

# Re-negotiating Science in Environmentalists' Submissions to New Zealand's Royal Commission on Genetic Modification

TEE ROGERS-HAYDEN

*Centre for Environmental Risk  
School of Environmental Sciences  
University of East Anglia  
Norwich NR4 7TJ, UK  
Email: t.rogers-hayden@uea.ac.uk*

JOHN R. CAMPBELL

*Department of Geography  
University of Waikato  
Private Bag 3105, Hamilton, New Zealand  
Email: jrc@waikato.ac.nz*

## ABSTRACT

The debate about genetic modification (GM) can be seen as characteristic of our time. Environmental groups, in challenging GM, are also challenging modernist faith in progress, and science and technology. In this paper we use the case of New Zealand's Royal Commission on Genetic Modification to explore the application of science discourses as used by environmental groups. We do this by situating the debate in the framework of modernity, discussing the use of science by environmental groups, and deconstructing the science discourses evident within environmental groups' submissions to the Commission. We find science being called into question by the very movement that has relied on it to fight environmental issues for many years. The environmental groups are challenging the traditional boundaries of science, for although they use science they also present it as a culturally embedded activity with no greater epistemological authority than other knowledge systems. Their discourses, like that of the other main actors in the GM debate, are thus part of the constant re-negotiation of the cultural construct of 'science'.

## KEYWORDS

Genetic modification, environmental groups, Royal Commission, modernity, science

## INTRODUCTION

The emergence of environmental groups in the latter part of the twentieth century is characteristic of the emergence of new social movements associated with postmodernity. Environmentalism may be seen as a critique of modernity in that it draws attention to the environmental costs of industrial progress and technological development (Beck, 1992). From this perspective environmentalists have challenged the scientific underpinnings of contemporary industrial society. A crucial element in the environmentalist critique of modernity has, however, been scientifically derived information. Given that science itself is a key component of the modernist project, this approach seems inherently contradictory. Within this challenge to modernity science occupies a dual position, being 'co-constructed' (see Irwin, 2001), as it is both a product of the structures of modernity and its boundaries are constantly re-negotiated as it is debated within a variety of discourses. In this paper we examine an environmental debate in Aotearoa/New Zealand, and in particular the discourses used by environmental groups against genetic modification (GM) in a public inquiry on the issue. We highlight the contradictions in the environmentalist arguments, which are on the one hand heavily dependent upon reductionist,<sup>1</sup> modernist science and on the other hand critical of its hegemony and dependence on rationality.

## BACKGROUND

Aotearoa/New Zealand presents an interesting context for an examination of environmental issues. On the one hand Aotearoa/New Zealand has developed an image of having a positive environmental record. This reflects the country's low population density, agricultural rather than industrial economy, and high rainfall, which renders much of the countryside visually verdant and fertile. Additionally, the stance of successive governments against visits by nuclear powered or armed ships (enshrined in legislation) and the rhetoric surrounding the Resource Management Act (1991) (one of the country's most far-reaching laws) which is ostensibly based on the notion of sustainability, have contributed to this image (Bührs and Barlett, 1993). Aotearoa/New Zealand likes to present itself as a 'clean and green' paradise located safely at the other end of the world, far from the threats of industrial pollution and environmental danger (Tong and Cox, 2000). A strong tourism industry has emerged and agricultural exports are portrayed as safe from mad cow and foot and mouth diseases.

On the other hand, Aotearoa/New Zealand has adopted a very strong pro-market approach to its economic and social policies, with a steady reduction in government intervention over the past one and a half decades. Government funding of research has also been significantly modified with a move towards

autonomous government-owned research institutions based on a private sector model, more competition among applicants for government funding, and a bias towards financing research outcomes that are perceived as providing greater economic benefits (Office of the Minister of Research Science and Technology, 1996). Within the rhetoric of science and capitalism that has emerged is the notion of the 'knowledge economy', which is presented as a key element for a successful future (Minister of Research Science and Technology, 2001). While this term has gained widespread currency it is only vaguely defined. It seems clear, however, that its two main components are seen as being information technology and biotechnology. Accordingly, there is powerful support, both in government and the private sector, for research involving genetic modification.

New Zealand's general elections in 1999 produced a change in government from one led by the National Party, which is from the centre-right, to Labour, a party which claims to be from the centre-left but which has keenly supported the neoliberal economic policies of its predecessor. While the Labour party was in coalition with the smaller Alliance party (perhaps a more traditional social democratic party) it still did not form a majority government. The balance of power was held by the Green Party of Aotearoa New Zealand, which, during the election campaign, demanded a royal commission into genetic modification. The Green Party, while not part of the government, pledged not to unseat it by supporting votes of no confidence against it. It was in this context, that soon after it came to power, the new government announced that it was establishing a royal commission to enquire into the role of genetic modification in Aotearoa/New Zealand. The Royal Commission on Genetic Modification (RCGM) formally began on 8 May 2000.

As part of the Royal Commission process submissions were sought from interested parties. These included a number of environmental groups who were strongly opposed to the use of genetic modification. The Royal Commission provided an excellent opportunity to examine environmentalist discourses on genetic modification.

### *The Royal Commission on Genetic Modification*

The Royal Commission on Genetic Modification is said to be a world first, and specialists from around the globe presented evidence, in person and via video link. Nationally, it was a political focal point. The Commission was given just over a year, followed by an additional two month extension (until 27 July 2001), to report its recommendations to the government.

The Commission was required to

*... receive representations upon, inquire into, investigate, and report upon the following matters:*

1. the strategic options available to enable New Zealand to address, now and in the future, genetic modification, genetically modified organisms, and products; and
2. any changes considered desirable to the current legislative, regulatory, policy, or institutional arrangements for addressing, in New Zealand, genetic modification, genetically modified organisms, and products (Royal Commission on Genetic Modification, 2001).

The Commission's investigation was based on evidence gathered from public meetings, written submissions from the public, *hui* with Maori (meetings with the indigenous peoples), and written and oral submissions from groups granted the status of 'interested persons' (IP). The findings of the RCGM provided non-legally binding recommendations for the government.

#### *Submissions to the Royal Commission*

This study focuses on the submissions of five environmental groups that were all formally recognised by the commission as interested persons. To gain IP status a group must have proved that it had an 'an interest in the inquiry apart from any interest in common with the public' (Royal Commission on Genetic Modification, 2001). These groups were invited to provide written submissions and oral presentations to the commission, face cross-examination, and had the opportunity to apply to cross-examine other IPs. The written submissions from these environmental groups (and for all other IPs) have been placed on the commission's website.<sup>2</sup> These groups were invited to complete their written submissions following a template provided, which is also accessible on the website. These written submissions, which total approximately 300 pages, are deconstructed in this paper.

#### *The Groups*

The written submissions from the four largest, most prominent environmental groups addressing GM at a national level, and one group with a local focus, are analysed. These groups are:

- Environment and Conservation Organisations of New Zealand (E.C.O.) (an umbrella organisation focusing on environmental preservation and management);
- Friends of the Earth (New Zealand ) Ltd (F.o.E.);
- GE Free New Zealand (Revolt Against Genetic Engineering (GE) in food and the environment Incorporated – R.A.G.E.) (an umbrella organisation formed to address GM);

## RENEGOTIATING SCIENCE ...

- Greenpeace New Zealand (Inc.); and
- Nelson GE Free Awareness Group (a group specially formed to address the needs and views of residents of the Nelson area).<sup>3</sup>

Each submission was analysed for discourses about science, with recurring discourses across the submissions then being grouped into 'like-minded' categories. The groups are, however, not mutually exclusive - as groups or presumably in individual membership. E.C.O., for example, represents 63 groups, two of which are F.o.E. and Greenpeace. Similarly, GE-Free New Zealand was established as an umbrella organisation to address GM (R.A.G.E.), and their membership includes Fo.E., Greenpeace and the Nelson Environment Centre (from which the Nelson GE Free Awareness Group developed) (Claire Southward, personal communication, 2001).

The RCGM saw an extraordinary level of co-operation among the environmental groups and their members, especially given that these groups rely mainly on volunteers who worked long hours to meet deadlines. This included some of the groups sharing some witnesses. For example, one individual provided a witness brief on behalf of six separate organisations two of which were F.o.E. and Greenpeace. It is also possible that this co-operation has led to submissions which are not mutually exclusive in authorship.

#### CONFRONTING MODERNITY AND THE BOUNDARIES OF SCIENCE THROUGH DISCOURSE

Science within the discourses of the environmental groups to the RCGM can be viewed, to use Alan Irwin's (2001) term, as a process of 'co-construction'. This is because the discourses form a dialectical relationship with societal structures, being both influenced by, and influencing, modernity. At the same time the controversy about GM involves debates about what is and is not science – renegotiating the cultural construct of 'science'.

##### *Modernity and Science*

The controversy over genetic engineering and the consequent Royal Commission can be viewed as characteristic of actions within what Ulrich Beck (1992) describes as second modernity. Second modernity is the transitional stage between industrialised society and reflexive modernisation. Whereas industrialised society, otherwise called modernity, was concerned with the production of goods, reflexive modernisation, otherwise called risk society, is concerned with the production of risks. This period between modernity and risk society is one where the systems and ideologies of modernity are no longer able to cope with

the consequences of modernity. Environmental issues and protests such as those surrounding GM exemplify this clash (Beck, 1992). The modernist ideologies of unquestioned faith in progress, science and technology, have led to increased environmentally threatening industrial production and inadequate critical facilities to address them.

These modernist ideals can be traced back to the Enlightenment project which included the industrial and scientific revolutions (Shiva, 1989). This was a period of rapid and significant organisational, technological and intellectual change. One of the key elements of this was the transformation of the structures of knowledge. Enlightenment saw the entrenchment of hierarchical dualisms. Such dualisms as mind and body and nature and culture, saw the institutionalisation of mind over body and culture over nature (Plumwood, 1993). Bronislaw Szerszynski (1996) describes the effect of this on language, as a change in the relationship between thought and truth. He describes this as disembodiment of language from nature – which is found in scientific discourses. This separation of language from nature enabled the development of modern science, as language is used to ‘objectively’ describe nature. These developments were embedded within the change of social relations in which reliance on tradition, as the foundation of knowledge, was replaced with a new dependence on rationality. This new knowledge base consisted of faith in unlimited economic development (progress) and modern science.

Modernist faith in progress, science, and technology remained during the prosperous period following World War Two (Nelkin, 1995), but by the 1960s and ’70s critiques of modernist principles developed and grew. The universalised position of science as a knowledge system was questioned by postmodernist and feminist scholars. These critiques of modernity showed that rationality is created by culture, and conversely, that rationality shapes culture (Feenberg, 1995). This mutual constitution of rationality and culture is discussed in regards to power relations by Harmke Kamminga (1995), who proposes that discussions about what constitutes knowledge are contests for power. Thus, it is necessary to address why science is viewed as superior and not merely equal to other knowledge systems, and why this construct of knowledge has been upheld by the established power structures for nearly two centuries. Sandra Harding (1996, p.15) identifies similar linkages, drawing attention to the relationship between knowledge and institutional power by arguing that ‘...the “order of knowledge” has also been the “order of society”’.

Science, therefore, has a very powerful position. Bobby Sayyid and Lillian Zac (1998) identify two criteria necessary for a discourse to be hegemonic. Firstly, it succeeds in making its own rules appear to be the ‘natural’ rules. Secondly, it contributes to the deactivation of projects against it. Part of the seemingly ‘natural’ entrenchment of science as the highest form of knowledge involves the belittlement of other knowledge systems and their discourses. The dominance of scientific discourses can be attributed in part to the separation of

the 'rational' from the 'romantic' in modernity (Grove -White et al. 1991). This has led to non-scientific discourses being labelled as irrational and/or emotive and thus dismissible.

### *The Boundaries of Science*

Hegemony describes power relations; it is the unstable but constant equilibrium built on subordination of groups and classes who are constantly struggling against this status quo (Fairclough, 1992). This effect is a dialectical struggle for social change in which people are both influenced by, and influence, discursive practices. Therefore, hegemony can never be complete, and resistance discourses which attempt to subvert hegemonic discourses have the possibility of success. Science as a hegemonic knowledge system is therefore constantly under re-negotiation.

This hegemonic representation of science as the highest form of knowledge, deserving of epistemological authority is challenged within 'science and technology studies' (STS). Science and technology studies are used to view science as culturally embedded like other forms of knowledge. Scientific ways of knowing are not automatically privileged over other knowledge systems, instead they are seen as cultural constructs constantly being re-negotiated (see Cozzens and Woodhouse, 1995; and Irwin, 2001).

One of the effects of this perspective is that it allows for a new way of valuing lay knowledges in disputes. Rather than assuming that science can 'objectively' represent the environment the constructionist approach of STS enables researchers to investigate what counts as 'knowledge', and how the knowledge claims are constructed and defended in a controversy (Irwin, 2001). This approach has been used to counter the hegemonic 'deficit model', in which the disparity in perspectives presented by the publics<sup>4</sup> and scientists is accounted for as a deficit in understanding of the 'real' issues as understood by scientists (Cozzens and Woodhouse, 1995). This traditional perspective denies the knowledges of the publics and instead frames controversies in technical terms - reinforcing the polarisation (Irwin, 2001; Michael, 1996; Wynne 1989). The publics are thus seen as needing more 'education' to bring their views closer to that of the scientists.

It has been suggested that since science became a public discourse powerful elites have been concerned about the 'public understanding of science'. Brian Wynne suggests that: 'A common thread has been anxiety among social elites about maintaining social control via public assimilation of "the natural order" as revealed by science' (p. 361). When the publics challenge this construction of science re-negotiating what counts as legitimate knowledge these elites often label the publics as 'anti-science' (Wynne, 1995). However, it has been suggested that such attempts to negotiate 'science' should more correctly, according to a constructivist view, be called 'pro-knowledge' because these are attempts

to revalue marginalised knowledges that science has excluded as opposed to devaluing science (Cozzens and Woodhouse, 1995; Wynne, 1995). An important point within this discussion Irwin and Wynne (1998) emphasise is that it doesn't set up a 'homogeneous science' versus a 'diverse public' dichotomy, but rather an acknowledgment that all knowledges are socially situated. What does and does not count as 'science' is therefore constantly re-negotiated. This struggle of redefinition is referred to by Thomas Gieryn (1995; 1999) as boundary work.

Boundary work can allow the investigation into the cognitive authority science holds, when describing nature – or in this case GM, without according to it essentialist qualities. Gieryn describes viewing science as a cultural construct:

When considered as a cultural space constructed in boundary-work, science becomes local and episodic rather than universal; pragmatic and strategic rather than analytic or legislative; contingent rather than principled; constructed rather than essential (Gieryn, 1999, p.27).

Disputes over technologies involve the renegotiation of the boundaries of science as what is legitimate knowledge is inevitably debated, along with questions about who should 'speak for nature'. Thus boundary work occurs in disputes over credibility (Gieryn, 1999). Within disputes, adversarial groups are involved in the manipulation of the boundaries of science to legitimate their beliefs about reality in order to achieve provisional epistemic authority. With this comes credibility and influence (Gieryn, 1999). This is also how the authority of science can be reproduced within debates. Science has endured partly due to its flexibility in the attributes assigned to it.

It is exactly this pliability and suppleness of the cultural space 'science' that accounts for its long-running success as the legitimate arbiter of reality: science gets stretched and pulled, pinched and tucked, as its epistemic authority is reproduced time and again in a diverse array of settings (Gieryn, 1999, p.xi).

Science's cultural dominance can thus, in addition to its hegemonic role of appearing as 'natural' and deactivating projects against it, also be attributed to its flexibility as a cultural construct, and epistemological authority is reproduced over time and in different situations.

### *Environmental Groups Confront Modernity and Science*

Environmental groups are confronting the consequences of modernity by challenging the modernist faith in progress, science, and technology as they are manifested in GM. In this debate they are also contesting the boundaries of science as they dispute knowledge claims about GM.



Susan Cozzens and Edward Woodhouse (1995) suggest that despite the centrality of contesting hegemonic knowledge systems to social movements, these movements generally did not set out with such goals. Instead, citizens find that the very observations that triggered their protests, such as local visible pollution, are discounted when they contradict scientific evidence. Cozzens and Woodhouse refer to the women's health movement, the alternative health movement and deep ecology, as having developed such a critique of professional knowledge and having gained an understanding of the political implications of science.

Even with the development of these movements and their critiques of science as a knowledge system, the relationship between science and the environmental movement is not clear. Despite social movements, such as environmental groups, being seen by Beck (1992) as agents of reflexive modernisation, environmental groups have a unique and intimate relationship with science compared to other social movements (Yearley, 1994). Although other social movements have also relied heavily on science to win their arguments, the difference is that some environmental problems (such as stratospheric ozone depletion) are only perceived through science (Yearley, 1994). At the same time environmentalists may have misgivings about science because it contributed to the creation of many of the environmental problems in the first place (Yearley, 1992).

Although environmental groups have emerged in different ways around the world (Yearley 1995), on the whole, they have developed a tradition of using science in their campaigns (Grove-White and Szerszynski, 1992; Hannigan, 1995; Wynne, 1982; Yearley, 1991; 1994; 1997). Steven Yearley (1997) contends that British environmental groups have become increasingly reliant on science. Even the more radical groups that have reservations about science have followed the more conservative groups in using scientific arguments for the environment (Yearley, 1992). Across a variety of issues from global warming to the release of genetically engineered organisms, environmental groups have used science as a source of authoritative advice (Yearley, 1995).

Despite the apparent popularity of using science, it is not an unambiguous option for environmental groups. Science may be helpful when dealing with authorities who use rational arguments and may respond better to scientific claims than discourses with a spiritual or moral basis (Yearley, 1992). However, there are also limitations to using science. Yearley (1996) proposes that the use of science by environmental groups, whether critically or uncritically employed, is problematic.

Groups may embrace the supposedly disinterested and universalistic charters of science; they are then ill prepared for cases when the authority of science is not robust under legal or political pressure. Alternatively, they can adopt a critical and sceptical approach to science as a form of knowledge. But this leaves them in an

interpretive fix when they want to support the judgements of the expert panels or official scientific agencies, since they have only ad hoc ways of distinguishing between the science they support and the science they don't (p. 200).

The use of science against science questions the epistemological authority of science. According to Beck (1992) this is a necessary step towards being reflexive. However, inconclusive scientific proof has often been used by authorities to justify not taking action (Yearley, 1994). There is also the risk that environmental groups will try to win the argument solely through the use of science when environmental problems have a much broader providence than science alone (Yearley, 1994). Therefore multiple approaches appear more appropriate given the multi-faceted nature of environmental problems (Yearley, 1992).

The framing of environmental problems as objective problems marginalises concerns such as those of a religious and/or philosophical nature (Grove-White and Szerszynski, 1992; Wynne, 1995). Robin Grove-White and Bronislaw Szerszynski (1992) suggest that this can be attributed to the rationalist (public) and romantic (private) discourse split brought about with modernity. As a result, discourses that are not science based are deemed 'private' concerns. A consequence of this has been that public discourses on environmental issues, in showing a lack of attention to the way social and cultural values are part of the debate, have contributed to a shift of public attention away from the human related activities that embody the environmental crisis (Grove-White and Szerszynski, 1992). The rationalisation of debate on environmental issues serves the interests of governments, which are happy to see the focus of such debates framed in politically 'neutral' terms (Grove-White, 1993; see also Hindmarsh, 2001). Wynne describes this as ritualised rationality. Governments often want to make issues immune from contestation and the use of 'objective' authority is often useful for this (Wynne, 1982).

This rationalisation of environmental debates is being both upheld and challenged in regards to debates about genetic engineering. Grove-White (1996), commenting on the construction of the debate on genetic engineering in Britain, suggests that the debate has generally been limited to discussion of the physical risks of releasing genetically modified organisms (GMOs) into the environment. Such an emphasis, on physical environmental effects, replaces discourses on the social and cultural issues 'simply because of the relative digestibility of their "realist" idioms to established political institutions' (Grove-White, 1996, p.277; see also Wynne, 1982). This elision of sociological, religious, minority, ethical and political concerns acts to conceal public concern about GM. Interestingly, the environmental groups addressing the issue in Britain (Green Alliance and Greenpeace) have similarly generally stayed within this 'physical risks' debate (Grove-White, 1996).

However, John Hannigan (1995) suggests that the debate about recombinant bovine growth hormone (rBGH), challenges 'scientific entrepreneurship' as causing the problem. Thus, environmentalist opposition to rBGH is based more on ethical and economic grounds than scientific evidence. A contributing factor to this use of non-scientific discourses is that there is considerable uncertainty surrounding many of the risks associated with rBGH. This is similar to the risks associated with GM. Deconstructing the scientific discourses used by environmental groups, in the RCGM will provide another opportunity to explore the possibility of GM being a case to challenge the hegemony of science. This approach will involve analysing how the boundaries of 'science' have been contested by the environmental groups. This investigation will use a discourse analysis of the groups submissions to the RCGM.

### *Discourse Analysis*

Discourse analysis involves the examination of the role of discourse within hegemony. It means analysing not only the ways in which discourse upholds hegemony, but how it challenges it. Challenges to hegemony present themselves as inconsistencies and contradictions within discourses.

The relationship between language and social change can therefore be explored through discourse analysis. There are a multitude of approaches to discourse analysis. In contrast to the traditionally linguistically based theories of discourse analysis Norman Fairclough (1992) proposes a multi-dimensional framework for discourse analysis in which the ideologies embedded in text are also seen as existing within a wider social context. In taking this approach Fairclough combines both traditional linguistic discourse analysis with social analysis, creating a social theory of discourse.

Fairclough's model of discourse consists of three concurrent elements: text, discursive practice, and the social and historical context. Text is situated within the context of discursive practice, which, in turn, is part of social practice. Text may be written material or spoken conversations, which, once transcribed, can be deconstructed. Fairclough refers to this as formal discourse analysis. He stresses that texts provide 'meaning potential' which is interpreted. The meaning potentials are often diverse and even contradictory. As such, texts are open to multiple interpretations. Text cannot be separated from its production, distribution and consumption – the discursive practice. These differ according to social factors. The production of a text may be the result of a collective effort such as a newspaper, or an individual endeavour. Text may be distributed as a causal conversation or political speech. It may be consumed like a love letter, or a cookery book. Discursive practices operate within the larger social practice. For Fairclough, social practice involves discourses operating within a hegemonic

power struggle. Discourse analysis is therefore a way of investigating power struggles through analysing language, its production and its context.

Fairclough's schema is useful for analysing the environmental groups' submissions to the Royal Commission. In this paper we use submissions to the RCGM available on the World Wide Web as the text. The submissions to the Royal Commission operate as arguments from environmental groups to the government. The necessity for these submissions to be persuasive to the structures of power, and the advantages and disadvantages of using science to do this forms the discursive practice of these submissions. Environmental groups' submissions confront the consequences of modernity. Science as a hegemonic knowledge system thus forms the social practice of the submissions. In this paper the discussion on 'Modernity and Science' addresses the social practice and the discussion on the use of science by environmental groups, 'Environmental Groups Confront Modernity and Science', outlines the discursive field for the submissions. The following formal discourse analysis of submission texts for their discourses on science is the final element of what constitutes the 'discourse' on science.

## THE TEXTS

### *Heavy Use of Science*

Many of the texts contained a considerable amount of scientific evidence and for some it was predominant. This partially reflected the instructions in the format.<sup>5</sup> For example, the instructions for section B(b) are as follows:

B (b) the evidence (*including the scientific evidence*), and the level of uncertainty, about the present and possible future use, in Aotearoa/New Zealand, of genetic modification, genetically modified organisms, and products. (Royal Commission on Genetic modification, 2001, emphasis added)

In some of the submissions the evidence is presented as lengthy quotations from scientific journals. In a number of the submissions scientific material seems to dominate in terms of number of words and the confidence with which assertions are made. The texts from the five environmental groups analysed display a clear reliance on a modernist scientific approach in their submissions to the commission. In the process of the commission, these scientific arguments were contested by large scientific and legal teams representing the 'Life Sciences', a group of pro-GE corporations and research institutions.<sup>6</sup> However, the environmental groups also employ a number of discourses that challenge the hegemony of modernist science, and act to re-negotiate the boundaries of science.

*Science Discourses*

The critique of science as instrumental in the creation of environmental problems, rather than merely offering a solution to them, as discussed above, is evident in the following passage by the Nelson GE Free Awareness group (2000):

The people of New Zealand are being offered a technology that promises undreamt of solutions to the problems that beset the people of this planet in the 21stC. These problems have been caused in the main by previous technologies and the demand for continued growth in economies (p.1).

Genetic engineering and the related technologies are presented as part of a system that contributes to the environmental degradation that GM is claimed to help alleviate. They are seen to be on 'offer', implying choice in the matter and the opportunity to reject GE. In the quote the proposed technological solutions are said to provide 'undreamt of solutions', connoting a fantasy like quality of the promises, inferring that GM cannot deliver such complete solutions. The quote, then, suggests that not all scientific discourses are indeed rational and that technology cannot be separated from the philosophies that demand a quest for economic growth. Thus, GM is not independent but part of a system of philosophies that embrace both science and economics. These philosophies are seen as contrasting with environmental care and instead as leading to environmental destruction, which will lead to more technological 'solutions' being sought.

The linking of modern science and industrialised environmental problems could be seen as a factor in the environmental groups being referred to as anti-science during the debate on GE. Greenpeace (2000) seeks to pre-empt accusations of being modern-day Luddite in their submission in the following quote:

Critics of genetic engineering have also been dismissed as 'anti-technology'. Yet many of these critics, including Greenpeace, are not anti-technology per se, but are for appropriate technologies, and are committed to the vision of an ecologically sustainable society in which technologies will play an important role (p.66).

Greenpeace address their critics by moving beyond the anti-technology, pro-technology dichotomy. In doing this they challenge some of the presumptions on which technoscience is based. Greenpeace are contesting the notion of neutral technologies that are merely used inappropriately, proposing instead that technological endeavours incorporate and reproduce values. Accordingly, current science and technology (of which GM is part) is seen as reproducing an ecologically non-sustainable society – from this perspective it is perceived as an inappropriate technology.

The environmental groups' discourses in challenging the ability of science to provide 'the' solution to environmental problems also challenges the view that

science is the only valid approach to environmental problems. The groups' critique of science includes within it the post-modernist approach that science is just one value and/or knowledge system. All the groups stressed the need to include ethical, cultural, social economic and scientific factors for consideration. Nelson GE Free Awareness Group (2000) even proposed that 'a properly balanced perspective allows equal weighting for environmental, spiritual, health and other viewpoints' (p. 19). This is a radical call, as it suggests that science should have no more influence on decisions for regulation and legislation on GM than, for example, concerns that it may be spiritually offensive to mix the DNA of different species. This view was also expressed by some Maori (indigenous peoples) in their submissions to the Commission.

Such a challenge to the structure of knowledge, and thus of society, also confronts the hegemonic elevation of the 'expert scientist' and consequential dismissal of public knowledge, as was highlighted in the following passage by Greenpeace:

Yet public concerns have often been unhelpfully and erroneously dismissed as 'emotional'. Nor is it a constructive response to conclude that public opposition is due to ignorance of what the technologies involve. Few people of this country could have described the process involved in nuclear fusion, yet their deep concern about nuclear technologies led to the banning of a technology that is widely held to carry singular threats to the environment. (2000, p. 66).

In this passage they reject the notion that it is necessary to scientifically understand a process or technology to have a valid opinion about (or objection to) it. Thus, once again, lay knowledge is presented as equal to scientific knowledge. The quote may also be seen as a reaction to the modernist separation of scientific knowledge (deemed rational) from all other knowledge (deemed irrational), by highlighting how the public's concerns were discounted as emotional.

In summary, the groups attempted to 'redraw' science as a culturally embedded activity, rather than a neutral activity separate from all other aspects of society. Thus science was presented as part of a system of philosophies which creates technologies – many of which lead to environmental problems that in turn further technologies are employed to solve. They presented a 'pro-knowledge' approach suggesting that science should be one contributor to a vision that will lead to an ecologically sustainable society. It follows then, that, a range of knowledges are seen as equally valid.

## FINAL COMMENTS

The general approach taken by the Aotearoa/New Zealand environmental groups could be described as one approach among many. The first approach they

could have taken is that identified by Grove-White (1996), of environmental groups relying solely on modernist science to fight GM. However, unlike the British situation that Grove-White describes, the RCGM template did have provision for non-scientific responses, such as those on the public interest aspect of GM, including cultural and ethical concerns. All of the environmental groups chose to take up this option rather than exclusively use the rational/scientific approach in their submissions.

The second tactic they could have used would have been to use purely romantic discourses, as Hannign (1995) reports happened in the fight against rBGH. This approach could be seen as anti-modernist – placing other value/knowledge systems as equal to science. However, Grove-White et al. (1991) suggest otherwise. They propose that such attempts to recover the ‘private’ and place it in the ‘public’ usually fail. This is because romantic discourses, in the practice of such debates, do not succeed in challenging modernist principles – but end up being used to reinforce the same rational/romantic split (Morris, 1991).

The Aotearoa/New Zealand environmental groups chose neither of these options. Instead they opted for a third, hybrid, approach in which rational science was both critiqued and used. Both rational and romantic discourses were employed. We will discuss the elements of this seemingly contradictory discourse before addressing its use as a tactic.

Following Fairclough (1992) the discourse utilised is constitutive of three elements: the text; discursive practice; and social and historical context. Firstly, despite employing modernist science, the texts show a strong awareness of the limitations of science, and the hegemonic role science occupies in western society. The groups attempted to subvert this hegemony in their discourse on science as just one value/knowledge system. They confronted the dominance of science, contesting its neutrality from industry and its role as the highest form of thought. In calling for equal weighting of citizens’ beliefs, values, and spiritual and ethical considerations they attempted to recover ‘the private’ (romantic discourses) which were excluded from argument in modernity. They were challenging the expert/layperson divide and opening up the possibility that citizen opposition to GM is enough for it not to proceed.

The second element of this discourse is the discursive field, where debates about environmental problems are subsequently seen as debates about knowledge itself – what and whose knowledge/values are counted as real and valuable. It is in this, the discursive field, where environmental groups can be seen as having attempted to persuade authorities. Here are situated the tradition of environmental groups using science, and the more recent development of some groups, reliance on romantic arguments, to oppose GM. This element is situated within the third element of the discourse where the social and historical context of the power struggle operates. This is the element of modernity, in which the rational–public and emotive–private discourse split leads to the elision of other



value and knowledge systems. Thus the environmental groups in engaging in the GM debate are confronting the structure of knowledge, and in Beck's (1992) terms being reflexive.

There are a number of issues that cannot be dismissed when considering the way the environmental groups presented their submissions, and the possible restrictions that these may have placed on them. Firstly, the way environmental groups generally advocated holistic science, yet still used the reductionist science they were critiquing, could be seen as a political move. They may have been trying to offer opposition to something and then still discuss the possibility of it happening. This may be deemed desirable if the group doubts their initial opposition will be sufficient to stop the course of things proceeding. In a similar vein and by way of example, some groups discussed their opposition to GM food and then suggested more comprehensive labelling of GM foods. Some may see this as a cop-out: if their first rejection of GM food was acted upon there would be no need to discuss GM labelling. However, it may be that the groups had little confidence that this would be the case and thus, pragmatically, put forward a fall-back position. This may also be seen partly as the rationale for the contradictory approach to science in the submissions to the RCGM. Groups may have offered a critique of science and anticipated that the RCGM would not deliberate on this, and thus proceeded to use scientific arguments to try to counter the GM science.

A second issue is that the use of 'science against science' does, as Beck (1992) suggests, challenge the definitive nature of science. However, the approach could be seen by some as undermining the environmentalists' potential for success. It is also possible that the characterisation of environmental groups, by GM proponents, as emotional and luddites, may have influenced their submissions. They may have feared receiving a similar reaction from the Royal Commission. Individual groups may also have feared all the other environmental groups appearing rational – marginalising themselves as fringe dwellers

A third issue to consider is the RCGM process. The timeline for submissions, and the length and detailed nature of the template, presented a serious challenge to environmental groups, which have limited resources in both volunteer power and funding.<sup>7</sup> Although none of the five groups completed every question on the RCGM template, the diversity of questions answered may have spread the energies of the groups thinly across material that the writers were not personally familiar with. It is also possible that mixed authorship may have occurred, contributing to the mixes in approaches.<sup>8</sup>

Additionally, the construction of the template, may have affected the submissions. Critical in the presentation of the submissions may have been the condition set by the RCGM that all answers were to be 'stand alone' answers. Despite this requirement some of the groups did provide slight variations to the template format. For environmental groups this requirement may have created a need to explain their alternative worldview for every question. This would have been tediously repetitive. It is unlikely writers would feel comfortable doing this



when there were already so many issues to cover in the submissions, and it is unlikely that readers would have persevered through the entire document if it was presented this way. The ability to start the submission by presenting an alternative worldview and then carrying on to situate each answer within this framework may have made a significant difference to the way environmental groups were able to articulate their opposition to GM. While scientists did not need to repeat their underlying worldview – it is naturalised as a hegemonic discourse – the approach employed by the Royal Commission handicapped opponents to GM because their views did not have such hegemonic purchase (see Rogers-Hayden and Hindmarsh, forthcoming).

To conclude, the approach taken by the environmental groups may have been influenced by a number of external and internal factors. Nevertheless the approach contested the boundaries of science and thus contested the order of society. Despite using science they also present it as a culturally embedded activity with no greater epistemological authority than other knowledge systems. Their discourses, like that of the other main actors in the GM debate, are thus part of the constant re-negotiation of the cultural construct of ‘science’.

## NOTES

This paper was prepared while Tee Rogers-Hayden was at the University of Waikato. Tee Rogers-Hayden’s doctoral research and related publications have been made possible by a University of Waikato Doctoral Scholarship, a 2001 Federation of New Zealand Graduate Women’s Fellowship and a 2002 Claude McCarthy Fellowship.

We also wish to thank Colin McLeay and Robyn Longhurst for their insightful remarks on earlier drafts of this paper, and the anonymous referees for their helpful comments. We are particularly appreciative of the referees’ suggestions pertaining to the boundaries of science.

<sup>1</sup> Reductionist refers to the concept that a complex system can be abstracted and comprehended through the isolation and analysis of an aspect of that system (see F. Capra, *The Web of Life: A New Synthesis of Mind and Matter*, London, 1997.)

<sup>2</sup> The RCGM website is <http://www.gmcommission.govt.nz>

<sup>3</sup> Nelson is located in the north of the South Island of Aotearoa/New Zealand.

<sup>4</sup> The plural to ‘the public’, ‘publics’ are referred to in order to highlight the diversity of public opinion rather than give the impression of a homogeneous ‘public’ (see Irwin, 2001).

<sup>5</sup> For a further discussion on the restrictions of the RCGM submission format and processes, and its effect on environmental groups’ submissions see Rogers-Hayden and Hindmarsh, forthcoming.

<sup>6</sup> The term ‘Life Sciences’ has been appropriated by this group and is not universally accepted by many of those opposed to GM.

<sup>7</sup> Interviews with representatives from the environmental groups discussed in this paper revealed a consensus on these factors.

<sup>8</sup> While there were multiple contributors to some submissions (Denys Trussel, personal communication), some activists also contributed to multiple submissions (Guy Hatchard, personal communication).

## REFERENCES

- Beck, Ulrich 1992. *Risk Society*. London: Sage.
- Bühns, Ton and Bartlett, Robert V. 1993. *Environmental Policy in New Zealand. The Politics of Clean and Green?* Auckland: Oxford University Press.
- Cozzens, Susan E. and Woodhouse, Edward J. 1995. 'Science, Government, and the politics of knowledge', in S. Jasonoff (ed.), *Handbook of Science and Technology Studies*, pp. 533–53. London: Sage.
- Environment Conservation Organisation. 2000. *Submission to the Royal Commission on Genetic Modification*.
- Fairclough, Norman 1992. *Discourse and Social Change*. Cambridge: Polity Press.
- Feenberg, Andrew 1995. *Alternative Modernity: The Technical Turn in Philosophy and Social Theory*. California: University of California.
- Friends of the Earth 2000. *Submission to the Royal Commission on Genetic Modification*.
- GE-Free New Zealand 2000. *Submission to the Royal Commission on Genetic Modification*.
- Gieryn, Thomas 1995. 'Boundaries of Science', in S. Jasonoff (ed.), *Handbook of Science and Technology Studies*, pp. 393–443. California: Sage.
- Gieryn, Thomas 1999. *Cultural Boundaries of Science: Credibility on the Line*. Chicago: University of Chicago.
- Greenpeace New Zealand 2000. *Submission to the Royal Commission on Genetic Modification*.
- Grove-White, Robin; Morris, Paul; Szerszynski, Bronislaw and Wynne, Brian 1991. *The Emerging Ethical Mood on Environmental issues in Britain*. Lancaster University: Global Environmental Research Programme.
- Grove-White, Robin and Szerszynski, Bronislaw 1992. 'Getting Beyond Environmental Ethics', *Environmental Values*, 1: 285–96.
- Grove-White, Robin 1993. 'Environmentalism: A new moral discourse for technological society?', in K. Milton (ed.), *Environmentalism*, pp.18–30. London: Routledge.
- Grove-White, Robin 1996. 'Environmental Knowledge and Public Policy Needs: On Humanising the Research Agenda', in S. Lash, B. Szerszynski and B. Wynne (eds), *Risk, Environment and Modernity*, pp. 269–85. London: Sage.
- Hannigan, John A. 1995. *Environmental Sociology: A Social Constructionists Perspective*. London: Routledge.
- Harding, Sandra 1996. 'Thinking Science, Thinking Society', *Social Text* 46/47 (1&2): 15–25.
- Hindmarsh, Richard 2001. 'Constructing Bio-utopia: Laying Foundations Amidst Dis-sent', in R. Hindmarsh and G. Lawrence (eds), *Altered Genes II: The Future?* pp. 36–52. Melbourne: Scribe.
- Irwin, Alan 2001. *Sociology and the Environment*. Malden: Blackwell.

- Irwin, Alan and Wynne, Brian 1998. 'Introduction', in A. Irwin and B. Wynne, *Misunderstanding Science? The Public Reconstruction of Science and Technology*, pp. 1–18. Cambridge: Cambridge University Press.
- Kammaing, Harmke 1995. 'Interpreting the World, and Living in the World: Is a 'Science for the People' Possible?', in T. Wakeford and M. Walters (eds), *Science for the Earth*, pp. 321–46. Chichester: John Wiley and Sons.
- Le Heron, Richard and Pawson, Eric (eds) 1996. *Changing Places : New Zealand in the Nineties*. Auckland: Longman Paul.
- Michael, Mike 1996. 'Ignoring Science: Discourses of Ignorance in the Public Understanding of Science', in A. Irwin and B. Wynne (eds), *Misunderstanding Science? The Public Reconstruction of Science and Technology*, pp. 105–124. Cambridge: Cambridge University Press.
- Minister of Research Science and Technology 2001. *Transforming New Zealand. Backing Our Innovators to Get the Most from Research, Science and Technology*. Wellington: Office of the Minister of Research, Science and Technology.
- Morris, Paul 1991. 'Annex A: The Historical Context of Ethical Choice', in R. Grove-White, P. Morris, B. Szerszynski, and B. Wynne, *The Emerging Ethical Mood on Environmental Issues in Britain*. Lancaster University: Global Environmental Research Programme.
- Nelkin, Dorothy 1995. 'Science and Controversies: The Dynamics of Public Disputes in the United States', in S. Jasonoff (ed.), *Handbook of Science and Technology Studies*, pp. 444–56. California: Sage.
- Nelson GE-Free Awareness Group 2000. *Submission to the Royal Commission on Genetic Modification*.
- Office of the Minister of Research, Science and Technology 1996. *RS&T: 2010. The Government's Strategy for Research, Science and Technology to the Year 2010*. Wellington: Office of the Minister of Research, Science and Technology.
- Plumwood, Val 1993. *Feminism and the Mastery of Nature*. London: Routledge.
- Rogers-Hayden, Tee and Hindmarsh, Richard forthcoming. 'Modernity Contextualises New Zealand's Royal Commission on Genetic Modification: A Discourse Analysis', *Journal of New Zealand Studies* 1 (1).
- Royal Commission on Genetic Modification 'Introduction'. Warrant, English Version [http://www.gmcommission.govt.nz/intro/warrant\\_eng.html](http://www.gmcommission.govt.nz/intro/warrant_eng.html) 7 March, 2001.
- Shiva, Vandana 1989. *Staying Alive*. London: Zed Books.
- Sayyid, Bobby and Zac, Lillian 1998. 'Political Analysis in a World Without Foundations', in E. Scarbrough and E. Tanebaum (eds), *Research Strategies in the Social Science: A Guide to New Approaches*, pp. 247–67. Oxford: Oxford University Press.
- Szerszynski, Bronislaw 1996. 'On Knowing What to Do: Environmentalism and the Modern Problematic', in S. Lash, B. Szerszynski and B. Wynne (eds), *Risk, Environment and Modernity*, pp. 104–137. London: Sage.
- Tong, Richard and Cox Geoffrey 2000. *Clean and Green? The New Zealand Environment*. Auckland: Bateman.
- Wynne, Brian 1982. *Rationality and Ritual*. Bucks: British Society for the History of Science.
- Wynne, Brian 1989. 'Frameworks of Rationality in Risk Management: Towards the Testing of Naive Sociology', in J. Brown (ed.), *Environmental Threats*, pp. 33–47. London: Belhaven.

- Wynne, Brian 1995. 'Public Understanding of Science', in S. Jasanoff (ed.), *Handbook of Science and Technology Studies*, pp.361–88. California: Sage.
- Yearley, Steven 1991. *The Green Case: A Sociology of Environmental Issues, Arguments and Politics*. London; HarperCollins Academic.
- Yearley, Steven 1992. 'Green Ambivalence about Science: Legal-rational Authority and the Scientific Legitimation of a Social Movement', *British Journal of Sociology* 43(2): 511–32.
- Yearley, Steven 1994. 'Social Movements and Environmental Change', in M. Redclift and T. Benton (eds), *Social Theory and the Global Environmental*, pp.150–68. New York: Routledge.
- Yearley, Steven 1995. 'The Environmental Challenge to Science Studies', in S. Jasanoff (ed.), *Handbook of Science and Technology Studies*, pp. 457–479. London: Sage.
- Yearley, Steven 1996. 'Campaigning and Critique: Public-Interest Groups and Environmental Change', in F. O. Hampton and J. Reppy (eds), *Earthy Goods*, pp. 198–220. Cornell University.
- Yearley, Steven 1997. 'Science and the Environmental', in M. Redclift and G. Woodgate (eds), *The International Handbook of Environmental Sociology*, pp. 227–39. Cheltenham: Edward Elgar.