RHETORIC AND REPRESENTATION IN AUSTRALIAN SCIENCE IN THE 1940s AND 1980s*

Jean Moran

The title of this paper is not meant to imply comprehensive treatment of developments in Australian science from the 1940s to the 1980s. Its more modest objective is to isolate particular parallels in the debates and rhetoric about science in these two decades. It argues that shifting political and economic contexts condition scientists' preferred strategies of self-legitimation. These shifts may cause major realignments within the scientific power structure. Two such shifts occurred during the 1940s. Coinciding with the outbreak of World War II, the catchery of 'science for society' catalysed unprecedented moves to register science as a key national resource. But the projection of the scientist as social engineer/mediator was not to be realised. With the onset of the Cold War, the scientific community reverted to the defence of autonomy and non-interventionism in scientific organisation. Scientific 'excellence' rapidly replaced 'relevance' as a justification for government support of science. The appeal to freedom from political interference remains a powerful article of faith within the stratified research hierarchy. Increasingly, however, the rationale of autonomy is out of step with the economic and political climate of the 1980s. Some exploratory observations are made about the legacy of the 1940s in the emerging current political debate about Australia's so-called 'technological dependence' and a renewed concern about strategic relationships among science, technology, productivity and national wealth.

Keywords: science history, Australian science, science and society, scientific values.

INTRODUCTION

In the early 1940s, 'science for society' became a touchstone in scientific discourse. The so-called 'social relations of science'

* I am indebted to Brian Martin's conceptualisation of the term 'scientific power structure', and to the persistently helpful encouragement of Ann Moyal.

movement heralded one of the earliest social responsibility moves among scientists in Australia, and announced an all-embracing notion of scientism as universal panacea for a brave new (post-war) world. With the mobilisation of science for the war effort, scientists took a quantum leap into the realm of socio-politics, and projected an image of the scientist as social mediator/engineer. Like some of their British counterparts, Australian scientists began to agitate for greater penetration of science into society at large — and a transformation in the status of science and scientists from 'outsiders' to political 'insiders'.¹ Science was announced as a critical national resource — vital for ''winning the war as well as winning the peace''. The underlying rhetoric promoted unprecedented reificiation of science.

A key vehicle for propagating these platforms was the Australian Association of Scientific Workers (AASW). Its history encapsulates the dilemmas faced by a growing new breed of young scientists concerned to take Australian science out of the narrow, isolationist mould in which it had grown.

ORIGINS OF THE AUSTRALIAN ASSOCIATION OF SCIENTIFIC WORKERS

Formed in July 1939, the immediate impulse to set up such an organisation came from several sources. Firstly, there were the compelling arguments of the 'social relations of science' movement in Britain, announced in a series of publications by Hyman Levy, Lancelot Hogben, J.B.S. Haldane and, not least, in J.D. Bernal's blueprint, The Social Function of Science. Second, because Australia did not at the time have postgraduate facilities, a nucleus of young Australian scientists studying at Cambridge and Bristol were exposed to the activities of the British Association of Scientific Workers (AScW) and the Cambridge Scientists' Anti-War Group (CSAWG). Among these activities was the highly publicised and hostile reaction of the British Parliament to CSAWG's experimental testing and cogent repudiation of the government's Air Raid Precautions provisions. This repudiation highlighted two crucial issues for British scientists: (a) the need for independent criticism of government policy in scientific matters; and (b) that science did have social relations which scientists could ignore only at the peril of themselves and society.²

Back in Australia, these initiatives were strongly supported by younger scientists, who claimed that the only other informal body representing the collective interests of scientists was the Australian National Research Council (ANRC). Its alleged elitist composition and close identification with government offered no organised outlet for them or for scientists in industry. AASW, it was hoped, could act as an umbrella organisation for all scientists interested in "securing the wider application of science for the welfare of society".³

Although it adopted many of the platforms of its parent body and tried very hard to replicate its charismatic influence, there were a number of reasons why the AASW could not embrace the same political and ideological critique of its British counterpart. In the first place, the British AScW had begun as the National Union of Scientific Workers in 1918, at a time when scientists had become recognised as powerful assets to the nation.4 The very term 'scientific worker' therefore represented a new classlessness among scientists and a view that emphasised the labour aspect of intellectual endeavour long before the advent of the atomic bomb made that position explicit. By the late 1930s, 'the social function of science' debate had become "part of the grammar of politics" in Britain.⁵ By contrast, AASW was formed on the eve of World War II and at a time when the position of scientists was essentially marginalised. Substantial ties had yet to be forged between science and industry, and science and government.

Secondly, the British Association's most prominent and visible spokesmen had already achieved outstanding reputations in their own areas of scientific specialisation, whereas AASW's most ardent advocates had yet to make their mark professionally. Moreover, Australia's total scientific population was extremely small — an estimated 3000-4000 scientists in all, or roughly 10 per cent of Britain's total scientific population.⁶

AASW's early charter was apolitical. The Association's activities, it suggested, should transcend party politics and vested interests. In this way it hoped to attract the broadest possible membership and to establish its *bona fides* with government. The national emergency declared within months of AASW's inception meant that before it had a chance to promote science 'for the benefit of society', a more immediate imperative became 'science in the service of the nation'.

The outbreak of World War II launched AASW on an energetic and pragmatic program to resist and reverse what was seen as the 'frustration of science'. The government's resounding indifference to these scientists' early overtures came to be seen by some scientists as a threat to the nation's security. This official indifference also placed scientists under greater pressure to legitimate their usefulness on a much wider scale. Although the axis of the war made AASW's early agenda less tentative and later

gave an enormous boost to the overall visibility of science, it diminished the social relations dimension. In a situation where the 'benefits of science' did not so much have to be promoted as tangibly produced, there was little scope for ideological engagement or questioning of the assumptions on which its original platform for social reform was based.

MOBILISING SCIENCE FOR THE WAR EFFORT

The bombing of Darwin in February 1942 marked a turning point in the mobilisation of science for the war effort. The stunning failure of hastily-installed radar equipment to raise the alarm of imminent attack by the Japanese impressed the authorities and civilian population alike.⁷ The deficiencies of Australia's technological capacity had been exposed with disarming transparency. The government and the armed services subsequently became more responsive to the scientists' lobbying for concerted mobilisation of the country's scientific resources.

For a time, the gruelling intensification of war nurtured a striking coherence and unity among scientists of very different political persuasions. It was also to inhibit critical and tactical probing of the extent to which government might be prepared to negotiate on the scientists' terms in the long run. Early in 1942 these terms were expressed in the empassioned rhetoric that "nothing short of the complete application of scientific knowledge and manpower will suffice in the winning of this war".⁸

In a country with an embryonic secondary industry sector, and where scientific expertise had barely begun to be incorporated in essential supply and service industries (CSIR's brief was officially extended to secondary industry only in 1936), the task AASW had set itself was indeed formidable. The scientists' commitment to the 'national interest' made their efforts ripe for co-option by government. Thus, by early 1943, AASW had gained a good deal of credibility in government circles, its membership had quadrupled, and it had chalked up an impressive track record.

Together with the ANRC, AASW had been instrumental in having Australia's first systematic scientific manpower registers compiled, and in establishing a Scientific Liaison Bureau (SLB). The brief of the SLB was three-fold. First, it was to locate 'technical' bottlenecks in industry. It was also charged with referring manufacturers to the appropriate research organisations to assist in meeting new wartime demands. Finally, it was to help avoid duplication of research between Council for Scientific and Industrial Research (CSIR) laboratories, university and industry laboratories. AASW had also set up joint production committees in strategic industries to advise on new manufacturing processes, and was represented on numerous advisory wartime committees. The Association investigated ways of overcoming critical shortfalls of raw materials previously imported from Germany. It lobbied for the urgent injection of funds to develop indigenous manufacturing processes for essential supplies (such as acetone, butyl alcohol, aluminium sheet and potash salts). Outstanding was the work of AASW's Drugs Committee. This Committee consisted of a research team of chemists who worked on pilot-scale synthesis of some 18 'essential' drugs. It was a remarkable undertaking given that Australia had never before undertaken the commercial synthesis of drugs. In many cases, the Committee also took on the task of persuading individual firms to undertake commercial production of these drugs - sometimes working around the clock to produce large quantities until a suitable commercial drug-house could be persuaded to take over. This work was performed on a shoestring budget and with extremely restricted facilities. The Committee's pioneering work on developing anti-malarial drugs became "as important as ammunition" as the incidence of malarial dysentery threatened to reach epidemic proportions among Australian troops fighting in New Guinea.⁹

CONSOLIDATION AND LEGITIMATION TACTICS

By 1943 the scientists' quest for self-legitimation had become more extensively defined, as AASW consolidated its platform on three fronts. Firstly, it began to formulate post-war policies for science so that the relations between science and government cemented during the war would continue after the war. Secondly, by advocating the introjection of the scientific method into many areas formerly considered to be economic and social concerns alone, AASW hoped to forge a managerial-engineering role for scientists. This was expressed by a commonly held sentiment that, "there is no social problem which cannot be solved by the use of the scientific method".¹⁰ Thirdly, the effect of AASW's platform to make science more socially relevant was to transform social and economic policy areas into science policies — or policies requiring skilful handling which only scientific expertise could provide.

The contrast between these claims and the pre-war 'advancement of science' mode was striking. Equally striking was the gap between the AASW scientists' aspirations and the extent to which formal government recognition (in the form of appropriate funding and legislative back-up) was forthcoming. Undeterred by what then appeared to be nothing more than temporary oversights and bureaucratic red tape, the scientists simply redoubled their efforts.

By 1944 science was projected not only as a decisive factor in winning the war, but also as a means of reducing social inequality. The pragmatic bent of AASW's program for social reform through science, previously held in abeyance by the pressing priorities of war, could now accommodate a broad-sweeping series of investigations (into health and industrial relations, education, housing, nutrition and family budgets, social security provisions and rationing anomalies). At the same time, the thrust towards planning in science had unmistakably arrived. By and large, however, the social relations of science were deemed not to include its political and economic relations. Thus, planning, left to scientists - with an apparent monopoly on the process of rationalisation and objectification - would neatly sidestep the demeaning influence of mundane social and political considerations. The reified view of science embraced by the bulk of AASW's membership (now representing more than 30 per cent of Australia's total scientific population) was thus held to be consistent with its apolitical mandate.

POLARISATION OVER MEANS AND ENDS

However, the view that science should reduce social inequality rather than generally benefit mankind was not unilaterally endorsed by its members. Polarisation between the progressive liberals and a small but very active radical nucleus, began to emerge. Essentially the internal tension prompted by this discourse was between those who wanted piecemeal reform (based on indisputably neutral 'facts') with greater responsibility concentrated in the hands of scientists themselves, and those who saw a planning role for science with an emphasis on greater public accessibility and participation.

This polarisation had first surfaced in 1943 over the issue of whether AASW should become a trade union. The pressure to unionise was partly catalysed by the ineligibility of members of two AASW branches (recruited from the local munitions factories) to claim recently-granted wage increases because they were not represented by a union. Partly also, some AASW scientists were persuaded by the example of the British AScW, which had successfully registered as a trade union two years earlier on the conviction that,

One of the main reasons why science does not occupy its proper place in national life is that scientific workers do not exercise in the political and industrial world an influence commensurate with their importance. It is also widely held that the reason they do not exercise such influence is that they have not hitherto adopted the form of organisation which, in a democratic community, is necessary to obtain it.¹¹

This view was ardently opposed by the progressives, who saw moves to unionise as incompatible with the ideology of professionalism and in open breach of AASW's nonpartisan charter. More critically, perhaps, unionisation was seen as identifying science and scientists too overtly with the political process in ways that might later demean the status of science and foreclose options for its continued support.

The formation of the Federation of Scientific Workers (FSTW) in October 1943 temporarily defused the need to confront directly the ideological rift that had surfaced. With FSTW acting as AASW's 'economic arm', AASW could now concentrate exclusively on the *social* relations of science. After three long years of bitter demarcation disputes, the Arbitration Court granted FSTW registration, but excluded those scientists employed by government institutions. This decision effectively severed official links between academic scientists and industrial scientists/technicians — in striking contrast to the cohesive bonds between these two groups in the British AScW.

PLANNING IN SCIENCE

Less easily resolved was the subsequent debate between the planners and the anti-planners (unkindly known.as the 'chaotics'). The thrust towards planning in science was consistent with the wider discourse of post-war reconstructions. It was partly motivated by a widespread anxiety that post-war Australia would witness a return to Depression conditions. Without a planned economy, it was argued, prospects for a 'new order' and greater social equity could not be realised.

Whatever misgivings were later voiced about how planning might place science and scientists, a national planning conference organised by AASW in May 1944 had sufficient appeal to attract more than 1500 scientists. The statement¹² which best epitomises the mood and context in which planning was set is contained in the following resolution:

Scientific knowledge and research must be planned so that the greatest efficiency may be realised. Science is only one part of the national economy, which must be designed so that full employment and a generally improved standard of living are achieved and that

freedom from want will be permanent. Therefore this conference believes that the Commonwealth Government must be invested with greater powers in order to ensure such a planned national economy.¹³

The extent to which these scientists' rhetoric had penetrated government thinking is evident too in pronouncements from such officials as Lloyd Ross (then in charge of public relations for the Ministry of Post War Reconstruction):

Scientific planning and planning with the aid of science are what we look forward to; planning, however, in which any new order we arrive at is fitted to our traditional freedom.¹⁴

The rhetoric of planning was, however, somewhat confused. For some, it implied the necessity of a 'new order': for others it did not. Significantly, for neither the progressives, nor for the radicals, did it concede any possibility of the external control of science. The scientists, then, did not envisage any essential change in the relationship between science and government — merely that science deserved greater social prominence. This is evident in such comments as:

Although AASW has already ... done [much] toward co-ordinating the efforts of science, ... much still remains to be done before science attains that place in the social scheme which it must occupy if the world is to move forward from chaos to comfort.¹⁵

In an ambience of such flambovant idealism, few could have anticipated the controversy that the planning issue was to set in train. In part, this was a function of circumstances external to AASW. In 1944 Menzies brought together 14 conservative bodies to found the Liberal Party. This unification was achieved in reaction against the threat posed by the Curtin Government's moves towards greater centralisation and regulation of private industry. In this context, planned science was perceived as no less a threat than planned economy and the Curtin Government's perceived thrust towards socialisation of industry. Sir David Rivett, for instance, confessed to a "growing dislike for the word planning" because it was linked "far too easily and glibly and irresponsibly to loose thoughts, half-baked proposals and untested hypotheses". Besides, he observed, "the behaviour of a group of men cannot be foretold as can a group of molecules".¹⁶ There was also the irksome question of how one 'plans' a discovery.

More serious was the contention of a highly vocal anti-planning minority, that planning was synonymous with totalitarianism contrary to the spirit of science and subversive of the ideological assumptions on which 'High Science' was predicated. Nevertheless, the dissent registered at the conference meant that the political implications of divergent conceptions of the future role of science could no longer be ignored. In that sense, the planning conference of 1944 marked a watershed. It underscored a 3-way tension inherent in AASW's original charter: (1) between apoliticism and the politicisation of scientists; (2) between professionalisation and popularisation; and (3) between democratisation and the promotion of a technocratic elite. Neither AASW's faith in Bernalism ('scientism') nor its apolitical mandate could continue to protect its cohesion as an umbrella organisation for socially interested scientists. After the 1944 conference, a sizeable number of its senior, 'respectable' membership resigned.

COMPETING CLAIMS FOR AUTHORITY

For a time, AASW continued with its science popularisation program, but its efforts to achieve an 'insider' status for science were to prove short-lived. Within 12 months, it was convinced that,

The general attitude that science contributes something to the general national set-up... is not enough... [Science] is viewed as something outside, detached from the political and social organisation. No member of Parliament ... is a scientist; no scientist is on the Public Service Board. Science is outside not inside; consequently Australia neglects science, and the scientist has to fight his way instead of having full opportunity and resources.''

This attitude was to earn AASW the undying antagonism of the ANRC — in striking contrast to their earlier harmonious cooperation. Specifically, ANRC objected to the 'policy-meddling' now undeniably inherent in AASW's platforms, and to its claim to represent the interests of all 'scientists. In essence, the difference between them centred on ANRC's desire to concentrate control of decision-making in the hands of a scientific elite, and AASW's concern to involve the public in science policy-making. ANRC clearly saw the discourse of 'science for the people' as confounding the principle of autonomy in the organisation of science, and debasing its national importance and social utility by inviting public, non-expert participation. Far more decisive, however, was the advent of the atomic bomb. With it, the reified discourse of reconstructionism was rapidly overtaken by the political, defence and foreign policy realignments announced by the Cold War.

COLD WAR POLITICS

The following account of the Cold War onslaught against scientists

is necessarily sketchy. It is presented only to establish the indelible impact on a generation of scientists, and the tenacious adherence to autonomy in science as a fulcrum in science policy for decades to come. The tenor of these attacks was set by W.C. Wentworth's public revelations about AASW in July 1946. Prominently featured in the pages of the *Daily Telegraph* (and to a lesser extent, the *Sydney Morning Herald*), Wentworth alleged that: ''Rusia operates largely through a physics lecturer at Sydney University, the AASW and FSTW''; that ''these two bodies have infiltrated the CSIR''; that AASW was a ''fifth column for Russia'' whose express policy was ''that even if 3/4 of the people in the world died, that would not matter as long as the remaining 1/4 were communists'' and that Russia's grand design was to ''distribute atomic bombs [as soon as she could make them] all over the world to ransom and blow up vital centres''.¹⁸

Six months later the discreditation of AASW became the subject of heated debate in Parliament. The timing of this attack coincided with the mobilisation of a protest movement against the proposed Anglo-Australian experimental testing range for guided missiles in which AASW played a not insignificant role. The rocket range had been approved in principle by federal Cabinet in November 1946, but the agreement had not yet been formally ratified. The vitriolic attack on AASW was led by Joe Abbott, Country Party MHR for New England. Fuelled by ready contributions from other members of the Opposition, the attack was seen as an attempt to silence the protest movement. More ambitiously, Abbott tried to engineer a case for instituting security checks on CSIR personnel, and, effectively, for the control of science in Australia. Through a series of conflational acrobatics, Abbott used a recapitulation of the Canadian espionage trials (largely featuring scientists) to: (a) insinuate a concrete connection between the Canadian and Australian Associations of Scientific Workers; and (b) to impel the Government into holding a royal commission to investigate "the whole of Communist activities in Australia" (including AASW's alleged infiltration of CSIR)." The last recommendation was endorsed by Herbert Spender (MHR for Warringah) in terms reminiscent of the McCarthy trials in the United States. Spender had some years earlier actively intervened to pre-empt AASW's moves towards rationalising the patent medicine industry. Three months later legislation formally approving the rocket range went through Parliament.

Abbott's attack also called on those CSIR scientists employed on research into guided weapons to dissociate themselves from the views expressed by Sir David Rivett's address, entitled 'Science and Responsibility', given to Canberra University College on 25 March, 1947. Rivett's speech contained a fairly standard defence of freedom in science and the right to ''free trade in scientific knowledge''. As an AASW spokesman pointed out at the time, ''if all Australian scientists whose views differed from those of Abbott were removed from active work . . . the [scientific] ranks would be rapidly thinned and Australia would be the loser''.²⁰ AASW's appeal for support from the wider scientific community was to fall on deaf ears. By then the stakes were too high as the assault on scientists provided the necessary lever for the Australian government's confirmation of the premises of the Cold War.

The attack was renewed in September 1948 following a formidable campaign against the government's moves to nationalise banks. This time the leader of the Country Party, Arthur Fadden, produced (but refused to table) a 'secret document', claiming that the US would withhold defence information from the UK and Australia because of the government's deficient security provisions in its own science organisation. Again, Abbott cited Rivett's Canberra speech as evidence of Rivett's desire to ''protect certain shibboleths and faiths, to the detriment of Australia''. He also accused Rivett of preaching ''wickedly and wrongly, the most dangerous doctrines to our young scientists''.²¹ Abbott's remarks were echoed by other members of the Opposition, with Archie Cameron (MHR for Barker) recommending that, ''the proper thing to do with Sir David Rivett would be to relieve him of his duties''. With the delicacy of a sledgehammer, Cameron later added

... the thing ... [Rivett] must get into his scientific mind — and if he has any mind other than scientific, so much the better — is that he is a paid servant of the Commonwealth ... Rivett, and his co-scientists are not a government on their own, they are not a law unto themselves. While they are particular capable and distinguished men — and I hope they are — they are citizens of the Commonwealth of Australia who render services ... for certain known emoluments. If they are internationalists at heart, let internationlism employ them and finance them.²²

In December 1948, the Public Service Bill (No. 2) was ratified in Parliament, enabling the government to transfer work performed by CSIR to other Commonwealth Departments. The Division of Aeronautics was duly transferred to the Department of Supply and Development in February 1949 — a step described by the ANRC as "a staggering blow" and of "the profoundest gravity and importance to Australia and Australian science".²³ On 19 May 1949, with the amendments to the *Science and Industry Act*, CSIR was reconstituted and re-named the Commonwealth Scientific and

Industrial Research Organization. CSIRO officers were now subject to security screenings and a new executive, without David Rivett, took office. AASW failed to survive the vitriolic onslaught against the scientists, and formally dissolved in July 1949.

A LEGACY OF THE COLD WAR

Understandably, the scientific community's response to this unremitting political pressure was to reaffirm the neutrality of science. Organisational autonomy was promoted as a prerequisite for scientific excellence. This elitist thrust was epitomised in the formation of the Academy of Science in 1954. The impact of organisational changes to CSIR/O was sufficiently traumatic to require also the 'self-immolation' of the ANRC. Explanations to account for this efficient and unusually altruistic kamikaze gesture are inconclusive, but available evidence points to a major realignment within the scientific power structure and a closing of ranks by the encumbent, self-appointed elite.²⁴ With the emergence of a visible elite, autonomy, it has been argued, was traded off for real influence.25 Whether the ascendance of the Academy of Science and the 'golden age of scientific autonomy' in the 1950s and 1960s were symptomatic of prudential acquiescance is a matter for further research and analysis.

Nevertheless the appeal for freedom from political interference and regulation remains a powerful article of faith within the stratified research hierarchy. It has continued largely unchallenged until the mid-1970s when the then Labor government threatened to transfer CSIRO's Mineral Research Laboratories and Solar Energy Studies Unit to the Department of Minerals and Energy. Again, an outraged and highly-organised media protest by CSIRO scientists hinged on the argument that autonomous organisational arrangements were insurance for creative research productivity.²⁶

Arguably, the ideology of professionalism and organisational autonomy has been a one-sided dialogue, typically resulting in *pro forma* agreements between scientific advisors and governments. Historically this has been characterised by four enduring features of Australian science policy:

- scientist-initiated, rather than government-instigated, advisory machinery;²⁷
- disproportionate funding of R&D by government;²⁸
- the reproduction of overseas models of excellence as a means of ratifying science as a fundamentally 'showcase' resource;
- the abject failure of social responsibility movements to redirect policy objectives towards social equity, rather than funding, as the basis for accountability.

These features are symptomatic of the marginalised status and role of science typically found in developing countries.²⁹ That the representation of science as a means of enhancing national prestige became firmly entrenched in the 1960s has been extensively documented elsewhere.³⁰

SCIENCE AT THE CROSSROADS

In proceeding to discuss particular developments in the 1970s, I am not suggesting that the 1960s and other developments in the 1970s were unimportant to the framing of an 'explicit' policy for science in Australia. For the purposes of this paper, it is my contention that there are instructive parallels between the 1940s attempt to negotiate a central relevance for science, and the emerging 1980s debate about the role of technology as a means of revitalising Australian industry and attenuating its client-state position.

As noted earlier, although AASW's platforms emphasised the *social* relations of science, its role in establishing joint production committees in key industries reflects a concern to forge stronger links between science and industry. Planning was initially endorsed by many AASW scientists as the appropriate strategy for achieving 'relevance' in scientific endeavour. But the association of planned science with the wider discourse of reconstructionism also aligned AASW politically with economic objectives which did not survive the Cold War years.

Although the context of the 1980s debate about deficiencies in the support of IR&D is not directly commensurable with the 1940s appeal for 'relevance', recent events make it clear that justification for the public support of science is once again at the crossroads. In the next section I will make some preliminary and very tentative observations about the paradigm shift that is in the making.

PRELUDE TO CHANGE: THE 1970s

Fast-moving developments in science policy machinery from the mid-1970s reflected the legacy of a decade of social protest, disenchantment with the political process, and a particular disavowal of the destructive influences of technolgy. Mounting pressure for accountability,³¹ alleged deterioration of morale among government scientists not employed by CSIRO, and concern about social displacement prompted two government-commissioned reports: that of the Science Task Force in 1975 and the Myers Report of 1980.³² These reports represented the first major reviews of the organisation of science and the impact of technological change respectively. Both reports strongly denied the need for

significant overhaul of the existing *status quo*. Again the discourse of neutrality and autonomy prevailed. Again the separation of science from technology — commonly referred to by scientists and social scientists alike as the divorce of science from society — was paraded as essential for the survival of 'creative' science. Missionoriented science and *dirigiste* organisational arrangements were hotly resisted as the appropriate mode for public science.

Another, although not exclusive, rationale for the support of basic research is offered in the 1978 Report to the Prime Minister from the Australian Science and Technology Council (ASTEC). Inter Alia the Report claims that support for reearch "is justified on intellectual and cultural grounds because it contributes to the national status, because it is important in education and training and in the understanding and control of new technologies, and as an investment for the future in terms of the economic, social and other benefits that may flow from it".³³

A similar assertion is ambivalently endorsed in the Minister's Science Statement of 1981. On the one hand, David Thomson accepts the discourse of science as "cultural activity" since it is "essential to the spirit of mankind". But, by a deft inversion of the more characteristic assertion that the support of science is essential for maintaining the nation's economic (as well as intellectual) stocks, the Science Statement also calls on "all sections of the economy" to "play their part in supporting science and technology if Australia is to be counted among the technologically advanced countries of the world". Acknowledging the alarming slump in R&D expenditure by the private sector in the 1970s, Thomson also maintains that Australia must "improve its data base of technological and scientific knowledge, otherwise we will lose jobs and business opportunities to other countries".³⁴

THE CHALLENGE OF THE 1980s

Increasingly, the 'intrinsic merit' justification and the insistence on autonomy represented by the Task Force Report and elsewhere are seen in many quarters to be out of step with the economic climate of the 1980s. With pervasive cutbacks in public spending since the late 1970s, it was perhaps inevitable that CSIRO would have to work harder to safeguard its slice of the R&D cake. The most recent challenge to CSIRO's hegemony has come from a number of sources. Two of these warrant particular comment. The first is a report by the Australian Scientific Industry Association (ASIA) released in February 1983. In the words of its chairman, Peter Farrell, this report was prompted by the ''monumental inaction'' and "ignorance of governments and their agencies concerning the needs of emerging technologies, particularly in relation to the proper nurturing and development within Australia of high and new technologies". Its specific recommendation on CSIRO's role in this context is revealing: "Attempts must be made to commercialize CSIRO research outputs". To this end it suggests that CSIRO's budget be "redirected at a rate of 5% per annum for ten years so that at the end of this period 50% of the total budget would be spend on actual market-led industrial research".³⁵

In a similar vein, Stuart Macdonald, in a recent issue of Search, questions a long-standing 'faith' in CSIRO as a ''scientific investment account paying attractive interest rates; and as a cornerstone of the technological foundations of the Australian economy''. He argues that the validity of the linear model of innovation ''has led to concentration on how good research is in some absolute sense, and has distracted attention from how good that research might be for the economy as a whole''. Macdonald examines, and finds wanting, the public justification for what CSIRO does. As an organisation which absorbs more than 16 per cent of Australia's total R&D expenditure and is ''in many ways the most powerful weapon in the armoury of government science policy'', Macdonald sees its funding as a matter of ''legitimate public concern''.³⁶

The subsequent 'exchange' between CSIRO and Macdonald highlights CSIRO's intense sensitivity to this sort of scrutiny.³⁷ CSIRO's chairman, Paul Wild, professes to finding Macdonald's arguments unintelligible. On behalf of the Division of Entomology, P.B. Carne, refutes Macdonald's capacity to understand and interpret the scientific literature pertinent to CSIRO's research programs. Essentially this 'dialogue' represents an attempt to invalidate the expertise of those outside the scientific enterprise, and to undermine their credibility vis-a-vis government and other potentially receptive audiences. Other instances of similar treatment of reputable science policy analysts have been documented.³⁸ The parallels between this sort of interchange and the paradigm struggle implicit in the competing discourses about science in the 1940s are intriguing and suggestive.

The pressure on CSIRO has not been relieved under the new Minister for Science and Technology, Barry Jones. The refusal of a newly-elected Labor government to bring CSIRO within the ambit of the Department of Prime Minister and Cabinet (instead of the Department of Science and Technology)³⁹ explicitly rejects the premises of the 1975 Task Force Report. For some time Jones has pressed the urgency of developing high technology industry in Australia. Science and technology is being specifically projected as a crucial dynamic in capital formation, rather than simply a national resource. Implicitly this focus is an appeal to a different sort of autonomy -a measure of technological 'sovereignty'.

The argument about Australia's technology 'subservience' is based on a particular perception of its innovation record and its capacity to generate industries based on the development of new technologies. Two key impediments in this development has been a heavy reliance on imported technology and a technological brain drain. The former has been characterised either by Australianowned firms purchasing licences to use technologies developed overseas, which inhibits further development or exploitation; or by Australian subsidiaries of overseas-owned companied using technologies developed in the country of origin with similar restriction on local adaptations or modifications. Australia, claims Jones, has adopted a colonial mode of technology transfer (similar to that in India, Mexico and much of South America). It is a syndrome characterised by an attitude of: ''Why bother inventing the wheel? If it's any good, the Americans will sell it to us''.⁴⁰

On this assessment, it is argued that Australia cannot develop new technology industries by reference to market forces alone that active industrial development policy on the part of government will now be needed to offset the historical pattern of technological dependence. Despite the high standards of CSIRO and academic research centres, Australia's record on the commercial end of R&D is undeniably poor. Hence the recent spotlight on the development of 'sunrise' industries as a means of revitalising Australian industry. In contrast with major industrialised countries, whose governments pay for a minor share of national R&D, Australian governments pay for about 76 per cent of national R&D and the private sector only about 20 per cent.⁴¹

The policy initiatives now being prescribed to bolster Australia's technological efforts are not new. The former Minister for Science and Technology also tried to impress on his government of the urgency of the initiatives. Specifically, these were:

- means of attracting venture capital;
- tax incentives to stimulate R&D in the private sector;
- enhancing transfer of technology through linkage between the universities and other research institutions and industry.

However, Thomson's views were not given conspicuous attention until the last election.

It is not my intention to assess the merits and demerits of the emerging debate about Australia's technological subservience,⁴² nor to forecast whether the drastic recommendations of the ASIA Report are likely to be implemented. What *is* pertinent here is that the shifting focus from the research phase is not likely to be easily removed from the political agenda. In this context, the consequent pressure on CSIRO to legitimate its significant share of R&D expenditure by government is self-evident. It remains to be seen whether a modified 'science-government' discourse will evolve in response to a changed political and economic imperative — that science and technology be vitally connected with productivity and capital-formation.

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- 2. G. Werskey, The Visible College, Allen Lane, London, 1978, p. 233.
- 3. Australian National University, Business and Labor Archives, E101A/1, AASW Constitution, adopted October 1940.
- 4. Roy and Kay MacLeod, 'The contradictions of professionalism: scientists, trade unionism and the First World War', *Social Studies of Science*, 9, 1974, p. 2.
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- 9. The urgency of developing anti-malarial drugs became particularly acute when the Japanese seized the Cinchona plantations of Java which then supplied some 95 per cent of the world's supply of quinine. Mellor, *op. cit.*, p. 619.
- 10. Australian National University Archives, E101B/4, Correspondence Files, 11 August 1939.
- 11. *ibid.*, E101A/6/5, recruitment pamphlet of AASW's Maribyrnong Branch. The quotation was taken verbatim from a memorandum issued by the British AScW, then known as the National Union of Scientific Workers, in 1918.
- 12. The NSW conference alone passed 50 resolutions. Among the most significant were the following: that a Parliamentary and Scientific Committee and a scientific manpower secretariat be established; that postgraduate courses in all branches of science be instituted at Australian universities; that institutes of technology be founded to forge links with industry; the necessity for "decentralization of our industrial system"; that more adequate and systematic statistical data "be made available for the use and guidance of those concerned with the planning of industry and economy"; proposals for a NSW agricultural science college and research station and for expansion of agricultural extension services and training of officers; proposals for a state-subsidised medical and dental service; immediate re-introduction of legislative controls over the manufacture, advertising and sales of patent medicines; increased national R&D funding, and improved research facilities.

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- 29. See Amilcar Herrera, 'Social determinants of science policy in Latin America' in C. Cooper (ed.), Science Technology and Development, Frank Cass, London, 1973, pp. 19-37. According to Herrera, marginalised science in developing countries is typically characterised by
 - imbalances in R&D expenditure
 - dysfunctions between 'explicit' and 'implicit' science policy
 - tenuous links between science and industry and science and production.

The net effect of this configuration is that "scientific institutions are alienated from production activities or 'marginalised' because there is no demand for locally developed technologies from the productive sectors. Consequently, science in underdeveloped countries is largely a *consumption* item, whereas in industrialized countries it is an investment item". Cooper, *op. cit.*, p. 5.

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- 31. Growing public concern over the effects of misdirected technology was not notably fostered by scientists. Unlike their British and American counterparts, the 'social responsibility of science' movement in the early 1970s did not make any significant inroad in Australia.

- 32. Towards Diversity and Adaptability, Report of the Royal Commission on Australian Government Administration by its Science Task Force, Australian Government Publishing Service, Canberra, 1975; Technological Change in Australia, Report of the Committee of Inquiry into Technological Change in Australia, Australian Government Publishing Service, Canberra, 1980.
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- 36. Stuart Macdonald, 'Faith, hope and disparity. An example of the public justification of public research, Search, 13, 11/12, 1983, p. 290.
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- 42. For an incisive critique of the quest for technological sovereignty via the high technology strategy, see S. Macdonald, 'The Low-Down on High-Technology Industry in Australia', paper presented to ANU Public Affairs Conference, 'Science Research in Australia: Who Benefits?', Canberra, 23-24 June, 1983.