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Science, Progressivism, and "Practical Idealism:" Reflections on Efficient Imperialism and Federal Science in Australia, 1895-1915

Roy MacLeod

Introduction[1]

> The task of Empire is the ... scientific conquest of its physical, and, shall we not be bold and say, ultimately of its political problems. [We must] endeavour ... to acquire that knowledge in scientific manner, and by scientific methods, which shall enable us to appreciate, in the first place, the vast, the incalculable natural resources which are present in our possession under the Flag—the means of utilising these instruments of material power for the benefit of our race.[2]

Thus Alfred Deakin, Prime Minister of Australia, in the presence of Sir Wilfrid Laurier of Canada, responded to the toast of 'Our Guests' at a combined session of the British Empire League and the British Science Guild in May 1907. The occasion—the Colonial Prime Ministers' meeting in London—presented a particularly appropriate moment for the condensation of typically volatile sentiments about the organic unity of science and empire, that had suffused the atmosphere of imperial relations for a generation. Today, the occasion gives Australians a point of departure, and reflection from which to assess, looking backwards, the picture of colonial science at the turn of the century, and forward to the promise in store for science in the service of a federal nation, loyal to Empire, but increasingly conscious of its own priorities.

Between 1900 and 1915, Australia was *per capita* one of the most prosperous nations on earth. This came about partly by foreign investment, partly by protective tariffs, and partly by the convenient absence of expensive defence commitments. But it also arose from the wealth generated by increasingly productive sectors of primary industry, in agriculture, wool, and, intermittently, minerals. Above all, it was a success story symbolised by 'Federation wheat,' developed by William Farrer and F.B.Guthrie—men who combined the skills of 'practical genetics' and systematic chemistry.[3]

1 This essay derives from studies in the history of Australian science assisted by the Australian Research Council. I am grateful to Richard Jarrell for his comments, and to Stan Veitsman for his assistance in completing a final text.

2 'Science and the Empire,' *Nature*, 76 (9 May 1907), 37.

3 See C.W. Wrigley and A. Rathjen, 'Wheat Breeding in Australia,' in D.J. and S.G.M. Carr (eds.), *Plants and Man in Australia* (New York: Academic Press, 1981); Colin Wrigley, 'F.B.Guthrie: Australia's Pioneer Cereal Chemist,' *Chemistry in Australia* (September

Theirs was the triumph of the 'practical man,' in a setting sensitive to the applications of science.[4] But it was a period also highly successful in the applications of 'scientific method' and rational analysis—in health, the social services, and in secondary education, where reformers like Francis Anderson sought to put Australian institutions on a par not with the least in Britain, but with the best in the world.

Just as Australians, fifty years on, are persuaded to see Gallipoli as a 'coming of age' of a federated nation, its young men fighting as Australians, rather than as Queenslanders or Victorians, welding different colonial traditions in a single sacrifice, so it is tempting to see a 'coming of age' in Australian science in the southern summer of 1915, when Australia created its first national Advisory Council for scientific research and its first Institute for Science and Industry. On 22 December, the day Prime Minister W.H. ('Billy') Hughes announced the miraculous withdrawal of Australian forces from ANZAC Cove, the same man took by storm a luncheon given for him at the University of Melbourne, striding into the room—as Currie and Graham put it—'as a prize fighter the ring'—'determined to challenge the scientific prowess of the Teuton warrior'.[5]

Hughes' acceptance and endorsement of proposals for a national research institute were consistent with the actions of his political contemporaries in Canada and Britain.[6] But they performed an act of constitutional magic, in making 'federal' what had hitherto been merely 'federated'. His words on that day led to the establishment of the Institue for Science and Industry, and eventually to the Council for Scientific and Industrial Research (CSIR)—whose delayed formal beginnings in 1926 signfied a sure, if early, token of Australia's cultural maturity.[7] In 1915, science had played, and not for the first time, a role in Australia's 'march to nationhood'.[8]

The war, which provoked substantial reconstruction in the machinery of government science in Britain, brought similar changes to Australian science, with consequences equally far reaching. From the war, came the Commonwealth Serum Laboratory and the Munitions Supply Laboratory, both set up in 1916. In recruiting large numbers of Australian scientists to the British muni-

1989), 306-311.

4 Roy MacLeod, 'The Practical Man: Myth and Metaphor in Anglo-Australian Science,' *Australian Cultural History*, 8 (1988), 24-49.

5 George Currie and John Graham, *The Origins of CSIRO: Science and the Commonwealth Government, 1901-1926* (Melbourne: Melbourne University Press, 1966).

6 Roy MacLeod and E.K. Andrews, 'The Origins of the DSIR: Reflections on Ideas and Men,' *Public Administration*, 48 (1970), 23-48.

7 Geoffrey Searle, *From Deserts the Prophets Come: The Creative Spirit in Australia* (Melbourne: Heinemann, 1973).

8 Roy MacLeod (ed.), *The Commonwealth of Science: ANZAAS and the Scientific Enterprise in Australasia, 1888-1988* (Melbourne: Oxford University Press, 1988).

tions effort, wartime experience contributed substantially to postwar manufacturing industry, just as wartime medical service benefited Australian research in parasitology and pharmacology.[9] It is undoubtedly correct to see the war as a turning point in the relations of science and government in Australia, as elsewhere in the Empire, in America and in Europe.[10]

But if we cast our eyes back to the decade before the war, we may find a rich soil of incipient traditions, germinating with ideas which were not only to give shape to wartime decisions, but also to foreshadow later Australian attitudes towards the use of science for national purposes. Ten years ago, I outlined, in a schematic way, a series of historical stages, or phases, through which I considered that Australian (and possibly other Dominion) tendencies in science had developed.[11] I intended this to be not so much an explanatory device, as a heuristic framework for testing hypotheses. Since that time, I have been filling in the picture where I can, and falsifying the 'model' where I cannot. I have also been trying to identify nodal points where one can see intersections between the discourses of science as culture, and as cultural agency.

In so doing, I have followed cultural historians in attempting to articulate the associations of science within what Michael Roe has called the 'bourgeoisie hegemony,' the system of socio-economic ideas that dominated the contrary imaginations of colonial Australia since the early nineteenth century.[12] It is debatable whether any single theory of culture can be applied to all Australia, with its urban population of city-states and its pastoral economy, its mythologies embracing, in the words of Francis Adams, coastal plain and inland desert.[13] Australia has been well-described as having not one but three 'founding' cultures—the convict-cum military culture of New South Wales which spread to Tasmania, Victoria, and Queensland, the gentleman-farmer colony of Western Australia, and the squire-farmer colony of South Australia. Indeed, given the intellectual distance between Melbourne and

9 Roy MacLeod, 'The Arsenal in the Strand: Australian Chemists in the British Munitions Effort, 1916-1919,' *Annals of Science,* 46 (1989), 45-67. See also Rod Home (ed.), *Australian Science in the Making* (Sydney: Cambridge University Press, 1988).

10 Roy MacLeod and Kay MacLeod, 'The Social Relations of Science and Technology, 1914-1939,' in Carlo Cipolla (ed.), *The Fontana Economic History of Europe:* Vol. 5: *The Twentieth Century,* Part I (London: Collins/Fontana, 1976), 301-335.

11 Roy MacLeod, 'On Visiting the "Moving Metropolis": Reflections on the Architecture of Imperial Science,' *Historical Records of Australian Science,* 5 (1982), 1-16, reprinted in Nathan Reingold and Marc Rothenberg (eds.), *Scientific Colonialism: A Cross-Cultural Comparison* (Washington, D.C.: Smithsonian Institution Press, 1987). See also Roy MacLeod, 'Passages in Imperial Science: From Empire to Commonwealth,' *Journal of World History,* 4 (1), (1993), 2-29.

12 Michael Roe, *Nine Australian Progressives: Vitalism in Bourgeois Social Thought, 1890-1960* (St. Lucia: University of Queensland Press, 1984), 319.

13 Francis Adams, *The Australians: A Social Sketch* (London: T.Fisher Unwin, 1893).

Sydney, it is doubtful that one culture can be said to embrace all Australian intellecutal life, whether in the 19th century or since.[14] But Roe is certainly right in asking us to think about the affiliations and transmissions of ideas that historically linked Australians in all the colonies to their counterparts in Britain and the United States, especially in the years leading up to Federation, when Australians began to sail as a nation into uncharted constitutional seas.[15]

1. 'Efficient Imperialism' and Progressive Australia

For this purpose, I want to consider a particular formative phrase in the 'passages of imperial science' occurring between Federation and 1915—a period in which we find within science an important interplay between inter-colonial commitments to Federalism—as economic and political motive, linked symbolically and in fact with the interests of national defence—and continuing Empire loyalties, best expressed in terms of 'imperial efficiency.' In Australia, this period saw a new phase of 'federal' science, inspired by a similar concern for 'national efficiency' that emerged in Britain during the 1890—in response partly to the challenges of American, German and Japanese competition, and partly to the tragedy of the Anglo-Boer war, and its devastating indictments of national mishandling.[16] A conceptual strategy for 'Efficient Empire' developed as a natural counterpart of national efficiency, with portable doctrines criss-crossing frontiers of ideology and party. In Britain, R. B. Haldane, A. J. Balfour, Lord Rosebery and the Webbs found resonance with Lord Milner and Joseph Chamberlain in seeking to set Britain right through reforms in administrative, military, commercial and academic life. 'Wake up Britain!,' the Prince of Wales had declaimed. Now that Edward was King, the colonies were to help the Empire by helping themselves, so that the whole would be the sum of more than its parts.[17] In this imperial design, science and its instruments of method were essential scaffolding.

Historians from Bernard Semmel to Geoffrey Searle have written of the 'social imperialism' of the period in Britain, with its lateral endorsement of social Darwinism, eugenics, and the application of 'scientific method' to all walks of life.[18] Whilst absorbing these doctrines, Australians saw similar values emerg-

14 See the workshop entitled 'St Petersburg or Tinsel Town? Science and Melbourne: Their Different Styles and Changing Relations,' in Jim Davidson (ed.), *The Sydney-Melbourne Book* (Sydney: Allen and Unwin, 1986).

15 For the period, see Gavin Souter, *The Lion and the Kangaroo: The Initiation of Australia, 1901-1919* (Sydney: Collins, 1976).

16 Geoffrey Searle, *The Quest for National Efficiency: A Study in British Politics and Political Thought, 1899-1914* (Oxford: Basil Blackwell, 1971; rev.ed., Ashfield Press, 1990).

17 See H.C.G. Matthew, *The Liberal Imperialists: The Ideas and Politics of a Post-Gladstonian Elite (Oxford: Oxford University Press, 1973).*

18 Bernard Semmell, *Imperialism and Social Reform* (New York: Anchor Books, 1968); see

ing in the American 'Progressive' movement, employing the rhetoric of scientific method from the conservation of woodlands and the creation of national parks to the Taylorite perfection of manufacturing industry.[19] Aethestics, utility, and ecology formed the secular trinity of America's 'efficiency cult,' and Australia was not to be spared its missionary influences.

Although differences between the two countries were many, similarities reached deeply. Progressivism in America grew not from the circumstances of separate colonies but within what Robert Wiebe has called a 'distended society,' during three decades in which a quilt of regions emerged from the destruction of the Civil War and a postwar depression to confront a new continental destiny. From a country of small town values and regional dependencies grew a nation shaped by industrialisation, mechanisation and urbanisation, with vast consequences for international trade and political affairs. New institutions at local, State and Federal levels valorised middle-class expectations of 'continuity and regularity, functionality and rationality, administration and management.' At the heart of the progressive impulse lay an impatience with patchwork government, and a commitment to reform through bureaucracy. Whether in urban reform, public education, or the protection of the 'race,' government conducted along scientific principles would bring 'opportunity, progress, order and community' to the nation as a whole. 'Organic cities' of brotherhood and settlement would become functional, efficient places to live. American society, with its complex legacy of colonialism and immigration, would improve not by accident, but by design.[20]

To an extent guided less by philosophy than by comparison, Australia offered a complementary vision, translated into the language of home and empire. From the 'gas and water socialism' and public health services of Britain's leading municipal boroughs, to the Crown's Development Commission and its strategy for scientific agriculture, came an Australian response to the half-finished work of Victorian reform. Community, order, and progress could be the expectation of Britons, home and overseas, and by implication, that of 3.7 million Australians (few mentioned the 95,000 Aborigines) as well. The tempo of progress would be set by modern science and its methods.

also Michael Worboys, 'The British Association and Empire: Science and Social Imperialism, 1880-1940,' in Roy MacLeod and Peter Collins (eds.), *The Parliament of Science: Essays in Honour of the British Association for the Advancement of Science* (London: Science Reviews, 1981), 170-188.

19 See Samuel P. Hays, *Conservation and the Gospel of Efficiency: The Progressive Conservation Movement, 1890-1920* (New York: Athenaeum, 1972); S. Haber, *Efficiency and Uplift* (Chicago: University of Chicago Press, 1964).

20 Robert H. Wiebe, *The Search for Order, 1877-1920* (London: Macmillan, 1967), viii, 166-170.

Perhaps the most talismanic evidence of science in aid of Empire lies in the archives of the once widely-known but now almost forgotten British Science Guild. Established in 1905, under the chairmanship of Sir Norman Lockyer, editor of *Nature*, and long-standing propagandist for the 'scientific movement', the Guild became a rallying point for the efficiency movement, within Britain and overseas.[21] In his presidential address to the British Association Congress at Southport in 1903, Lockyer had seized upon the title of Captain Alfred Mahan's celebrated book, to awake Britain to the 'Influence of Brain Power on History.' Disappointed by the inertia of the BAAS, Lockyer diverted his energies into establishing a new 'League, a Guild, call it what you may,' a new organisation in any case, which soon became the darling of the progressive wing of British science. Indeed, judging by Lord Haldane's inaugural address at the Mansion House in the City of London, the Guild's polychromatic program of reforms shone with the brilliance of modernism.[22]

Emblematically, the British Science Guild took its message south, and established imperial branches in NSW in 1907 and in South Australia in 1911. In Sydney, Archibald Liversidge (a friend and confederate of Lockyer), Thomas Anderson Stuart, J.T.Wilson, and William Warren—all University of Sydney scientists and engineers—played leading roles in the Guild's work.[23] They were inspired in part by the imperial sentiments issuing from the Royal Society of London, whose Biological Secretary, the distinguished physiologist, Sir Michael Foster, encouraged steps to strengthen the unity of British science, home and overseas.[24] They worked mostly through private lectures, and sometimes through the Royal Society of New South Wales. If their organised numbers were small—the total membership of the Royal Society of NSW in

21 For a history of the Guild, see Roy MacLeod, ' Science for Imperial Efficiency and Social Change: Reflections on the British Science Guild, 1905-1936,' *Public Understanding of Science*, 3 (1994), 155-193 and W. H. G. Armitage, *Sir Richard Gregory, His Life and Work* (London: Macmillan, 1957). For the Guild's Australian branches, see the *Journal of the British Science Guild* (1907-1936),which includes annual reports from NSW and South Australia. Papers from the South Australian branch are held in the Library of the Academy of Science (Canberra), MS 61 (BSG: SA Branch).

22 Roy MacLeod, 'The Social Function of *Nature* in its First Fifty Years,' *Nature*, 224 (November 1969), 441-446; Peter Collins, 'The British Association as Public Apologist for Science, 1919-1946,' in MacLeod and Collins (eds.), *op.cit.* note 14, 211-237; A.J. Meadows, *Science and Controversy: A Biography of Sir Norman Lockyer* (London: Macmillan, 1976). Admiral Mahan's famous book is entitled *The Influence of Sea Power on History* (London edition: Sampson, Low, 1890).

23 For Liversidge and his circle, see Roy MacLeod, *Imperial Science under the Southern Cross: Archibald Liversidge, FRS and the Culture of Anglo-American Science* (forthcoming). The NSW branch of the BSG ended soon after Liversidge returned to England in 1908, but the South Australian Branch continued until at least 1934. The BSG was folded into the British Association in 1936.

24 See *ibid.*, chapter 8.

1905, of which they could command a small proportion, was only 344—their influence on the University community, at least, seems measurable.[25] Their local program was specifically Australian, and they spoke to a context receptive to their message. In America, the zealous pursuit of nature, and Frederick Jackson Turner's frontier interpretation of American history, complemented Australia's search for a manifest destiny of its own, which lay not only in the conquest of external nature, but also in the taming of human nature, and in the provision of social justice. W.G. Spence's *Australia's Awakening* of 1909 brought labour on side with science, a model for Lockyer's attempt to unite labour and capital in the mutual enjoyment of scientific method. Deakin embraced the British message, but he welcomed the American ethos even more, just as he welcomed the American fleet, without Colonial Office approval. Australia's destiny would be in the hands of its scientists. With ultimate confidence, Deakin even let his daughter marry one.[26]

With science would come progress, and with progress, profit. The lesson was a legacy of the Enlightenment and the Industrial Revolution. But the familiar messages of rationality hid deep contradictions. Progressivism shared their moral ambiguity, overtly equivocal in matters of distribution and reward. But progressivism as a mentality suited the empirical temper, and translated to Australia, its assumptions and ambiguities gained a hold at once more compelling and less well defined than in either Britain or the United States.The 'search for order' in Wiebe's America led equally in Australia to the application of 'method' to all departments of state and every discipline of knowledge. The rise of a federal bureaucracy, where there had been none coincided with a new interest in guiding the applications of science to agriculture, public health, weather forecasting, railway transportation, electrification and radio communication. That Australia's future was problematic, was preached by reports of falling fertility rates, and widespread fears of the country's becoming 'unfit' to continue in the race among nations.[27] By common reasoning, notionally unfettered university science, whether in physics or psychology, Arts or anthropology, must be turned to public service; and scientific research must be assessed at least in part by practical outcomes. Such pragmatic progressivism gave a particular connotation to educational reform in the early years of the

25 In the same year, the membership of the Royal Society of Victoria was 163, South Australia 85. To these should be added the (approximate) 100 members of the Royal Society of Queensland, 140 of the Royal Society of Tasmania, and perhaps 100 of the Royal Society of Western Australia. See F. Yuan, 'Education and Science' in Wray Vanplew (ed), *Australians: Historical Statistics* (Sydney: Fairfax, Syme and Weldon, 1988), 345.

26 That is, David Rivett, Melbourne chemist, Rhodes Scholar, FRS, and later Director of the CSIR. See Rohan Rivett, *David Rivett: Fighter for Australian Science* (Melbourne: privately printed, 1972).

27 Neville Hicks, *'This Sin and Scandal': Australia's Population Debate, 1891-1911* (Canberra: Australian National University Press, 1978).

Commonwealth, notably among the four universities in Melbourne, Sydney, Adelaide, and Queensland, which prided themselves on their effusive 'practicality,' but which sometimes failed to convince a sceptical public of their utilitarian value.

2. Federation and the Cult of Science

The period between Federation and the Great War is remembered for many important developments in the relations between science and society in Australia. Between 1901 and 1915, as 'federated' science became Federal, senior public servants and academics added new glosses to the gospel of efficiency. Under the Australian Constitution, the jurisdictions of agriculture and mineral resources, education (including universities) remained with the States. The States ceded power over customs at once, and over other domains—including 'postal, telegraphic, telephonic and other like services'—by proclamation.[28] Over 90% (16,000) of new federal public servants were employed by the Postmaster General's Department, which took on responsibilties for the science of communications. Federation also highlighted the importance of securing national uniformity in statistical measures. Each of the six colonies previously had separate patent laws, but the Patents Act of 1903 established a uniform standard. In 1906, the Commonwealth Bureau of Census and Statistics was formed, and became responsible for the first national census (1911), the first household-based expenditure survey, and the recording of data on wealth, prices, and wages. Within the states, reviews of technical education, water management systems, land tenure and land reservation became hallmarks of the era. Government agriculturists, chemists, and botanists took up where colonial surveyors and explorers—men of 'straight lines,' as David Denholm once put it—had left off.[29]

In some cases, there was a simple change in form: colonial botanists gave way to State botanists; and one must not exaggerate either the extent, or the consequences, of these constitutional changes for funding activities which the States retained. Nor did Federation mean the end of British connections in many scientific agencies. Sydney's Royal Mint, for example, continued until 1927 in the pay of the British Treasury. But with the passage of time, came shifts in orientation. In agriculture, mining and education, eyes had already turned to America, where Australians looked for instruction in domains which would earlier have been defined as British.[30]

28 See Wray Vanplew (ed), *op.cit.*, xv.

29 David Denholm, *The Colonial Australians* (Harmondsworth: Penguin, 1980).

30 Roy MacLeod, 'Of Men and Mining Education: The Establishment and Early History of Sydney's School of Mines, 1894-1914,' presented to the Third International Mining History Conference, Golden, Colorado, June, 1994.

Looking at this conjuncture from the distance of nearly a century, and quickened by the coming centenary of Federation, historians are only now beginning to ask how these changes were associated with an adaptive, pragmatic Progressivism, which both gave shape to Federation Australia, and tailored policies in which science had a special role to play. We may begin, perhaps, with a few observations, by way of suggesting why this association of ideas is both plausible and important.

First, whether in America, Britain or Australia, ideas associated with progressivism, like those associated with social imperialism, or the idealism of T. H.Green, gave an unquestioned role to the state. That role, however, was not arbitrary but accountable. Progressive advocates, including members of the British Science Guild never tired of arguing that parliamentary democracy was necessary, but that it could only be made useful through the exercise of a strong bureaucracy. In Australia, reforms affecting housing, health and the environment could not wait upon the hidden hand of *laissez-faire*, much less upon the undependable factionalism of party politics. Instead, science itself waited upon bureaucracy, which, with expanding State departments of agriculture, public health and education, gradually took form in the first years of Federation.[31]

Second, for progressives everywhere, the key-word was 'efficiency,' a concept suitably class-less and egalitarian, rooted in equality of access and opportunity, yet a concept that was intrinsically opposed to no interest. In Britain, as Lord Rosebery put it, there were Progressives who were not Liberals, but there were no Liberals who were not Progressives.[32] The same might be said of 'One-Nation' Tories. The argument had a pleasing democratic ring. Its application, to be sure, could harbour other messages. Manifestly, the efficient behaviour of one class could be easily translated into the profit of another; the technical preferment of the workman, into the pockets of the manager. In Australia, similar contradictions emerged. Efficiency appealed to the apostles of applied learning and technical training, and to those in the workforce who by the early years of the century far outnumbered those in university education. Efficiency became an agreeable platform for coalition conservatives, and a 'keyword' in parliamentary debate.

Less desirably, perhaps, the rhetoric of 'efficiency' may also have appealed to the deep, persisting current of anti-scholasticism in Australian life—not quite the same as the 'anti-intellectualism' of Clive James' unreliable memoirs, but a current with similar consequences, just the same. Australian universities, as Eric Ashby later recalled, could no longer justify themselves as oases in a cultural desert, bastions of civilisation, whose purpose was to enlighten the heathen sons of merchants and squatters. Above all, they were public institu-

31 See MacLeod, *op.cit.* chapter 8.

32 Quoted (1898) in Raymond Williams, *Keywords: A Vocabulary of Culture and Society* (London: Fontana, 1976), 244.

tions; they gained their credibility from the 'practical' services they performed, in return for the public money they were given.[33] For those who approved of this, progressivism proved to be pragmaticism in a positive light. For a generation taught under Francis Anderson at the University of Sydney, practicality became as conventional a test of philosophy, as efficiency was of a mechanical engine.[34]

Third, progressivism appealed to the particular ethos of Australian science, reflected historically in its community of learned amateurs; men who, like John Smith and W.B.Clarke, Archibald Liversidge and Robert Etheridge, prided themselves on being 'objective' collectors of natural and human artefacts, and who valued their contributions most highly, when they were assimilated within the knowledge structures of Europe and North America. For them, as well as for the practical men, for the inventors on the land as in the cities, as well as for overseas interests which doubled the number of patents taken out in Australia during this period—celebrants of what Ann Moyal has called 'colonial technology'— there was no more useful social philosophy than progressivism.[35] For scientific agriculturists, the extensive grazing and farming regions of the country became, as J.M. Powell has shown, gigantic practical laboratories for *in situ* innovations, many using methods of scientific control, if not new scientific knowledge itself.[36] Not all impulses traced their origins to the applications of science, still less to any systematic philosophy, but many did, and those that did, were advertised. The diffusion of refrigeration into dairy farming proceeded alongside the introduction of superphosphates and improved grasses; with relatively little licence, both could be heralded as scientific and methodological achievements.

In the first decade after Federation, the tradition of Australia's neutral, objective observers, who had made themselves a necessary virtue in colonial times, now gained credibility from the establishment of new federal agencies, notably in telecommunications, meteorology (in 1907), and tropical medicine (1909).[37]

33 Eric Ashby, 'Universities in Australia,' *The Future of Education*, No. 5 (Sydney: Australian Council for Educational Research, 1944).

34 See G.V.Portus, *Happy Highways* (Melbourne: Melbourne University Press, 1953); W.M.O'Neil, 'Sir Francis Anderson (1858-1941),' *Australian Dictionary of Biography, 7* (1979), 53-54.

35 Ann Moyal, 'Invention and Innovation in Australia: The Historian's Lens,' *Prometheus*, 5 (1), (1987), 92-110.

36 J.M. Powell, 'Protracted Reconciliation: Society and the Environment,' in Roy MacLeod (ed.), *The Commonwealth of Science: ANZAAS and the Scientific Enterprise in Australasia, 1888-1988* (Melbourne: Oxford University Press, 1988), 250.

37 See K.T. Livingston, 'Anticipating Federation: The Federalising of Telecommunications in Australia,' *Australian Historical Studies*, No. 102 (April 1994), 97-117; R.W. Home and K.T. Livingston, 'Science and Technology in the Story of Australian Federation: The Case of Meteorology, 1876-1908,' (in press); Roy MacLeod and Milton Lewis (eds),

Guild progressives gained much from their example, and their achievements appealed to politicians of all hues. The weather favoured no class or state; while disease showed no ideology—or rather, spoke with an ideology of its own—in the typhoid-laden streets of Melbourne and Sydney, and in rural areas made uninhabitable by dengue fever. State activity surfaced—NSW to set up a Bureau of Microbiology in 1908, prompting Queensland to do likewise—where federal writ failed to run. But as between states, as in the federal agencies, Australian science crafted 'tools of federalism,' no less impressive and as far reaching as Britain's imperial 'tools of empire.'[38]

Progressivism in Australia appealed to a quiescent Americanism among some Australians, including some of the most assertively 'transplanted Britons.' George (later Sir George) Knibbs, a protégé of Liversidge, was a case in point. Self-educated, then apprenticed to the public service, Knibbs briefly taught at Sydney University in mathematics and surveying before moving, under Liversidge's watchful eye, into the public service. In 1902, he help set up regulations for administering Rhodes Scholarships; later, following progressive criticisms of the New South Wales' educational system, he undertook a roving commission to 'enquire and report' on developments in secondary education in Europe and North America. His review, drawing particularly on American experience, laid a framework for the restructuring of public education that took place in New South Wales after 1912. For Knibbs, that event marked the beginning of a long career in public service. In 1905, he became superintendent of technical education, and in 1906, first Commonwealth Statistician and Director of the Commonwealth Bureau of Census and Statistics. His progressive, 'federalist' impulse inspired demands for uniformity from the States in statistical returns, and helped bring about the first *Commonwealth Yearbook*, which set benchmarks for State and Federal policy-making. Almost self-designed for the role, Knibbs later became the first director of the Commonwealth Institute of Science and Industry in 1921.[39]

While it would be incorrect to speak of Knibbs as 'American' in either manner or taste, his strategies for science, measurement and social improvement were drawn straight from the preoccupations of Washington and New York. His vision of a progressive Australia appealed equally to Americans—from Theodore Roosevelt, who in 1905, proclaimed, 'Next to my own country, I am

Disease, Medicine and Empire: Perspectives on Western Medicine and the Experience of European Expansion (London: Routledge, 1988); and Roy MacLeod and Donald Denoon (eds), *Health and Healing in Tropical Australia and Papua New Guinea* (Townsville: James Cook University Press, 1991).

38 Daniel Headrick, *The Tools of Empire: Technology and European Imperialism in the Nineteenth Century* (New York: Oxford University Press, 1981).

39 Susan Bambrick, 'Sir George Knibbs (1858-1929),' *Australian Dictionary of Biography*, 9 (1983), 620-621.

interested in the progress, success and safety of Australia, that great democratic island-continent,'[40] and sent a Great White Fleet to prove it; to Herbert Hoover, sometime mining engineer in Kalgoorlie, whose conservative sympathies proved ill-suited to the social policies needed by Depression America. Ironically, it was an inability to see the inherent weaknesses in social engineering that led to progressivism's mixed press. Even as W.H. Warren, professor of engineering at Sydney University, pressed his fellow Australian engineers to work for the public benefit, university anthropologists relied upon scientifically-based arguments to forecast the inevitable extinction of the Aborigines—unless they were 'protected' by the government.[41] Indeed, factored out of the Federal census, Aborigines became non-persons for the next sixty years, until a reforming Federal administration began the process of restoring them their full civil rights.

Even at the time, progressivism as a doctrine appealed clearly to the interests of Australian nationalism, even in its less progressive forms. Australian members of the British Empire League and British Science Guild were frequently united in their approval of the methods and rationale of colonial anthropology, of eugenic policies, and of policies of ethnic immigration designed to ensure a continuing White Australia.[42] In this, they were not necessarily in harmony with their British counterparts. But in speaking to certain wider imperial interests, notably imperial defence, they could speak with one voice. Thomas Laby, Liversidge's student at Sydney, and later a distinguished professor of natural philosophy at Melbourne, was archetypical. Keen advocate of the Australian branch of the Round Table, friend and correspondent of J.J. Thomson and Ernest Rutherford, who sent no fewer than thirteen of his students as '1851 Exhibitioners' to England, most of them to the Cavendish, Laby reflected what Barry Butcher has called an 'imperial vision,' which parlayed a progressive Australian patriotism into a higher imperial loyalty.[43]

40 Quoted by Roe, *op.cit.* 1.

41 See Tigger Wise, *The Self-Made Anthropologist: A Life of A.P.Elkin* (Sydney: George Allen and Unwin, 1985).

42 Here, the public positions taken by Dr Richard Arthur, MP for NSW, John Chalmers Eldridge, a member of the Federal Labour Government, and Robert Francis Irvine, professor of economics at the University of Sydney—key figures in the eugenics movement in Australia—would appear to be highly relevant. For these interconnections, see the forthcoming doctoral study 'Striving for National Fitness: Eugenics in Australia, 1880-1950,' by Diana Wyndham, Department of History, University of Sydney.

43 Barry Butcher, 'Science and the Imperial Vision: The Imperial Geophysical Experimental Survey, 1928-1930,' *Historical Records of Australian Science*, 6 (1), (1984), 31-44. For Laby, see Cecily Close, 'Thomas Howell Laby (1880-1846),' *Australian Dictionary of Biography*, 9 (1983), 640-641; H.. S.W. Massey, 'T. H. Laby, FRS - The Laby Memorial Lecture,' *Australian Physicist* (December 1980), 181-187.

Finally, progressivism was successful within a wide intellectual circle in Commonwealth politics, governed for much of its first decade by a succession of coalitions, both radical and conservative, without being demonstrably biased. Federal parliament, operating from Melbourne, conveyed an image both of liberalism and restraint. The admission of women to the vote was a case in point. Federation also suited educated men of business and commerce who had little confidence in politicians, and even less in an under-educated public; but who believed in the power of knowledge to shape a 'conservative liberalism' for Australian society. Their 'conservative liberalism' neatly mirrored the continuing tradition of 'liberal conservatism' which the late John Manning Ward finds deeply structured in the history of Australian society, and of which he was himself a formidable exponent.[44] As such, it was a natural progressivism, requiring no revolutionary change. Social justice could be compatible with 'bourgeois hegemony.' And with this progressivism *sans doctrine*, science formed a willing partner, in the elaboration of what Powell has called the 'complex texture of legislation, refinements of bureaucratic management procedures, and a battery of improvements in transport and communications, tenure arrangements, credit provision and bank facilities' that typified the progressive impulse.[45]

If I am correct, the net effect of these affinities was to foster in Australian science a vision of what I have elsewhere called 'practical idealism,' a vision of progressivism adapted to Australian traditions and circumstances. For many Australians, the biennial Congresses of the AAAS provided the easiest forum for its advocates, including Liversidge, the Association's 'founding father.' In his inaugural address in 1888, Henry Russell, the Government Astronomer of NSW, the first Australian-born FRS, and Fellow of the University's Senate, foreshadowed the necessity to conserve the resource endowments of his 'new country.'[46] In 1890, Baron von Mueller of Melbourne delivered what some historians consider Australia's first public appeal for the reservation of selected land for the benefit of future generations.[47] The AAAS made room for debate on such issues, complementing the progressive position, while it highlighted the findings of social science, the new biology, and the applications of forestry, agronomy, public health, and chemistry to Australia's economic future.

44 John M. Ward, *James Macarthur, Colonial Conservative, 1798-1867* (Sydney: Sydney University Press, 1981).

45 Powell, *op.cit.* 252.

46 H.C. Russell, President's Address, *Report of the Australasian Association for the Advancement of Science,* I, (Sydney, 1888), 12-13.

47 Powell, *op.cit.* note 25, 251; also J. M. Powell, *Environmental Management in Australia, 1788-1914: Guardians, Improvers and Profit: An Introductory Survey* (Melbourne: Oxford University Press, 1976).

Indeed, the AAAS proved at least as progressive as its British counterpart. It was by the Medical Section of the AAAS, for example, that Australians were taught to prevent tuberculosis, to consider the sources of mental deficiency, and to improve provision for child health. It was, perhaps, an elitist philosophy—yet, given a fair press, these messages touched many whom the colonial learned societies had failed to reach. Guided first by Liversidge, then by J.H. Maiden of Sydney and David Orme Masson of Melbourne, the AAAS successfully transformed itself from being the principal agent of 'federated', intercolonial science,' into becoming the principal publicist for 'federal' science. Years later, it also became the nursery for the nation's first Academy of Science. Its practical idealism *sans doctrine* contrived to bring progressive reforms onto the platform of all political parties—at least, before the apocalypse of Gallipoli, Flanders and the Somme, and the depression of the interwar years, put paid to so many of Australia's pre-war visions of progress.

3. The Contradictions of Progress

It would be wrong to suggest that this half-movement to America, let alone the acceptance of any broad, progressive mandate, was the product of any consistent or systematic reasoning on the part of Australian government, industry, or academia. Progressivism in its Australian form was a blank cheque of limitless possibilities, on which statesmen and scientists could draw airily upon ideals, without worrying too greatly about realities; it was a platform of convenience, on which scientists, social scientists and politicians could for certain purposes join forces, while on others, go their separate ways. Nor can it be said that progressive policies, even when enacted by consensus, always had the effects their advocates anticipated. The political economy of Australia did not fundamentally change. Farming areas that were marginal in colonial times, remained so under Federation. Official advice on cropping and grazing was not always taken, or well received. Mining interests, in times of commodity crisis, failed to keep pace with the lessons of scientific management. Bubonic plague may have been banished from Sydney's Rocks in 1901, but the health administrators of NSW retained a legacy of problems in sanitation, water supply and sewerage.

Indeed, progressivism had yet to witness its greatest victories when, in 1914, Australia played host to its first (and only) visit by the British Association for the Advancement of Science. Nothing was more indicative of the country's embrace of Empire and nationalism, than the reception accorded the Association. The visit, in planning since the BA's first successful overseas Congress, at Montreal in 1884, was taken as an imperial gesture, Australia's scientific 'coming of age.'[48] (It may be asked whether it signalled a similar meaning for

48 Peter Robertson, 'Coming of Age: The British Association in Australia, 1914,' *Australian Physicist,* 17 (2), (1980), 24.

Canadian science, a generation earlier).[49] Arriving on the eve of war, with some of its European guests destined for Australian internment, the BA travelled from one capital city to another, much as it has done in South Africa, when, following the Anglo-Boer War, it had consolidated the community of scientists in a symbolic act of Union.[50] In Australia, its presence prompted a review of science as an function of imperial obligation and national sovereignty.

Historians have yet to assess the impact of the BA's visit on the discussions of 1915, which led, past Gallipoli, to the creation of the Institute for Science and Industry. But the coverage given its meetings, coupled with the revelations of the war itself, conveyed a sense of national urgency to the business of science, and projected its scientists, now made known to the public, into the political arena. The war, which threw greater entitlements upon the Federal Government, also required the Federal Government to assume responsibility for meeting imperial mandates, issued by Britain, which only a coherent policy for science and industry could achieve. The prospect was one of opportunity and uncertainty, and the practice, one of experiments, that became the substance of postwar debate. But the events of 1915-1916, while uniting the nation behind its scientists, also revealed tensions with important ramifications for 'Commonwealth science'. Both then and afterwards, these were to undermine and frustrate the political agenda of progressivism. Among these frustrations, I will mention four.

The first—and in a contemporary Canadian context, most compelling—tension that threatened progressivism derived from the relatively weak nature of Australian Federalism. Scarcely debated before they arose, Federal-State jurisdictions in science divided national efforts and, when complicated by private enterprise, produced strange and frequently 'inefficient' alignments. For example, the Federal government assumed control of postal and telegraph services, but interstate telephone services (the first, between South Australia in 1902, and between Sydney and Melbourne in 1907) remained in private hands, under State regulation. In 1905, the Commonwealth took responsibility for regulating experiments in radio communication; but food and drug regulation remained the province of the States.

Agriculture, similarly, remained the province of the States, but rabbit plagues, which devastated South Australia in 1904, and Paterson's Curse, in 1906, were not confined by nature to that unhappy jurisdiction. Prickly Pear demanded a national, coordinated response. In 1916, when Orme Masson and his newly-

49 See Vittorio de Vecchi, 'Science and Government in Nineteenth Century Canada' (Unpublished Ph.D. dissertation, University of Toronto, 1978); 'The Dawning of a National Scientific Community in Canada, 1878-1896', *Scientia Canadensis*, VIII (1), (1984), 32-58, and 'Scientists and Scientists in Government, 1878-1896 - Part I,' *Scientia Canadensis*, VIII (2), (1984), 112-142; Part II, *idem*, IX (2), (1985), 97-113.

50 MacLeod and Collins (eds.), *op.cit.* Introduction.

established Advisory Council for Science and Industry visited Brisbane and Sydney to coordinate the war against pests, they faced an uphill struggle.[51] On the claws of the miserable tick, hung a vital issue of Commonwealth jurisdiction, with tangled issues of divided responsibility for quarantine and laboratories confronting State and Federal Governments. Mineral exploration presented a similar problem: mining regulation was a State jurisdiction, and continues to be so. Not until 1946, when a Commonwealth Bureau of Mineral Resources was established, did Australia have a central agency to coordinate scientific resources for exploration and mapping for the good of the country as a whole.

There were other important problems bearing upon Commonwealth policy , on which scientific advice might have had a beneficial influence. As Bruce Davidson points out, at none of the thirteen AAAS Congresses before Federation was there any discussion of the division of powers affecting agriculture, although the States' retention of commodity price-fixing powers, the control of Crown land, and the transport system on which agriculture depended, were of obvious economic and scientific importance. Indeed, the AAAS had other failures on its account books; its Agricultural Section failed to confront the devastation of Prickly Pear until 1913, by which time the weed covered 8 million hectares in Queensland and NSW.[52] Perhaps its greatest failure, although the one for which it was least responsible, was its act of self-suspension during the war, when decisions were taken that put thousands of inexperienced ex-servicemen on the land, on small farms in marginal areas. That romantic vision was destined to run its course, and thoroughly disillusion the prophets of progress, well before more rational counsels prevailed.

Questions of federalism affected even scientific organisations. Pressure to make the AAAS (later ANZAAS) and the Australian Association of Chemists (later the RACI) fully representative of scientists from the different states at times threatened efficient self-government. Before the Federal government's translation to Canberra, 'national' organisations of scientists (as of other groups) had to choose their capital allegiances, and by their choice, much was decided. Locating the headquarters of the AAAS in Sydney was initially convenient in 1888, but it was not necessarily the best permanent home for Australia's 'federated scientists'. The city-state identification of Australian scientists remained powerful, long after Federation. The residues are with us today. There remains something faintly anachronistic about a 'National' Museum being in Melbourne, but there is similarly no logic, other than that of history, in an 'Australian' Museum being in Sydney.

51 See Len Weickhardt, *Masson of Melbourne: The Life and Times of David Orme Masson* (Melbourne: RACI, 1989), 87.

52 Bruce Davidson, 'Developing Nature's Treasures: Agriculture and Mining in Australasia,' in MacLeod (ed.), *The Commonwealth of Science, op.cit.* 276-277.

A second frustration grew from the unresolved position of the universities. The years between 1900 and 1914 were ones of dramatic expansion in student numbers, and in the prospects for generating a Huxleyan 'army of science.' The six universities, including the two established in this decade, were left to maintain themselves, and their increasingly expensive science departments, by a mixture of fees and block grants from the State governments. At first, the universities were slightly better off, as certain State charges were taken up by Federal revenues, and the benefits were returned in the form of larger university endowments. But this soon wore off, and the increased pressure on buildings, arising from increasing student numbers in all faculties, taxed the unit of resource to the limit. Neither the States nor the Federal Government had a solution to this; and a weary repetition of reformist failures was left to haunt the country for nearly two decades after the war.

A similarly unsatisfactory prospect greeted progressive advocates of large scientific projects, including expeditions to the Antarctic. Scientific societies, languishing in membership and in appeal, had to raise funds for such enterprises from State governments in much the same way as their predecessors had done from colonial governments, and with the same limited, *ad hoc* results. The AAAS sought remedies; as did the British Science Guild, but without success. Hopes would brighten in the 1920s; but as late as 1914, solutions eluded Guild members, and their worthy research committees.

It can also be argued that the progressive impulse, which drew much from Australia's obligation to an 'efficient' Empire, left unresolved the character of Australia's obligation to Britain. The tradition of sending the country's best and brightest students to England, accelerated by the Rhodes Scholarships and the 1851 Exhibition awards, remained a feature of the landscape for a generation to come. Rhetorically, such links strengthened the crimson thread of kinship. More realistically, as Liversidge recognised, they tended to place Australians in permanent jobs overseas. This was perhaps an inevitable function of size and distance. And it would be wrong to see the ' brain drain' gradient towards Britain in terms of an inevitable and continuing intellectual deference. As Allan Maccoll has shown, a powerful Melbourne-Bloomsbury axis in inorganic chemistry worked to the extreme advantage of Britain, and more than repaid British investment in the education of the young Australians concerned.[53] Similar accounts could be presented at the tally of research in agriculture and anthropology. But whatever the Guild progressives might have wished, Britain retained its monopsonistic hold on Australian science. British government advice was sought and followed; British standards were studied and applied; and Britain remained Australia's official source of recognition, and font of reward. British models

53 Allan Maccoll, 'Australian Chemists at University College London, 1899-1988,' *Ambix*, 36, Part 2 (1989), 82-90.

continued to have an overwhelming influence on the culture of Australian government, science, and industry.

Finally, the rational program of progressivism could not completely ovetake the inertia of public sentiment. Romantic myths of heroic, pioneering individuals exploring the outback and the 'dead heart,' retained their hold on the Australian imagination and in some ways inhibited the acceptance of scientific research as a public responsibility. A belief in boundless riches around the corner, awaiting discovery—an endless frontier of opportunity—proved difficult to displace, as the experience of T. Griffith Taylor, Sydney's professor of geography, bitterly revealed. In his hands, 'environmental determinism' forced attention to the real limitations of white settlement in Australia. It was, ironically, the famous Canadian 'possibilist,' Vilhjamur Stefansson, who became the darling of the environmental imperialists, while Griffith Taylor, true to his progressive views, was forced to move to the less provincial environment of the University of Chicago.[54] The 'lucky country' remains a powerful myth, one with which advocates of science have effected an uneasy alliance.

Conclusion

These observations suggest ways of looking afresh at the years 1895 to 1914 as a critical period in the history of Australian science. Throughout the industrial world, this was a period of experimentation in the organisation of scientific services, as in the application of physics, chemistry, and the biological and earth sciences. In Australia, between the 'march to nationhood' of the 1890s and the massive changes prompted, intensified, and accelerated by the Great War, emerged a set of ideas and practices—some imported, others promoted from within—that set Australia on a course that would ultimately absorb 'efficient imperialism' into a perspective distinctly Australian. Following the war, Australia's science, defence, and political economy entered a period dominated by British policies aimed at encouraging imperial self-sufficiency. In these arrangements, what may be called a new phase of 'Australian Commonwealth science' emerged, in which Australian scientists found a continuing role within the Empire self-serving in several respects.[55] An apparent willingness to remain a sub-set of British science, identified with particular forms of British progressivism, would remain a characteristic and debated feature of Australian science for the next fifty years. Only with the 1960s would Australian science take on an increasingly international frame of reference, with implications we are only now beginning to understand.

54 For this account, see Powell, *op.cit.* 254.

55 Boris Schedvin, *Shaping Science and Industry: A History of Australia's Council for Scientific and Industrial Research, 1926-49* (Sydney: Allen and Unwin, 1987), 18.

Here, however, the history of science meets science policy, and social history meets the predicament of Australia in the world of 'big science' and multinational competition. The progressive impulse of the early Commonwealth years raised expectations that two world wars, a Depression, and many years of low investment in science have failed to dispel. As we begin to recover the origins and bearing of 'Commonwealth science,' especially between now and the celebration of Federation in 2001, it will be useful to reconsider the contributions of such concepts as practical idealism, progressivism and imperial efficiency in creating a 'state of mind' within which an independent—and interdependent—national science came into being.[56] Arguably, such an intellectual framework remains relevant, and its understanding awaits a generation of historians who are ready to turn the axis of received wisdom, until it catches the light.

56 R.W. Home and Sally Gregory Kohlstedt (eds), *International Science and National Scientific Identity: Australia between Britain and America* (Dordrecht: Kluwer Academic Publishers, 1991), reviewed in *Historical Records of Australian Science,* 9 (1), (1992), 67-70.