'Across Australia by motor cycle', *Walkabout*, vol. 1, no. 10, 1 August 1935, pp. 26-8.

Bantell, John F, 'The origins of the world government movement: the Dublin conference and after', *Research Studies*, vol. 42, no. 1, March 1974, pp. 20--35.

Basalla, George, 'The spread of western science', *Science*, vol. 156, 1967, p. 611.

Bashford, Alison, 'Quarantine and the imagining of the Australian nation', *Health*, vol. 2, no. 4, October 1998, pp. 387-402.

Batten, Michael, 'This land was desolate', *Walkabout*, vol. 24, no. 12, 1 December 1958, pp. 11-14.

Baxter, JP, 'Peaceful uses for atomic energy', in 'Australia Unlimited' supplement, *Sydney Morning Herald*, 19 June 1957, p. 16.

———, 'What atomic energy can do for Australia', *New Commonwealth*, vol. 29, no. 10, 16 May 1955, pp. 467-470.

'The Bikini atomic bomb trials', *Australian Journal of Science*, vol. 9, no. 2, October 1946, pp. 72-3.

Blatt, John M, 'Danger from atom tests is an unknown quantity', *Sydney Morning Herald*, 21 December 1955, p. 2.

Bolton, HC, 'JJ McNeill and the development of optical research in Australia', *Historical Records of Australian Science*, vol. 5, no. 4, 1983, pp. 55-70.

———, 'Optical instruments in Australia in the 1939-1945 war: successes and lost opportunities', *Australian Physicist*, vol. 27, no. 3, March 1990, pp. 31-43.

Borrie, WD, 'The family', in George Caiger (ed.), *The Australian way of life*, Heinemann, London, 1953, pp. 23-44.

Bourke, Helen, 'Sociology and the social sciences in Australia, 1912-1928', *Australian and New Zealand Journal of Sociology*, vol. 17, no. 1, March 1981, pp. 26-35.

Boyarin, Jonathon, 'Space, time, and the politics of memory', in Jonathon Boyarin (ed.), *Remapping memory: the politics of timespace*, University of Minnesota Press, Minneapolis, pp. 1-37.

Bradfield, JJC, 'Restoring Australia's parched lands', *Australian Quarterly*, vol. 14, no. 1, March 1942, pp. 27-39.

———, 'Rejuvenating inland Australia', *Walkabout*, vol. 7, no. 9, 1 July 1941, pp. 7-15.

Brady, Edwin James, 'The almighty atom', *Midday Times*, 1 September 1945, p. 8.

———, 'Brady replies to Shaw - "The arch legpuller of Whitehall Court"', *Life Digest*, vol. 8, no. 10, 1 January 1946, pp. 8-10.

———, 'Can the dead heart of Australia be revived?' *Australasian*, 12 June 1937, p. 5.

———, 'A Columbus of science', *Native Companion*, vol. 2, no. 1, 1 August 1907, pp. 50-52.

———, 'E.J. Brady, by Himself', *Life Digest*, vol. 3, no. 3, June 1949, pp. 20-3.

———, 'Faith in Australia - Solving the national problem', *Life Digest*, vol. 9, no. 1, 1 April 1946, pp. 1-3.

———, '"I's" for Australia! - Irrigation and immigration', *Australasian*, 21 August 1937, p. 5.

———, 'Life's highway - extracts', *Southerly*, vol. 13, no. 4, 1952, pp. 192-202.

———, 'Life's highway - extracts (concluded)', *Southerly*, vol. 16, no. 4, 1955, pp. 198-201.

———, 'Life's highway - extracts (continued)', *Southerly*, vol. 14, no. 1, 1953, pp. 20-7.

———, 'Life's highway - extracts (continued)', *Southerly*, vol. 15, no. 4, 1954, pp. 280-290.

———, 'Life's highway - extracts (continued)', *Southerly*, vol. 16, no. 2, 1955, pp. 104-116.

———, 'Life's highway - extracts (continued)', *Southerly*, vol. 15, no. 1, 1954, pp. 53-8.

———, 'A map and some pins', *Bank Notes*, vol. 21, September 1938, pp. 10-13.

———, 'The truth about Australia', *Bank Notes*, vol. 21, December 1938, pp. 13-17.

———, 'What is to be done with our vast North?' *Australasian*, 3 July 1937, p. 5.

Breinl, Anton, 'The influence of climate, diseases and surroundings on the white race living in the tropics', in Springthorpe, JW (ed.), *Therapeutics, dietetics and hygiene*, James Little, Melbourne, 1914.

Brett, Judith, 'The bureaucratization of writing', *Meanjin*, vol. 50, no. 4, Summer 1991, pp. 513-22.

Buckley-Moran, Jean, 'Australian scientists and the Cold War', in Brian Martin, C.M. Ann Baker, Clyde Manwell and Cedric Pugh (eds), *Intellectual suppression: Australian case histories, analysis and responses*, Angus & Robertson, Sydney, 1986, pp. 11-23.

Burge, CO, 'Presidential address', *Journal and Proceedings of the Royal Society of NSW*, vol. 39, 1905, p. 19.

Burgmann, Meredith, 'Hot and cold: Dr Evatt and the Russians, 1945-1949', in Ann Curthoys and John Merritt (eds), *Australia's first cold war, 1945-1953*, Allen & Unwin, Sydney, 1984, pp. 80-108.

Burke, Peter, 'History of events and the revival of narrative', in Peter Burke (ed.), *New perspectives on historical writing*, Polity Press, Cambridge, 1995, pp. 233-248.

Burnet, Frank Macfarlane, 'Biology, not H-bombs may solve our future', *Herald*, 8 February 1950, p. 4.

———, 'Mankind at the crossroads...' *Australian*, 19 May 1982, p. 7.

Butcher, Barry W, 'Gorilla warfare in Melbourne: Halford, Huxley and 'man's place in nature'', in Roderick Weir Home (ed.), *Australian science in the making*, Cambridge University Press, Cambridge, 1988, pp. 153-169.

Cain, Frank, 'An aspect of postwar Australian relations with the United Kingdom and the United States: Missiles, spies and disharmony', *Australian Historical Studies*, vol. 23, no. 92, April 1989, pp. 186-202.

Cambage, RH, 'Presidential address', *Report of the 19th meeting of the Australasian Association for the Advancement of Science*, Hobart, 1928, pp. 1-29.

Carment, David, 'Groom, Sir Littleton Ernest', in Bede Nairn and Geoffrey Serle (eds), *Australian Dictionary of Biography*, Melbourne University Press, Melbourne, 1983, pp. 130-1.

———, 'The making of an Australian liberal : The political education of Littleton Groom, 1867-1905', *Journal of the Royal Australian Historical Society*, vol. 62, no. 4, March 1977, pp. 232-50.

Castles, Francis G, 'Social laboratory', in Graeme Davison, John Hirst and Stuart Macintyre (eds), *Oxford companion to Australian history*, Oxford University Press, Melbourne, 1998, pp. 592-3.

Cayton, Andrew R L, 'Insufficient woe: sense and sensibility in writing nineteenth-century history', *Reviews in American History*, vol. 31, 2003, pp. 331-41.

Chambers, David Wade, 'Does distance tyrannize science?' in Roderick Weir Home and Sally Gregory Kohlstedt (eds), *International science and national scientific identity*, Kluwer, Dordrecht, 1991, pp. 19-38.

Christesen, Clem, 'Editorial', *Meanjin Papers*, vol. 4, no. 3, Spring 1945, p. 149.

Churchill, Winston, 'Sinews of peace', in Randolph Churchill (ed.), *The sinews of peace: post-war speeches by Winston S Churchill*, Cassell, London, 1948, pp.

Clunies Ross, Ian, 'The place of science in agriculture in Australia', *Country Hour Journal*, vol. 4, no. 11, November 1953, pp. 3-4.

———, 'The role of science and technology', *Canberra Comments*, vol. 13, no. 3, 15 March 1959, pp. 1-2.

———, 'Science, research lift farming output', in 'Australia unlimited' supplement, *Sydney Morning Herald*, 19 June 1957, p. 28.

———, 'Some problems of Australia's scientific development', *Welcome*, vol. 4, no. 11, August 1958, pp. 11-13.

Clunies Ross, Jane, 'O, brave new social order!' *Australian Quarterly*, vol. 14, no. 4, December 1942, pp. 77-85.

'The coming age of electricity', *Australasian Manufacturer*, vol. 8, no. 377, 23 June 1923, pp. 9-10.

Coombs, Herbert Cole, 'The economic aftermath of war', in DAS Campbell (ed.), *Post-war reconstruction in Australia*, Australasian Publishing Company, Sydney, 1944, pp. 67-99.

David, TW Edgeworth, 'The aims and ideals of Australasian science', *Report of the 10th meeting of the Australasian Association for the Advancement of Science*, Dunedin, 1904, pp. 1-43.

———, 'Presidential address', *Report of the 14th meeting of the Australasian Association for the Advancement of Science*, Melbourne, 1913, pp. xliii-xcii.

Davidson, Canon EJ, 'Challenge to human nature', *Voice*, vol. 3, no. 7, April 1954, p. 19.

Davies, Paul. 'The arts have lost it'. *Australian Magazine*, 19-20 October 1996, 30-1.

Davison, Graeme, 'Railways', in Graeme Davison, John Hirst and Stuart Macintyre (eds), *Oxford companion to Australian history*, Oxford University Press, Melbourne, 1998, pp. 542-4.

Deery, Phillip, 'Scientific freedom and postwar politics: Australia, 1945-55', *Historical Records of Australian Science*, vol. 13, no. 1, June 2000, pp. 1-18.

Denning, Warren, 'Where the big bomb was exploded', *Walkabout*, vol. 20, no. 2, 1 February 1954, pp. 10-13.

Einstein, Albert, 'World government or atomic war, says Einstein', *Sydney Morning Herald*, 29 October 1945, p. 2.

Eisenstein, Elizabeth L, 'Clio and Chronos: An essay on the making and breaking of history-book time', *History and Theory*, vol. 5, no. Beiheft 6, pp. 36-64.

Elkin, A P, 'The Australian National Research Council', *Australian Journal of Science*, vol. 16, no. 6, 21 June 1954, pp. 203-211.

Farwell, George, '"Mary K": model town in the spinifex', *Walkabout*, vol. 24, no. 5, 1 May 1958, pp. 10-15.

———, 'Northern Australia: the everlasting promise', *Walkabout*, vol. 25, no. 11, November 1959, pp. 18-22.

Feely, FS, 'Science conquers the sands', *Walkabout*, vol. 15, no. 4, 1 April 1949, pp. 34-37.

Fleming, Donald, 'Science in Australia, Canada, and the United States: some comparative remarks', *Proceedings of the 10th International Congress of the History of Science, Ithaca, 1962*, Paris, 1964, pp. 179-96.

Flynn, John, 'Australia's north and centre', *Australia To-Day*, 11 November 1922, pp. 95-109.

Freestone, Robert, and Sharon Veale, 'The street beautiful: triumphal arches and urban improvement in Sydney, 1888-1925', *Public History Review*, vol. 4, 1995, pp. 25-40.

'A future for atomic power', *Australasian Engineer*, 7 January 1955, pp. 89-101.

Garran, Robert Randolph, 'Australia after the war', *Australia To-Day*, no. 10, 1915, pp. 47-57.

———, 'Australia's new outlook', *Australia To-Day*, no. 15, 1920, pp. 131-137.

Garran, Sir Robert, 'A National University at Canberra', *Australian Quarterly*, no. 27, September 1935, pp. 9-15.

Garton, Stephen, 'Sound minds and healthy bodies: reconsidering eugenics in Australia, 1914-1940', *Australian Historical Studies*, vol. 26, no. 102, 1994, pp. 163-81.

Gascoigne, SCB, 'Astrophysics at Mount Stromlo: the Woolley era', *Proceedings of the Astronomical Society of Australia*, vol. 5, no. 4, 1984, pp. 597-605.

———, 'Bok, Woolley and Australian astronomy', *Historical Records of Australian Science*, vol. 9, no. 2, 1992, pp. 119-26.

Gellatly, Francis Mephan, 'Cost of the Institute', *Science and Industry*, vol. 1, no. 5, September 1919, pp. 257-260.

———, 'Foreword', *Science and Industry*, vol. 1, no. 1, May 1919, pp. 1-2.

———, 'The Institute and the States', *Science and Industry*, vol. 1, no. 3, July 1919, pp. 129-30.

———, 'The task ahead', *Science and Industry*, vol. 1, no. 5, September 1919, pp. 287-293.

Gepp, HW, 'Australia self-contained', *Science and Industry*, vol. 1, no. 3, July 1919, pp. 147-151.

———, 'Australia self-contained', *Science and Industry*, vol. 1, no. 4, August 1919, pp. 220-225.

Gibbs, W J, 'A perspective of Australian meteorology - 1939-1978', *Australian Meteorological Magazine*, vol. 30, no. 1, March 1982, pp. 3-17.

———, 'A very special family: Memories of the Bureau of Meteorology, 1945-1962', *Metarch Papers*, no. 13, May 1999.

Gieryn, Thomas F, 'Boundaries of science', in Sheila Jasanoff, Gerald E Markle, James C Petersen and Trevor Pinch (eds), *Handbook of Science and Technology Studies*, Sage, Thousand Oaks, 1995, pp. 393-443.

Gilmore, Robert J, 'The mighty atom - and what it means to you', *Herald*, 21 January 1948, p. 4.

Goodall, Heather, 'Colonialism and catastrophe: contested memories of nuclear testing an measles epidemics at Ernabella', in Kate Darian-Smith and Paula Hamilton (eds), *Memory & history in twentieth century Autralia*, Oxford University Press, Melbourne, 1994, pp. 55-76.

Gordon, David J, 'Bridging a continent', *Australia To-Day*, no. 13, 21 November 1917.

Grant, Kerr, 'Historical, scientific and technical aspects of atomic energy', in Kerr Grant and GV Portus (eds), *The atomic age*, United Nations Association, SA Division, Adelaide, 1946, pp. 1-13.

Greig-Smith, R, 'Presidential address', *Journal and Proceedings of the Royal Society of NSW*, vol. 50, 1916.

Griffiths, Tom, 'Going with the flow: Flying fox and drifting sand', in Marion Halligan (ed.), *Storykeepers*, Duffy & Snellgrove, Sydney, 2001, pp.

Gullett, H S, 'The Empire's capacious continent', *Australia To-Day*, no. 15, 1920, pp. 33-49.

Hains, Brigid, 'Mawson of the Antarctic, Flynn of the Inland: Progressive heroes on Australia's ecological frontiers', in Tom Griffiths and Libby Robin (eds), *Ecology and empire: Environmental history of settler societies*, Melbourne University Press, Melbourne, 1997, pp. 154-66.

Harrison, Peter, 'Miller, David (1857-1934)', in Bede Nairn and Geoffrey Serle (eds), *Australian Dictionary of Biography*, Melbourne University Press, Melbourne, 1986, pp. 505-6.

Hilgartner, Stephen, 'The dominant view of popularization: conceptual problems, political uses', *Social Studies of Science*, vol. 20, 1990, pp. 519-39.

Hill, Ernestine, 'Along the last lost border', *Walkabout*, vol. 5, no. 7, 1 May 1939, pp. 39-43.

Holmes, Charles H, 'Half-way round the world to test atomic weapons', *Walkabout*, vol. 18, no. 7, 1 July 1952, pp. 10-15.

———, 'Half-way round the world to test atomic weapons', *Walkabout*, vol. 18, no. 7, 1 July 1952, pp. 10-15.

Home, Roderick Weir, 'Australian science and its public', *Australian Cultural History*, no. 7, 1988, pp. 86-103.

———, 'David Forbes Martyn (1906-1970)', in John Ritchie (ed.), *Australian Dictionary of Biography*, Melbourne University Press, Melbourne, 2000, pp. 320-2.

———, 'Eric Henry Stoneley Burhop (1911-1980)', in John Ritchie (ed.), *Australian Dictionary of Biography*, Melbourne University Press, Melbourne, 1993, pp. 301-2.

———, 'History of science in Australia', *Isis*, vol. 73, no. 268, 1982, pp. 337-342.

———, 'Origins of the Australian Physics Community', *Historical Studies*, vol. 20, April 1983, pp. 383-400.

———, 'Rainmaking in CSIRO: The Science and Politics of Climate Modification', in Tim Sherratt, Libby Robin and Tom Griffiths (eds), *A change in the weather: climate and culture in Australia*, NMA Press, Canberra, 2005 (forthcoming).

———, 'Science on service, 1939-1945', in RW Home (ed.), *Australian science in the making*, Cambridge University Press, Cambridge, 1988, pp. 220-51.

———, 'Sir Thomas Ranken Lyle (1860-1944)', in Bede Nairn and Geoffrey Serle (eds), *Australian Dictionary of Biography*, Melbourne University Press, Melbourne, 1986, pp. 172-4.

Howard, John Winston, 'Time to build on bold ideas', in 'Australia unlimited' special liftout, *Weekend Australian*, 8-9 May 1999, p. 5.

Hungerford, TAG, 'Uranium refinery plant opens at Rum Jungle', *National Development*, no. 9, September 1954, pp. 2-9.

Hurley, Frank, 'The Red Centre', *Walkabout*, vol. 6, no. 12, 1 October 1940, pp. 9-13.

Hurst, John, 'Schuler, Gottlieb Federich Henry (1854-1926)', in Geoffrey Serle (ed.), *Australian dictionary of biography*, Melbourne University Press, Melbourne, 1988, pp. 539-40.

Hutton, Captain FW, 'Presidential address', *Report of the 9th meeting of the Australasian Association for the Advancement of Science*, Hobart, 1902, pp. 1-3.

Idriess, Ion L, 'Sand: impressions of a large tract of dry country in the interior of Australia', *Walkabout*, vol. 1, no. 11, 1 September 1935, pp. 22-4.

James, Henry C, 'Food from the desert', *Walkabout*, vol. 18, no. 5, 1 May 1952, pp. 13-16.

Jensen, HI, 'The Darwin Rebellion', *Labour History*, no. 11, November 1966, pp. 3-13.

Johnston, Ron, 'Social responsibility of science: the social mirror of science', in Roy MacLeod (ed.), *The commonwealth of science: ANZAAS and the scientific enterprise in Australasia, 1888-1988*, Oxford University Press, Melbourne, 1988, pp. 308-25.

Johnston, Ron, and Jean Buckley, 'The shaping of contemporary scientific institutions', in RW Home (ed.), *Australian science in the making*, Cambridge University Press, Cambridge, 1988, pp. 374-398.

Jones, Greta, 'The mushroom-shaped cloud: British scientists opposition to nuclear weapons policy, 1945-57', *Annals of Science*, vol. 43, no. 1, January 1986, pp. 1-26.

Jones, Robert A, 'The Boffin: a stereotype of scientists in post-war British films (1945-1970)', *Public Understanding of Science*, vol. 6, 1997, pp. 31-48.

Keane, Kim, 'The story of the atom', *The Herald Atomic Age and Industrial Exhibition*, Herald & Weekly Times, Melbourne, 1948, pp. 6-20, 42-60.

Kiernan, Brian, 'Perceptions of Australia, 1915-1965', *Penguin new literary history of Australia, special issue of Australian Literary Studies*, vol. 13, no. 4, October 1988, pp. 269-83.

Kirkpatrick, Peter, '"His name is not in *Who's Who in Australia*": the life and some of the opinions of "a modest genius", Hugh McKay', *Southerly*, no. 2, June 1990, pp. 222-239.

Kirsch, Scott, 'Watching the bombs go off: photography, nuclear landscapes, and spectator democracy', *Antipode*, vol. 29, no. 3, 1997, pp. 227-55.

Knibbs, George H, 'Science and its service to man', *Report of the 16th meeting of the Australasian Association for the Advancement of Science*, Wellington, 1923, pp. 1-46.

Kovel, Joel, 'Speaking truth to power', *Meanjin*, vol. 50, no. 4, Summer 1991, pp. 447-62.

Laby, T H, 'A university for the Commonwealth', *Australian Quarterly*, no. 1, March 1929, pp. 32-42.

Lang, JD, 'Australia's water resources', *Walkabout*, vol. 13, no. 3, 1 January 1947, pp. 6-20.

Langer, M, 'Why the atom is our friend: Disney, General Dynamics and the USS Nautilus', *Art History*, vol. 18, no. 1, March 1995, pp. 63-96.

'The law of progress in business and men', *Australasian Manufacturer*, vol. 4, no. 184, 11 October 1919, pp. 26-7.

Layman, Lenore, 'Development', in Graeme Davison, John Hirst and Stuart Macintyre (eds), *The Oxford Companion to Australian History*, Oxford University Press, Melbourne, 1998, pp. 184-6.

———, 'Development ideology in Western Australia', *Historical Studies*, vol. 20, no. 79, 1982, pp. 234-60.

Laytha, Edgar, 'Overland to Darwin', *Walkabout*, vol. 8, no. 2, 1 December 1941, pp. 7-12.

Leeper, G W, 'Restoring Australia's parched lands - A comment', *Australian Quarterly*, vol. 14, no. 2, June 1942, pp. 50-52.

Lees, Stella, and June Senyard, 'Cold War, hot books: an analysis of boys' adventure books published during the 1950s', *Journal of Australian Studies*, no. 13, November 1983, pp. 3-17.

Lewis, Milton, 'Canberra as a cultural centre: the aspirations of the Canberra University Movement 1927-1945', *Journal of the Royal Australian Historical Society*, vol. 65, no. 1, June 1979, pp. 59-64.

Lightfoot, Gerald, 'Science, the press, and the public', *Science and Industry*, vol. 1, no. 7, November 1919, pp. 385-8.

Lockwood, Douglas, 'The man who found Rum Jungle', *Walkabout*, vol. 23, no. 11, 1 July 1957, pp. 14-15.

Love, Rosaleen, 'Science and government in Australia, 1905-14: Geoffrey Duffield and the foundation of the Commonwealth Solar Observatory', *Historical Records of Australian Science*, vol. 6, no. 2, 1985, pp. 171-88.

———, 'The Science Show of 1914: the British Association meets in Australia', *This Australia*, vol. 4, no. 1, 1984, pp. 12-16.

Loveday, P, 'Liberals and the idea of development', *Australian Journal of Politics and History*, vol. 23, no. 2, 1977, pp. 219-226.

MacCallum, Monica, 'MacKenzie, Sir William Colin (1877-1938)', in Bede Nairn and Geoffrey Serle (eds), *Australian Dictionary of Biography*, Melbourne University Press, Melbourne, 1986, pp. 306-8.

MacKenzie, William Colin, 'Functional anatomy and medical practice', *Medical Journal of Australia*, 6 October 1928, pp. 422-30.

MacLeod, Roy, 'The 'Arsenal' in the Strand: Australian chemists in the British munitions effort, 1916-1919', *Annals of Science*, vol. 46, 1989, pp. 45-67.

———, 'From imperial to national science', in Roy MacLeod (ed.), *The commonwealth of science: ANZAAS and the scientific enterprise in Australasia, 1888-1988*, Oxford University Press, Melbourne, 1988, pp. 40-72.

———, '"Full of honour and gain to science": munitions production, technical intelligence and the wartime career of Sir Douglas Mawson, FRS', *Historical Records of Australian Science*, vol. 7, no. 2, June 1988, pp. 189-201.

———, 'On Visiting the "Moving Metropolis": Reflections on the architecture of imperial science', *Historical Records of Australian Science*, vol. 5, no. 3, 1982, pp. 1-16.

———, 'Organising science under the Southern Cross', in Roy MacLeod (ed.), *The commonwealth of science: ANZAAS and the scientific enterprise in Australasia, 1888-1988*, Oxford University Press, Melbourne, 1988, pp. 19-39.

———, 'The 'Practical man': Myth and Methaphor in Anglo-Australian Science', *Australian Cultural History*, no. 8, 1989, pp. 24-49.

———, 'Science, progressivism and practical idealism: reflections on efficient imperialism and federal science in Australia 1895-1915', *Scientia Canadensis*, vol. 13, no. 1, 1994, pp. 7-26.

Maslunka, Michele, 'Quick, Sir John (1852-1932)', in Geoffrey Serle (ed.), *Australian dictionary of biography*, Melbourne University Press, Melbourne, 1988, pp. 316-7.

Masson, David Orme, 'Inaugural address', *Report of the 13th meeting of the Australasian Association for the Advancement of Science*, Sydney, 1911, pp. 1-18.

McAlpine, D, 'Science and industry - Prime Minister's scheme', *Argus*, 29 January 1916, p. 6.

McCalman, Janet, 'Tudor, Francis Gwynne (1866-1922)', in John Ritchie (ed.), *Australian Dictionary of Biography*, Melbourne University Press, Melbourne, 1990, pp. 281-2.

McCrea, William, 'Richard van der Reit Woolley', *Historical Records of Australian Science*, vol. 7, no. 3, 1988, pp. 315-45.

McKay, Hugh Cleland, 'The forgotten universe', *Native Companion*, vol. 2, no. 3, 1 October 1907, pp. 163-166.

———, 'Magic eyes of war and peace', *Smith's Weekly*, 18 November 1939, p. 13.

———, 'Mankind's last stand', *Smith's Weekly*, 15 September 1923, p. 29.

——— (HCM), 'The man of the week - Counsel for the yellow streak', *Smith's Weekly*, 14 July 1923, p. 2.

McShane, Ian, 'Building a National Museum of Australia: a history', *Public History Review*, vol. 7, 1998, pp. 75-88.

Mendelsohn, Oscar, 'One man's view of EJ Brady', *Southerly*, vol. 15, no. 1, 1954, pp. 58-61.

Menzies, Robert Gordon, 'For "Australia unlimited"', *Australian Liberal*, vol. 2, no. 1, November 1958, p. 1.

Michael, Mike, 'Ignoring science: discourses of ignorance in the public understanding of science', in Alan Irwin and Brian Wynne (eds), *Misunderstanding science? The public reconstruction of science and technology*, Cambridge University Press, Cambridge, 1996, pp. 107-25.

Middleton, Margaret, 'The Australian family', in Maguire, RJ (ed.), *Hemisphere: Asian-Australian viewpoints and ideas*, Cheshire, London, 1964, pp. 263-8.

Minnett, HC, and Rutherford Robertson, 'Frederick William George White', *Historical Records of Australian Science*, vol. 11, no. 2, 1996, pp. 239-58.

Moorehead, Alan, 'The sky's the limit at Woomera', *Herald*, 9 July 1952, p. 4.

'More about science in our schools', *Australasian Manufacturer*, vol. 1, no. 35, 25 November 1916, p. 10.

Moyal, Ann Mozley, 'Australian Atomic Energy Commission: Case study in Australian science and government', *Search*, vol. 6, no. 9, 1975, pp. 365-84.

———, 'The Australian Academy of Science: the anatomy of a scientific elite. Part I (History and sociology)', *Search*, vol. 11, no. 7, 1980, pp. 231-8.

———, 'The Australian Academy of Science: the anatomy of a scientific elite. Part II (Relations with government)', *Search*, vol. 11, no. 8, 1980, pp. 281-8.

'Mr HW Gepp, industrial scientist', *Science and Industry*, vol. 1, no. 4, August 1919, pp. 246-8.

Murdock, George Peter, 'The common denominator of cultures', in Ralph Linton (ed.), *The science of man in the world crisis*, Columbia University Press, New York, 1945, pp. 123-142.

'The A.N.A. Exhibition - a revelation of what Australia can do', *Australasian Manufacturer*, vol. 7, no. 357, 3 February 1923, p. 10.

'A.N.A. Exhibition of Australian products & manufactures', *Australasian Manufacturer*, vol. 7, no. 359, 17 February 1923, pp. 13-19.

'The need of scientific thinking', *Australasian Manufacturer*, vol. 1, no. 31, 28 October 1916, p. 9.

Newton, JO, 'Ernest William Titterton, 1916-1990', *Historical Records of Australian Science*, vol. 9, no. 2, 1992, pp. 167-188.

Nile, Richard, and David Walker, 'Marketing the literary imagination: production of Australian literature, 1915-1965', *Penguin new literary history of Australia, special issue of Australian Literary Studies*, vol. 13, no. 4, October 1988, pp. 284-302.

Nimkoff, Meyer F, 'Trends in family research', *American Journal of Sociology*, vol. 53, 1947-8, pp. 477-482.

Oldroyd, David R, 'Griffith Taylor and his views on race, environment, and settlement, and the peopling of Australia', in D F Branagan and G H McNally (eds), *Useful and curious geological enquiries beyond the world: Pacific-Asia historical themes. The 19th*

*International INHIGEO Symposium*, International Commission on the History of Geological Sciences (INHIGEO), Sydney, 1994, pp. 251-274.

Oliphant, Marcus Laurence Elwin, 'Australia could use atomic power in 10 years', *Sydney Morning Herald*, 26 March 1947, p. 2.

———, 'Peace or destruction', *Voice*, vol. 3, no. 7, April 1954, pp. 12-13.

Palmer, Vance, 'A note on E J Brady', *Meanjin*, vol. 11, 1952, pp. 290-292.

Parker, RS, 'Garran, Sir Rober Randolph (1867-1957)', in Bede Nairn and Geoffrey Serle (eds), *Australian Dictionary of Biography*, Melbourne University Press, Melbourne, 1981, pp. 622-5.

Paton, John, 'Woomera - The most expensive area in Australia', *Trade Digest*, vol. 3, no. 2, June 1952, pp. 19-20.

Picken, D K, 'Science and culture', *Australian Quarterly*, vol. 5, no. 19, September 1933, pp. 75-86.

Piddington, JH, and MLE Oliphant, 'David Forbes Martyn 1906-1970', *Records of the Australian Academy of Science*, vol. 2, no. 2, 1971, pp. 47-60.

Pittock, A Barrie, 'The atmospheric effects of nuclear war', in Michael Denborough (ed.), *Australia and nuclear war*, Croom Helm Australia, Canberra, 1983, pp. 136-60.

Portus, GV, 'The atom bomb and the world', in Kerr Grant and GV Portus (eds), *The atomic age*, United Nations Association, SA Division, Adelaide, 1946, pp. 14-27.

Powell, Alan, 'Gilruth, John Anderson (1871-1937)', in Bede Nairn and Geoffrey Serle (eds), *Australian dictionary of biography*, Melbourne University Press, Melbourne, 1983, pp. 17-19.

'The practical man', *Australasian Manufacturer*, vol. 3, no. 153, 8 March 1919, p. 20.

Prehn, William, 'Australia's atomic future', *Pacific Neighbours*, vol. 9, no. 2, 1954, pp. 16-20.

'Public Figures - Young Hollway', *Hard Comment*, vol. 1, no. 9, December 1947, p. 3.

'Putting Australia on the map', *National Development*, no. 5, September 1953, pp. 36-8.

Raggatt, H G, 'Bright new era in mineral development', in 'Australia unlimited' supplement, *Sydney Morning Herald*, 19 June 1957, p. 10.

Rehak, Pam, 'Helen Harbour: housewife of the 1950s', in Marilyn Lake and Farley Kelly (eds), *Double time: women in Victoria, 150 years*, Penguin, Melbourne, 1985, pp. 415-22.

Richmond, WH, 'S. M. Bruce and Australian Economic Policy 1923-9', *Australian Economic History Review*, vol. 23, no. 2, September 1983, pp. 238-257.

Rivett, David, 'Note for the AASW and FSTW Conference on Atomic Power, April 12-14, 1946', *Bulletin of the Australian Association of Scientific Workers*, no. 67, April-May 1946.

———, 'Science and responsibility', *Melbourne University Magazine*, 1947, pp. 9-12.

———, 'Science in Australia', *Australian Journal of Science*, vol. 14, no. 2, 21 October 1951, pp. 33-4.

———, 'Science, secrecy and security', *Herald*, 20 January 1949, p. 4.

Robertson, Peter, 'Coming of age: the British Association in Australia, 1914', *Australian Physicist*, vol. 17, 1980, pp. 23-7.

Robertson, T Brailsford, 'Scientific and industrial research in the United States, Canada, and Austalia', *Science and Industry*, vol. 2, no. 3, March 1920, pp. 145-149.

Robin, Libby, 'Collections and the nation: science, history and the National Museum of Australia', *Historical Records of Australian Science*, vol. 14, no. 3, 2003, pp. 251-89.

———, 'Ecology: a science of empire?' in Tom Griffiths and Libby Robin (eds), *Ecology & empire: environmental history of settler societies*, Melbourne University Press, Melbourne, 1997, pp. 63-75.

———, 'Natural history', in Graeme Davison, John Hirst and Stuart Macintyre (eds), *Oxford companion to Australian history*, Oxford University Press, Melbourne, 1998, pp. 461-2.

Roe, Michael, 'H.W. Gepp: His Qualification as Chairman of the Development and Migration Commission', *Papers and Proceedings: Tasmanian Historical Research Association*, vol. 32, no. 3, September 1985 1985, pp. 95-110.

Rose, Deborah, 'The Year Zero and the North Australian frontier', in Deborah Rose and Anne Clarke (eds), *Tracking knowledge in North Australian landscapes*, NARU, Darwin, 1997, pp. 19-36.

Rose, Deborah Bird, 'Hard times: an Australian study', in Klaus Neumann, Nicholas Thomas and Hilary Ericksen (eds), *Quicksands: foundational histories in Australia and Aotearoa New Zealand*, UNSW Press, Sydney, 1999, pp. 2-19.

Rosenblum, E I, 'From Woomera to Luna: space travel - when?' *Walkabout*, vol. 23, no. 11, 1 November 1957, pp. 33-4.

———, 'Walkabout in space', *Walkabout*, vol. 20, no. 9, 1 September 1954, pp. 10-12.

Ross, AD, 'Physical science in the post-war world', *Report of the 25th meeting of the Australian and New Zealand Association for the Advancement of Science*, Adelaide, 1946, pp. 14-21.

Ross, Lloyd, 'A new social order', in Campbell, DAS (ed.), *Post-war reconstruction in Australia*, Australasian Publishing Company, Sydney, 1944, pp. 183-237.

Rowse, Tim, 'The people and their experts: a war-inspired civics for HC Coombs', *Labour History*, no. 74, May 1998, pp. 70-87.

'Rum Jungle uranium project opened', *Chemical Engineering and Mining Review*, vol. 47, 11 October 1954, pp. 3-6.

Schedvin, CB, 'Rivett, Albert (1855-1934) and Rivett, Albert Cherbury David (1855-1961)', in Geoffrey Serle (ed.), *Australian Dictionary of Biography*, Melbourne University Press, Melbourne, 1988, pp. 398-401.

'Science and defence - Australian Association of Scientific Workers', *Australian Journal of Science*, vol. 2, no. 2, October 1939, pp. 40-43.

'Science and security', *Australian Journal of Science*, vol. 11, no. 5, 21 April 1949, pp. 145-7.

'Science and society', *Australian Journal of Science*, vol. 2, no. 2, August 1939, pp. 15-16.

'Science and society - Summary of some of the contributions to the discussion held by the ANZAAS during its meeting at Canberra', *Australian Journal of Science*, vol. 1, no. 4, February 1939, pp. 116-119.

'Science for the people - a suggestion', *Australasian Manufacturer*, vol. 2, no. 95, 26 January 1918, p. 7.

'Scientific snobbery', *Australasian Manufacturer*, vol. 2, no. 54, 14 April 1917, p. 13.

Scott, Ernest, 'The history of Australian science', *Report of the 24th meeting of the Australian and New Zealand Association for the Advancement of Science*, Canberra, 1939, pp. 1-16.

Shanahan, Dennis, 'A fair and decent place', in 'Australia unlimited' special liftout, *Weekend Australian*, 8-9 May 1999, p. 1.

Sherratt, Tim, 'Australian scientists at the British atomic weapons tests', in Robyn Williams (ed.), *Science Show II*, Thomas Nelson, Melbourne, 1986, pp. 216-9.

———, 'Making science for whom?' *Antithesis*, vol. 2, no. 2, 1989, pp. 13-18.

———, 'A physicist would be best out of it: George Briggs and the United Nations Atomic Energy Commission', *Voices*, vol. 3, no. 1, 1993, pp. 17-30.

———, 'A political inconvenience: Australian scientists at the British atomic weapons test, 1952-3', *Historical Records of Australian Science*, vol. 6, no. 2, 1985, pp. 137-52.

———, 'Review of Wayne Reynolds, Australia's bid for the atomic bomb', *Historical Records of Australian Science*, vol. 13, no. 4, December 2001, pp. 536-8.

———, 'Science, history of', in Graeme Davison, John Hirst and Stuart Macintyre (eds), *Oxford Companion to Australian History*, Oxford University Press, Melbourne, 1998, pp. 572-3.

———, 'Scienceworks - a review', *Historical Records of Australian Science*, vol. 9, no. 4, December 1993, pp. 387-8.

Smith, James A, 'Linking a continent', *Australia To-Day*, 10 November 1924, pp. 87-99.

Somer, HM, 'Recuperative Australia', *Australia To-Day*, no. 11, 1 November 1915, pp. 35-46.

'Space weapons', *Aircraft*, vol. 26, no. 12, September 1948, pp. 15, 44.

Spencer, Walter Baldwin, 'Presidential address', *Report of the 15th meeting of the Australasian Association for the Advancement of Science*, Melbourne, 1921, pp. liii-lxxxix.

Stevens, Bertram, 'Australian writers - Edwin J Brady', *Herald*, 16 August 1919.

'The story of ourselves', *Australasian Manufacturer*, vol. 2, no. 79, 6 October 1917, p. 16.

Taylor, Thomas Griffith, 'Geography and national problems', *Report of the 16th meeting of the Australasian Association for the Advancement of Science*, Wellington, 1923, pp. 433-87.

Thompson, Edward, 'Notes on exterminism, the last stage of civilisation', in New Left Review (ed.), *Exterminism and Cold War*, Verso, London, 1982, pp. 1-34.

Thomson, Donald F, 'Rockets will doom aborigines', *Herald*, 11 October 1946, p. 4.

Titterton, Ernest William, 'The facts about radio-strontium and risk to life', *Sydney Morning Herald*, 25 April 1957, p. 2.

———, 'Some questions and answers on latest atom tests', *Sydney Morning Herald*, 15 May 1956, p. 2.

———, 'Tests of nuclear bombs - as a scientists sees them', *Sydney Morning Herald*, 24 April 1957, p. 2.

———, 'Why Australia is preferred as an atom testing site', *Sydney Morning Herald*, 16 May 1956, p. 2.

Torney-Parlicki, Prue, '"Whatever-the-thing-may-be-called": the Australian news media and the atomic bombing of Hiroshima and Nagasaki', *Australian Historical Studies*, vol. 31, no. 114, April 2000, pp. 49-66.

'Travel', *Walkabout*, vol. 1, no. 5, 1 March 1935, p. 9.

Tuckfield, Trevor, 'The Monte Bello Islands', *Walkabout*, vol. 17, no. 8, 1 August 1951, pp. 33-4.

'"Uranium fever" in Australia', *New Commonwealth*, vol. 24, 15 September 1952, p. 295.

'Uranium for the Atomic Age', *National Development*, no. 1, October 1952, pp. 8-13.

Vallance, TG, and DF Branagan, 'David, Sir Tannatt William Edgeworth (1858-1934)', in Bede Nairn and Geoffrey Serle (eds), *Australian Dictionary of Biography*, Melbourne University Press, Melbourne, 1981, pp. 218-21.

Vonwiller, O U, 'The discussion on science and society: Afterthoughts', *Australian Journal of Science*, vol. 1, no. 4, February 1939, pp. 119-121.

———, 'The social relations of science', *Australian Journal of Science*, vol. 1, no. 1, August 1938, pp. 30-32.

Walker, David, 'Climate, civilisation and character in Australia, 1880-1940', *Australian Cultural History*, no. 16, 1998, pp. 77-95.

———, 'The curse of the tropics', in Tim Sherratt, Libby Robin and Tom Griffiths (eds), *A change in the weather: climate and culture in Australia*, Halstead Press, Sydney, 2005 (forthcoming).

Waterford, Jack, 'A Labor myth?' in Curthoys, Ann and John Merritt (eds), *Better dead than red*, Allen & Unwin, Sydney, 1986, pp.

Waterson, DB, 'Groom, William Henry (1833-1901)', in Pike, Douglas (ed.), *Australian Dictionary of Biography*, Melbourne University Press, Melbourne, 1972, pp. 304-5.

Weatherburn, CE, 'On general relativity and gravitation', *Melbourne University Magazine*, vol. 14, October 1920, pp. 128-30.

White, Frederick, 'CSIR to CSIRO - The events of 1948-1949', *Public Administration*, vol. 34, no. 4, December 1975, pp. 281-93.

White, Neville H, 'McAlpine, Daniel (1849-1932)', in Bede Nairn and Geoffrey Serle (eds), *Australian dictionary of biography*, Melbourne University Press, Melbourne, 1986, pp. 193-4.

Wilsmore, NTM, 'The present position of chemistry and chemists', *Report of the 15th meeting of the Australasian Association for the Advancement of Science*, Melbourne, 1921, pp. 19-42.

Wilson, JLJ, 'The family', *Current Affairs Bulletin*, vol. 13, no. 5, December 1953.

Woolley, Richard, 'Mount Stromlo Observatory', *Records of the Australian Academy of Science*, vol. 1, no. 3, September 1968, pp. 53-7.

Wragge, Clement L, 'The Stiger Vortex', *Wragge's Australasian Almanac and Weather Guide*, 1902, pp. 182-4.

Wynne, Brian, 'Misunderstood misunderstandings: social identities and the public uptake of science', in Alan Irwin and Brian Wynne (eds), *Misunderstanding science? The public reconstruction of science and technology*, Cambridge University Press, Cambridge, 1996, pp. 19-46.

## Books and pamphlets

Adam, Barbara, *Time and social theory*, Polity Press, Cambridge, 1990.

———, *Timescapes of modernity: the environment and invisible hazards*, Routledge, London, 1998.

Allen, Stanley F, *The new order - Why? What? How?*, Sydney, 1941.

Alperovitz, Gar, *Atomic diplomacy: Hiroshima and Potsdam*, expanded and updated ed., Penguin, New York, 1985.

———, *The decision to use the atomic bomb and the architecture of an American myth*, Harper Collins, London, 1995.

Anderson, Warwick, *The cultivation of whiteness: science, health and racial destiny in Australia*, Melbourne University Press, Melbourne, 2002.

Angus, Samuel, *Man and the new order*, Angus & Robertson, Sydney, 1941.

Annabell, Ross, *The uranium hunters*, Rigby, Adelaide, 1971.

Arnold, Lorna, *A very special relationship: British atomic weapon trials in Australia*, HMSO, London, 1987.

Atkinson, Meredith, *The new social order - a study of post-war reconstruction*, Workers' Educational Association of Australia, Melbourne, 1919.

Australian Radiation Advisory Council, *British nuclear tests in Australia: a review of operational safety measures and of possible after-effects, ARAC No. 9*, Australian Government Publishing Service, Canberra, 1983.

Australian Radiation Protection and Nuclear Safety Agency, *Austalian strontium 90 testing program, 1957-1978*, ARPANSA, 2001.

*Australia unlimited! - a nation on the march*, Liberal Party of Australia, Canberra, 1958.

Baillie, John, *The belief in progress*, Oxford University Press, London, 1950.

Ball, Desmond, *A suitable piece of real estate: American installations in Australia*, Hale & Iremonger, Sydney, 1980.

Beadell, Len, *Blast the bush*, Rigby, Adelaide, 1976.

Beale, Howard, *This inch of time: memoirs of politics and diplomacy*, Melbourne University Press, Melbourne, 1977.

Bean, Charles Edwin Woodrow, *In your hands, Australians*, Cassell and Company, London, 1919.

———, *War aims of a plain Australian*, Angus & Robertson, Sydney, 1943.

Best, Steven, and Douglas Kellner, *The postmodern adventure: science, technology, and cultural studies at the Third Millennium*, Guilford Press, New York, 2001.

Bickel, Lennard, *The deadly element: the men and women behind the story of Uranium*, Macmillan, London, 1979.

Birrell, Bob, *Federation: the secret story*, Duffy & Snellgrove, Sydney, 2001.

Blainey, Geoffrey, *A land half won*, Sun Books, Melbourne, 1983.

———, *The rush that never ended: a history of Australian mining*, Melbourne University Press, Melbourne, 1963.

———, *This land is all horizons: Australian fears and visions, 2001 Boyer Lectures*, ABC Books, Sydney, 2001.

———, *The tyranny of distance*, Pan Macmillan, Sydney, 2001.

Blakeway, Denys, and Sue Lloyd-Roberts, *Fields of thunder: testing Britain's bomb*, Unwin Paperbacks, London, 1985.

Bolton, Geoffrey, *Spoils and spoliers - Australians make their environment, 1788-1980*, George Allen & Unwin, Sydney, 1981.

Bowler, Peter, *The invention of progress: the Victorians and the past*, Basil Blackwell, Oxford, 1989.

Boyer, Paul, *By the bomb's early light: American thought and culture at the dawn of the Atomic Age*, Pantheon Books, New York, 1985.

Bradley, David, *No place to hide*, University Press of New England, Hanover, 1984.

Brady, Edwin James, *Australia Unlimited*, George Robertson and Company, Melbourne, 1918.

———, *The king's caravan: across Australia in a wagon*, Edward Arnold, London, 1911.

———, *The land of the sun*, Edward Arnold & Co., London, 1924.

———, *Picturesque Port Phillip*, George Robertson & Company, Melbourne, 1911.

———, *River rovers*, George Robertson & Co., Melbourne, 1911.

———, *Sydney Harbour*, Builder Printing Works, Sydney, 1903.

———, *Two frontiers*, Frank Johnson, Sydney, 1944.

Brady, Edwin James, and Leslie Rubinstein, *Dreams and realities*, York Press, Melbourne, 1944.

Branagan, David, and Graham Holland (eds), *Ever reaping something new: a science centenary*, University of Sydney, Sydney, 1985.

Brett, Judith, *Robert Menzies' forgotten people*, Sun, Sydney, 1993.

Buller-Murphy, Basil, *Safety of our future: world federation*, Robertson & Mullens, Melbourne, 1957.

Burnet, Frank Macfarlane, *Dominant mammal*, Heinemann, Melbourne, 1970.

Bury, J B, *The idea of progress: an inquiry into its origin and growth*, Macmillan, London, 1920.

Butlin, S J, and C B Schedvin, *War Economy, 1942-1945, Australia in the war of 1939-1945, series 4 (civil)*, vol. 4, Australian War Memorial, Canberra, 1977.

Button, C N, *God, Man, and The Bomb*, St Andrews Kirk, Ballarat, 1945.

— — —, *Whither Australia? An address delivered at the opneing of the General Assembly of the Presbyterian Church of Victoria, Monday 4th May 1942*, Waller & Chester, Ballarat, 1942.

Button, C N, Hector Maclean, JT Lawton, AT McNaughton, and HC Matthew, *The Church and the new era*, Presbyterian Church of Australia, Melbourne, 1937.

Cain, Frank, *The Australian Security Intelligence Organization : an unofficial history*, Spectrum Publications, Richmond, Vic., 1994.

Carroll, Lewis, *Through the looking-glass and what Alice found there*, Folio Society, London, 1962.

Carter, Paul, *The road to Botany Bay: an exploration of landscape and history*, Alfred A Knopf, New York, 1988.

Caulfield, Catherine, *Multiple exposures: chronicles of the radiation age*, Secker & Warburg, London, 1989.

Cawte, Alice, *Atomic Australia: 1944-1990*, New South Wales University Press, Sydney, 1992.

Cilento, Raphael, *The white man in the tropics: with especial reference to Australia and its dependencies*, Commonwealth of Australia, Department of Health, Melbourne, 1925.

Clark, Ronald W, *The birth of the bomb: the untold story of Britain's part in the weapon that changed the world*, Phoenix House Ltd, London, 1961.

— — —, *The greatest power on earth: the story of nuclear fission*, Sidgwick & Jackson, London, 1980.

Clunies Ross, Ian, *John Anderson Gilruth: The influence of his life and work on the development of the livestock industries of the Commonwealth, The John Murtagh Macrossan Memorial Lectures for 1954*, University of Queensland Press, Brisbane, 1956.

Cockburn, Stewart, and David Ellyard, *Oliphant: the life and times of Sir Mark Oliphant*, Axiom Books, Adelaide, 1981.

Coombs, Herbert Cole, *Trial balance: issues of my working life*, Sun Books, Melbourne, 1983.

Cross, Roger, *Fallout: Hedley Marston and the British bomb tests in Australia*, Wakefield Press, Adelaide, 2001.

Crotty, Martin, John Germov, and Grant Rodwell (eds), *'A Race for a place: eugenics, Darwinism and social thought and practice in Australia, Proceedings of the history & sociology of eugenics*, Faculty of Arts & Social Science, University of Newcastle, Newcastle, 2000.

Currie, Sir George, and John Graham, *The origins of CSIRO: Science and the Commonwealth Government 1901-1926*, CSIRO, Melbourne, 1966.

Davison, Graeme, *The rise and fall of marvellous Melbourne*, Melbourne University Press, Melbourne, 1981.

———, *The unforgiving minute: how Australia learned to tell the time*, Oxford University Press, Melbourne, 1993.

Day, David, *Claiming a continent: a history of Australia*, Angus & Robertson, Sydney, 1996.

Deakin, Alfred, *Federated Australia: selections from letters to the Morning Post, 1900-1910*, Melbourne University Press, Melbourne, 1968.

Denborough, Michael (ed.), *Australia and nuclear war*, Crook Helm, Canberra, 1983.

Dening, Greg, *Performances*, Melbourne University Press, Melbourne, 1996.

Divine, Robert, *Blowing on the wind: the nuclear test ban debate, 1954-1960*, Oxford University Press, New York, 1978.

Easlea, Brian, *Fathering the unthinkable: masculinity, scientists and the nuclear arms race*, Pluto Press, London, 1983.

Eckersley, Richard (ed.), *Measuring progress: is life getting better*, CSIRO Publishing, Melbourne, 1998.

Falk, Jim, *Global fission: the battle over nuclear power*, Oxford University Press, Melbourne, 1982.

———, *Taking Australia off the map*, Penguin, Melbourne, 1983.

Fenner, Frank (ed.), *The Australian Academy of Science: the first forty years*, Australian Academy of Science, Canberra, 1995.

Finney, Colin, *Paradise revealed: natural history in nineteenth-century Australia*, Museum of Victoria, Melbourne, 1993.

———, *To sail beyond the sunset: natural history in Australia, 1699-1829*, Rigby, Adelaide, 1984.

Foley, J C, *Droughts in Australia: Review of records from earliest years of settlement to 1955, Bulletin no. 43*, Bureau of Meteorology, Melbourne, 1957.

Foster, SG, and Margaret M Varghese, *The making of the Australian National University, 1946-1996*, Sydney, Allen & Unwin, 1996.

Gepp, Herbert William, *Address by HW Gepp at the Sydney Rotary Club, 21st January 1930*, ST Leigh & Co, Sydney, 1930.

Gieryn, Thomas F, *Cultural boundaries of science: credibility on the line*, University of Chicago Press, Chicago, 1999.

Goldberg, Stanley, *Understanding relativity*, Birkhauser, Boston, 1984.

Gowing, Margaret, *Independence and deterrence: Britain and atomic energy, 1945-1952*, 2 vols., vol. 1, Macmillan, London, 1974.

Griffiths, Tom, *Forests of ash*, Cambridge University Press, Melbourne, 2001.

———, *Hunters and collectors: the antiquarian imagination in Australia*, Cambridge University Press, Cambridge, 1996.

———, *Secrets of the forest: discovering history in Melbourne's ash range*, Allen & Unwin, Sydney, 1992.

Groom, Jessie (ed.), *Nation building in Australia : The life and work of Sir Littleton Ernest Groom*, Angus and Robertson, Sydney, 1941.

Groom, Littleton, *Australian Bureau of Agriculture: memorandum on the establishment of*, Parl. paper no. 194, Canberra, 1908.

———, *Nation building in Australia: the work of the second Deakin administration, 1905-1908*, Protectionist Association of Victoria, Melbourne, 1908.

———, *Work at the Federal Capital: address delivered by Hon. Littleton E Groom at the National Club Luncheon on Monday, 29 August, 1921*, Canberra, 1921.

Hains, Brigid, *The ice and the inland: Mawson, Flynn and the myth of the frontier*, Melbourne University Press, Melbourne, 2002.

Hamilton, Clive, *Running from the storm: the development of climate change policy in Australia*, UNSW Press, Sydney, 2001.

Hamilton, Clive, and Richard Denniss, *Tracking well-being in Australia: the Genuine Progress Indicator 2000, Discussion paper no. 35*, Australia Institute, Canberra, 2000.

Hancock, William Keith, *Australia*, Ernest Benn, London, 1930.

Hardy, Clarence, *Atomic rise and fall: The Australian Atomic Energy Commission, 1953-1987*, Glen Haven Publishing, Peakhurst (NSW), 1999.

Hartnett, Laurence, *Big wheels and little wheels*, Lansdowne Press, Melbourne, 1964.

Hasluck, Paul, *Diplomatic witness: Australian foreign affairs, 1941-1947*, Melbourne University Press, Melbourne, 1980.

———, *The government and the people, 1939-1941, Australia in the war of 1939-1945, series 4 (civil)*, vol. 1, Australian War Memorial, Canberra, 1952.

———, *The government and the people, 1942-1945, Australia in the war of 1939-1945, series 4 (civil)*, Australian War Memorial, Canberra, 1970.

Hatfield, William, *Australia reclaimed*, Cumberland Newspapers Ltd, Sydney, 1944.

Haynes, Raymond, Roslynn Haynes, David Malin, and Richard McGee, *Explorers of the southern sky: a history of Australian astronomy*, Cambridge University Press, Cambridge, 1996.

Haynes, Roslynn D, *From Faust to Strangelove: representations of the scientist in Western literature*, Johns Hopkins University Press, Baltimore, 1994.

Henriksen, Margot A, *Dr Strangelove's America: society and culture in the atomic age*, University of California Press, Berkeley, 1997.

*The Herald Atomic Age and Industrial Exhibition*, Herald & Weekly Times, Meboume, 1948.

Herken, Greg, *The winning weapon : the atomic bomb in the cold war, 1945-1950*, Knopf, New York, 1980.

Hilgartner, Stephen, Richard C Bell, and Rory O'Connor, *Nukespeak*, Penguin, Harmondsworth, 1982.

Hines, Neil O, *Proving ground: an account of the radiobiological studies in the Pacific, 1946-1961*, University of Washington Press, Seattle, 1962.

Hirst, John, *The sentimental nation: the making of the Australian Commonwealth*, Oxford University Press, Melbourne, 2000.

Home, RW (ed.), *The making of Australian science*, Cambridge University Press, Cambridge, 1988.

Home, RW, and Sally Gregory Kohlstedt (eds), *International science and national scientific identity*, Kluwer, Dordrecht, 1991.

Idriess, Ion L, *Fortunes in minerals - including uranium*, Angus and Robertson, Sydney, 1951.

———, *The great boomerang*, Angus & Robertson, Sydney, 1941.

Inglis, KS, *CE W Bean, Australian historian, John Murtagh Macrossan Lecture, 1969*, University of Queensland Press, St Lucia, 1970.

Irving, Helen, *To constitute a nation: a cultural history of Australia's constitution*, Cambridge University Press, Cambridge, 1999.

Irwin, Alan, and Brian Wynne (eds), *Misunderstanding science?: the public reconstruction of science and technology*, Cambridge University Press, Cambridge, 1996.

Joint Task Force One, The Office of the Historian, *Operation Crossroads - The Official Pictorial Record*, New York, WH Wise & Co, 1946.

Jones, Greta, *Science, politics and the Cold War*, Routledge, London, 1988.

Jordan, Richard, and Peter Pierce (eds), *The poets' discovery: nineteenth-century Australia in verse*, Melbourne University Press, Melbourne, 1990.

Keating, Jenny, *The drought walked through: a history of water shortage in Victoria*, Department of Water Resources, Victoria, Melbourne, 1992.

Kern, Stephen, *The culture of time and space, 1880-1918*, Harvard University Press, Cambridge, Mass, 1983.

Kingston, Beverley, *Glad, confident morning, 1860-1900, Oxford history of Australia*, vol. 3, Oxford University Press, Melbourne, 1993.

Kleinman, Daniel Lee (ed.), *Science, technology, and democracy*, State University of New York Press, Albany, 2000.

Kovel, Joel, *Against the state of nuclear terror*, South End Press, Boston, 1984.

La Nauze, J A, *Alfred Deakin - a biography*, 2 vols. Melbourne University Press, Melbourne, 1965.

Lamont, Lansing, *Day of Trinity: the dramatic story of the men who opened the nuclear age*, Hutchinson, London, 1965.

Lapp, Ralph E, *The voyage of the Lucky Dragon*, Shakespeare head, London, 1958.

Lewis, Milton, *Managing madness: psychiatry and society in Australia 1788-1980*, AGPS, Canberra, 1988.

Lieberman, Joseph I, *The scorpion and the tarantula : the struggle to control atomic weapons, 1945-1949*, Houghton Mifflin Company, Boston, 1970.

Lines, William, *Taming the great south land: a history of the conquest of nature in Australia*, Allen & Unwin, Sydney, 1991.

Lumb, RD, and GA Moens, *The Constitution of the Commonwealth of Australia - Annotated*, 5th ed., Butterworths, Sydney, 1995.

Lyotard, Jean Francois, *The postmodern condition: a report on knowledge*, University of Minnesota Press, Minneapolis, 1984.

Macey, Samuel L, *The dynamics of progress*, University of Georgia Press, Athens, Georgia, 1989.

———, *Patriarchs of time: dualism in Saturn-Cronos, Father Time, the Watchmaker God, and Father Christmas*, University of Georgia Press, Athens, Georgia, 1987.

Macintyre, Stuart, *1901-1942: The succeeding age, Oxford history of Australia*, vol. 4, Oxford University Press, Melbourne, 1986.

Macintyre, Stuart, and Anna Clark, *The History Wars*, Melbourne University Press, Melbourne, 2003.

Macleod, Roy, *The commonwealth of science: ANZAAS and the scientific enterprise in Australasia, 1888-1988*, Oxford University Press, Melbourne, 1988.

Manne, Robert, *The Petrov affair: politics and espionage*, Pergamon, Sydney, 1987.

Martin, Brian, *Nuclear knights*, Rupert Public Interest Movement, Canberra, 1980.

McKay, Alwyn, *The making of the atomic age*, Oxford University Press, Oxford, 1984.

McKnight, David, *Australia's spies and their secrets*, Allen & Unwin, Sydney, 1994.

Mellor, David Paver, *The role of science and industry, Australia in the war of 1939-1945, Series 4 (civil)*, vol. 5, Australian War Memorial, Canberra, 1958.

Milliken, Robert, *No conceivable injury: the story of Britain and Australia's atomic cover-up*, Penguin, Melbourne, 1986.

Milne, Tessa, *Archways to Federation: the story of the celebratory arches of 1901, Researching Federation manual no.* 2, 1901 Centre, University of Technology, Sydney, 2000.

Moorehead, Alan, *Rum Jungle*, Hamish Hamilton, London, 1953.

Morton, Peter, *Fire across the desert: Woomera and the Anglo-Australian Joint Project 1946-1980*, AGPS, Canberra, 1989.

Moyal, Ann, *A bright and savage land*, Penguin, Melbourne, 1993.

Murdoch, Walter, *Alfred Deakin - A sketch*, Bookman, Melbourne, 1999.

Murdock, George Peter, *Social structure*, Free Press, New York, 1949.

Murphy, John, *Imagining the fifties: private sentiment and political culture in Menzies' Australia*, UNSW Press, Sydney, 2000.

Murphy, John G, *Who will build a new order?*, Sydney, 1943.

Nation's Forum of the Air, *Should Australia be used as a bomb alley for rockets?*, Australian Broadcasting Commission, Sydney, 1946.

Nowotny, Helga, *Time: the modern and postmodern experience*, Polity Press, Cambridge, 1994.

Oliphant, MLE (ed.), *Science in Australia*, FW Cheshire, Melbourne, 1952.

Pittock, Barrie, *Beyond darkness: nuclear winter in Australia and New Zealand*, Sun Books, Melbourne, 1987.

Pizzey, Graham, *Crosbie Morrison: voice of nature*, Victoria Press, Melbourne, 1992.

Pollard, Sidney, *The idea of progress: history and society*, CA Watts & Co, London, 1968.

Portus, GV, *Happy highways*, Melbourne University Press, Melbourne, 1953.

Powell, Joseph Michael, *Griffith Taylor and 'Australia Unlimited', The John Murtagh Macrossan Memorial Lecture, 1992*, University of Queensland Press, Brisbane, 1992.

Pyne, Stephen J, *Burning bush: a fire history of Australia*, Allen & Unwin, Sydney, 1992.

Quick, John, and Robert Randolph Garran, *The annotated constitution of the Australian Commonwealth*, reprint of 1901 ed., Legal Books, Sydney, 1995.

Rasmussen, Carolyn, *A Museum for the People: A history of Museum Victoria and its predecessor institutions*, Scribe Publications with Museum of Victoria, Melbourne, 2001.

Ratcliffe, Francis, *Flying fox and drifting sand*, Angus & Robertson, Sydney, 1947.

Redner, Harry, and Jill Redner, *Anatomy of the world*, Fontana, Melbourne, 1983.

Reiger, Kerreen, *The disenchantment of home: modernising the Australian family 1880-1940*, Oxford University Press, Melbourne, 1985.

Reingold, Nathan, and Marc Rothenberg (eds), *Scientific colonialism: a cross-cultural comparison*, Smithsonian Institution Press, Washington, 1987.

*Report of the Preliminary Scientific Expedition to the Northern Territory*, Department of External Affairs, Commonwealth of Australia, Melbourne, 1912.

*The report of the Royal Commission into British nuclear tests in Australia*, 2 vols., vol. 1, Australian Government Publishing Service, Canberra, 1985.

*The report of the Royal Commission into British nuclear tests in Australia*, 2 vols., vol. 2, Australian Government Publishing Service, Canberra, 1985.

Reynolds, Wayne, *Australia's bid for the atomic bomb*, Melbourne University Press, Melbourne, 2000.

Rhodes, Richard, *Dark sun : the making of the hydrogen bomb*, Simon & Schuster, New York, 1995.

———, *The making of the atomic bomb*, Simon & Schuster, New York, 1986.

Rivett, David, *The application of science to industry, the John Murtagh Macrossan Memorial Lectures for 1943*, University of Queensland, Brisbane, 1944.

Rivett, Rohan, *David Rivett: fighter for Australian science*, R D Rivett, Melbourne, 1972.

Robin, Libby, *Defending the Little Desert: the rise of ecological consciousness in Australia*, Melbourne University Press, Melbourne, 1998.

Roe, Michael, *Australia, Britain and migration*, Cambridge University Press, Cambridge, 1995.

———, *Nine Australian progressives: vitalism in bourgeois social thought, 1890-1960*, University of Queensland Press, St. Lucia, 1984.

Rolls, Eric, *They all ran wild: the story of pests on the land in Australia*, Angus & Robertson, Sydney, 1969.

Rosen, and Goldfinch, *Time marches on*, Sydney, 1942.

Ross, Andrew, *Strange weather: culture, science and technology in the age of limits*, Verso, London, 1991.

Rowse, Tim, *Australian liberalism and national character*, Kibble Books, Malmsbury, Victoria, 1978.

———, *Nugget Coombs: a reforming life*, Cambridge University Press, Cambridge, 2002.

Ruthven, Ken, *Nuclear criticism*, Melbourne University Press, Melbourne, 1993.

Schedvin, C B, *Shaping science and industry: a history of Australia's Council for Scientific and Industrial Research, 1926-49*, Allen & Unwin, Sydney, 1987.

Serle, Geoffrey, *From deserts the prophets come: the creative spirit in Australia 1788-1972*, Heinemann, Melbourne, 1973.

Sexton, Christopher, *The seeds of time: the life of Sir Macfarlane Burnet*, Oxford University Press, Oxford, 1991.

Shattuck, Roger, *Forbidden knowledge: from Prometheus to pornography*, Harcourt Brace & Company, San Diego, 1996.

Shepherd, Mark, *A lifetime in the bush: the biography of Len Beadell*, Corkwood Press, Adelaide, 1998.

Shute, Nevil, *On the beach*, Heinemann, London, 1957.

Simms, Marian, *A Liberal nation: the Liberal Party and Australian politics*, Hale & Iremonger, Sydney, 1982.

Smith, Alice Kimball, *A peril and a hope: the scientists' movement in America 1945-47*, MIT Press, Cambridge, Massachusetts, 1970.

Smith, Jeff, *Unthinking the unthinkable: nuclear weapons and western culture*, Indiana University Press, Bloomington, 1989.

Southall, Ivan, *Meet Simon Black*, Angus & Robertson, Sydney, 1950.

———, *Rockets in the desert*, Angus & Robertson, Sydney, 1964.

———, *Woomera*, Angus & Robertson, Sydney, 1962.

Spaull, Andrew, *John Dedman: a most unexpected Labor man*, Hyland House, Melbourne, 1998.

Sprigg, Reg C, *Arkaroola - Mt Painter in the Northern Flinders Ranges, SA: The last billion years*, Arkaroola, 1984.

Stenning, IR, *Postwar reconstruction for our new order*, Our New Order Association, Sydney, 1942.

Strahan, Lynne, *Just city and the mirrors: Meanjin Quarterly and the intellectual fron, 1940-1965*, Oxford University Press, Melbourne, 1984.

Strahan, Ronald, *Rare and curious specimens: an illustrated history of the Australian Museum*, Australian Museum, Sydney, 1979.

Tame, Adrian, and FPJ Robotham, *Maralinga: British A-bomb, Australian legacy*, Fontana/Collins, Melbourne, 1982.

Titterton, Ernest William, *Facing the Atomic Future*, FW Cheshire, Melbourne, 1956.

Toynbee, Arnold J, *Democracy in the Atomic Age - The Dyason Lectures 1956*, Oxford University Press, Melbourne, 1957.

Tregenza, John, *Professor of democracy: the life of Charles Henry Pearson 1830-1894*, Melbourne University Press, Melbourne, 1968.

Walker, David, *Anxious nation: Australia and the rise of Asia 1850-1939*, University of Queensland Press, St Lucia, 1999.

———, *Dream and disillusion: a search for Australian cultural identity*, ANU Press, Canberra, 1976.

Ward, Russel, *The Australian legend*, paperback ed., Oxford University Press, Melbourne, 1974.

Watson, Don, *Brian Fitzpatrick: a radical life*, Hale & Iremonger, Sydney, 1979.

Watts, Padre G Stuart, *The digger, the Church and the New Social Order*, FH Johnston, Sydney, 1945.

Weart, Spencer, *Nuclear fear: a history of images*, Harvard University Press, Cambridge, Massachusetts, 1988.

———, *Scientists in power*, Harvard University Press, Cambridge, Massachusetts, 1979.

Weickhardt, Len, *Masson of Melbourne: the life and times of David Orme Masson*, Royal Australian Chemical Institute, Melbourne, 1989.

Weller, Patrick, *Dodging raindrops - John Button: A Labor life*, Allen & Unwin, Sydney, 1999.

White, Hayden, *The content of the form: narrative discourse and historical representation*, Johns Hopkins University Press, Baltimore, 1987.

White, Richard, *Inventing Australia*, George Allen & Unwin, Sydney, 1981.

Whitlam, Nicholas, and John Stubbs, *Nest of traitors: the Petrov affair*, Jacaranda Press, Milton, 1974.

Whitrow, GJ, *Time in history: views of time from prehistory to the present day*, Oxford University Press, Oxford, 1988.

Wilcox, Craig, *For hearths and homes: citizen soldiering in Australia, 1854-1945*, Allen & Unwin, Sydney, 1998.

Wilks, Judy, *Field of thunder: the Maralinga story*, Friends of the Earth, Melbourne, 1981.

Windschuttle, Keith, *The killing of history*, Macleay Press, Sydney, 1996.

Wittner, Lawrence S, *The struggle against the bomb, vol. 1, One world or none: A history of the world nuclear disarmament movement through 1953*, Stanford University Press, Stanford, 1993.

Yack, Bernard, *The fetishism of modernities: epochal self-consciousness in contemporary social and political thought*, University of Notre Dame Press, Notre Dame, Indiana, 1997.

## Newspapers & magazines

*Adelaide Advertiser*

*Age*

*Argus*

*Australasian Manufacturer*

*Australian Women's Weekly*

*Bulletin*

*Canberra Times*

*Courier Mail*

*Daily Telegraph*

*Herald*

*Sun*

*Sydney Mail*

*Sydney Morning Herald*

*Tribune*

## Poems

Brady, Edwin James, 'A continent to loot', *Bulletin*, vol. 30, no. 1528, 27 May 1909, p. 6.

———, 'Pro patria', *Bulletin*, vol. 31, no. 1566, 17 February 1910, p. 3.

———, 'Steam (obit 1912?). An epitaph', *Bulletin*, vol. 30, no. 1550, 28 October 1909, p. 43.

Briggs, Ernest, 'Atomic bomb', *Meanjin*, vol. 4, no. 3, Spring 1945, p. 175.

Evans, George Essex, 'A federal song', in Jordan, Richard and Peter Pierce (eds), *The poets' discovery: nineteenth-century Australia in verse*, Melbourne University Press, Melbourne, 1990, pp. 421-2.

———, *Ode for Commonwealth Day*, Sydney, 1901.

Gordon, JL, 'The present situation', *Towards a New Order: Ten poems 1938-1940*, Sydney, 1941?.

Hawkes, Morgan, 'The psalm of united Australia', in Jordan, Richard and Peter Pierce (eds), *The poets' discovery: nineteenth-century Australia in verse*, Melbourne University press, Melbourne, 1990, pp. 433.

Hope, AD, 'Prometheus unbound (Bikini, March 1, 1954)', *Voice*, vol. 3, no. 7, April 1954, p. 21.

Jasby, 'Peeps at the professions: 15 - The scientist', *Bulletin*, vol. 55, no. 2860, 5 December 1934, p. 25.

Paterson, AB (Banjo), 'Investigating Flora', *Bulletin*, vol. 20, no. 1034, 9 December 1899.

———, 'Song of the future', in Campbell, Rosamund and Phillipa Harvie (eds), *Singer of the bush, A B Paterson complete works, 1885-1900*, Lansdowne, Sydney, 1983, pp. 95-8.

PL, 'The modern spirit', *Bulletin*, vol. 14, no. 741, 28 April 1894, p. 15.

### Theses

Carment, David, 'Australian liberal: a political biography of Sir Littleton Groom, 1867-1936', PhD, Australian National University, 1975.

James, Rodney B, 'Representation of the Bomb in Australian art and culture, 1945-1959', MA, Monash University, 1990.

Moran, Jean, 'Scientists in the political and public arena: a social-intellectual history of the Australian Association of Scientific Workers', M.Phil, Griffith University, 1983.