THE SOCIAL SHAPING OF A LABORATORY: THE ESTABLISHMENT OF THE AUSTRALIAN ANIMAL HEALTH LABORATORY*

Pam Scott

Technologies are often presented and perceived as being inevitable, natural and necessary, as if they were the products of some inner logic. As a result, there has been a tendency in the past to focus on the effect or impact a technology has on society at the expense of investigating the origin of the technology. More recently, efforts have been made to penetrate the 'black box' of the technological artifact in order to reveal the variety of ways technologies are shaped. This paper will discuss the economic, political and other social factors which shaped the Australian Animal Health Laboratory and which determined its proposed functions.

Keywords: Australian Animal Health Laboratory, AAHL, technology, social shaping, laboratory

INTRODUCTION

In their book, *The Social Shaping of Technology,* MacKenzie and Wajcman argue that there has been a tendency in the past, in studies of technology, to concentrate on the impact that technology has on society, that is, on the 'effects' of technology rather than on the 'prior and perhaps more important question' of what has shaped the technology having these effects.[1] The main thrust of their book is to look at how the kind of society we live in affects the kind of technology we produce.

The view that technology develops in an autonomous way as a result of an inner logic is thus replaced by a view of technology as the outcome of complex interactions between social, political, economic and technical factors. As Law puts it:

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> . . . a technological artifact . . . [is the] congealed outcome of a set of negotiations, compromises, conflicts, controversies and deals that were put together . . . [2]

Another way of expressing this is to view technology as the outcome of decisions and of social arrangements.[3] Allison argues in *The Essence of Decision,* that in order to explain why a particular decision was made:

> . . . it is necessary to identify the games and players, to display the coalitions, bargains and compromises and to convey some feel for the confusion.[4]

In this paper I refer to the Australian Animal Health Laboratory (AAHL) as a technology. This fits with the widely held view that technology includes more than just hardware, and can apply to human activities and human knowledge, organisations and management, artefacts and the social relations between them. Some writers have lamented the fact that technology has become "a catchword with a confusion of different meanings",[5] and MacKenzie and Wajcman agree that the term is "a slippery one".[6] However, whilst the debate over definition goes on, for practical purposes the idea of considering AAHL a technology, or perhaps more precisely to use Hughes' term, a "technological system",[7] is a productive one.

The idea that technologies are the products of social choice is not new. However, until recently much of this work was concerned with tracing general mechanisms of the shaping process.[8] Now, partly inspired by the microsociology of science, and by an interest in specialised institutions, including laboratories, studies of technology are being carried out at a more detailed level than before.[9] Interest in the general development of technology is being replaced by an interest in why a particular technology developed in a particular way.

MacKenzie and Wajcman begin with the seemingly simple and self-evident statement that 'we live our lives in a world of things that people have made'. Yet often when we are confronted with a completed and installed, highly technical artefact, there is a tendency to forget that someone made it, that someone selected the elements to combine, made decisions about its form, and rejected alternatives. Instead, the technology is viewed, and usually presented by the proponents, as predetermined, and its shape and function inevitable.

Opening amidst controversy in 1985, the Australian Animal Health Laboratory, a sophisticated maximum security animal health laboratory for studying and diagnosing exotic animal diseases at Geelong in Victoria, was presented as the inevitable outcome of an undeniable need to protect Australia's livestock industry. If, however, we get inside this 'black box' of the technological artefact and 'identify the games and the players', if we follow the scientists and engineers and decision-makers through society as Latour exhorts us to,[10] then a different picture emerges. What we see instead is a technology or technological system

which has been shaped — not just figuratively, but also literally — by economic, political and bureaucratic factors much more than by technical or scientific considerations. Covering more than a decade of decision-making, this paper provides a brief account of how the design and functions of AAHL were determined, or in other words, how the laboratory was socially shaped.

ENTER EICHHORN

Whenever the story of the Australian Animal Health Laboratory is told, 1964 is usually chosen as the starting point. This was the year that Dr Eichhorn, a Foot-and-Mouth disease expert with the United Nations Food and Agricultural Organisation, was invited by the Australian Government to advise on Australia's preparedness to cope with an outbreak of exotic disease. No doubt, this is considered an appropriate starting point since it was Eichhorn's report which recommended the establishment of a maximum security animal health laboratory, and detailed the functions it was to perform. But what were the circumstances which led to Eichhorn's visit?

That Australia should request or require such advice is presented as obvious and natural in these accounts of the origins of the laboratory. Yet, given Australia's geographical and historical circumstances, this action was anything but obvious and natural. Australia had not had an outbreak of Foot-and-Mouth disease since at least 1872, and even that incident is disputed; other serious animal diseases had also been avoided. This was a product of its geographic isolation and stringent quarantine measures. Certainly in 1964 there had been no changes, or even potential changes or threats to Australia's disease-free status: farmers were not petitioning the government for action on exotic diseases, extortionists or terrorists were not threatening to infect our livestock, nor had there been any recent accidental outbreaks of disease here. So why then was Eichhorn invited? Since the answer is not to be found in any immediate or potential threat, we must therefore look to those who invited him and the circumstances leading to this invitation.

It is often quite difficult to pinpoint when a decision was made and who made it, even when it may be quite clear that one was made. Discussions about establishing an exotic diseases laboratory in Australia occurred among veterinary scientists in the late 1950s. There were a number of reasons for this interest. The recently established science of virology was seen as holding the promise of eradication, or at least better control, of a number of viral diseases. If Australian veterinary scientists wanted to participate in this promising research then they needed to establish a laboratory. There had also been a number of recent successful disease eradication campaigns. Following the eradication of Rinderpest in China, the United Nations Food and Agricultural Organisation became actively involved in setting up laboratories around the world

specialising in particular animal diseases. An Australian, Dr K. Kesteven, who maintained important links with Australia,[11] was actively engaged in this work and it was he who suggested Dr Eichhorn as an expert to advise the Australian government.

The Australian Veterinary Association first suggested to the government that there was a need to establish diagnostic facilities for exotic diseases in each State.[12] At that time, the Australian Veterinary Association was quite a powerful and influential body whose advice on veterinary matters was often sought by various government departments. The Division of Veterinary Hygiene within the Commonwealth Department of Health, the division responsible for veterinary matters including animal diseases, employed no veterinary scientists directly at that time, but relied on the Australian Veterinary Association, CSIRO or universities for technical and scientific advice.

At this stage, the facilities proposed were quite modest, requiring only four or five rooms adjacent to existing State diagnostic laboratories. While supporting the proposal, even these modest requirements caused the Standing Committee on Agriculture to note that high cost and staffing could be a problem.[13] Two years later, at the 1961 Biennial Conference of Commonwealth and State Veterinarians, it was recommended that Australia invite overseas experts to visit and discuss control and eradication of exotic diseases.[14] This was supported by the Standing Committee on Agriculture in 1962.

Over the next two years the Exotic Diseases Committee of the Australian Veterinary Association engaged in a number of formal and informal discussions with the Director of Veterinary Hygiene, Mr McIntosh and the Director-General of Health, Mr Refshauge, concerning the establishment of a laboratory. During this period the idea of separate laboratories for each State was rejected, primarily for economic reasons, in favour of a centralised facility. It was proposed that the functions of this central facility should include i) testing for exotic diseases after the initial diagnosis had been confirmed overseas, ii) training State Veterinary officers in diagnostic techniques, iii) undertaking research on endemic viral diseases, and iv) collecting information on diseases and supplying advice to the Director of Veterinary Hygiene.[15]

Already it is clear that the proposal for an animal diseases laboratory was strongly influenced by its origins. Once the problem was identified in particular terms, the agenda became set in a certain way, and the decisions available were thus limited. In other words, veterinary scientists defined animal diseases which were exotic to Australia as a threat, and, reflecting their interests, defined the solution in terms of establishing a laboratory in Australia for diagnosis and research. Yet a number of alternatives could have been considered. For example, if it was feared that these exotic viruses were going to enter Australia, then quarantine measures could have been strengthened and extended, and an extensive public education campaign mounted. Alternatively, greater involvement in efforts to reduce the incidence of these diseases overseas, especially

in neighbouring countries, would reduce the threat. Other possibilities included strengthening existing arrangements with overseas laboratories, collaborative research programmes, or establishing a laboratory, staffed by Australian scientists, overseas where these diseases are endemic. Some of these alternatives were eventually adopted when the functions of the laboratory were curtailed following the public controversy which developed in the 1980s.

Support for establishing a centralised laboratory was not unanimous, nor was it widespread, being confined to a small group of veterinary scientists at this stage. Primary producers, the group that would be most affected by an outbreak of exotic disease, had not initiated or participated in any of these discussions, or even been informed of these plans. Instead of involving farmers, the proponents of the laboratory negotiated directly with the policy-makers, that is, those in positions of influence and power within the relevant government departments and organisations.

One way of generating support for a proposal is to stress its scientific and technical validity. As Latour reminds us, science is one of the most convincing tools to persuade others of what they should want.[16] This is often achieved by using experts, especially overseas experts who are presented as impartial advisors. This tradition was well established in Australia: for example, Sir Edward Heath was invited to advise on the establishment of CSIR, and Lord Cherwell, a member of Britain's Advisory Council on Science Policy, was invited to promote an Australian Atomic Research establishment.[17] In 1974 Dr Eichhorn was invited to advise on Australia's preparedness to cope with an outbreak of Foot-and-Mouth Disease. In all these cases the selection of the advisor was crucial to the outcome.

Dr Eichhorn's work with the FAO involved setting up animal disease laboratories around the world. His previous positions had been Director of the Palo Alto Diagnostic and Vaccine Production Institute, and Director of the Pan-American FMD Centre, Rio de Janiero. These influences would suggest that he would favour a particular approach to the question of how Australia could best protect itself, and in fact, Eichhorn recommended the establishment of a laboratory resembling those he had experienced.

Through his contact with Dr Kesteven, Eichhorn was also aware of some of the discussions within Australian veterinary circles. Indeed, it could be argued that Eichhorn was invited precisely because it was believed that his view would coincide with, and provide authoritative support for, the view already established by the proponents of the need for a centralised maximum security laboratory; a view which reflected the interests, values and assumptions of these veterinary scientists. A laboratory would provide significant resources and prestige for the responsible organisation and scientists involved. It would also recognise and legitimate the prerogative of those involved to define these sorts of problems, and thus enhance their power and influence in the future.

Eichhorn's recommendations were, however, to have a significance beyond merely supporting the proponents' view. Eichhorn extended the proposed functions to include the production of Foot-and-Mouth disease vaccine. In retrospect, this was not a surprising inclusion given Eichhorn's background in vaccine production laboratories, but in the context of Australia's long established policy not to resort to vaccination in the event of an outbreak of Foot-and-Mouth disease, it was unexpected.

This recommendation, and its subsequent endorsement, was to have an enormous impact on the design, or 'shape', of the laboratory. The inclusion of vaccine production as a function meant not only incorporating a vaccine production unit into the laboratory, but also including facilities for potency and safety testing of vaccines, procedures requiring the inoculation and hence secure accommodation, of large animals. Furthermore, the production of vaccine requires large amounts of live virus. As Dr Pierce, CSIRO's Chief of the Division of Animal Health, pointed out:

> Thousands of litres of very virulent viruses have to be grown and handled by comparatively (as compared to scientists) unskilled technicians.[18]

This meant the incorporation of the most stringent security measures into the design of the laboratory.

The Proposal Evaluation Team which was formed later to consider feasibility and cost of establishing a laboratory capable of carrying out these functions safely, reported that the vaccine production unit and large animal accommodation caused the major stumbling block in the design. Yet, despite the difficulties associated with it, the additional risk and expense involved, and despite the questionable need to produce vaccines and the even more unlikely use of Foot-and-Mouth disease vaccine in Australia, the proponents persisted with the inclusion of this function. In order to understand why this was so, we need to consider not as one might expect, scientific or technical arguments, but the politics of the bureaucracy.

ENTER CSIRO

Following Eichhorn's report, the next important development in shaping the laboratory was the active involvement of CSIRO, initiated by Dr Pierce when he became Chief of CSIRO's Division of Animal Health in 1967. Following Eichhorn's visit, the Department of Health had taken over responsibility for the laboratory and CSIRO had not been involved in any of the planning. This was most likely because of Pierce's predecessor's lack of enthusiasm for the project.[19] Pierce, on the other hand, believed that CSIRO should not only be involved in the planning of the facility, but should be responsible for operating it, and he set about trying to convince the Chairman and CSIRO Executive of this.

His reasons were stated quite clearly: He saw the laboratory as "powerful" and "a centre of excellence", which would if placed elsewhere "drastically reduce the significance of virological research of the Division of Animal Health".[20] He argued that CSIRO would be "immensely strengthened" by having responsibility for the laboratory, but "very seriously weakened" if it did not.[21] No doubt, the Department of Health had similar ambitions, wanting to keep the responsibility for what one of their Chief Veterinary Officers, Dan Flynn, called "this gorgeous jewel".[22]

THE BATTLE FOR CONTROL

These moves by Pierce signalled the beginning of a tussle between CSIRO and the Department of Health for control of the laboratory, with each of the contenders attempting to establish the legitimacy of its claim. Functions were included, extended and described in such a way as to enhance the arguments for control of the laboratory by each of these organisations. That is, as well as providing justification for establishing the laboratory, the functions proposed reflected particular expertise, or areas of responsibility of the proponents. In this way, the functions became an important aspect of the politics of power and influence.

McIntosh, the Director of Veterinary Hygiene, argued that the functions proposed for the laboratory did not fall within CSIRO's area of responsibility, but were, on the other hand, legitimate activities for the Department of Health. However, Pierce claimed that CSIRO was the only organisation with the required expertise, and pointed out that CSIRO was already engaged in a number of activities which could be considered outside their normal terms of reference, thus establishing a precedent.

CSIRO emphasised the research functions of the laboratory while pointing out its scientific expertise and role in veterinary affairs. The Department of Health on the other hand, held firmly to its responsibility for quarantine and vaccine production. At this stage, the Department of Health was anxious to stress the vaccine production function. Even CSIRO had to admit that if included as a function, then vaccine production was a Department of Health responsibility since it already operated the Commonwealth Serum Laboratories.[23]

CSIRO tried to counter this by arguing that vaccine production facilities were not required. But the State veterinary officers, especially in Victoria, wanted vaccine production included, despite the arguments put forward about the dangers involved, the difficulties of security, the high cost, and the alternatives available. Pierce believed that "Victoria would be very determined" to include vaccine production because its Chief Veterinary Officer, Flynn, had chaired the Commonwealth-States Veterinary Committee Working Party which had recommended and had it approved as a function.[24] Pierce also believed that a lack of

confidence in the Commonwealth Serum Laboratories by the States also contributed to their desire for the new laboratory to undertake vaccine production.[25]

The Proposal Evaluation Team Report also favoured the inclusion of a vaccine production unit. However, its terms of reference did not include consideration of the need or desirability of vaccine production, just feasibility and cost, and as Pierce later pointed out, they were "not asked or informed about alternative plans".[26] Furthermore, it should be noted that Dr Holmes of the National Biological Standards Laboratory was included in the Proposal Evaluation Team specifically to advise on vaccine production.

Pierce was in a difficult position in regard to the Proposal Evaluation Team recommendations. As he told the CSIRO Chairman, he could "put up very few and not very strong reasons for the inclusion of a vaccine production unit".[27] Yet as Chairman of the Advisory Proposal Committee, the parent committee of the Proposal Evaluation Team he felt some obligation towards its recommendation. He was also concerned about the attitude of the States and the effect his opposition to the vaccine production unit would have on his working relationship with them, given that they had expressed support for vaccine production.

As well as feeling these pressures, Pierce believed that including vaccine production as a function and giving the responsibility to the Department of Health would ensure the support of the Minister for Health for the submission, and thus facilitate Cabinet approval for the laboratory. So despite his reservations and earlier efforts to eliminate vaccine production, and despite the scientific arguments against vaccine production and use, Pierce began to support the function. Moreover, he even argued for the linking of research to vaccine production, and also for CSIRO to take responsibilty for potency and safety testing of vaccines as a way of strengthening CSIRO's position.

The vaccine production function became a major stumbling block in drafting a Cabinet submission. This was exacerbated by a large number of Ministerial changes. During the period the submission was being prepared from 1970 to 1972, the approval of nine different Ministers was sought: two for Primary Industry, three for Health and four for Science & Education.[28] During these changes, the Department of Health went from supporting the inclusion of a vaccine production unit to opposing it, now claiming it was "unnecessary and unwarranted".[29]

One reason for this change, apart from Ministerial changes, was that during this long period of submission preparation, with delays caused mainly by Health, Cabinet had approved a Department of Health proposal to construct its own high security vaccine production facility. Another reason was that satisfactory alternatives had been negotiated. Pierce had several meetings in England with Burroughs Wellcome who offered comprehensive services with guaranteed supplies of Foot-and-Mouth disease vaccines tailored to Australia's needs. This was not greeted

enthusiastically by some proponents of the laboratory, and concern was expressed over reliability and cost. Pierce then met with the Director of the British Government's Animal Virus Research Institute at Pirbright, Dr Brooksby, who agreed to supply Foot-and-Mouth disease vaccines to Australia in an emergency "at no cost unless some demand is made, then a voluntary contribution could be considered."[30] This agreement was formalised by the Governing Body of the Animal Virus Institute and Australia's Director-General of Health, Refshauge. Interestingly, this agreement was never made public, even during the controversy over the laboratory and the need for vaccine production.

Despite all the scientific arguments against the need to produce vaccines, and despite the available alternatives, the final submission included a vaccine production unit capable of producing 200,000 doses of Foot-and-Mouth disease vaccine per month. Bureaucratic politics and pressure from the States, supported by the feasibility study of the Proposal Evaluation Team had prevailed, and significantly affected the physical design of the building as well as its operations.

The opposing arguments and alternatives to vaccine production were not included in the submission to the Cabinet or made widely known. Painter and Cary in their book on government policy-making in Australia, *Politics Between Departments,* point out that there is an expectation of unanimity by Cabinet which results in efforts being made by the sponsoring departments to avoid or conceal irreconcilable differences.[31] The problem with the consensus approach and search for unanimity is that it often produces a report which fails to satisfy any of the participants.[32] However, the important point to note is that once the decision to include vaccine production was made, all the proponents of the laboratory then presented a united front and endorsed the arguments constructed to substantiate this conclusion, regardless of their original position.

The Department of Health, however, was not dependent solely on vaccine production to justify its claim for control; quarantine matters were also clearly its responsibility. And a new strategy adopted by the Standing Committee on Agriculture, which emphasised the role the laboratory could play in the safe importation of new breeds of livestock, provided the Department of Health with a new and significant argument and role to play.

It was not the intention of Walter Ives, the newly appointed Secretary for the Department of Primary Industry, to provide the Department of Health with new ammunition when he recommended this strategy to the Standing Committee on Agriculture. His aim was to develop arguments which would provide justifications and convince the government of the need for the laboratory outside a disease outbreak situation. Ives believed this was necessary to show that the cost of the facility was justified, but it also had the advantage of avoiding total reliance on the argument of the impending and increasing risk of an outbreak of exotic disease.

Economic factors, whilst not addressed specifically in any formal sense at this stage, were often invisible threads running through discussions and being woven into assumptions. One of these assumptions was that in order to justify the cost of this laboratory to Parliament, it would have to be shown that it would be a worthwhile investment even if there was never an outbreak of exotic disease. Walter Ives argued that there were "two separate and different, but equally strong cases"[33] for establishing the laboratory. The first was the defensive role of the laboratory in the event of an outbreak of exotic disease, but the second would allow new genetic material to be brought into Australia and, in Ives' words, "justify the existence of the laboratory even if we never have a crisis".[34]

CSIRO, not to be outdone, also wanted to follow this advice. However, the problem it faced was in showing how research on diseases which Australia had been fortunate enough to avoid, could benefit the Australian livestock industry. CSIRO argued that their work would help keep back the frontiers of disease, that the research could be applied to diseases already in Australia, and that research was needed to improve diagnostic methods and vaccines and make them more reliable. These arguments do not bear close inspection. Research on endemic diseases can be performed much more cheaply in ordinary laboratories, and does not need maximum security. The frontiers of disease can be held back just as effectively from within the affected country. And, ironically, if Australia made a breakthrough which facilitated eradication or reduced the incidence of Foot-and-Mouth disease in other countries, then this would disadvantage Australia's trading position by creating disease-free export competitors.

The training function also grew in this climate of cost justification. Originally confined to training laboratory staff, the Commonwealth-States Veterinary Committee expanded the training function to include training of field workers. This no doubt reflected its members' values and interests and their responsibility for field diagnosis. Training of field staff, however, required quite different facilities from training laboratory staff in diagnostic techniques. These included large animal accommodation, facilities where animals could be safely infected with various diseases, facilities for observing the symptoms and providing 'hands-on' experience for trainees, and facilities for ultimately destroying the infected animals safely. All of these provided a security headache. Furthermore, it was not made clear who would be responsible for this function or even how it would operate, given the reassurances that live virus would not be imported into the laboratory prior to an outbreak of the disease!

Economic factors played an important role in the shaping of the laboratory from the earliest discussions when the idea of separate units attached to each State laboratory was rejected in favour of a centralised facility. Once the centralised facility was agreed upon, the functions proposed grew to justify what was now recognised to be a costly venture.

But these functions grew in particular directions, supporting and reinforcing the claims of the groups competing for control, and placating others. Matters were further complicated by moves to establish a high security quarantine station, and a veterinary bureau within the Department of Primary Industry. Both of these proposals had significant implications for the quarantine testing function and for the administration and control of the laboratory.

The final proposal which, after many re-drafts, was referred by Cabinet to the Parliamentary Public Works Committee for approval in 1974 was for a centralised maximum security animal health laboratory at Geelong. The functions proposed were diagnosis, including testing of imported livestock, research, training of both laboratory and field workers, and vaccine production and testing. The Public Works Committee concluded that there was a need to establish the laboratory and that these functions were appropriate.

The submissions to the Public Works Committee have no indication of the bureaucratic competition and departmental territorialism, or of the negotiations, bargaining, adjustments and consensus formation which had occurred, or of any of the external and non-scientific factors which had shaped the proposal. Instead, rational scientific arguments were constructed to justify the laboratory and its functions. These arguments appealed to consideration of the 'public good' and avoided any suggestion of the narrow self-interest exposed here. All uncertainties, value judgements, and opposing views or alternatives also disappeared. The rather messy and untidy reality of the decision-making process was replaced by a *post hoc* reconstruction with no hint of the political, economic or social factors which had influenced the final outcome.

CONCLUSION

The Australian Animal Health Laboratory was publicly presented as a technical answer to a scientific problem — a rational, scientific and, what is more, almost inevitable response to an obvious problem. This paper presents a quite different view. In the first place it shows how the definition of the problem, which in turn influenced the type of solution proposed, reflected the perceptions, preferences and interests of a small group of veterinary scientists. The exclusion of farmers and others from the decision-making process meant that alternative ways of defining and dealing with exotic animal diseases were not adopted. Economic factors also played an important role in shaping the laboratory. The decision to establish a centralised laboratory, despite the fact that there were scientific arguments which favoured the improvement and extension of existing State facilities, was an economic decision. Considerations of cost, and later, the power and prestige associated with an ultra-modern high-technology facility, appeared to favour a centralised facility.

As discussions about the laboratory continued, bureaucratic politics and individual aspirations became important considerations as departments and organisations promoted and protected their interests. As Painter and Cary have noted, there are pressures on departments to capture new territory and prevent any encroachment on existing responsibilities.[35] As the interested parties struggled to prevail in the bid for control of the laboratory, functions were added, extended and elaborated to support the various claims. In order to convince the government of the need to establish such a expensive facility, a variety of arguments supporting the laboratory were collected. However, these arguments did not always bear close scrutiny, nor were alternatives sought or evaluated. The inclusion of vaccine production provides an example of how scientific considerations were overruled by political ones and how alternatives were rejected.

In fact, it could be argued that actual scientific and technical considerations were of secondary importance in shaping the laboratory. The decision to build it did not depend on, nor was it a result of some technical expertise or innovation. Much of the technology required was developed only after approval for the laboratory was obtained. In other words, the technology was not seen as a factor which constrained plans in the same way that economic or political factors did.

In 1981, during construction of AAHL, farmers learned that it was intended to import live Foot-and-Mouth Disease virus into the laboratory despite earlier reassurances that this would not occur. The ensuing public debate led to a questioning of the need for the laboratory and the need for it to perform all of its approved functions.

In attempting to answer these criticisms, the proponents tried to claim, as they had done at the Parliamentary Public Works Committee Inquiry in 1974, that the laboratory and its functions were a scientific and technical necessity. However, as the debate continued and 'oustide' scientists became involved, it became clear to farmers and other interested parties that the establishment of the laboratory had emerged from social choice and not technical necessity. The outcry from farmers was a protest against their exclusion from this process.

In the case of AAHL, the decision-making process had been confined almost entirely within the bureaucracy, and thus the laboratory was shaped in an artificially constrained environment reflecting only the interests of those in control of the process. Cries for greater public participation in decision-making come from a desire that all interested parties participate in the shaping process. If this were to happen, the resulting technology may come closer to reflecting the needs, values and interests of all the relevant groups in society and not just those able to determine, control and manipulate the shaping environment.

NOTES AND REFERENCES

1. D. MacKenzie and J. Wajcman (eds), *The Social Shaping of Technology: How the Refrigerator got its Hum,* Open University Press, Milton Keynes, 1985, p. 2.
2. J. Law, 'The structure of sociotechnical engineering: A review of the new sociology of technology', (unpublished draft, 1986).
3. This can sometimes be a decision not to make a decision!
4. G.T. Allison, *The Essence of Decision,* Little Brown, Boston, 1971, p. 146.
5. A. Pacey, *The Culture of Technology,* Basil Blackwell, Oxford, 1983, p. 3.
6. *op. cit.,* p. 3.
7. T.P. Hughes, *Networks of Power: Electrification in Western Society 1880-1930,* Johns Hopkins University Press, Baltimore, 1983.
8. For discussion of this see MacKenzie and Wajcman, *op. cit.,* p.295.
9. A number of these detailed studies have begun to appear; for example, T.P. Hughes, *op. cit.,* B. Latour and S. Woolgar, *Laboratory Life,* Sage, London, 1979. See also MacKenzie and Wajcman, *op. cit.,* for bibliography.
10. B. Latour, *Science in Action: How to Follow Scientists and Engineers Through Society,* Open University Press, Milton Keynes, 1987.
11. Dr Kesteven was Australian delegate at FAO conferences and consultant to the Department of Primary Industry. He returned to Australia for four weeks each year to visit various laboratories and government departments to transfer information on the international scene. [Personal interview 4/6/84].
12. Department of Health, Agenda Paper for Standing Committee, 19 December 1963.
13. *ibid.*
14. Australian Agricultural Council 63, *Agenda Item* 39(a), June 1963.
15. Exotic Diseases Committee, *Report,* 9/3/64.
16. B. Latour, 'Give me a laboratory and I will raise the world', in K. Knorr-Cetina and M. Mulkay (eds), *Science Observed: Perspectives on the Social Study on Science,* Sage, London, 1983, p. 144.
17. A. Mozley Moyal, 'The Australian Atomic Energy Commission: a case study in Australian science and government', *Search,* 6, 9, September 1975, p. 366.
18. A. Pierce, Letter to Walter Ives, Secretary of DPI, 9/10/70, p. 2.
19. Dr Gregory, Pierce's predecessor, was opposed to the idea of a centralised laboratory, favouring instead the building up of State laboratories. He also argued that the matter of establishing a centralised laboratory was "getting a little out of proportion" since quarantine was efficient and liaison with overseas laboratories well established. [Report of AVA Annual Conference, Alice Springs, 31/5/64-6/6/64, p. 17].
20. A.E. Pierce, 'A Review of Current Activity in Relation to the Future of the Division of Animal Health', paper prepared for the CSIRO Executive, 9/3/72, p. 9.
21. *ibid,* p. 2.
22. Cattle Council of Australia, Annual Conference, *Report,* April 1981.
23. A.E. Pierce, Letters to J. Price (CSIRO Chairman) 17/9/70 and 21/7/71, pp. 1-2.
24. A. Pierce, *Maximum Security Laboratory — Meeting at Parkville, Report,* 13/1/71, p. 1.
25. A. Pierce, Letter to J. Price (CSIRO Chairman), 21/7/71, pp. 1-2.
26. A. Pierce, Letter to J. Price (CSIRO Chairman), 21/7/71, p. 2.
27. A.E. Pierce, Letter to J. Price (CSIRO Chairman), 21/7/71, p. 4.
28. During Gorton's Ministry (January 1968-March 1971), Anthony was Minister for Primary Industry and Forbes was Minister for Health. Prior to becoming Prime Minister, Gorton was Minister for Science & Education, a portfolio he retained until handing it over to Bowen. Fraser was Assistant Minister for Science & Education, eventually becoming Minister during this period. From March 1971 to December 1972, the period of McMahon's Ministry, Primary Industry passed to Sinclair, with Anthony becoming Deputy Prime Minister. Health passed to Greenwood and then Anderson, and Science and Technology to Fairbairn and then Fraser again. [*Australian Parliamentary Handbook,* 19th ed. Aust. Gov. Pub. Service, 1975].

29. A. Pierce, *Meeting on National Institute for Animal Diseases,* CSIRO internal file document, 19/10/70, p. 2.
30. A. Pierce, Letter to W. Gee, 21/4/72.
31. M. Painter and B. Cary, *Politics Between Departments,* University of Queensland Press, 1979, p. 75.
32. *ibid.*
33. Standing Committee on Agriculture 82, *Agenda Item* 26, pp. 198-199.
34. *ibid.,* p. 199.
35. M. Painter and B. Cary, *op. cit.*