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**Reflecting Diversity or Selecting Viewpoints:
An Analysis of the GM Debate in New Zealand's Media 1998 – 2002**

A thesis presented in partial fulfilment of the requirements for the degree of PhD in
Communication at Massey University, Palmerston North, New Zealand.

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Abstract

The advent of genetically modified (GM) food in New Zealand in 1998 saw the beginning of a highly politicised debate about GM use in the country. The concern over GM and the political situation after the 1999 general election saw the Government establish a Royal Commission of Inquiry on Genetic Modification in May, 2000. The Royal Commission and strong public opposition to GM, evident in large public protests and other actions, made the issue highly newsworthy.

The aim of this study was to explore how newspapers reported the GM debate, in particular, examining whether the reportage facilitated greater public debate and awareness about GM through journalists adhering to the ideals of the theory of social responsibility and enacting their watchdog role as encapsulated in the Fourth Estate tradition of the media. To achieve these aims the overall tone of the reportage and also which news source types and themes were most frequently reported were examined. In addition, the relationship and perceptions of scientists and journalists involved in the reporting were explored to examine how these relationships may have influenced the reportage.

Content analysis showed the reportage had a pro-GM bias with policy-makers, scientists and industry spokespeople the most frequently cited news sources. The themes of Science, Economics and Politics dominated the reportage. Other source types and themes were less represented, especially themes dealing with ethical and environmental arguments. This lack of representation occurred despite the Royal Commission offering a space for all interested parties to speak.

The interviews illustrated that scientists believed the quality of newspaper coverage of GM lacked depth and that important issues were unreported. Journalists found the issue complex to report and said they took care not to oversimplify the science and issues surrounding GM. The relationship between scientists and journalists indicated particular tensions existing between the two groups.

The thesis concludes that if robust public debate is to occur within New Zealand regarding GM and other scientific developments, then the media should reflect a greater diversity of opinion by citing other potential news sources offering alternative arguments based on, for example, ethical or environmental grounds.

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Chapter One

Scope of the Research

1.1 Introduction

Since the first successful recombinant DNA (deoxyribonucleic acid) (rDNA) experiments in the early 1970s, biotechnology has been the subject of ongoing debate with questions over the safety and morality of its use. These debates and the progress of biotechnology are followed closely by the news media (Krimsky, 1982; Nisbet & Lewenstein, 2002; Pfund & Hofstadter, 1981). New Zealand entered the debate in 1998 with the advent of genetically modified food, or food containing genetically modified ingredients, in New Zealand supermarkets (Weaver & Motion, 2002).

This advent of genetically modified foods in New Zealand saw the beginning of what came to be known, in New Zealand, as the genetic modification (GM) debate. The debate was fuelled by public anxiety over the safety of GM foods and the environmental effects of releasing genetically modified organisms (GMOs) into the wider environment (Allen, 2000; Southward & Howard-Clarke, 2000; Watson, 2000). There were also a number of ethical concerns about the use of GM, with some people believing that GM contravened Judaeo-Christian principles by introducing non-human genes into humans (Brown, 2000). Some Māori, the indigenous people of New Zealand, had objections to GM on a spiritual level believing that it breached, “tikanga Māori (Māori culture) [by] causing moral and spiritual offence” (Hutchings, 2004, p. 181). The ethical and spiritual objections to GM will be returned to later in the chapter.

The strength of opposition to GM resulted in a number of actions being taken by the public including: large public protests, an example of which was a public march in Auckland in 2001 involving an estimated 10,000 people (Rees, 2001). Other actions included individuals and local councils symbolically recording their homes or regions as GM-free zones and a number of anti-GM groups were created (Rogers-Hayden, 2004). There were also some cases of more direct action against GM with experimental crops being destroyed in Christchurch in 1999 and 2002 (“Attacks”, 2002; Samson, 1999). The public protests against GM were supported by the New Zealand Green Party (Greens). The Greens called for a Government inquiry into GM and this, as will be discussed below, meant the debate became highly politicised.

While there was a large amount of protest against GM there were also groups promoting GM with the Life Sciences Network (LSN) arguing that the New Zealand economy would suffer if the use of GM technology were banned or surrounded by too much bureaucracy (Life Sciences Network, 2008). Other people argued that GM offered solutions to medical and environmental problems and, therefore, GM research should be pursued (for example, Berridge, 2000; Miller, 2000). Groups opposed to GM and those promoting its use attempted to influence government policy by making submissions to the Royal Commission of Inquiry on Genetic Modification, which will be discussed below, and by trying to gain news media attention to put forward their particular viewpoint.

The news media are said to play an important role in informing the public on scientific and technological developments once people leave the formal education system (Malone, Boyd & Bero, 2000; Nelkin, 1995). How the media report on science and technology is the subject of much research, and in recent years an important dimension of this research has been the focus on how the media has reported biotechnology (Durant, Bauer & Gaskell, 1998; Hyde, 2006; Kitzinger & Williams, 2005; Kohring & Gorke, 2000; Nisbet, Brossard & Kroepsch, 2003; Nisbet & Lewenstein, 2002; Petersen, 2001). As will be shown below, previous research has found that the reportage in both Europe and the United States (U.S.) has presented a limited range of opinion resulting in reportage that has a pro-GM bias (Kohring & Gorke, 2000; Nisbet & Lewenstein, 2002). The present thesis explores how the New Zealand media reported the GM debate and the issues described above, considering the implications of this coverage in terms of the diversity of opinion and issues reported and the interface between journalists and their scientist news sources.

The GM issue already had continuity for the New Zealand media because it was already an issue of concern internationally. In Europe, the concerns over GM food and crops had been debated in many countries since 1996 and more general concerns about biotechnology had been expressed since the mid-1980s (Campbell, 2000; Durant et al., 1998). New Zealand's late entry into the debate also coincided with New Zealand's second general election in 1999 under the Mixed Member Proportional (MMP) system. The election result saw a Labour-led coalition Government that was supported on issues of supply and demand by the New Zealand Green Party (Greens). The Greens had made the issue of genetic modification part of their election campaign, calling for a government inquiry into the issue if they should be elected. The Greens' support for the Labour coalition saw the Royal Commission of Inquiry on Genetic Modification (RCGM) established in May, 2000. During this time political

involvement in the GM issue was strong (see Ashwell & Olsson, 2004; Rogers-Hayden, 2004; Rogers-Hayden & Hindmarsh, 2002; Weaver & Motion, 2002), and, hence, also became a very newsworthy issue receiving increased media attention throughout the period.

This chapter backgrounds the research and begins by establishing the preferred terms to be used in the thesis, before moving on to review the various debates surrounding genetic modification and its applications. This is followed by a brief discussion of the RCGM, possibly the single largest event concerning GM that occurred during the period from January 1998 to February 2002. How the news media have reported biotechnology in the U.S. and Europe is then briefly examined. Following this is a brief outline of the research methods and questions for the thesis followed by an explanation of its theoretical framework. The chapter concludes with an outline of the thesis structure.

1.2 Biotechnology, Genetic Engineering (GE) and Genetic Modification (GM)

Modern biotechnology is described as, “the third strategic technology of the post-war period following nuclear power in the 1950s and 60s and information technology in the 1970s and 80s” (Durant et al., 1998, p. 3). It is termed a strategic technology due to its potential to fundamentally change our future lives (Durant et al., 1998).

Biotechnology, as described by Durant et al. (1998), refers to the use of recombinant DNA (rDNA) techniques to alter the genetic structure of an organism. These techniques have existed since the early 1970s and allow researchers to take genetic material from disparate organisms and combine them to create new genetic sequences that can be inserted into a host organism (Krimsky, 1982). The goal of this type of research is to create a transgenic organism and to, “change something about the proteins produced in that organism: to produce a new protein, to stop producing an old protein, to produce more or less of a protein, and so on” (Kreuzer & Massey, 2005, p. 409).

These techniques have led to the creation of a number of genetically modified staple food crops, for example, rice, soy beans, corn, canola and sugar beet (Carman, 2004; Holdrege & Talbott, 2008). In addition, the use of rDNA techniques and continued research into genetics have also seen the development of DNA testing for genetic disorders, DNA fingerprinting to solve crimes, the cloning and genetic modification of animals, stem cell research and the creation of biopharmaceuticals using plants and animals (Hil & Hocking, 2004; Ho, 1998). This list is by no means exhaustive but rather illustrates the diversity and complexity in the application of these techniques.

These applications and techniques are labelled using a number of alternative umbrella terms including biotechnology, genetic engineering (GE), genetic modification (GM) and, more recently, life sciences (Bud, 1991). The definitions and use of these terms are ambiguous and contested (Bud, 1991; Durant, et al., 1998). The preferred term used in this thesis to describe the technology of rDNA and its resulting applications is genetic modification (GM). However, it is recognised that GM is a contested term.

The term genetic modification (GM) is contentious because in reality human beings have been genetically modifying plants and animals for thousands of years through selective breeding (Nottingham, 2002). In addition, the process of natural mutation has led many organisms to become genetically modified. Although the techniques for such modification may now follow more scientific principles than the first fumbling attempts by our forebears, the principles have remained relatively the same. This type of genetic modification is considered relatively trouble-free, “because experience has shown that the behaviour of plants produced by traditional breeding is predictable and only occasionally troublesome” (Rissler & Mellon, 1996, p. 4).

When the term GM is used to describe these trouble-free forms of genetic modification there is no real contention. However, “recently, the term has come to apply specifically to newly-developed recombinant DNA technologies, in which the genome of an organism is modified by artificial techniques...” (Tester, 2001, p. 785). The synonymous use of GM with GE and biotechnology causes disputes between proponents and opponents of the technology. Opponents argue that supporters use the term GM to describe GE and biotechnology as it, “downplays the unique features of genetic engineering” (Nottingham, 2002, p. 3), thereby reducing the apprehension in the minds of the public which the label genetic engineering seems to engender.

While the contentious nature of the GM term is recognised, it is the preferred term used in this thesis. The reason for this is that the issue in New Zealand became commonly known as the “GM debate”. It was also the preferred term used in the news media, although there was some debate within the New Zealand media over whether the term GE or GM should be used in reporting the debate (Samson, personal communication, October 17, 2002). Whichever term is used there is a continuing debate over the implementation of GM with proponents and opponents having very different views on the future if the use of GM is pursued. The next

section briefly reviews some of the alternative views that exist about the use of genetic modification.

1.3 The Pros and Cons of GM

Writing at the time the New Zealand GM debate began, Durant et al. (1998) argued that, your opposition or support for GM technology would determine whether you saw the future in dystopian or utopian terms. While the arguments both for and against GM technologies have moved forward since the period analysed, many of the concerns are still current today (Hindmarsh, 2008). This section briefly reviews the opposing viewpoints that existed at the time as a background to some of the issues raised in the New Zealand GM debate, whilst also acknowledging the current situation where appropriate.

Proponents argue that GM offers a solution to a large number of problems. Robert Shapiro, the past CEO of Monsanto, argues that biotechnology combined with information technology would provide the sustainable means to treble the world's food production without continuing reliance on pesticides and herbicides to increase yields. He states, "if we put the right genetic information in the plant at the outset we waste less stuff [pesticides and herbicides] and increase productivity" (Shapiro, 1999, p. 28). Also it is argued that the use of fewer chemicals means these crops will be more environmentally friendly, while at the same time eradicating the health dangers, real or imagined, associated with these chemicals.

Proponents further argue that human health has already benefited from GM. A number of GM products are now available for the treatment of particular conditions, including diabetes, with GM insulin being available since 1982 (Berridge, 2000). In New Zealand, the Malaghan Institute of Medical Research is using GM to develop and trial vaccines for a number of diseases, including cancer, asthma, tuberculosis (Tb), multiple sclerosis (MS), arthritis, paediatric respiratory viruses and, "rotavirus ... a highly contagious virus that most commonly affects children under the age of two ... [causing] diarrhoea and vomiting" (Malaghan Institute, 2007, p. 18). In addition, work in the areas of gene therapy and stem cell research is also showing the potential to cure certain diseases and ailments. In New Zealand, stem cell research is being used to ultimately to develop drugs and vaccines to treat and prevent cancer (Malaghan Institute, 2007). Finally, in the future, foods may be genetically modified to deliver certain drugs or to contain fewer fats or more essential vitamins. An example of these designer foods is Golden Rice, so named for its pale yellow core which is the result of an insertion of a daffodil gene used to produce beta-carotene, "a

nutrient that can be converted to Vitamin A” (Environmental News Network, 2001, ¶ 4). This rice is upheld as the answer to the problem of vitamin A deficiency suffered by many children in the Third World.

Genetic modification could also have environmental benefits in terms of the possible control of animal and insect pests; in New Zealand’s case, possums and wasps may be able to be controlled. Endangered species may also benefit through the use of GM which may be used to enhance current breeding programmes (Miller, 2000).

However, while proponents point to a positive future with the adoption of GM techniques increasing crop yields and alleviating disease and environmental problems, opponents see the potential of GM very differently (Durant et al., 1998). Opponents argue that GM crops and foods carry a number of potential threats to human health and agricultural systems, and also threaten the livelihood of Third World farmers. Some argue that adopting GM in New Zealand would damage, what is sometimes described as the country’s *clean, green* image and thereby, have an adverse effect on New Zealand’s economy (Campbell, 2000).

At the time of the debate a number of scientists and medical professionals believed that human health may be threatened by GM foods. They argued that the long-term effects of eating GM food were unknown and that GM foods could contain new toxins that could result in a range of allergens hitherto unknown. They also argued that the tests for *substantial equivalence*, showing that a GM food was chemically similar to its natural counterpart, were not adequate to determine the possible toxicological or allergenic effects of these new foods (Millstone, Brunner & Mayer, 1999). Moreover, some scientists were concerned about the use of antibiotic-resistant marker genes in the development of GM crops, arguing that through *horizontal gene transfer*, the transfer of genetic material from one organism to another, this antibiotic resistance could spread to humans, and, therefore, the efficacy of antibiotic medical treatments could be nullified (Ho, 1998). Since this study was undertaken a number of feeding studies have found that some GM foods could cause negative health effects in the test animals fed (for example see Malatesta, Biggiogera, Manuali, Rocchi, Baldelli & Gazzanelli, 2003; Prescott, Campbell, Moore, Mattes Rothenberg, Foster et al. 2005, Seralini, G. Cellier, Spiroux de Vendomois, 2007).

Opponents also argue that environmental damage may be caused by GM crops, as many of the genetically modified crops are engineered to resist herbicides. For example, Monsanto has produced varieties of cotton, canola, corn and soybeans, to name but a few, to be resistant

to its Roundup herbicide. Environmentalists and scientists have argued that the spread of pollen from these GM varieties to related plants could lead to the production of herbicide-resistant super-weeds outside the cultivated areas (Ho, 1998). Seed producers advise farmers to use buffer zones when planting GM crops to stop the spread of pollen to other plants. However, research (Beckie, Hall & Warwick, 2001) has called into question the adequacy of some of the proposed buffer zones, with some out-crossings being found 550 metres from a crop with a recommended buffer zone of 175 metres.

These results also give substance to the concerns of organic farmers fearing the spread of GM-pollen and out-crossings to their own crops. Campbell (2000) argues that “the International Federation of Organic Agriculture Movement (IFOAM) has resoundingly rejected the possibility that there can be any such thing as a GM organic product” (p. 76).

Another area of controversy is in the development of crops genetically modified to express the bacterium *Bacillus thuringiensis* (Bt) which produces a toxin that kills Bt-sensitive insects, for example, the European Corn Borer (Schacter, 1999). Bt is often sprayed by farmers, especially organic farmers, to control such insects. It is feared that the use of Bt-crops will result in Bt-sensitive insects becoming resistant to Bt, thus, making such spraying ineffective (Schacter, 1999).

Therefore, the use of GM crops can threaten organic and other farmers with super-weeds and also the possibility of insects resistant to Bt. If super-weeds and Bt resistance eventuate, the cost of alternative controls could adversely affect farmers’ economic returns.

Another concern is that large-scale planting of GM crops increases monoculture farming with its associated environmental degradation and increased pesticide use (Hindmarsh, 2008). It had already been found that in the U.S. between 2001 and 2002 there was increased use of glyphosate herbicide on GM soybean crops and also an increase in the use of pesticides with GM corn, soybeans and cotton varieties (Benbrook, 2003).

According to GM opponents it is not only organic farmers that could be affected economically through the use of GM technology. Due to the strong rejection of GM crops by both European and Japanese consumers New Zealand’s economy could suffer if the use of GM crops became widespread. Campbell (2000) argues that the farming of such crops could damage the “trading image of New Zealand as a provider of clean green foods” (p. 77).

Arguments that GM crops will feed the world are also rejected by opponents who argue that most crops developed to date are commercial in nature and aimed at “the prosperous farmers of the North” (Rissler & Mellon, 1996, p. 19). They are not aimed at Third World farmers unable to pay for them. Indeed some groups are concerned that the use of GM crops will negatively impact small farmers’ livelihoods (Hindmarsh, 2008). Secondly, it is argued that GM does not “offer significant technical advantage over traditional breeding for increasing levels of crop production” (Rissler & Mellon, 1996, p. 19). Finally, even if new high-yield crop varieties are produced it is only one factor among many that contribute to the alleviation of world hunger.

In conjunction with these more practical concerns, GM opponents raise a number of ethical issues. Some, including the contravention of both Judaeo-Christian and Māori spiritual principles, have already been mentioned in section 1.1. These objections are acknowledged and yet it is not the aim of this thesis to examine these issues in depth. In addition, there exist objections to using animals to produce human proteins for medical use, concerns about human cloning and about the ethics of genetic testing (Evans, 2000). There is also concern over the safety and ethics of embryonic stem-cells (Ho, 2004). Finally, some groups are concerned about the ethics of the ownership of genetic resources. Some multinational companies are involved in bioprospecting, or biopiracy depending on your perspective, wherein they, “seek out valuable organisms or plants, often drawing upon the wisdom of indigenous peoples. They then take samples back to laboratories where they isolate active ingredients or genetic sequences and patent them as their own inventions” (Anderson, 2000, p. 95). This practice has resulted in some indigenous communities having to pay royalties to multinational companies, “for the right to use something that was part of their legacy” (Anderson, 2000, p. 96).

The issues described above have caused widespread debate, since the first successful rDNA experiments in the early 1970s, amongst scientists, policy makers and members of the public in the U.S., Europe, Australia and New Zealand (Durant et al., 1998; Hindmarsh & Lawrence, 2004; Ho, 1998; Krimsky, 1982; Prebble, 2000). As noted, the 1999 Labour Government established the Royal Commission of Inquiry on Genetic Modification (RCGM) in May 2000 to investigate some of these issues. The Royal Commission was to become a focal point for much of the newspaper reportage this thesis examines.

1.4 The Royal Commission on Genetic Modification

In New Zealand, Royal Commissions have been established to investigate policy issues about which there exists, “considerable public anxiety” (Fitzgerald, 2001, p. 9). Previously they have investigated a number of issues including Social Policy (1988), the Electoral System (1986) and State Services (1962).

According to Wynne (1982) a Commission of Inquiry, “is a rare point of contact between local people, national pressure groups, policy makers and industrial developers. Almost by historical accident, it has become the sole formal setting for public conflict about such developments” (p. 52).

In order to investigate the issues and debate surrounding GM the Royal Commission was given the following Warrant:

to receive representations upon, inquire into, investigate and report upon:

(1) the strategic options available to 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, p. 6).

Using this mandate, the Royal Commission undertook a number of initiatives to gather information. These included a public opinion survey, nationwide public meetings, a consultation process with Māori, a youth forum, a public submission process and formal hearings that lasted 13 weeks (Royal Commission on Genetic Modification, 2001).

There were over 10,000 written submissions, of these 92.1% were opposed to GM, and the formal hearings included presentations heard from more than 100 *interested persons* (IPs) and nearly 300 witnesses (Royal Commission of Inquiry, 2001). Interested persons were defined by the Commission as, sole corporations or groups of people whether incorporated or unincorporated and any individual that satisfied the Commission that the evidence heard by it may adversely affect that person’s interest (Royal Commission on Genetic Modification, 2001). Those seeking Interested Person status also had to satisfy the Commission:

- that they have “an interest in the inquiry”, that is, an “interest” in the Inquiry on Genetic Modification, and

- that their interest is “apart from that in common with the public (Royal Commission on Genetic Modification, Appendix 1, 2001, p. 115).

Those meeting these criteria had the right to appear before the Commission in person or be represented by counsel or an agent (Royal Commission on Genetic Modification, Appendix 1).

The groups and individuals represented through these and the other processes mentioned had diverse viewpoints on GM, and the Royal Commission appeared to provide a space in which a variety of issues could be raised that may be marginalised in other forums. The Royal Commission and other related events in New Zealand, such as a number of public protests and the destruction of GM crops by protesters, made the issue of GM a highly newsworthy one (Rupar, 2007a).

1.5 The News Media and GM

At its heart, the GM debate is about the use of this science in the wider society. As already noted, the news media become the main channel of information about science and technology for many people once they have finished their formal education (Billington & Bibby, 1991; Friedman, Dunwoody & Rogers, 1999; Hijmans, Pleijter & Wester, 2003; Malone et al., 2000; Nelkin, 1995; Nisbet & Lewenstein, 2002). Therefore, the media play an important role in how the public comes to understand developments in science and technology.

More important is the manner in which the news media report science, as it can aid to “facilitate civic debate about the governance of life sciences innovation” (Hindmarsh & Du Plessis, 2008). According to Salleh (2008), by upholding the ideal of the news media as the Fourth Estate, journalists can act as watchdogs, holding scientists to account and also informing the public about the debates that exist within the scientific community about GM and other scientific developments. The ideal of the media as Fourth Estate is also closely related to the normative theory of the social responsibility of the media that argues the media should report the diversity of opinion that exists concerning any issue. By upholding these ideals in their reporting the news media could play an important role in the democratisation of GM and science more generally. These ideals will be discussed in more depth in the next chapter, along with the existing pressures on journalists that hinder their efforts to report issues in a manner which properly reflects these ideals. One of these pressures is the close relationship that journalists have with their sources.

Research has shown that news sources often have a large role to play in how issues are reported and framed (Gans, 1979; Hall, Critcher, Jefferson, Clarke, & Roberts, 1978; Sigal, 1973; Tuchman, 1978). According to Gamson and Modigliani (1989), a media frame “is a central organizing idea for making sense of relevant events suggesting what is at issue” (p. 157). Through their selection and framing of particular issues, the news media increase the salience of these issues in the public arena. In so doing, the news media are able to influence the agenda of public opinion by suggesting which issues should be deemed important to the public, first level agenda setting, and which aspects of those issues should be given most attention by the public, second level agenda setting (McCombs & Ghanem, 2001). The topic of agenda setting is discussed in more depth in the next chapter.

Research of newspaper coverage reporting GM in the U.S., Europe, Australia and New Zealand has shown that news sources played a large part in how these stories were framed (Hornig-Priest, 2001; Kohring & Gorke, 2000; Nisbet & Lewenstein, 2002; Petersen, 2001; Rugar, 2007a). A number of studies using content analysis have found that, since the announcement of the first successful rDNA experiments, the reportage in the U.S. and Europe has relied heavily on the comments of scientists, policy makers and industry spokespeople at the cost of excluding other viewpoints (Kohring & Gorke, 2000; Nisbet & Lewenstein, 2002). This heavy reliance on scientists, policy makers and industry spokespeople has also led to reportage that has a limited number of themes and that is often positive towards GM (Durant et al., 1998; Kohring & Gorke, 2000; Nisbet & Lewenstein, 2002). This positive bias towards GM has also been found in more qualitative studies exploring the reporting of cloning and stem cell research, two sub-branches of GM technology (Hyde, 2006; Kitzinger & Williams, 2005).

In New Zealand, research has examined a number of facets of the GM debate. Using discourse analysis, researchers have examined how different companies and organisations have used public relations to articulate their position on GM (Henderson, Weaver & Cheney, 2007; Motion & Weaver, 2005a, 2005b; Rogers-Hayden & Campbell, 2003; Weaver & Motion, 2002). Discourse analysis has also been used to examine the submissions of anti-GM groups to the Royal Commission (Rogers-Hayden, 2004). The Royal Commission has also been the subject of further research examining which types of groups gained *Interested Party* (IP) status at the Commission and also which types of groups did not (Tucker, 2003). Other research has examined the Commission in terms of its suitability as an agora or place of public debate (Davenport & Leitch, 2005). In addition, government-sponsored research

explored the use of dialogic techniques to promote communication about the science and technology of GM between different community groups (Cronin & Jackson, 2004). Another facet examined was the political rhetoric that surrounded the GM debate leading up to the 2002 New Zealand General Election (Ashwell & Olsson, 2004).

A small number of studies have also examined the New Zealand media's role in reporting the GM debate. Motion and Weaver (2005b) examined Greenpeace's attempts to gain media attention to articulate its viewpoint on GM to the wider public. Rupar (2007a) examined how journalistic practices in three New Zealand newspapers shaped the media's reporting of the GM debate between July 2001 and July 2002. These studies and the other research mentioned above are discussed in more detail in Chapter 2.

The current research explores how six New Zealand newspapers reported the GM debate from its early beginnings in 1998 to February 2002, four months after the Government's policy announcement based on The Royal Commission's findings. It examines whether newspapers reported the issue in a manner that reflected the diversity of opinion that existed in New Zealand at the time of the GM debate and also whether this reporting could be said to have truly facilitated civic debate about GM. In particular, the research examines which news sources were used in the reporting of the debate and how this may have influenced the reporting in terms of the themes discussed and the overall bias of the reporting. It also examines which news sources and themes were less represented or marginalised, and how this impacts the diversity of opinion entering the public sphere, and its possible effects on the policy process.

Moreover, as noted, journalists when reporting science are often heavily reliant on scientists as sources of information, and therefore, the relationship between scientists and journalists is the subject of much research in the U.S., Europe, Australia and New Zealand, with the relationship being likened to the clash between two professional cultures (Goodell, 1985; Lyons, 1997; McIlwaine, 2001; Peters, 1995; Reed, 2001; Salleh, 2001). However, while there has been some research into the relationship between these two groups in New Zealand, it is limited, with recent research concentrating on exploring the views of journalists only (Rupar, 2007a; Sessions, 2003).

The current study, by interviewing scientists and journalists involved in reporting the GM debate, expands on this research. It asks how the two groups perceived the reporting of the

GM debate and their relationship towards each other, in order to explore how this may have affected the resulting reportage.

1.6 Research Strategy and Choice of Methods

As noted, the research explores newspaper coverage of the GM debate between 1998 and February 2002. The period includes the beginnings of the GM debate and finishes in February 2002, four months after the Government announced its policy on GM based on the Royal Commission's findings on October 31, 2001. This period is highly significant as the Commission and the debate surrounding it set the policy agenda for the use of GM in New Zealand. As already shown, the news media are often the main source of information for the public regarding developments in science and technology. This situation leaves the media in a strong position to influence how the public comes to understand these scientific and technological developments whilst also encouraging democratic debate about such issues. Therefore, the GM debate offers a unique opportunity to explore how the news media, in particular, newspapers, came to report this new and controversial science about which there was considerable public anxiety.

Any researchers selecting a methodology should, "not only consider which is the most appropriate method for the study of their chosen topic ... but also what combination of research methods will produce a better and deeper understanding of it" (Hansen, Cottle, Negrine & Newbold, 1998, p. 1). This research addresses this aim by employing a combination of two relevant research and inter-related methods: content analysis and interviews. Content analysis provides quantitative data about the reportage volume, frequency and volume of news source citations, themes and the overall tone of the coverage. The second method of semi-structured interviews provides qualitative data to explore the perceptions from scientist news sources and journalists involved in reporting the GM debate. In order to try to explain how their interaction may influence the reporting, the interviews particularly focus on the journalists' and scientists' views of the reporting and their relationship with each other in the process.

This mixture of methodologies makes a contribution to understanding how this particular controversial and scientific debate was reported by the media. By combining content analysis with interviews to explore the media's reporting of genetic modification, the research may help to explain how the interactions of scientists and journalists affected the coverage of this issue in the New Zealand context.

1.7 Research Questions

As highlighted in section 1.5, previous research into the media's reporting of GM has found it dominated by a limited number of news source types and themes. Moreover, the reportage has been strongly pro-GM. The aim of this study was to explore how newspapers reported the GM debate, in particular, examining the overall tone of the reportage and also which news source types and themes were most frequently reported. In particular, the research explores whether the presence of the Royal Commission of Inquiry resulted in a different pattern of reportage than that found in overseas research. As also illustrated in section 1.5, the relationship between scientists and journalists can affect how science is reported. Therefore, interviews were conducted with scientists and journalists involved in the reporting of the GM debate, to gauge their perceptions of the reportage and their relationships with one another. These aims resulted in the following research questions for the thesis given below. Further justification for these questions is given in the Methodology chapter, Chapter 3.

The overall question guiding the research is, "How did New Zealand newspapers report the GM debate?" The methodologies concentrate on six related research questions which illustrate how the thesis is constructed:

1. Who were the most frequently cited sources in the reportage?
2. What themes were most frequently reported on?
3. What stance did the different news source types take on the themes reported?
4. How did scientists and journalists perceive the reporting of the GM debate?
5. How did the journalists and scientists perceive their relationship with one another in the reporting of the GM debate?
6. What are the implications for GM, the news media, and the New Zealand public's understanding of GM and science generally?

The content analysis seeks to answer questions 1 to 3 and the interview analysis questions 4 and 5. These methods are combined to answer question 6 by exploring the possible implications for genetic modification, the news media, and the public understanding of genetic modification in New Zealand.

1.8 Theoretical Framework

Research into the news media's coverage of genetic modification in the U.S. has critiqued what is described as inequitable coverage that has given prominence to scientists, policy

makers and industry spokespeople while marginalising other interest groups (Nisbet & Lewenstein, 2002; Pfund & Hofstadter, 1981). Little research exists in New Zealand that examines how news sources are used in the reporting of biotechnology and the implications this may have on the resulting reportage. Therefore, the thesis seeks to contribute to an understanding of these issues.

The criticisms of inequitable coverage in the U.S. are based on the underlying expectation that the media should report a diversity of views and opinions when reporting controversial issues. These expectations are based upon the normative theory of social responsibility which is the guiding force for many Western media organisations and reporters (Altschull, 1995; Baran & Davis, 2006). The theory of social responsibility assumes that the media have particular obligations to society and these should be achieved through the application of “high or professional standards of informativeness, truth, accuracy, objectivity and balance” (McQuail, 1987, p. 117). In so doing, the media should be pluralist and reflect the diversity of viewpoints on different issues (McQuail, 1987). In addition, the ideal of the media as Fourth Estate argues that journalists act as watchdogs over the powerful, exposing any abuses of power to public scrutiny (Louw, 2005). In the case of science this ideal suggests that journalists should hold scientists to account whilst also exposing any debates that may exist between scientists to public scrutiny (Salleh, 2008). By reporting a diversity of opinion and by exposing debates that may exist in the scientific community the media play an important role in the democratisation of science and also how the public ultimately come to understand the science reported.

The media’s reporting of science and how it ultimately affects the public’s understanding of science has been the subject of much research (see Friedman, Dunwoody & Rogers, 1986; Nelkin, 1995; Reed, 2002). This interest is based upon the unspoken assumptions of models like the public understanding of science, originating in the United Kingdom, which argues that in order for democratic decisions to be made about science, there must be a scientifically literate public (Bodmer, 1985; Broks, 2006; Miller, 1998). The media not only inform the public about these issues but they also play an increasingly important role in the policy decision making process surrounding the issues (Cobb & Elder, 1981; Kennamer, 1992; Sigal, 1973). Therefore, researchers have examined the construction of the reporting on GM to understand how the issue is framed and by whom (Nisbet & Lewenstein, 2002). As argued in section 1.5 above, the current thesis seeks to contribute to an understanding of how news

source use has influenced the reportage of the GM debate and its implications for the policy making process.

1.9 Structure of the Thesis

The next chapter, Chapter 2, reviews the literature on the news media's role in society and, in particular, the reporting of scientific issues. The review illustrates some of the inadequacies of the news media's reporting of science and genetic modification, while also examining the apparently consistent problems within the reporting of science faced by journalists and scientists in their interactions with one another. The chapter concludes with a review of the current New Zealand research on the GM debate, placing the current thesis within the context of this and previous research.

Based on Chapter 2, Chapter 3 develops a suitable content analysis methodology which was used to examine the content of the newspaper coverage highlighting the contribution of sources within the items and the themes discussed. It also explains the interview methodology used with some of the main actors involved in the news coverage. Chapter 4 reports the content analysis and interview analysis results. The chapter describes how the volume of reportage was distributed across the period examined, illustrating which news source types and themes were most frequently reported and the overall bias of the reportage. The chapter also presents a thematic analysis of the interviews with scientists and journalists involved in the reporting of the GM debate. Chapter 5 discusses the implications of these results, particularly for the less represented interests involved in the controversy, and discusses how the journalist-source relationship has influenced this coverage. The conclusions of the study are drawn in Chapter 6.

Chapter Two

Science and the Media: A Review of the Literature

2.1 Introduction

The chapter begins by discussing the importance of science in society and the efforts by policy makers to ensure that the public have sufficient understanding of science to enable them to engage in democratic debate with regard to its use. The media's role in this process is briefly introduced before the chapter discusses the normative theory of the social responsibility of the media and the ideal of the media as the Fourth Estate and watchdog over those in power. The implications of these two concepts for the reporting and possible democratisation of science are also reviewed. A discussion then follows of the role of news values in the construction of media output, and how these outputs can influence the agenda of public opinion and the formulation of public policy, in particular, policy concerning science and technology. The media's role in the formation of public policy leads it to be a site of contest for those wishing to influence the policy making process, and the chapter discusses the role of news sources in the structure of media output. Sources are often utilised to provide "balance" to news stories and, therefore, the chapter briefly discusses the ideal of journalistic balance and "objectivity". The chapter then discusses how the media report science, including the effects of journalistic practice on that reporting and the relationship between scientists, often prime news sources for science stories, and journalists. The literature on the media's reporting of science and biotechnology is then reviewed, including an exploration of the relationship between scientists and journalists. The chapter concludes with a review of New Zealand research into biotechnology and society, situating the current research within the field.

2.2 The Public Understanding of Science

Since the late nineteenth century, the development of science and technology has become an integral part of society and is recognised by governments as a key instrument for economic growth. According to the New Zealand Ministry of Research, Science and Technology (MORST):

Science has a vital role to play in New Zealand society. The government is committed to lifting the recognition of RS&T and of scientists and technologists, the

value they contribute to New Zealand and improving the quality and quantity of engagement between the RS&T sector and New Zealand communities. Greater uptake and or commercialisation of public science and research is needed to ensure New Zealand gets the optimum benefit from science. The government is committed to supporting innovation through the linkages between science and those who use it and ensuring effective transfer of public RS&T to businesses and other user communities (Ministry of Research, Science & Technology, 2006, p. 3).

The increased importance of science has also created an increasing gulf between those who practise it, scientists, and what Bucchi (1998) terms the more, “generally educated” public (p. 1). This distance formed as a result of the professionalisation of science and scientists. Professionalisation has given scientists a level of autonomy with regard to the rest of society and has elevated scientists’ status as the legitimate voices on scientific matters (Broks, 2006). This increased autonomy and separation of scientists from the rest of society has had two major effects.

First, Bucchi (1998) argues that there has been, “a widening knowledge gap between researchers and the generally educated” (p. 1). This knowledge gap has resulted in the public having lower levels of scientific understanding or scientific literacy. The term *scientific literacy* can be defined, “as a threshold measure of minimal understanding of the processes, terms and social impact of science” (Billington & Bibby, 1991, p. 4).

It is argued that in order for citizens to participate in a modern democracy they should have a civic scientific literacy and this literacy would have three related dimensions:

- (1) A vocabulary of basic scientific constructs sufficient to read competing views in a newspaper or magazine;
- (2) An understanding of the process or nature of scientific inquiry; and
- (3) Some level of understanding of the impact of science and technology on individuals and society (Miller, 1998, p. 205).

Surveys of scientific literacy in European countries found low levels of scientific literacy amongst adults with only 1% to 10% being considered scientifically literate; similar U.S. studies only found approximately 7% of adults to be scientifically literate (Broks, 2006). A comparative New Zealand (NZ) study found that 10% of NZ adults were scientifically literate and that, “13% of NZ adults were *attentive to* or interested in science” (Billington & Bibby,

1991, p. 4, emphasis in original). However, when these results were combined, only 3% of NZ adults were both attentive to and literate about science (Billington & Bibby, 1991). The report suggests that this level of scientific literacy is far too low, “if decision-making on science related issues is to be democratic” (Billington & Bibby, 1991, p. 5).

In addition to the low levels of scientific literacy amongst the general public, science’s separation and autonomy from the wider society led to an increasing sense of public distrust and disillusionment in science, or more specifically the fruits of science. According to Broks (2006) the disillusionment with science was evident before the First World War and, “the history of popular science is a history of the public’s unfulfilled expectations” (p. 76). The development of the atomic bomb brought with it the real possibility of annihilation. When this threat was coupled with other concerns, for instance, the potential damage caused to the environment by man-made chemicals, it only seemed to exacerbate the disillusionment and distrust the public has in science.

The public distrust and disillusionment with science coupled with the lack of scientific literacy has led policy makers to instigate a number of initiatives. One such initiative was the United Kingdom’s *Public Understanding of Science*, the major thrust of which was to increase public scientific understanding, then seen to be:

a major element in promoting national prosperity, in raising the quality of public and private decision-making and in enriching the life of the individual...Improving the public understanding of science is an investment in the future, not a luxury to be indulged in if and when resources allow (Bodmer, 1985, p. 9).

The programme required scientists to actively communicate with the public as part of their scientific duty (Miller, 2001). While on the surface this initiative appeared designed to increase the public’s understanding of science, a more critical evaluation suggests that the initiative was designed to re-legitimise science. This move was seen as necessary to overcome the public’s distrust resulting from the increasing autonomy of science from the rest of society (Broks, 2006; Wynne, 1982). However, the Public Understanding of Science initiative, and others like it, saw these problems purely in terms of people’s scientific ignorance and as issues of poor communication. Within this model the public is conceived as an empty vessel which needs to be filled with the right scientific knowledge to overcome ignorance and distrust. This conceptualisation of the problem has its roots in one of three models of the public understanding of science, the deficiency model (Ziman, 1991). This

limited model implicitly assumes that people's ignorance and distrust of science are because they have insufficient scientific knowledge. Therefore, initiatives such as the Public Understanding of Science are designed to give the public more information about science, information that scientists deem important, in order to overcome this deficiency.

According to Bucchi (1998) this normative model of science communication is based upon the ideal, although limited, SMCR (sender, message, channel, receiver) model of communication. In ideal conditions the message will be sent perfectly as intended by the sender with the complete agreement between the sender and receiver as to the meaning of the message. According to this model any deviation of the message is due to *noise*, whether physical, physiological or psychological. Therefore, to ensure perfect delivery of a message one only has to control for 'noise' which could distort or pollute all or part of the message. According to Hilgartner (1990) this model is characteristic of the Public Understanding of Science and similar initiatives with any deviations of messages being due to *pollution* or *distortion* on the part of those transmitting the message to the public. Often this blame is laid upon the media and journalists as they are seen as the mediators making, "scientific achievements more suitable and accessible to the public" (Bucchi, 1998, p. 3).

This model of science communication assumes firstly that science is a coherent body of knowledge that only becomes, "misrepresented and misunderstood outside well-defined boundaries by people who simply do not know any better" (Ziman, 1991, p. 16). However, as Ziman (1991) notes, at times scientists themselves are divided as to what does and does not constitute science. Representing the public's lack of understanding of science in terms of their ignorance or the miscommunication of science by the media ignores the existence of scientific disputes. Furthermore, it ignores the difficulty that the public have trying to assess the merit and accuracy of the different scientific positions taken in such disputes.

The second assumption of the model is that science communication is a unidirectional process where scientists simply have to transmit the right information to the public in order for them to have gained a sufficient level of scientific knowledge. However, the process of communication is never unidirectional nor are the public mere empty vessels waiting to be filled with the right scientific information. Rather, the public actively construct their own meanings regarding the science information received. According to Ziman (1991) their resultant understanding of science will be influenced by four elements:

- i) the context in which they receive the communication;

- ii) their involvement and interest in the science;
- iii) whether they find the scientist or expert credible; and
- iv) they will combine scientific knowledge with their own ethical and life views to create personal positions on controversial matters (pp. 18-19).

This active construction of meaning has led to a public distrust of science. This distrust, according to Wynne (2001), is not due to public ignorance, but is rather due to the public perception that science continues to deny “its intrinsic lack of control as manifested in the endemic predicament of unanticipated consequences...” (p.478). According to Wynne (2003) more communication to the ‘scientifically ignorant public’ only exacerbates the public mistrust in science, especially when institutional science attempts to objectify and rationalise questions of risk and ethics raised about scientific developments. Therefore, to blame the public’s lack of scientific understanding on the media and journalists denies the fact that science is often a contested body of knowledge, and also that the public’s understanding of science is subject to the influence of a number of factors, which may not be subject to the media’s influence.

Indeed, the public’s exposure, education and eventual understanding about science come from a variety of sources with possibly the most influential of these being the formal education system. However, once people have left this system the media become their primary source of science information (Billington & Bibby, 1991; Malone et al., 2000; Nelkin, 1995). In New Zealand, Billington and Bibby (1991) found that the media, in particular, the press, were a major source of science information for many people. These results illustrate the important role the news media play in educating the public about science and technology and aiding in developing a more scientifically literate public. According to Billington and Bibby (1991), a scientifically literate public is necessary, “if decision-making on science related issues is to be democratic” (p. 20). Therefore, as will be discussed later in the chapter, the media have the potential to play an important role in the policy making process by informing the public about scientific and technological developments. However, the media need to do this by relaying the diversity of opinion that exists on these developments in order that the public can make an informed decision.

2.3 The Social Responsibility of the Media and the Fourth Estate

This normative theory of the social responsibility of the media argues that ideally the media serve essential functions for society, especially with regard to the democratic process (McQuail, 1987). Baran and Davis (2006) argue that the theory of social responsibility is used by many Western news organisations and journalists to guide and legitimise their practices and place in society.

The theory of social responsibility has its origins with America's Hutchins's Commission on Freedom of the Press, 1947, convened in response to what was considered as the declining standards of the free market press. In particular, the press, "was said to have led to lower chances of access for individuals and diverse groups and lower standards of performance in meeting the informational, social and moral needs of society" (McQuail, 1987, p. 116).

The theory requires that three divergent principles be reconciled: individual freedom and choice, media freedom, and media obligation to society (McQuail, 1987). In order to do achieve this reconciliation the theory proposes the development of public and independent oversight of broadcasting along with increasing standards of professionalism and self-regulation by the press.

In New Zealand, this oversight is carried out by the Broadcasting Standards Authority, an independent statute-based regulatory authority and the New Zealand Press Council, a newspaper industry-funded body. Both organisations investigate complaints and strive to increase the standards of professionalism within their industries.

The main principles of the theory of the social responsibility of the media are outlined by McQuail (1987) as follows:

- Media should accept and fulfil certain obligations in society.
- These obligations are mainly to be met by setting high or professional standards of informativeness, truth, accuracy, objectivity and balance.
- In accepting and applying these obligations media should be self-regulating within the framework of law and established institutions.
- The media should avoid whatever might lead to crime, violence or civil disorder or give offence to minority groups.

- The media as a whole should be pluralist and reflect the diversity of their society, giving access to various points of view and to rights of reply.
- Society and the public, following the first named principle, have a right to expect high standards of performance and intervention can be justified to secure the, or a, public good.
- Journalists and media professionals should be accountable to society as well as employers and the market (p. 118).

The theory of the social responsibility of the media is criticised due to its pro-capitalist basis and its narrow focus on the issue of the political control of the media (Nerone, 1995). In having this focus, the theory appears to ignore the possible problems caused by the concentration of media ownership into a smaller number of hands. Keane (1991) suggests that this concentration of ownership has resulted in the creation of multi-media oligopolies producing market-driven products. He argues that the modern “*communication markets restrict freedom of communication* by generating barriers to entry, monopoly and restrictions upon choice, and by shifting the prevailing definition of information from that of a public good to that of a privately appropriable commodity” (Keane, 1991, p. 89, emphasis in original).

In the New Zealand context, an example of these restrictions on the freedom of communication is given by Rosenberg (2008) arguing that the concentration of media ownership, accompanied by the drive to cut costs through centralisation, has resulted in, amongst other things, reduction in the variety of views expressed.

In a recent survey of New Zealand journalists, it was found that many journalists believed that the market-driven nature of the media had reduced resources, resulting in the watchdog role performed by the media being compromised (Hollings, Lealand, Samson & Tilley, 2007). Furthermore, more than half those journalists answering a question about the impact of commercial pressures, “agreed that newsrooms had been pressured to do a story because it related to an advertiser, owner or sponsor” (Hollings et al., 2007, p. 187). These opinions appear to support the idea that there exists:

a structural contradiction between freedom of communication and unlimited freedom of the market, and that the market liberal ideology of freedom of individual choice in the marketplace of opinions is in fact a justification of privileging

corporate speech and of giving more power to investors than to citizens (Keane, 1991, p. 89).

It is argued that not only does the market-driven centralisation of the media privilege corporate speech but the resulting reduction of resources alluded to by New Zealand journalists actually privileges routine institutional news sources, for example, policy makers, government and industrial spokespersons, often cited by journalists.

The commercial pressures of the media also reinforce these particular voices in another way. The news media survive by appealing to a wide audience. Therefore, it is unlikely that the media will run stories that may offend large portions of that audience and this leads to ideas and people that may offend or alienate large numbers of people. According to Louw (2005), people and ideas that seem to threaten what is considered 'sensible', if they are reported at all, are reported in a manner which makes the audience aware that these people and their ideas are extreme and unacceptable to the mainstream.

This situation is thought to make it increasingly difficult for the media to act in a socially responsible manner in other areas. For example, Barney (1986) argues that a socially responsible media should uphold the ideal of pluralism by reporting a wide range of views. He states that pluralism is, "a critical element in a society that expects broad participation among its citizens" (p. 69). When applied to science, this ideal suggests that if the public are to have a truly democratic input into how science is integrated into society, as expected by the public understanding of science model, then the media should present a plurality of viewpoints on the science in question. This point will be returned to later in the chapter.

The theory of social responsibility has also been critiqued as having a Western bias that does not adequately explain the practices of alternative press systems, especially in the Asian marketplace (Yin, 2008). As one example, Yin (2008) argues that the theory of social responsibility is based on libertarian theory and the ideal of a free press which uses that freedom in a responsible manner. However, Yin (2008) points out that due to fear of government retribution the press in some Asian countries is far from free and rather uses strong self-censorship in order to survive. Finally, Yin (2008) suggests that the theory does not account for the situation in developing countries or those that have just gained democracy.

Despite the criticisms and problems outlined above, as noted, the theory of social responsibility still guides many Western media organisations and journalists in their practices

(Baran & Davis, 2006). Not only does the theory guide and legitimise the practices of the media it also reinforces the ideal of the news media fulfilling the role as the Fourth Estate (Schultz, 1998).

In their role as the Fourth Estate the news media ideally play an important political role by acting:

as a conduit for information, ideas and opinions to assist in the good governance of society; to act as a check on the powerful, by reporting, analysing their actions on behalf of the public which lacks direct access to information or power (Schultz, 1998, p. 52).

Therefore, this ideal argues that the news media act as society's watchdog, constantly scrutinising those in power and exposing any abuse of power when it occurs. However, while journalists subscribe to this ideal, like the theory of social responsibility, it too, is threatened by commercial pressures and journalistic practices under which journalists operate.

One example of the impact of these pressures is given by Louw (2005) who argues that the commercial imperatives of the news media have seen the media's watchdog role hybridised with reports highlighting conflict, competition and the personal indiscretions or character flaws of those reported upon. This hybridised type of reporting serves to fulfil the entertainment role of the media, a role that according to Schultz (1998) has always been and continues to be a driving force of media publication.

While the above illustrates how commercial realities impact the news media's ability to uphold its watchdog role, the role is also influenced by the routine practices of journalists. According to Louw (2005), journalists are reliant on the information supplied by their sources, leaving them vulnerable to manipulation and unable to truly hold those sources accountable. While Louw is discussing the situation that exists between politicians and journalists, he could equally be discussing the situation between journalists and scientists. Journalists reporting science are very reliant on scientists for information and this situation makes it difficult for journalists to hold these scientists to account and negatively affects the ability of the media to play an adequate role in the democratisation of science. The relationship between journalists and scientists will be explored further later in the chapter.

The ideals of theory of social responsibility and the Fourth Estate do not only guide news media organisations in their practices but they also offer standards by which news media output on different issues may be judged. When these ideals are applied to the reporting of science, the theory of social responsibility suggests that ideally the media should report

science in an accurate, objective and balanced manner. The reporting should also reflect the diversity of views that exist about a particular science and/or technology, while also giving the right of reply once articles are published. Nevertheless, the ideal of the news media as the Fourth Estate, acting as society's watchdogs, suggests that journalists should hold scientists to account for the new science they introduce into society, whilst also alerting the public to any alternative views about the science being reported.

However, as noted, the news media, both in Western and Asian countries, find themselves challenged in trying to uphold the ideals of the theory of social responsibility and acting as societal watchdogs because of the differing pressures placed upon them (Rosenburg, 2007; Yin, 2008). For example, it is unlikely that Western newspapers will publish overly negative stories about large advertisers or even about their own organisation. Also as argued, the concentration of media ownership and the need to satisfy the larger audience has resulted in only particular types of stories being published, as well as privileging institutional news sources. These pressures, combined with other routine practices of journalism, make it difficult for the media to report issues in a socially responsible manner. One of the routine practices of journalists is their adherence to news values (Harcup & O'Neill, 2001; Hartley, 1994; McGregor, 2002) and the effects these have on what is reported is now discussed.

2.4 News Values

Not all stories are equal in potential news value and only particular events and issues are selected for publication, including events and issues regarding science and technology. Journalists select their stories based on an, "informal paradigm of news values" (Hartley, 1994, p. 76). News values act as a set of ground rules for journalists in their decisions on what will be reported as news (Harcup & O'Neill, 2001). McGregor (2002) argues that journalists, through assimilation, training and the affirmation or rejection by their editors, come to know what is considered newsworthy. News values, coupled with their training and assimilation into journalism, leave journalists with a template of what is newsworthy, which they use to select the stories they will report. However, the adherence to news values, as will be explained, may conflict with the media's commitment to act in a socially responsible manner.

In their influential study of foreign news Galtung and Ruge (1965) argued that a story will be considered newsworthy if it has one or more of 12 factors. These included, "the eight general factors of frequency" (the time span taken by an event); threshold; unambiguity; meaningfulness; consonance (the predictability or desire for an event to occur);

unexpectedness, continuity and composition (referring to the fact that the likelihood of a story being reported will depend on the mixture of other events being reported that day). The typology also included the four culture bound factors of elite nations; elite persons; personalisation (the tendency for the media to report structures or groups in individualistic terms, for example, Helen Clark's Labour Coalition Government) and negativity (bad news) (McGregor, 2002).

According to McGregor (2002) a number of significant changes have occurred in the news media industry since the typology was developed in 1965, not the least of which is the ubiquity of television news with its strong focus on the visual depictions of news events. Therefore, McGregor (2002) has proposed four additional news values be added to Galtung and Ruge's typology and these are: visualness, emotion, conflict and celebrification - where celebrity journalists become part of the news they report.

Additionally, Harcup and O'Neill (2001) in their study of the tabloid press in the United Kingdom have updated Galtung and Ruge's typology by developing a more contemporary list of news values. These include many of those listed above, as well as the four additional news values of celebrity, entertainment, good news and whether or not a story fits with the newspaper's own commercial agenda.

When examined in terms of stories about science and technology these news values suggest that science stories will be published if they fit easily within the news cycle (frequency) and contain one or more of the following elements: unexpectedness, negativity, unambiguity, meaningfulness, conflict, emotion, good news, entertainment and/or are about elite nations or persons and are personalisable. As examples, the Chernobyl and Three Mile Island nuclear accidents occurred in elite nations and were unexpected, negative, meaningful and unambiguous. Another example was the 2004 tsunami disaster which led some New Zealand journalists to ask scientists about the risk to New Zealand from a tsunami, thus, making the issue meaningful to readers (Patterson, 2004, p. 3). Other stories about saving wildlife or successful breeding programmes for endangered species may have more likelihood of being reported because they are meaningful and can arouse emotions amongst the audience. Sometimes these types of stories can provide opportunities to obtain good pictures or can be treated in a humorous fashion thereby raising their entertainment value. However, while stories may contain one or more of these news values, this will not guarantee their publication, as other considerations may determine whether or not it is included or excluded

on the day. For example, a story may not be reported because it may contravene the news policies of a particular newspaper and/or it may not fit well with the composition of other events being reported that day (Soloski, 1989). Alternatively, the story may not be reported because it is perceived that publication of the story may offend a large proportion of the audience will be offended (Louw, 2005). Therefore, while journalists may write a very newsworthy story containing many of the news values discussed, it may remain unpublished due to one or more of the other factors described above.

Price and Tewksbury (1997) argue that news values play an important role in how journalists frame public issues and are, therefore, an important element in how the media set the agenda of public opinion. The agenda may represent an unbalanced view of issues because through the use of news values to select, “certain events and people to include in news accounts, journalists ignore other events and people, and as a result, news consumers receive an uneven presentation of the world...” (Johnson-Cartee, 2005, pp. 125-126) resulting in only selected issues and viewpoints entering the public sphere. This uneven media reporting reveals the conflict that exists between journalistic practice and the ideal of the theory of social responsibility, which suggests that a diversity of views should be reported on any issue.

2.5 Agenda Setting

As already stated in Chapter 1, section 1.5 through their processes of selection the news media report and emphasise a limited number of issues. Emphasising these particular issues increases their salience, leading people to perceive these issues to be more important than others (Coleman & McCombs, 2007). In essence, this is the central tenet of agenda setting theory. The theoretical core of agenda setting is that, “the degree of emphasis placed on issues in the media influences the priority accorded these issues by the public” (McCombs & Ghanem, 2001, p. 67).

According to McCombs and Ghanem (2001), the agenda setting process occurs at two levels — the object level and the attribute level. Research has primarily focussed on object level agenda setting, examining how media coverage might influence the importance people place upon particular objects in the social world; for instance, political candidates, environmental problems or other issues (Baran & Davis, 2006). At this level of agenda setting the media suggest what the public should think about (McCombs & Ghanem, 2001). In terms of attribute level agenda setting the media give salience to particular attributes of objects in the

social world. The theory proposes that this results not only in the media telling the audience what to think about, but also telling them how to think about the selected issues.

According to Bryant and Thompson (2002), agenda setting research has gone through four distinct phases. The first stage was the initial study by McCombs and Shaw in 1972. This phase examined how the salience given to issues by the news media transferred onto the public agenda. The second phase also began with a study by McCombs and Shaw in 1977. This study found that regular news media users would have agendas that corresponded with those of the news media (Bryant & Thompson, 2002). This study also claimed to find support for the agenda setting function of the press although as Bryant and Thompson (2002) suggest, some researchers argued that the evidence was not convincing. The third phase of agenda setting research also began in the late 1970s and examined the second level effects of agenda setting and how these were influenced by voter characteristics, including their geographic location, occupation and education. The fourth and present stage of agenda setting began in the 1980s when researchers started to examine the sources of the news media agenda. Within “this phase of research, the news media suddenly became the *dependent* rather than independent variable” (Bryant & Thompson, 2002, p. 146, italics in original). This phase of the research also saw agenda setting become linked with other strands of research including news framing, agenda priming, gate-keeping and news diffusion (Bryant & Thompson, 2002).

While agenda setting research continues the theory does have its limitations. For example, Baran and Davis (2006) argue that agenda setting research is primarily focussed on news and political campaigns and gives little regard to other types of content and their possible effects. More importantly, while agenda setting research clearly shows that a link exists between media reports and public issues it does not necessarily illustrate the direction that link takes. Does the public set the agenda and then the media merely reinforce it or do the media set the agenda which the public then absorb?

It appears that this question remains unanswered as research has given conflicting results. Brosius and Weimann (1996) in their agenda setting research found that in some cases individuals act as early recognizers who identify emerging issues and feed these onto the news media agenda. Other results from the same research suggested that the media fed the public agenda. They argue that the agenda setting process is complex, and is not a one-step model of information flow from the news media to the public. Rather their results suggest a two-step flow of information from the public to the media and the media to the public.

However, a more recent meta-analysis of agenda setting studies argues that the direction of causation is from the media to the public. The study found significant agenda setting effects on four factors: “single versus multiple issues, individuals versus aggregate data, media content versus media exposure, and cross-sectional versus longitudinal data” (Wanta & Ghanem, 2007, p. 48). While these conflicting results leave unresolved the question of the causal direction of agenda setting effects, what is known is that news media output and the public agenda are linked.

Understanding that the causal direction of agenda setting is still in question, it is still necessary to examine how the theory applies to the public agenda regarding science. Cronholm and Sandell (1981) argued that the news media set the scientific agenda by making some scientific issues more salient than others. As Nelkin (1995) argues, for most people, “the media are their only contact with what is going on in rapidly changing scientific fields, as well as a major source of information about the implications of those changes in their lives” (p. 2). This places the news media in a stronger position to influence the scientific agenda in comparison, for instance, to politics where the public may have a greater number of information sources from which to form their opinions. Therefore, when it comes to public policy regarding science, the news media are in a powerful position to influence and shape public opinion regarding science. It is argued here that the media should exercise this power in a manner that facilitates democratic debate about the place of new and existing science in our society. To do so the media will have to exercise their watchdog role by holding scientists and policy makers to account. At the same time they will have to report the diversity of views that exist on an issue, without limiting these ideas by suggesting that they are beyond the bounds of what is understood to be sensible.

2.6 The News Media and Public Policy

As already noted in section 2.2, the media have a central role in the policy making process. The media’s centrality in the policy making process is not only demonstrated by the educational role they play regarding different topics, but also in their ability to set the agenda of how and what issues the public should think about (Kennamer, 1992; McCombs, 2004; Sigal, 1973). Cobb and Elder (1981) argue that the news media have three types of linkage with the policy process.

The first of these links is a result of the news media’s agenda setting function and occurs early in the policy process. Cobb and Elder (1981) argue the news media set the agenda for

the policy process, “by selectively directing attention to aspects of that environment ... [becoming] ... active agents in stimulating, filtering and structuring the inputs of the policy process” (p. 392).

The second link the news media have in the policy process is through their position as an important channel for policy-relevant information between policy makers, short-cutting, “the formal and often restrictive channels of intra-governmental communication” (Cobb & Elder, 1981, p. 392). This type of short-cutting has also been found in the reporting of science with the media often acting as a source of information about new scientific and technological developments for scientists (Bucchi, 1998). As an example, Bucchi (1998) refers to the controversial cold fusion experiments reported at a press conference by Pons and Fleischmann in 1989 which captured worldwide media attention. At the time of the announcement there were no published papers for scientists wishing to replicate the experiment to follow. Therefore, the news media became the main source of information about the experiment, even to the point that some scientists were using newspaper photographs of Fleischmann and Pons’ equipment to try to replicate the experiments (Bucchi, 1998).

The final linkage the news media have comes at the conclusion of the policy process or when the policy is released. While the outcomes of the policy process are a matter of public record, the ease and cost of accessing this information may be prohibitive for individual citizens (Cobb & Elder, 1981). As a result, the public often turn to the media for this information. Therefore, “popular reactions to policy actions and actors are, thus, likely to hinge on what media choose to report and how” (Cobb & Elder, 1981, p.392).

While traditional media may still influence how the public react to policy actions, more recent studies indicate that the internet is increasingly being used as a source of political information by those dissatisfied with more traditional media (Tolbert & McNeal, 2003). Other studies suggest that those using the internet for such purposes are likely to be more highly educated individuals (Bonfadelli, 2002).

While the internet may be having some effect on how political policy information is accessed by some members of the public, the media still act as a valuable source of information for policy makers. This informative role is achieved through the media’s increased use of public opinion polls, many of which are sponsored and reported by the media themselves, thereby becoming active participants in measuring and reporting public opinion. In some situations

these polls act as a valuable source of information for policy makers on topics where they do not possess a better source of public opinion (Pritchard, 1992).

The centrality of the news media in the policy making process results in them becoming a place of contest for those wishing to influence the process (Nisbet & Lewenstein, 2002). As Berkowitz (1992) states:

If policy makers can define their stand on an issue, as well as the alternative available for discussion, then they have defined the situation in more ‘winnable’ terms. Not only can they bring out their side more effectively, but they have delimited the general arguments the opposition can make (p. 91).

At a more subtle level policy makers or official sources can avoid questions from the media about particular issues and this may result in the issue not being reported at all (Berkowitz, 1992). Therefore, various political actors and interest groups contest with each other in their attempts to become media sources on issues in order to, “shape the attention and emphasis of coverage in a way that marshals support for their positions” (Nisbet & Lewenstein, 2002, p. 362).

These contests for media attention occur over a wide variety of issues, including how science and technology are to be used in society. The next section discusses the influence of news sources in the media’s reporting of issues.

2.7 News Sources

News sources play an integral part in how the news is constructed. Due to their limited numbers, journalists cannot be witness to many of the events they report and so rely on news sources for information (Sigal, 1973). As Hall et al. (1978) note, “the media themselves do not autonomously create news items; rather they are ‘cued in’ to specific topics by regular and reliable institutional sources” (p. 253). Previous research has found that over half of all news stories are source-originated (Sigal, 1973; Soloski, 1989).

A number of studies have investigated news source use in newspapers (for example, Brown, Bybee, Wearden & Straughan, 1987; Bullock, 2008; Lacy & Coulson, 2000; Powell & Self, 2003; Sigal, 1973; Soloski, 1989; Welch, Weber & Edwards, 2000) television (for example, Comrie, 1999; Comrie & Fountaine, 2005; Gant & Dimmick, 2000; Whitney, Fritzler, Jones, Mazzarella & Rakow, 1989) and more recently research has analysed news sources in online newspapers (Jha, 2007).

Many of these studies have found that official sources, for instance, government, government officials, scientific authorities and other established news sources, are the most frequently used news source types (Hall et al., 1978; Sigal, 1973). These news sources become routine channels of news for journalists, as they are regarded as legitimate sources, due to their access to centralised information, their particular position in the political sphere or expertise on particular issues (Ericson, Baranek & Chan, 1989; Gans, 1979; Sigal, 1973; Tuchman, 1978). Hall et al. (1978) argue that the over-accessing of these particular news sources by journalists leaves them in the position of primary definers on differing issues, thus, giving them power to set the agenda and boundaries of debate. Hall et al. (1978) state that:

primary definition *sets the limit* for all subsequent discussion by *framing what the problem* is. This initial framework then provides the criteria by which all subsequent contributions are labelled as ‘relevant’ to the debate, or ‘irrelevant’ – beside the point. Contributions which stray from this framework are exposed to the charge that they are ‘not addressing the problem’ (italics in original, p. 59).

According to this theory, other interest groups have to insert themselves into this pre-existing news frame, placing them at a disadvantage for having their particular viewpoint accepted.

The theory of primary definition is critiqued as being too media-centric, and that rather than primary definition being a predetermined outcome due to the structural constraints of journalist practice, it is a position achieved through competition for news media attention between differing interest groups (Miller, 1993; Schlesinger, 1990). Despite this limitation of the primary definition concept, Miller (1993) notes, “the massive resources at the disposal of the central institutions of the state give them a significant advantage in struggles for definition” (p. 402). Davis (2000) supports this observation, arguing that despite the critiques many researchers continue to find, “that institutional and government sources consistently outnumber all other types of news sources in news text” (p. 45).

This situation often results in other interest groups, for example, ethnic minorities, environmental or protest groups, being underrepresented as news sources (Christians, 1986; Nisbet & Lewenstein, 2002). As will be discussed later in the chapter this is often the fate of the latter two groups in the reporting of GM. If these groups are sought for their alternative viewpoints, it is often to satisfy the need for journalistic balance and to illustrate journalistic objectivity.

2.8 Journalistic Objectivity and Balance

The ideological ideal of journalistic objectivity has its roots in two trends in U.S. journalism. The first was the move away from the partisan press by newspapers in the late 1860s (Schudson, 2001; Sigal, 1973). The second trend came with the utilisation of wire services and the establishment of newsgathering organisations. The clients of these associations had a diversity of political views and, therefore, journalists wrote copy that avoided controversy or readily recognisable subjective judgements (Sigal, 1973). Part of the norm of objectivity is the need to balance stories by presenting one point of view and then another. Even when this principle is used by journalists, official sources still have a greater chance of being heard (Davis, 2000; Gamson & Modigliani, 1989; Miller, 1993; Sigal 1973).

While journalistic balance may protect journalists from accusations of bias, strict adherence to the ideal can lead to issues being reduced to two opposing points of view, even in cases where there clearly may be a number of viewpoints. Sometimes, this can lead journalists to simply find a news source with an opposing view, without really considering the credibility of that viewpoint and this is especially so when reporting science (Dunwoody, 1999; Mooney, 2004; Nelkin 1995).

As Dunwoody (1999) argues, “the balance norm also requires that a journalist suspend her analytical judgement, this time to give equal space to competing points of view regardless of their likelihood of being correct” (p. 72). Dearing (1995) in a study of newspaper coverage of three cases of maverick science - Iben Browning’s earthquake predictions, Peter Duesburg and the cause of AIDS, and the cold fusion experiments - found that newspapers reported the improbable scientific theories in all three cases in a supportive manner. In another study examining news coverage of court cases in America between scientists supporting creationism and those supporting evolutionary theory, Taylor and Condit (1988) found that the news media reports gave the competing theories equal scientific status, regardless of the fact that the court ruled that creationist theories were unscientific. In Nelkin’s view, the adherence to journalistic balance can mean the resulting science stories give “readers little guidance about the scientific significance of different views” (1995, p. 88).

Moreover, this practice can have some very real policy implications. In their study of climate change reporting in the U.S. prestige press, Boykoff and Boykoff (2004) found that adherence to the norm of journalistic balance by the U.S. prestige press had led to an, “informationally biased coverage of global warming” (p. 134). This was the result of the reporting of climate-change giving equal voice to sceptics who argued that the issue of global

warming was uncertain and therefore any action taken to combat it was questionable. This was despite most of the international scientific community agreeing that immediate action was required to combat global warming. They argue that this biased reporting had influenced U.S. Government policy by creating, “both a discursive and political space for the United States Government to shirk responsibility and delay action regarding global warming” (Boykoff & Boykoff, 2004, p. 134).

Alternatively, the ability to balance stories is threatened in some cases because of the tendency of journalists and their newspapers giving less representation to those views that seem to threaten the status quo. As already noted, the viewpoints of sources that appear to threaten what is considered ‘sensible’ are given far less representation than those that appear to support mainstream views (Hansen et al., 1998; Louw, 2005). Therefore, the activities and arguments of protest groups may receive limited coverage, because the civil or potential civil unrest associated with them may be seen by journalists and editors as being offensive to the wider audience. This is despite the fact that such groups may be trying to widen debate on issues to include environmental and ethical considerations.

These points again illustrate the important role the media play in educating the public about science and also in the policy process. The next section examines how the news media report science, before moving on to examine the relationships between journalists and scientists.

2.9 The News Media and the Reporting of Science

As already noted above in section 2.2, the public’s exposure, education and eventual understanding about science comes from a variety of sources. However, for most, the media become their primary source of information regarding science once they leave the formal education system (Billington & Bibby, 1991; Malone et al., 2000; Nelkin, 1995).

According to Friedman et al. (1986), the reporting of science by the news media is a relatively recent phenomenon. Before World War I and World War II there were few science journalists working for newspapers, and science news was not a regular feature in newspapers. This changed with the use of weapons of mass destruction during World War II, including the atomic bomb, which began to arouse the public’s awareness of science and its possible impacts; resulting in an increased demand for science news. This demand increased with events such as the launch of Sputnik and the subsequent Apollo missions (Friedman et al., 1986). Although the amount of science news reported in newspapers has increased since

World War II, it still only accounts for about 5% of the total space of newspapers (Gregory & Miller, 1998).

The tone of this science reportage has also changed over time. Up until the late 1960s the tone of science reportage was generally positive, due, in part to journalists covering, “the cosmic events of the space program and the dramatic discoveries in the physical sciences with wonder and élan” (Nelkin, 1995, p. 10). During this time science was reported as a series of scientific and technological breakthroughs and revolutions (Nelkin, 1995). This situation began to alter in the late 1960s when environmental and social impacts of science began to be questioned. This is another illustration of what is regarded to be the public’s disillusionment with the fruits of science (Broks, 2006). As a result the tone of coverage from this point began to report, “the less beneficial impacts of science and technology” (Peters, 1995, p. 3). Nelkin (1995) is more circumspect than this and argues that while science reporting in the 1970s concentrated on the consequences of scientific and technological discovery, the 1980s saw a return to more positive reporting albeit, “tempered by the continued fear of risk” (Nelkin, 1995, p. 10). Gregory and Miller (1998) concur with this assessment, arguing that the early 1990s had seen a return to more positive reporting of science, although risk was still a major feature in the reportage.

Despite the changing tone of science reporting, as already noted, science stories are often framed in terms of breakthroughs, revolutions or gee-whiz science (Metcalf & Gascoigne, 1995; Nelkin, 1995; Reed, 2002; Salleh, 2001). These stories are generally cast in a dramatic frame with scientists seen as pioneering heroes working at the frontier of new knowledge (Nelkin, 1995). Journalists appear to prefer to write science stories that have drama and/or elements of human interest and that are relevant to the audience, for instance, medical or environmental issues. Stories dealing with basic science are not as readily reported (Friedman, 1986; Metcalf & Gascoigne, 1995).

The focus on the dramatic leaves little room for critical analysis and the social, economic and ethical consequences of science and technology are often not reported by the media (Hornig-Priest, 2001; Nelkin, 1995). This results in some potential sources or viewpoints being ignored or at least marginalised and, as will be discussed later in the chapter, the reporting of GM follows a similar pattern. By marginalising these themes and sources the news media are not adhering well to the principles of the normative theory of the social responsibility of the media, which argue that they should report a diversity of views. Furthermore, by reporting the issue in this manner, the media are not really acting as watchdogs by exposing alternative

viewpoints that may raise the social and ethical issues concerning GM. Therefore, the news media in this instance are not facilitating a wider debate resulting in a greater democratisation of science. There are a number of reasons why science results in being reported in this manner, with some being due to journalistic practice. The next section reviews these practices and how they affect the reporting of science.

2.10 Journalistic Practices and Science Reporting

Edelson (1979) describes science news as a “ghetto of journalism” [where] “most of the coverage is done by people other than science writers” (p. 13). Friedman (1986) gives an explanation for this occurring. As she notes, many smaller news organizations do not have dedicated science writers and are, therefore, obliged to send more general assignment reporters to report on science stories. Normally only organisations with large full-time staffs have dedicated beat or round reporters. These latter reporters often have an educational background in science and may have a great deal of experience in reporting science news. Friedman (1986) argues that misunderstandings and inaccuracy can be caused because of the lack of scientific knowledge held by the more generalist reporters. Friedman (1986) suggests that scientists should make themselves aware of the reporter’s level of understanding if inaccuracies or misquotes are going to be avoided. This seems to place the blame with reporters and yet scientists’ lack of understanding of the needs of reporters, and in many cases inability to simplify their work can also compound the problem.

Even when pre-packaged news is uncritically reported, misquotes and inaccuracies still occur, due to the demands of the various media that report these stories. For example, as Friedman (1986) points out, the hard news portion of a newspaper is limited with the rest of the space being taken up with advertising, the lifeblood of newspaper profits. Therefore, articles need to be brief. When this brevity is combined with the inverted pyramid method of writing news stories, where the conclusions are written in the first sentence, it can lead to the scientific details of the story being cut off by a sub-editor looking to conserve space. This leads scientists to accuse journalists of distorting and oversimplifying stories (Friedman, 1986).

The situation gets increasingly worse when stories are reported on radio or television. Time constraints in both of these media make it very difficult for the detail deemed necessary by scientists to be reported. One reporter recalls his colleague asking, “Nobel Prize winner David Baltimore to explain in twenty seconds or less how recombinant DNA worked”

(Friedman, 1986, p. 35). Time constraints were also found by Pfund and Hofstadter (1981) as a possible cause of inaccuracy.

The factor of time is not solely limited to television and radio reporting. Time is also a factor in newspaper reporting, with printing deadlines that must be met by reporters on a daily basis. This reality is often not appreciated by scientists who ask to check the accuracy of a reporter's story and then become unhappy when the request is refused. This refusal is not only based on time but is also a move on the part of journalists to maintain some autonomy over the writing of their story (Friedman, 1986).

As already alluded to in section 2.3.5, the types of stories reported are also affected by time demands and journalistic training. As Tuchman (1978) argues, reporting the news is a daily activity and is driven by immediacy and the ability to report stories in an uncomplicated manner. She states "the tempo of newswork, including covering a different story every day, mandates an emphasis on events, not issues" (1978, p. 134). Louw (2005) argues that, journalistic training privileges the writing of hard, factual news stories using the inverted pyramid style of reporting where the conclusions are written at the top of the item and deeper explanations at the bottom of the article. Moreover, he argues that journalists gather news using the six-question-formula of (*who* does *what*, *when*, *where*, *why* and *how*), a formula well served to capture the essence of immediate events-based stories. Unfortunately this formula does not serve journalists well to uncover the complexity of long-running issues. Philips (1976) supports this view, arguing that journalists present news as a series of discrete events that are unrelated to other events in society.

Long-running or complicated issues, therefore, are often not reported because they do not fit the daily tempo of the news routine. If such issues are reported the background information is normally missing or the long-running issue is reported on only when newsworthy events occur. For example, a study of newspaper coverage of the identification and lengthy clean up of three major pollution sites in the U.S. found that journalists only reported these issues in terms of a series of, "intermittent 'newsworthy' events" (Dunwoody & Griffin, 1993, p. 47). By concentrating on events the journalistic frames about these issues were limited in two ways. First, journalists were reliant on sources when the events occurred and as a result these sources could control the framing of the issues. Secondly, it absolved journalists of examining the wider picture (Dunwoody & Griffin, 1993). Therefore, issues such as these, or others where the reading public may require a large amount of background information to

understand the issue, often go unreported, even though the issues could have serious ramifications for the public (Dunwoody & Griffin, 1993).

Even when reporters write stories with great care in order to maintain balance and accuracy, they are still at the mercy of their chief reporters or sub-editors who can alter their stories to the detriment of these ideals. Eventually, journalists come to realise their sub-editors' particular preferences, and write their stories accordingly, in order to gain continued acceptance and success in the newsroom (McGregor, 2002; Popovich, 1986).

These journalistic practices can produce science stories that put journalists at odds with one of their major news sources for such stories, the scientists themselves. This situation can result in an antagonistic relationship between the two groups; how these two groups interact with one another is now explored.

2.11 Scientists and Journalists

The large number of scientific developments occurring during and after the Second World War was accompanied by an increased coverage of these events by the news media. This led to growing numbers of journalists being employed as full or part-time science reporters in newspapers, magazines, television and radio (Friedman et al., 1986). This trend continued with later studies in Australia, Norway and Canada finding an increasing amount of science news being reported (Eide & Ottosen, 1994; Metcalfe & Gascoigne, 1995; Saari, Gibson & Osler, 1998). The growth of degree courses in science writing in the U.S. is another indication of this continuing trend (Dunwoody et al., 1999). There is a paucity of research into science journalism in New Zealand. For example, only one published study known to the author examines the accuracy of the New Zealand media's reporting of climate change (Bell, 1994). The study argued that the media were the New Zealand public's primary source of information on the topic, illustrating the important role science journalism plays as a source of science information in New Zealand.

While the reporting of science has increased, the number of journalists employed to report solely on science is relatively small. In the U.S. it is estimated that only 1% of all journalists are science journalists (Dunwoody, 1993). In Australia, Metcalfe and Gascoigne (1995) found that 6% of journalists reported on science, technology, environment, medicine and computers and yet only a handful of these journalists reported solely on these issues. Saari et al. (1998) found a similar situation in Canada with only the major dailies employing full-time science reporters.

The increased demand for science news has led to a corresponding increase in the number of scientists being drawn into the science communication process, some more reluctantly than others (Friedman et al., 1986). As noted above in section 2.2, the increased contact between scientists and the wider community was encouraged by initiatives like the United Kingdom's Public Understanding of Science initiative. Furthermore, as will be explained below, the need to gain funding has led some scientists to seek a public profile for their research. However, while the numbers of scientists involved in this process may have increased, this has not necessarily led to a corresponding increase in the number of scientists cited as sources. Saari et al. (1998) found that many science stories reported in Canadian newspapers relied on, "wire service copy for science stories" (p. 78). While not specifically discussing science stories, research has also found that New Zealand journalists rely heavily on the New Zealand Press Association (NZPA) for stories (Leitch, 1992; Norris, 2002). In contrast Eide and Ottosen (1994) found that Norwegian journalists preferred to interview scientists rather than use written sources of science information such as research reports or journals. However, the journalists tended, "to use the same scientists as sources over and over again" when writing these stories (p. 431). These results appear to indicate that the increased science reportage has not been matched by a corresponding increase in resources devoted to such reporting.

According to Dunwoody (1999), as the complexity of society has increased so has our reliance on experts. Dunwoody (1999) also argues that scientists are trusted based on their continuing ability to interpret evidence and solve problems. Therefore, scientific experts are called upon by the media for their opinion on a range of matters, including scientific discoveries, new technologies, and the possible causes of disasters - and even on the outcomes of elections. As shown, scientists have become primary definers because of their access to centralised knowledge and because of their expertise on particular issues. According to Dunwoody (1999), this leaves scientists in a strong position to influence the agenda of science reporting. Dunwoody (1999) argues that once a story, "becomes news the majority of the time science's notion of what matters continues to drive the interpretive framework of stories, sometimes for months or years" (p. 63).

However, this situation fails to take into account the changing nature of science in society. First, it appears that the news media may not realise the extent to which science is now being produced directly for commercial application. This may not be surprising as the commercially sensitive nature of these products means that it is not open to public scrutiny in

order to preserve any commercial advantages the producers may have. This may result in some scientific developments going unreported and some scientists never being called to account about the science they produce. Second, the news media's heavy reliance on experts seems to deny the challenges put forward by movements asking for greater public engagement in science policy (Wynne, 2006). Indeed by treating scientists as the only legitimate voices to speak about science the news media could be furthering the mistrust of science that already exists amongst the public, many of whom are calling for a more democratic approach to scientific decision making (Wynne, 2006).

This apparent lack of understanding by the news media results in scientists still being able to set the news media agenda. Often this power is due to the relationship that exists between scientists and some of the journalists who report on science. There are a number of reasons for this. The first is that science journalists, "identify more closely with their subject and their sources than do journalists in many other fields ..." (Nelkin, 1987, p. 108). This can lead journalists to report on science in an uncritical manner (Hornig-Priest, 2001; Metcalfe & Gascoigne, 1995; Petersen, 2001).

Another closely related reason why journalists are likely to uncritically report science is because of their reliance on scientists for information. This dependence means that journalists must earn the trust of scientists and are, therefore, reluctant to publish material that will alienate scientists (Crewdson, 1993; Dornan, 1990; Dunwoody, 1999; Eide & Ottosen, 1994; McIlwaine, 2001; Nelkin, 1995). According to Dornan (1990), unlike other journalists on the court or police news beats, journalists reporting science have, "no set forum whose affairs could be covered on a daily basis", and, thus, they can become, "dependent on the co-operation of the scientific community" (p. 175). To maintain access to scientist sources Dornan argues that a, "journalist must cultivate the trust of scientists, and this could be accomplished only by producing coverage of which scientists themselves approved" (Dornan 1990, p. 175). These types of close links, where journalists appear to become part of the very establishment they report on, were also discovered by Ericson et al. (1989) in their study of journalists working the court and police beats. In some cases journalists became quasi-police or quasi-court workers and would suppress some stories in order to protect the credibility of their sources. Nelkin (1987) suggests that an overly close relationship, combined with the pressure of time, has led to journalists becoming reliant on pre-packaged information, reporting it without critique. The increasing use of public relations officers in the service of scientific establishments has added to the amount of pre-packaged information available to

journalists. The demand to meet tight deadlines pressures journalists at times to accept the latest press release and publish it with little or no changes. Although journalists, including science journalists, are naturally suspicious of public relations people or *spin doctors* (Comrie, 2002; Nelkin, 1987) many still hold scientists up as trusted sources. However, Nelkin (1987) notes that the Challenger Space Shuttle disaster did awaken some journalists to their uncritical acceptance of sources, resulting in some reporters accusing themselves of accepting, “spoon fed news” (1987, p. 172). More recent studies have found that the trend to uncritically report science is still an issue. As already noted Saari et al. (1998) found that many Canadian science stories were based on wire service bulletins. In Norway, Eide and Ottosen (1994) found that many science stories analysed only cited one scientific source and that often these sources were allowed to set the story agenda. They also found that some scientists were cited regularly in these science stories. A possible reason for this pattern of news source use is that journalists have a tendency to return to sources whom they find to be accessible and articulate (Conrad, 1999; Sedorkin & McGregor, 2002). Metcalfe and Gascoigne (1995) also found that science reporting in Australia lacked critical evaluation and argued that this might place journalists at the mercy of scientists who exaggerate scientific claims in order to gain much needed funding.

In addition to journalists becoming close to their scientific sources another possible reason for the continued uncritical reporting is that, unless formally trained in science, journalists are obliged to accept and print what scientists tell them (Friedman, 1986; Goodell, 1985; Hornig-Priest, 2001). This has led to a call for journalists reporting science to have scientific qualifications or training (Friedman, 1986; Metcalfe & Gascoigne, 1995; Nelkin, 1987; Peters, 1995; Petersen, 2001; Saari, Gibson & Osler, 1998), although research by Reed (2001) does suggest these efforts to educate journalists about science should be targeted more towards editors who have the final control on how the story will be published.

Despite the increased reliance on scientists as sources, journalists still find it difficult at times to gain access to scientists for information. A number of writers note that the relationship between scientists and journalists is often characterised by tension and conflict (Goodell, 1985; Lyons, 1997; McIlwaine, 2001; Peters, 1995; Reed, 2001; Salleh, 2001). There are a number of reasons for this: the first is that some science, by its very nature, is complex and its intricacies are difficult to explain in a sound bite or in a newspaper column. If the discovery cannot be reported in the limited space available to the journalist it may never be reported at all (Dunwoody, 1986; Dunwoody & Griffin, 1993). If an issue is reported, and due to its

complexity or editorial decisions the background is left out, then journalists are accused of being inaccurate and misrepresenting the case (Goodell, 1985; Schneider, 1986; Tankard & Ryan, 1974; Flatow et al., 1986).

Some scientists use journalistic inaccuracy as a reason not to respond to requests for information from journalists. Accuracy in science reporting is important for a number of reasons. Flatow et al. (1986), argues that, “not only do inaccuracies infuriate scientists and prejudice them against journalists, but inaccuracies can also have dangerous and far reaching effects” (p. 104). Inaccurate stories about cures for cancer or other ailments can have devastating effects by giving false hope to the sufferers (Flatow et al., 1986). Earlier research on news media coverage of biomedical innovations found the overall standard of accuracy in the stories examined to be reasonably high, yet the space and time pressures journalists find themselves under did increase the risk of inaccurate stories (Pfund & Hofstadter, 1981). Singer (1990) analysing a number of science stories reported by newspapers, magazines and television found there were a, “large number of stories containing substantially inaccurate statements” (p. 114). In her view, such inaccurate reporting could lead to scientists and their findings being given more credence than they actually warranted and when these findings were later called into question, not only would the scientists themselves suffer, but also journalistic standards would come into question (Singer, 1990).

This type of situation occurred recently in New Zealand, with the news media reporting of Lyprinol, an extract from New Zealand green lipped mussels, which promised a possible cure for cancer. The reports were premature, as while the extract had been found to kill cancer cells in the laboratory, no further research had been conducted. However, the reports resulted in over \$2 million worth of Lyprinol pills being sold within the one day it was on New Zealand shelves. At the end of that day the distributors, in negotiation with the New Zealand Ministry of Health, withdrew the product from sale (Comrie, 2000). Comrie (2000) argues these reports, “were largely to blame for needlessly harming cancer sufferers by holding out false hope” (p. 16).

However, despite the protests of some scientists and researchers about inaccuracy, a number of surveys have found that scientists are often satisfied with the levels of accuracy and the manner in which they were reported (Dornan, 1990; Hansen & Dickinson, 1992; Tichenor, Olien, Harrison & Donohue, 1970). Hansen and Dickinson (1992) in a study of 500 scientific

sources cited in science news coverage, found that those, “sources tend on the whole *not* to be critical of the specific coverage of items in which they appear” (italics in original, p. 374).

While some stories published are accurate, they leave out contextual material that can give the impression that the scientists involved are being unoriginal. This is of concern to the scientists involved as it may harm their standing with their peers. As Schneider (1986) explains:

Scientists who have made discoveries greatly valued by their peers are disappointed when they find that journalists have primarily repeated what is already known to the scientific community and at most have made only peripheral mention of the new discovery in the article. These scientists fear that they may appear to their colleagues as unoriginal (pp. 106-107).

Scientists do not avoid journalists or media exposure just because they may be inaccurately cited or appear unoriginal. In some cases the avoidance is due to an attitude amongst particular scientists concerning the public exposure of their work.

According to Dunwoody:

Scientists are part of a culture that still remains relatively indifferent to the public understanding of its work. The scientific community does not reward its members for informing the public, and in some instances it may punish them for doing so (1986, p. 8).

Scientific reputations are not made through being cited in newspapers; rather they are made through the publication of research in refereed scientific journals. Dunwoody and Ryan (1985) suggest that some scientists may see other scientists spending time in the media limelight as frivolous and wasting time that would be better spent on dedicated research. Moreover, others scientists may argue that seeking media attention before proper peer reviews have taken place undermines the integrity of the scientific process. However, as noted above, initiatives such as the Public Understanding of Science and in more recent times the need to gain funding, may have seen a reduction in this reluctance to engage with the media and the wider public. While some scientists resist being drawn into communicating about their particular research through the media, others do choose to talk with the media. While many of these scientists only discuss their particular area of expertise, others are called upon to give their scientific opinion on a number of differing issues and this can be problematic. When sources are used to establish “facts” they are constituted as authorised

knowers and their view of reality is given authority over others (Ericson et al., 1989). Hansen & Dickinson (1992) argue that scientists are now in the position of authorised knowers regarding various areas of science and have, therefore, become primary definers for that particular area of science. For example, in the area of human reproductive technology it can be argued that Lord Robert Winston is treated as an authorised knower by the media. Lord Winston has become a media personality, having hosted a number of documentaries on the human body and appearing as a guest expert on matters of genetic manipulation and cloning in various news articles.

While there is nothing wrong with scientists becoming media personalities it can become problematic if and when these scientists begin to give journalists opinions on areas of science outside of their area of expertise or training, and these opinions are reported as scientific facts. For example, the late astronomer Carl Sagan was presented as an expert on fields as diverse as evolution, global warming, the nuclear-winter effect and the possible effect on global temperature due to the Kuwaiti oilfield fires following the first Gulf War. Fumento (1993) argues that only on the last of these issues could his assertions be put to the test, and there he was completely wrong because rather than his training being in meteorology or climatology, “Sagan’s training is as an astronomer” (p. 349).

Although many journalists do attempt to avoid overly cooperative sources like Sagan, they are nevertheless faced with an increasing number of scientists willing to speak with them about their particular research. As illustrated, this has not always been the case, and yet recent commercial imperatives in the area of research funding can compel some scientists to volunteer themselves as sources for the news media in order to raise or indeed create a public profile for their work. In the U.S. context, Crisp argues that, “with belt-tightening by federal funding agencies, there is an incentive for some scientists to get attention in Washington via the media if their grant is up for renewal” (1986, p. 85).

This situation of increasing competition for research funding is not limited to the U.S. In 1998, the New Zealand Ministry of Research, Science and Technology began to develop and implement the Foresight process designed, “to rethink and prioritise research directions for New Zealand into the next century” (Harvey, 1999, p. 1). According to Harvey (1999) the Foresight process is designed to focus already contestable science funding into areas that would make New Zealand competitive in the global economy. This trend is in line with the Mode 2 knowledge production as outlined by Gibbons et al. (1994).

Gibbons et al. (1994) argue that the production of knowledge has evolved from being created within particular disciplines which are bound by particular cognitive and social norms that determine “what shall count as significant problems, who shall be allowed to practise science and what constitutes good science”(p.3)..This type of knowledge production, termed Mode 1, seeks to solve discipline-based problems and is often based in universities and government-funded scientific institutes. Mode 2 knowledge production, on the other hand, engages in solving problems organised according to desired applications. According to Gibbons et al. (1994), mass education since the Second World War has led to many individuals being able to conduct scientific research. These individuals work for many organisations and scientific research is no longer only conducted by universities and government-sponsored scientific institutes. As noted above, research and knowledge production is now carried out in many industries and private research institutions. Research of this nature is often conducted to find marketable solutions to particular problems. Therefore, the Foresight policy is indicative of government policy that wishes to focus research funds towards Mode 2 knowledge production and research that produces practical and marketable solutions to particular problems.

Cronin (2004) while conducting research into the use of dialogue as a method of engagement between scientists and the public with regard to biotechnology, found that scientists were increasing their communication with the public and the media (personal communication, Cronin, May 25, 2005). According to Cronin (personal communication May 25, 2005), this increased communication was designed to increase public understanding and acceptability of biotechnology by combating some of, what was considered by scientists, to be misinformation about some aspects of the science. However, while this communication may have been a genuine attempt to better inform the public about biotechnology, it can be argued that this communication may have also increased the public profile of the research, thus enhancing the chances of the scientists involved in gaining future research funding.

Of course not all scientists are financially motivated in their pursuit of news media attention; some instead are politically motivated. According to Russell (1986) regardless of whether or not scientists are financially or politically motivated, journalists are obliged to articulate these non-scientific motivations in order that the audience can judge their relevance.

The scientific community does try to avoid these situations by advising members that when communicating with external audiences, including the media, they should only speak about

their own area of expertise and do so in an ethical and open-minded manner. For example, the code of ethics of the Royal Society of New Zealand states that its members should, “only represent themselves as experts in their fields of competence as defined by their formal qualifications or other demonstrable experience” (Royal Society of New Zealand, 2009, Section 3, ¶ 2).

It can be seen that the practices and routines of journalism and the relationship between scientists and journalists can affect how science stories are reported. This in turn can affect how and what the public comes to know about science and also affect any ability and/or interest of the public to meaningfully contribute to the policy debate surrounding science and technology. It is the aim of this thesis to explore how newspapers reported the GM debate, in particular, examining the overall tone of the reportage and also which news source types and themes were most frequently reported. The next section reviews previous research into the media’s reporting of genetic modification before placing the thesis in the context of this literature.

2.12 The Reporting of Genetic Modification (Biotechnology)

As noted, the media, in particular, newspapers, are one of the leading sources of scientific information for the general public (Billington & Bibby, 1991; Hijmans et al., 2003; Nelkin, 1995; Nisbet & Lewenstein, 2002). Understanding this situation, researchers have, since the announcement of the first successful rDNA experiments in the late 1970s, been interested in how the mass media, in particular, newspapers, have reported biotechnology. This research has uncovered a number of consistent trends.

One of the earliest studies in the area was conducted by Pfund and Hofstadter (1981). Using content analysis, Pfund and Hofstadter examined the reportage on biomedical innovations in a number of major U.S. newspapers and magazines. They found that the coverage was event-led, for example, stories focussed on, “congressional hearings, court rulings or ... scientific and research breakthroughs and press conferences” (Pfund & Hofstadter, 1981, p. 141) They argue this type of coverage leads to a type of *pack journalism*, leaving some issues and groups being marginalized and resulting in stories dealing with wider issues being relegated to back pages of newspapers (Pfund & Hofstadter, 1981).

More recently, Nisbet and Lewenstein (2002) have also found that newspaper coverage of biotechnology in the U.S. is driven by events. They state:

Biotechnology coverage has been heavily event centred or episodic within years, peaking or plummeting across week or month in correspondence to the latest major article appearing in *Science* or *Nature*, the announcements of politicians or regulatory bodies, a major announcement of a scientific meeting, or the occasional high-profile incident (p. 384).

As already stated, Dunwoody and Griffin (1993) argue that event-led reporting leads to sources being able to frame how issues are reported and also absolves journalists from examining the wider issues surrounding a topic. For example, in their analysis of newspaper coverage of PCB (polychlorinated biphenyls) contamination of the Sheboygan river in Milwaukee, Dunwoody and Griffin (1993) found that reliance on sources framed the issue in terms of “how to clean up the river” and “restoration of commercial and recreational fishing”(p. 42). Alternative frames such as who was responsible for the pollution, or the health risks associated with it were given limited or no attention.

Indeed, recent research shows that newspaper reporting of biotechnology is dominated by particular themes while others are consistently marginalized. Nisbet and Lewenstein (2002) in their longitudinal content analysis of U.S. newspaper coverage of biotechnology between 1970 and 1999 found that from the 1980s to the mid-1990s the dominant emphasis was on “DNA research in general, pharmaceuticals and vaccines, human inheritances and predictive medicine” (p. 381). They also found that coverage of biotechnology increased in the late 1990s after the announcement of the cloning of Dolly the sheep in 1997.

The patterns found by Nisbet and Lewenstein (2002) were similar to those found by Kohring and Gorke (2000) in their cross-cultural content analysis of newspaper coverage of genetic engineering. The study compared coverage of genetic engineering in U.S., German, French and British newspapers. They found that research, medicine and human applications (for instance, vaccines and genetic screening) were the main themes covered. Stories dealing with the agricultural and environmental effects of biotechnology were most common in German newspapers, but in the other countries surveyed they did not receive more than 10% of the coverage.

The increase in the number of stories found by Nisbet and Lewenstein (2002) had also been evident in Europe, with Durant et al. (1998) finding that from 1992 to 1997 the number of newspaper articles reporting on biotechnology increased by up to 60% from the previous five year period (1987 to 1991). During this period, in the 12 European countries they studied,

newspaper stories increased to an almost daily event in four countries, to a weekly news event for a further four and for the remaining four countries the issue appeared monthly or less frequently. However, since this survey Durant et al. (1989) note that the news media in these latter countries appeared to awaken to the issue of biotechnology and the newspaper stories on the issue subsequently increased. This increase was also accompanied by a decrease in public support for *green* or agricultural biotechnology and an increase in public support for *red* or medical biotechnology. It is argued that the decline in support for *green* biotechnology occurred as a result of the political debates that followed the announcement of the cloning of Dolly the sheep in 1997, and the announcements of the releases of genetically modified organisms, in the form of staple food crops (Bauer, 2005a).

Dolly the sheep raised the issue of cloning and related technologies like stem-cell research into the news media spotlight. Studies using more qualitative methods of analysis have examined newspaper coverage of cloning and stem cell research. Petersen (2001) found that Australian newspapers portrayed genetic research in positive terms despite the announcement about Dolly the sheep. Hyde (2006), in his later study of news media accounts of cloning, found that newspapers and online news sources portrayed cloning, “in a positive, future-looking light” (p. 246). Many of the reports suggested that cloning would improve the quality of human life (Hyde, 2006). The positive framing of cloning research is also found in the reporting of stem cell research. Kitlinger and Williams (2005) found that the British reporting of stem cell research had many visions of the future benefits and potential of the research.

The dominance of the themes concerned with genetic research and medicine has left other themes concerning GM marginalized. Nisbet and Lewenstein (2002) found that themes dealing with, “ethics, legal regulation, public opinion, and other competing interests, including environmentalists, religious groups, bio-ethicists, consumer groups, and the public in general” (p. 385) were not covered by the newspapers examined. Kitlinger and Williams (2005) in their examination of reporting on embryo stem cell research argue that certain themes were missing from the reportage. They note that the coverage had an absence of:

feminist critiques (for example, concern about women as the source of embryos) and the lack of debate about potential health risks or reflection on the present therapeutic gap. In all the talk about the potential and ‘prospects’ of stem cell research there was also very little attention to the financial prospecting aspects of such work (p. 739).

Hyde (2006) also found in his analysis of cloning coverage reported by three print and three online U.S. newspapers that only a “small portion of the news reports covered the social or ethical issues connected to cloning” (p. 246).

In addition to the prominence of certain themes and the marginalization or lack of coverage of others, all the research in this area has found a positive bias towards biotechnology and its related technologies. It is acknowledged that the very early coverage “served to acknowledge the existence of controversy and provided fuel for intense policy deliberations” (Pfund & Hofstadter, 1981, p. 146). However, later coverage emphasized the benefits of biotechnology and this rendered “policy concerns over the safety and appropriateness of the technology to tangential status” (Pfund & Hofstadter, 1981, p. 146).

This positive tone in the reporting of biotechnology has continued right through until the late 1990s (see Durant et al., 1998; Hyde, 2006; Kitzinger & Williams, 2005; Kohring & Gorke, 2000; Nisbet & Lewenstein, 2002; Petersen, 2001; Petersen, Anderson & Allan, 2005). While concerns in the late 1990s with cloning and embryonic stem cell research and, to a lesser extent GM crops, increased the number of stories dealing with the possible negative effects of biotechnology, these were matched by an increase in the coverage of the potential benefits of the technology (Kitzinger & Williams, 2005; Nisbet & Lewenstein, 2002; Petersen, 2001)

There are a number of reasons proposed for this positive bias towards biotechnology. Firstly, unlike nuclear energy there have, “been no major catastrophes related to biotechnology” (Nisbet & Lewenstein, 2002, p. 386). Therefore, until such a disaster occurs it is likely that coverage will remain positive, in line with the cultural norm of science being seen as progressive for society. The increase in the potential benefits that accompanied the increase of stories in the late 1990s may be explained by the media’s need to appear balanced in its reporting. Finally, it is argued that the pro-biotechnology tone of the coverage is due to the dominance of certain source types. The reportage is normally dominated by scientific, industry and political sources (Hyde, 2006; Kohring & Gorke, 2000; Nisbet, Brossard, & Kroepsch, 2003; Nisbet & Lewenstein, 2002; Pfund & Hofstadter, 1981). For the most part, other sources such as environmentalists, religious leaders or dissident scientists are marginalized (see Nisbet et al., 2003; Nisbet & Lewenstein, 2002; Pfund & Hofstadter, 1981). This predominance of pro-biotechnology sources has also been prevalent in the

coverage of cloning and stem cell research, despite the rising concerns about the potential negative effects of such technologies (Hyde, 2006; Nisbet et al., 2003).

In summary, the news media reporting of biotechnology in the U.S. and Europe is event driven, and until the late 1990s was dominated by stories concerning genetic research, vaccines, pharmaceuticals and human applications. After this time, stories concerning cloning, embryonic stem cell research and to a lesser extent agricultural biotechnology, began to dominate the reportage. These reports began to raise some concerns over the possible negative consequences of such technology and yet these were ameliorated by increased reportage of the potential benefits. A positive tone towards biotechnology is a continued feature of the news reportage and this is possibly due to the predominance of scientific, industry and political sources favouring the technology.

2.13 The New Zealand Genetic Modification Debate

As noted in the introduction, Section 1.1, genetic modification in New Zealand became a highly politicised issue culminating in the Labour Government establishing a Royal Commission of Inquiry in May 2000. The findings of the Commission and the Government's subsequent policy decision were the subject of large scale protest and political debate. Moreover, the debate was of academic interest as it was a case study in the communication of new science and technology to the public. This resulted in considerable academic research into the New Zealand GM debate, and this is now reviewed.

The research into the issue can be divided into a number of methodological strands. The first of these is a series of studies using discourse analysis that examined various public relations (PR) strategies used during the GM debate. The first of these studies examined the scandal over the PR firm Communication Trumps. This firm was employed by King Salmon and the publicly funded Crown Research Institutes. The latter wished, "to use public relations to create a climate of favourable public opinion for their work through the establishment of an educational trust called the Gene Technology Information Trust" (Weaver & Motion, 2002). The Green Party called attention to the work of Communication Trumps and this resulted in the appointment of a parliamentary select committee to investigate the funding of the Gene Pool information programme established by the Gene Technology Information Trust. It was found that the trust was largely funded by corporate interests involved in GM research. Weaver and Motion (2002) argue that the case illustrates how PR in New Zealand is linked to, "the neo-liberal political economy where the 'public interest' has been subsumed by

corporate interests” (p. 340). In the case of the Communication Trumps PR campaign the democratic right of the public to make informed choices was ignored in favour of the commercial drive to engineer public consent for GM (Weaver & Motion, 2002). This reliance on economic arguments was also found in the PR campaign instigated by the pro-GM group the Life Sciences Network (LSN). This campaign articulated GM in terms of an economic discourse arguing the benefits of GM to the New Zealand economy while at the same time negating anti-GM discourses (Weaver & Motion, 2005a).

In a related study, Henderson et al. (2007) examined how two major New Zealand export industries, the New Zealand Dairy Board and Kiwifruit New Zealand, holding opposing views on the desirability of GM, communicated these views to their wider audiences. They found that both organisations used, “the rationality of the marketplace to argue for their respective GM policies” (Henderson et al., 2007, p. 30). These results illustrate the strong role that economic arguments had in the debate concerning the implementation of GM technology in New Zealand.

Still utilising discourse analysis, other research has examined the strategies of anti-GM groups. Henderson (2005) examined the PR strategy of the GE Free New Zealand campaign. The results of this study illustrated the GE Free campaign was successful in partially influencing government policy on the GM issue, encouraging public participation in the debate and also in contesting, “the dominant discourses about genetic engineering” (Henderson, 2005, p. 133). In another examination of the discourse of anti-GM groups, Rogers-Hayden and Campbell (2003) analysed the submissions of environmental groups to the Royal Commission on Genetic Modification. It was found that these groups challenged the epistemic authority of science as a knowledge system by arguing that science is, “a culturally embedded activity with no greater epistemological authority than other knowledge systems” Rogers-Hayden & Campbell, 2003, pg. 531). This study was part of a larger doctoral study by Rogers-Hayden (2004) which found that in addition to anti-GM groups challenging the authority of science as a system of knowledge, many of these groups could not gain Interested Person (IP) status at the Commission, because of the restrictive timelines that favoured well-funded and centralised organisations. Tucker, (2003) also examined the selection process for Interested Persons (IPs), finding that those who supported GM were more likely to gain IP status than those opposed to it. Furthermore, the Commission favoured arguments that used rational scientific discourse, and as noted, the submissions of many anti-

GM groups questioned the authority of such discourse, thus placing them at a disadvantage. This thesis will examine whether this disadvantage also affected the representation of anti-GM groups and their viewpoints in the media coverage.

The Royal Commission was also analysed in terms of its ability to act as an agora or place for public debate over GM (Davenport & Leitch, 2005). The findings suggest that the Royal Commission did not satisfy the very different expectations of its many participants. This was because people who were expecting to have an equal right to speak before the Commission were excluded as they were unable to gain 'interested person' (IP) status. Furthermore, the Commission was not set up as arena of debate where people could challenge and exchange viewpoints and thereby influence the decision making process. Rather, the Commission was set up to "provide strategic input into governmental consideration of the topic, so the processes were as much about informing the Royal Commission as they were about societal debate" (Davenport & Leitch, 2005, p. 151). Therefore, the focus of the Commission resulted in many participants not having the influence they might have expected by participating in the Royal Commission.

As noted in the introduction, section 1.1, the GM debate was highly politicised, and other research examined the political rhetoric surrounding the debate. This research examined the political contest over GM that ensued between the Labour and Green parties leading up to the 2002 general election (Ashwell & Olsson, 2004). Before the 2002 election Nicky Hager, an investigative journalist, released a book called, "*Seeds of distrust: The story of a GE cover-up*". The book accused the Labour Government of knowingly allowing genetically modified sweet corn to be grown commercially in New Zealand despite there being a moratorium on the commercial release of GM crops. The issue became known as *Corngate* and threatened the Labour Government's credibility. It also appeared that the contents of the book were known to the Green Party before its publication, suggesting that the Party were somehow complicit in its publication and thus seeking to discredit the Government just before the election. The Labour party therefore, accused the Greens of dirty tactics and political betrayal, shifting the argument away from the rights and wrongs of allowing the GM sweet corn being grown. As a result, Ashwell & Olsson (2004) suggest that, "in the lead up to the 2002 New Zealand General Election the core of the debate often had less to do with the pros and cons of genetic modification, and more to do with the political concern of party credibility" (p. 60).

Other research, and of greater importance to this thesis, has examined the New Zealand media's role in reporting the GM debate. Motion and Weaver (2005b) examined how Greenpeace used the media to draw attention to its version of the GM debate. They found that while Greenpeace established itself as a source of new leads for the media, "it was less successful in establishing itself as an epistemic authority whereby the framing of news stories represented the Greenpeace perspective" (Motion & Weaver, 2005b). Motion and Weaver (2005b) also suggest that Greenpeace's use of dramatic protest can jeopardise its ability to become a credible news source (Motion & Weaver, 2005b). The current research expands on this by examining how all news sources reported during the GM debate were represented in terms of the volume of reportage they received and the types of arguments given coverage.

The media's reporting of the RCGM has also been examined by Rugar (2002). Using content analysis of newspaper reportage on the Royal Commission, Rugar (2002) found that the reportage was often framed in terms of a conflict between the government and environmentalists and that the government was often cited "as an authoritative (rather than contested) source" (Rugar, 2002, p. 59). A further examination of editorials published from July 2001 to July 2002 found that these editorials using the notion of common sense supported the Commission's call to proceed with caution with GM (Rugar, 2007b). Rugar (2007a) also examined the transparency of New Zealand journalists' newsgathering techniques. Using a combination of quantitative content analysis and qualitative discourse analysis, Rugar (2007a) analysed news articles between July 2001 and July 2002 reporting genetic engineering. The research found that the reportage did not establish where the journalist had gathered the news from, for example, a press conference, interview, press release and/or citing another media outlet. Rugar (2007a) argues that the lack of transparency on how news is gathered results in facts and opinions being treated equally. Finally, the research argued that the reportage on genetic modification reduced the issue to what people said rather than reporting what the issue was about (Rugar, 2007a).

The current research also examines how New Zealand newspapers reported the GM debate. The period chosen for analysis differs from Rugar (2007a), as it begins in 1998, the year when genetically modified food was discovered in New Zealand supermarkets, and finishes in February 2002, four months after the Government announced its GM policy based on the Royal Commission's findings. This period includes the Royal Commission and the aftermath of the Government's policy decision based on the Commission's findings, illustrating how

the reportage changed over time and how these events affected the reportage. The use of content analysis in this study examines which news sources were most frequently cited in the reportage, in order to explore the influence of news source use on the themes most frequently reported in the coverage and the resulting overall bias of the reportage. As shown, this will illustrate how sources and the themes they discussed within the reportage changed over time giving a greater understanding of how the news media's reporting of the issue may have shaped the public and policy agenda with regard to GM in New Zealand. In addition, the interviews with scientists and journalists involved expands on the limited New Zealand research into the relationship between these two groups and adds a new dimension to the GM research already conducted in New Zealand. By exploring how each group perceived the reporting of the issue and how the two groups related to each other, the research explores how this relationship may have influenced the reporting of the issue. The next chapter describes the methods used in this analysis.

2.14 Summary

In summary, the apparent lack of scientific understanding amongst the public has been of concern to policy makers in a number of countries, including New Zealand. Initiatives such as the United Kingdom's Public Understanding of Science are designed to alleviate this lack of understanding. These initiatives and other factors have resulted in increased contact between scientists and the media as the latter are an important site of scientific information for the public. The relationship between journalists and scientists has a number of tensions. These include a power imbalance with journalists reliant on scientists for information, accusations from scientists of inaccurate reporting, scientific indifference to publicity for their work and overly cooperative scientists. These tensions combined with commercial pressures and routine journalistic practices make it increasingly difficult for the media to report science and other issues in a socially responsible manner or to uphold their role as watchdogs over those in power.

The media's reporting of GM has been the subject of much international research, and while there has been an increasing amount of research on the subject of GM in New Zealand, little of it has examined the media's treatment of the issue. The aim of this thesis is to explore how newspapers reported the GM debate, in particular, examining the overall tone of the reportage and also which news source types and themes were most frequently reported. The next

chapter discusses the methodologies chosen to achieve this aim and to explore the relationships and perceptions of scientists and journalists involved in the reporting of GM.

Chapter 3

Methodology

3.1 Introduction

In examining the reporting of the GM debate by the New Zealand press between January 1998 and February 2002 two methods of analysis are employed: content analysis and interview analysis. The content analysis provided quantitative data to answer the question, “How did the press report the GM debate?” The interview analysis provided qualitative data to explore how journalists and scientific news sources perceived the reporting of the GM debate, while also providing some indication of their experiences in interacting with one another.

Since the first successful rDNA experiments of the early 1970s media theorists have examined how the press has reported on biotechnology or GM. The press is a major arena where, “policy issues related to biotechnology are defined and symbolized” (Nisbet & Lewenstein, 2002, p. 360). This process of definition and symbolisation is likely to be strongly influenced by sources, with some sources being privileged over others (Nisbet & Lewenstein, 2002). Therefore, the combination of content and interview analysis is used to illustrate how the interaction between sources and journalists has influenced the reporting of the GM debate by the New Zealand press.

3.2 Content Analysis and GM

Contemporary studies of press coverage of GM have used a number of research methods including frame, rhetorical, and metaphor analysis which concentrate on particular aspects of GM technology, for instance, cloning, stem cell research and gene therapy (Hyde, 2006; Kitzinger & Williams, 2005; Petersen, 2001; Rupar, 2002). However, content analysis remains a major technique for the systematic survey of press coverage of GM as a whole (see Bauer, 2005b; Nisbet & Lewenstein, 2002).

Content analysis can be defined as an unobtrusive research method for “systematically analysing and making inferences from texts” (Schutt, 2009, p. 454). By using content analysis researchers can hope to identify the intentions, focus, or communication trends of an individual, group, or institution (Berelson, 1952). In addition, content analysis can generate

“new evidence about the nature and effect of specific communications” (Kolbe & Burnett, 1991, p.244). For these reasons content analysis is an ideal method to analyse how GM reportage and news source use in the New Zealand press has changed over time. As Babbie (2007) argues, content analysis is a particularly useful method for answering the question: Who says what, to whom, why, how and with what effect? (p. 320). The method is also well suited to, “studying processes occurring over long time periods” (Babbie, 2007, p. 330). Furthermore, content analysis has the potential to be used with other methods of analysis (Brewer & Hunter, 1989). In the case of this research content analysis and interviews are used together. The method of content analysis will be discussed in more detail below.

Much of the literature informing this thesis comes from the U.S., with a strong tradition of research into biotechnology (Nisbet & Lewenstein, 2002), but work from Britain, Germany, Italy (Durant et al., 1998; Kohring & Gorke, 2000), Australia and New Zealand (Rupar, 2007) have also informed the analysis. Previous content-based studies of GM reportage have tended to examine a small number of elite and broadsheet newspapers, coding all stories that relate to biotechnology or GM. These studies have examined a number of facets of the reportage including the predominant topics and themes, the tone, and the source distribution (Nisbet & Lewenstein, 2002). Other studies have conducted cross-cultural comparisons of GM reportage (Bauer, 2005b; Kohring & Gorke, 2000). Moreover, content-based studies have also been used to examine the differences in coverage of medical and agricultural GM (Bauer, 2005a) and also to conduct cross-cultural studies into how the media influence knowledge gaps with regard to GM (Bonfadelli, 2005).

In this study, content analysis was used to explore the question, “How did New Zealand newspapers report the GM debate?” with particular interest on the place of the Royal Commission of Inquiry on Genetic Modification in the reportage. The analysis was designed to provide information about story variables and source distribution which both inform the analysis and interpretation in chapters 4 and 5. Specifically the content analysis was used to answer three sub-questions:

1. Who were the most frequently cited sources in the reportage?
2. What themes were most frequently reported on?
3. What stance did the different news source types take on the themes reported?

The manner in which the content analysis was employed to answer these questions is discussed later in the chapter. The following section defines and explains content analysis as a research method and its applicability to this research.

3.2.1 Content Analysis as a Method

Content analysis as a methodology has a long history and is defined by Berelson (1952) as a, “research technique for the objective, systematic and quantitative description of the manifest content of communication” (p. 18). This definition was formulated and published in the 1950s and since this time media researchers have come to recognise that the content is not a fixed object of analysis, as numerous studies have discovered, “that people ‘read’ the news in different ways, interpreting and taking away different messages” (Fountaine, 2002, p. 70). Understanding that people read and interpret content in differing ways brings into question the ideal of objectivity. Because no content analysis ever analyses all the elements in a text it can never be an objective or value-free methodology (Hansen et al., 1989). Rather the dimensions of a text chosen by a content analyst indicate that he or she considers those elements are important for study, even though the choices made are, “generally informed by the theoretical framework and ideas which circumscribe his or her research” (Hansen et al., 1998, p. 95).

Therefore, more contemporary definitions of content analysis have moved away from the insistence on objectivity, and define content analysis as a research technique, “for making replicable and valid inferences from texts (or other meaningful matter) to contexts of their use” (Krippendorff, 2004, p. 18). So rather than being objective, content analyses should be replicable.

Content analyses are replicable because the method is quantitative with the purpose of counting the frequency, “of specified characteristics or dimensions of texts, and through this, to be able to say something about the messages, images, representations of such texts to their wider social significance” (Hansen et al., 1998, p. 95).

The quantitative nature of content analysis has also been criticised. According to Hansen et al. (1998), these criticisms have two dimensions. The first concern is that merely counting the frequency of occurrence of certain symbols does little to illustrate the, “significance of these symbols in the texts analysed” (p. 98). The other main criticism is that content analysis fragments texts into units of analysis and then measures how often a particular unit occurs. This approach does not guarantee that the meaning of these occurrences is truly captured

because, “meaning arises from the complex interaction of symbols in texts” (Hansen et al., 1998, p. 97). While these criticisms may be valid for a content analysis that merely counts the frequency of occurrence of particular textual characteristics, they are less valid for a content analysis which uses a theoretical framework to analyse these occurrences. As Hansen et al. (1998), state these criticisms are more about, “the potential and actual (mis)-uses and abuses of the method” rather “than to do with any inherent weaknesses of this method as a method of data collection” (p. 98).

Therefore, content analysis offers a systematic and replicable method of examining media content which has more validity and reliability than studies that are not underpinned by a theoretical framework; indeed, this is one of its main advantages. Also, a well constructed content analysis allows others to understand how the judgments and findings were derived while also allowing them to replicate those results (Krippendorff, 2004). Babbie (2007) notes other advantages of content analysis in that it is an unobtrusive method that is economical to undertake and can analyse large amounts of data that may occur over large time periods. Content analysis also lends itself to being, “integrated into larger research efforts involving not just the analysis of media content, but also other methods of inquiry (surveys, experiments, participant observation, qualitative and ethnographic audience research) and types of data” (Hansen, et al., 1998, p. 93).

Importantly for this study, content analysis is a useful method to identify the themes, sub-themes and the primary actors/definers within a selected group of media texts. In so doing, content analysis can illustrate how the media, in this case the press, reflect, “social and cultural issues, values and phenomena” (Hansen et al., 1998, p. 92).

3.2.2 Limitations of Content Analysis

As noted, content analysis does have limitations. First, by its nature content analysis is restricted to textual analysis. The reliance on recorded material raises another concern as the content analyst will find it difficult to draw “inferences about the intentions of sources or isolating effects” (Kaid & Wadsworth, 1989, p. 213). Even where inferences are made using content analysis, Berger (2005) argues that it is not possible to prove they are correct.

Another limitation is that the findings of any “particular content analysis are limited to the framework of the categories and the definitions used in that analysis” (Wimmer & Dominick, 2003, p. 144). Categories which are too rigid could result in the researcher missing an important nuance in the data. On the other hand, categories which are not mutually exclusive

can lead to a blurring of categories resulting in an unclear analysis. This is not the only methodological problem that can arise. If the researcher has to rely upon a convenience sample rather than a properly selected random sample then this will limit the ability to generalise the findings.

While many of these methodological problems can be addressed, some cannot. Where this is the case an acknowledgement and discussion of their effect on the final analysis is required. A well constructed content analysis that acknowledges its weaknesses can increase our knowledge of how the press constructs its reportage.

Problems can also arise if unclear guidelines are given to those coding the data. However, measures can be employed, “to ensure that everyone involved in the research (given there is more than one researcher) understands the categories in the same way” (Fleming, 2000, p. 324). This was not an issue for this thesis as the writer was the sole coder. Therefore, the test-retest method was used to test the reliability of the coding; the details of this testing are to be found later in the chapter in section 3.2.10. It is acknowledged that this form of reliability, labelled *stability* by Krippendorff (2004) is a weaker form of reliability when compared to inter-coder reliability. Despite these limitations, content analysis can systematically illustrate, “what is published and broadcast and what is not”, and can indicate “who are authorized knowers and what organisations they represent” (Ericson et al., 1989, p. 80), thereby giving insight into the ideology of the press and their regular sources.

3.2.3 How Content Analysis is Used in This Study

The use of content analysis to study press reportage of biotechnology or GM is well established, beginning with the seminal study by Pfund and Hofstadter in 1981. While content analysis cannot access the motivations or actions of the sources and journalists involved in the process, interpretations that are valid and reliable can still be made (Nisbet & Lewenstein, 2002). Furthermore, the interview analysis goes some way to address this limitation by giving insights into the interviewees’ motivations, their perceptions of the issue and their relationship with one another, indicating how these perceptions and relationships may have affected how the GM issue was reported.

The process of content analysis can be broken down into a number of key steps, with some scholars recommending as few as four and others as many as twelve steps (Hansen et al., 1998). For this study the six step process recommended by Ericson et al. (1989), is followed:

“definition of the research problem, selection of media and sample, defining analytical categories, constructing a coding schedule, piloting the coding schedule and checking reliability, data preparation and analysis” (p. 98).

These steps were chosen as they offer a logically, structured approach to analysing the newspaper data collected for this study. The steps also clearly illustrate, “how the research was conducted [whilst also serving] as a set of *instructions* to coders, fellow researchers and critics” (Krippendorff, 2004, p.82, italics in original).

3.2.4 Defining the Research Problem

The selection of any research methodology should follow the establishment of the research problem. In the case of this study the research problem or question was how did the New Zealand media report the GM debate? With this question established a suitable method of analysis that could answer the question needed to be chosen. Following the example of previous research (Kohring & Gorke, 2000; Nisbet & Lewenstein, 2002) into the media’s reporting of biotechnology in the U.S. and Europe, content analysis was chosen as the method of analysis for this study. Choosing content analysis for this study also made it possible for comparisons to be made between the results of this study and those conducted previously. Once content analysis had been selected the next step was to decide which media were to be chosen for analysis.

3.2.5 Selection of the Media and Sample

It is not possible to select and analyse all the media output about any one phenomenon. Therefore, the content analyst must select a smaller sample of the whole and, according to Berelson (1952), this process has three stages. The first is the selection of the type of media to be analysed (television, radio magazines, newspapers) and then which programmes or titles of a particular media are to be analysed. The next step requires the selection of the issues or dates to be analysed from the titles selected and the final stage requires the selection of the relevant content.

3.2.5.1 Selecting the Media

The term *the media* covers a vast range of outlets and could be anything from radio, television, magazines or newspapers. In selecting the media to be analysed the content analyst must take into account a number of considerations including: accessibility and availability of the material, geographical reach, audience size, audience type and the content

characteristics of the media, for example, tabloid versus quality press (Hansen et al., 1998). According to Hansen et al. (1998), most researchers limit themselves to the analysis of one or two types of medium. The current research limits itself to the analysis of six New Zealand newspapers, four metropolitan dailies: *The Dominion*¹, *The New Zealand Herald*, *The Press*, *Otago Daily Times* and two regional dailies the *Manawatu Standard* and the *Waikato Times*. The four metropolitan dailies were chosen because they have the largest circulation of all newspapers in New Zealand and cover both the North and South Islands. The two regional dailies were selected as both were published in cities where GM research was conducted. The circulation figures for these newspapers as at the September 30, 2001, one month before the policy announcement concerning the Royal Commission's findings, is shown below in Table 1. This date is between the announcement of the Royal Commission's findings and the Government's subsequent policy announcement.

Newspapers were chosen for analysis over other forms of media because while television has to some extent replaced newspapers as a major source of news and information, in the 1990s newspapers were still regarded by New Zealanders as the most reliable source of information over television and radio (Roberts & Levine, 1996). Whether the New Zealand public still holds this view is unknown. However, recent newspaper readership surveys suggest that newspapers are still a strong source of information for the New Zealand public. A newspaper readership survey conducted in 2008 found that 1.6 million New Zealanders would read a newspaper on a daily basis and that 80% of all homeowners would read a newspaper each week (Newspaper Advertising Bureau, 2008). Given New Zealand's population at the 2001 census was 3,737, 277, this is a relatively high proportion of the population that read newspapers (Statistics New Zealand, 2002, p. 9). As Table 1 shows the six newspapers chosen for this study had a combined circulation of just over 477,000 at the time of analysis making newspapers a large source of information for many New Zealanders on the issue of GM.

¹*The Dominion* is now known as the *DominionPost*, the result of a merger between the *Dominion* and *Evening Post* newspapers in July 2002.

Table 1: Average Circulation of the Selected New Zealand Newspapers as at September 2001

Newspaper	Ownership	Average Circulation, September 30, 2001
<i>The Dominion (now The Dominion Post)</i>	Fairfax New Zealand Ltd	68,571
<i>New Zealand Herald</i>	Australian Provincial Newspapers	211,117
<i>The Otago Daily Times</i>	Independently Owned by the Smith family	43,822
<i>The Press</i>	Fairfax New Zealand Ltd	91,024
<i>The Waikato Times</i>	Fairfax New Zealand Ltd	41,909
<i>Manawatu Standard</i>	Fairfax New Zealand Ltd	20,840
Total		477,283

3.2.5.2 Selecting the Dates

The selection of the sample for analysis can be made either on the basis of particular events occurring, or alternatively it may be selected to map a particular dimension of coverage, for example, race relations. In terms of this research the period 1998 – February 2002 included the beginning of the GM debate in New Zealand and also included the major event that occurred during that time, the Royal Commission of Inquiry on Genetic Modification. The Commission was pivotal for the establishment of public policy regarding the use of GM in New Zealand and therefore, the dates selected included the period that the Inquiry sat.

However, as Hansen et al., argue:

while event-specific coverage may be clearly defined by the dates of an event, the key to understanding the role and nature of media coverage would often necessitate analysis of coverage both before and after the dates or period of a specific event (1998, p. 103).

With this in mind a search of the Newztext and *Otago Daily Times* databases was conducted to find a point where the coverage of the GM issue became current. While stories began to appear sporadically in 1997, material for all newspapers was not available for analysis until January 1998 and, therefore, this was chosen as the starting date. The year 1998 also coincided with the discovery of genetically modified in New Zealand supermarkets also making it a logical starting point. The chosen finish point was February 28, 2002. This was four months after the Government had announced its policy decision regarding the findings of the Royal Commission, and analysis of the database also indicated a marked decline in the number of items being published on the issue.

3.2.5.3 Choosing a Relevant Sample

The last step in selecting the content for analysis is to ensure that such content is relevant. The relevance of content will be based on the research questions or hypotheses already established. It is the interest of this thesis to analyse the reportage of the GM issue by the selected newspapers with regard to what themes were reported and what types of news sources were most frequently cited. Hence, a search of the Newztext newspapers and *Otago Daily Times* databases using the search terms ‘genetic modification’, ‘genetic engineering’ and ‘biotechnology’ was conducted. The Newztext newspapers database gives the full text of most New Zealand newspapers from 1995 to the present. However, the New Zealand Herald did not appear on this database until January 1998 and this, along with the fact GM foods had been found in New Zealand supermarkets the same year, was another reason why 1998 was chosen as the beginning point for the data collection.

The resulting items included letters to the editor, opinion pieces, columns, editorials, features and news stories. This sample was reduced further to analyse only *hard* news stories as the study was concerned with GM reportage and more specifically how the sources in those stories discuss the issue. Moreover, science stories are often reported as hard news (Baran & Davis, 2006; Friedman, 1986). Given this focus, editorials, opinion pieces and columns were not considered for analysis as they cannot be considered news items per se, nor can their authors be regarded as informed sources in the normal sense of the term. According to Kuypers (2002) editorials, columns and opinion pieces do not adhere very strongly to the journalistic ideals of objectivity and balance; rather these articles put their opinions forcefully and with little room for other viewpoints. While opinion pieces and letters to the editor may give some indication of public opinion on an issue/event they are not news items written by journalists. Rather they are the opinions of a constructed public on various events and issues

(Wahl-Jorgensen, 2001). Finally, feature articles are in-depth articles which background specific issues and are not event-led like news stories, and so feature articles were also excluded from the final sample.

The remaining sample was further reduced as in a minority of cases the search terms produced stories not concerned with the GM issue. For example, a story entitled, “Room for all in Citroen cruiser” published in *The Dominion*, September 15, 2001 used the words ‘genetically modified’ to describe the styling of Citroen’s C5 Cruiser. This story is obviously not connected with the GM issue under investigation, although it does reflect the manner in which the term slipped into more common usage. Another example is a story entitled, “At last - how to run a royal commission of inquiry”, also published by *The Dominion*, February 13, 2001. This story, while mentioning the Royal Commission of Inquiry on Genetic Modification, concerned reportage of a document produced by the Department of Internal Affairs entitled *Setting up and Running Commissions of Inquiry* (italics in original). Such stories where similar search terms were used but not concerned with the GM issue were omitted from the sample.

As Kaid and Wadsworth (1989) note, any sample must be representative of the universe from which it is drawn. In terms of this thesis a relevance or purposive sample was selected (Krippendorf, 2004) of all news stories appearing from January 1, 1998 to February 28, 2002 in the six selected newspapers, meaning that the whole universe of stories was selected and, therefore, the sample was representative.

3.2.6 Defining the Categories

According to Kaid and Wadsworth (1989) the most crucial step in any content analysis is, “the formulation of categories and their units of analysis” (p. 203). Content analysis categories can be divided into two basic types: substance categories (what is said) and form categories (how it is said) (Berelson, 1952, p. 203). This thesis explored what was said and by whom regarding the GM issue and, therefore, following previous studies into the reporting of biotechnology in the U.S. and Europe (Kohring & Gorke, 2000; Nisbet & Lewenstein, 2002; Pfund and Hofstadter, 1981), a number of substance categories were formulated across three dimensions: themes, sources and value stance. According to Hansen et al. (1998), these three dimensions are commonly used in the analysis of media texts. The choice of themes allows the content analyst to classify the themes and sub-themes of the general area of reportage, in this case GM, being examined. The analysis of news sources is, according to

Hansen et al. (1998), “essential to an understanding of media roles in social representation and power relationships in society” (p. 108). In the case of this study the analysis of sources will illustrate which type of sources dominated the GM reportage. Finally, classifying media coverage in terms of the tone or value stance taken on different themes or sub-themes often forms part of content analyses (Hansen et al., 1998). For this thesis this analysis will illustrate the overall tone of the GM coverage as well as indicating the differing views held by the different news source types on the various themes and sub-themes reported. Also examined was the amount of space given to the different themes and news sources as a further indication as to the importance given to particular themes and news sources.

It is important that existing categories be tested against a sample of the data, as those categories may be particular to the context or culture in which they were developed and, therefore, some may not be relevant for the data being analysed. In the case of this thesis, New Zealand, as noted in the introduction, entered the GM debate quite late in comparison to other countries. Moreover, in comparison to the U.S. and Europe, where much previous research was conducted, NZ has a small economy and a small scientific research community. Lastly, New Zealand’s economy is heavily reliant upon the export of agricultural primary produce and this reliance, combined with the limited size of the NZ economy and scientific community, may be reflected in the news sources and the issues they discussed in regard to GM. Therefore, as suggested by Hansen et al. (1998), the categories were developed and tested using a sub-sample of stories distributed across the time period analysed. Following the advice of Babbie (2007) a sub-sample of 50 stories was selected across the time period examined and used to test and develop a series of mutually exclusive theme and sub-theme categories and their descriptions as shown in Table 2, section 3.2.8.2. Further, description of this process is given in the latter section.

3.2.7 Units of Analysis

The unit of analysis is what is counted by the researcher (Hansen et al., 1998). A unit of analysis can be anything from a news story, paragraph, a sentence or a single word. As already explained in the previous section the units of analysis selected for the content analysis used in this thesis were the space given to the stories in terms of the headline and column volumes, the themes discussed either in source statements or unsourced material, the types of news sources cited and the value stance taken on the themes discussed.

As stated by Kaid and Wadsworth (1989), the unit of enumeration, “is the way in which quantification is accomplished for each category and unit” (p. 204). First, each story in the sample was uniformly photocopied and the headlines and columns were measured to ascertain the overall reportage volume. Next the themes and sub-themes were quantified by first identifying source citations and unsourced content and measuring the volume of each (cm²). The source citations or unsourced content were then coded according to the theme and sub-theme/s to which they referred. The types of news sources were measured simply as a count of their occurrence in news stories. Finally, the value or stance given to a topic was measured in two ways. First, source citations were read to see whether in the researcher’s judgement they were pro, anti, or neutral towards genetic modification. Secondly, source citations were read to find whether they were affirmative, negative, or wished to retain the status quo on an issue and/or they wanted more or less of something. Taking the Science sub-theme as an example a news source may argue that GM research is good for science and scientific progress (affirmative), alternatively they may argue that GM research is not good for science and scientific progress (negative). In making these arguments a news source might argue for more research or less research into GM science or alternatively they may consider the current research into GM science sufficient (status quo). The coding instructions for these five different categories are to be found in Appendix 5. As shown in Chapter 4, Table 8 these five different categories were eventually combined into positive, negative and neutral for ease of analysis.

As already noted in section 3.7.3, newspaper stories that used the term GM but were not really about the GM debate were omitted from the final sample. Therefore, all themes and sources found in the final sample were recorded and subsequently analysed.

3.2.8 The Coding Schedule

The construction of a coding schedule is an integral part of defining the categories (Hansen et al, 1998). As, “content analysis is designed to be consistent and objective” (Kaid & Wadsworth, 1989, p. 204), the construction of a clear and consistent coding schedule is necessary.

In line with standard practice the coding schedule was divided into two sections; the first section was used to record details of the newspaper story and in the second section details of the themes discussed, source types and the value stance taken on GM and the themes being

discussed both in the sourced and unsourced reportage were recorded. A copy of the coding schedule can be found in Appendix 1.

3.2.8.1 Story Categories

Section 1 of the coding schedule began with the recording of newspaper story variables including the story number, the newspaper in which it was published, the newspaper section it appeared in, the headline, the headline size (cm²), column size (cm²) and authorship of the story. The section of a newspaper where a story appears can be an indicator as to the importance that the media place on an issue (Zoch & Turk, 1998). The importance the media place on an issue can also be indicated by the amount of headline and column space devoted to it (McQuail, 1989). The final part of Section 1 recorded the authorship of the story. Was the story written by an identified journalist only, attributed to the New Zealand Press Association (NZPA) only, attributed to the NZPA and an identified journalist, or did the story have no by-line. The NZPA, “is New Zealand’s national news agency ... owned by the country’s daily newspaper publishers and supplies them with a 24-hour national and international news service and breaking news images” (NZPA, 2009, About NZPA, ¶ 1). The authorship was recorded to establish how much the NZPA service was used and to judge how much repetition existed in the stories published. As noted in Chapter 2, section 2.11, New Zealand journalists have been found to rely heavily on the NZPA service for stories (Leitch, 1992; Norris, 2002). Therefore, the research addresses explore whether this pattern of NZPA usage was also evident in stories regarding the GM debate.

3.2.8.2 Theme, Source and Value Stance Categories

Section 2 of the coding schedule was used to record and measure the volume in cm² given to the themes discussed and the news sources quoted. The value stance taken by different news source types was also recorded in this section: first with regard to GM, and secondly to the different themes discussed.

As explained in section 3.2.6 the theme categories were developed using a selection of 50 stories and testing existing categories against these. The process of developing the theme and sub-theme categories and their descriptions took place over a period of approximately three months. The development of these categories went through a number of iterations. Using previous research (Kohring & Gorke, 2000; Nisbet & Lewenstein, 2002; Pfund & Hofstadter 1981) the sub-set of 50 stories was read to ascertain whether any of the central themes of previous research corresponded to the New Zealand data. Using axial coding (Babbie, 2007)

a number of central themes were identified through this process: Science, Economics, Environment and Health. Following this initial coding, the sub-set of stories were again read and, using a more open coding method (Babbie, 2007), the central theme of Morality was identified along with the sub-themes shown in Table 2 below. Each version of the themes and sub-themes and their descriptions was discussed in-depth with my supervisors until the categories shown in Table 2 were finally agreed upon. During the process of coding the rest of the data the coder remained open to other possible sub-themes being identified, but no changes were made to the original codes established. A more in-depth description of each theme and sub-theme category is also given in the Coding instrument and instructions in Appendix 5. As noted in section 3.2.7 each source statement and all the unsourced reportage was read and the space given to each theme and sub-theme measured and recorded in cm². This information described what themes were the most prevalent in the coverage, while also showing the differential between sourced and unsourced reportage.

Table 2: Theme and Sub-theme Categories Used in the Study

Science	The scientific issues surrounding GM
GM Science	GM science and research issues
Containment	Risks associated with the limitations of GM containment
Rigour	Disputes over the scientific method used in GM research
Loss of scientists	Possible loss of scientists involved in GM experimentation
Science regulation	Possible impacts of regulation(s) on GM research/science
Politics	Political environment surrounding the GM issue
Political process	The political process in relation to GM for example, the passage of bills through parliament
Political division	Conflict between or within political parties regarding GM
Anti-GM activism	Anti-GM activism and protest occurring outside of Parliament
Balance	Issues of bias in Royal Commission of Inquiry on GM proceedings
Political procedure	Processes and/or procedures of the Royal Commission of Inquiry on GM and the Environmental Risk Management Authority
Political regulation	Control of GM within existing or proposed legislation
Report of the Royal Commission	The report of the Royal Commission of Inquiry on GM
Economics	Economic issues surrounding GM
Consumer choice	Ability of consumers to choose whether or not they eat GM food, including issues of labelling and/or food traceability
GM economics	Economic implications of GM
Organics	Economic possibilities of organic farming
GM/Organics	Possible coexistence and/or the future collapsing of the distinction between organic and GM food production
Economic regulation	Impact of GM regulation in relation to economics
Morality	How GM may affect or conflict with spiritual, natural, ethical and cultural values.
Ethical consideration	Regard for ethical/moral values when making GM decisions
Ethical Transgression	Possible transgression of ethical/moral values by GM use
Ethical regulation	The control of GM in relation to ethical/moral values
Environment	Environmental issues surrounding GM
Environmental effects	Possible effects of GM technology on the environment
Environmental regulation	Impact of GM regulation in relation to the environment
Health	GM and its possible impacts on human health
Health effects	Possible effects of GM on human health
Health regulation	Impact of GM regulation in relation to medicine.

The next part of section 2 of the coding schedule recorded the sources by their full name and affiliation where possible, and also according to their source type. This action was taken as previous studies have found reportage of GM dominated by three source types, “scientists, industry spokespeople and policymakers” (Nisbet & Lewenstein, 2002, p. 365). Alternative sources, for example, anti-GM groups or dissident scientists, are often marginalised unless they can generate substantial media attention (Hornig-Priest, 2001), or community conflicts arise where “the norm of journalistic objectivity leads reporters to try to cover the various sides of the debate” (Berkowitz, 1992, p. 101). Therefore, the research explored the pattern of news source use in the New Zealand media’s reportage of the GM debate. Of particular interest was whether or not the presence of the Royal Commission of Inquiry produced a different pattern of source use than that found in previous international research. A different pattern of source use may have occurred because part of the Royal Commission’s Warrant was that it would “consult with the public in a way that allows people to express clearly their views, including ethical, cultural, environmental and scientific perspectives, on the choices regarding genetic modification in New Zealand” (Royal Commission on Genetic Modification, 2001, p. 160). Therefore, the Royal Commission theoretically gave a space where the public and other interested parties could voice their views regarding GM. Because of the importance attached to Royal Commissions, it might be expected that these views could gain more media attention had the Royal Commission not been established.

Previous studies in the U.S. have sub-divided the source types of scientists and industry spokespersons into smaller sub-categories. For example the sub-categories for scientists were: University scientists, institute scientists, scientific organisations, physicians and hospitals and the sub-categories for industry spokespersons were producers, distributors and industry scientists (Nisbet & Lewenstein, 2002). Due to the small nature of the New Zealand research community and economy these source types were not sub-divided in this thesis. Originally, as shown in Table 3 below, this research used the two sub-categories of politicians and government officials but these were later combined into the sub-category of policy makers for easier analysis. On reflection it may have been more useful to separate Green politicians from other policy makers for easier analysis. This was not done and is a limitation of the coding instrument. However, where possible the differences between the two groups are reflected in the findings and discussion chapters. The other source types were identified from reading the previous literature and examining a sub-sample of 50 stories, and are shown in Table 3 below.

Table 3: Source Categories Used in the Study

Source	Explanation of those included
Scientists	Individuals designated as scientists or scientific experts.
Industry	Industrial and commercial enterprises and their employees.
Policy makers	Central government and local body politicians and government officials and spokespersons.
Anti-GM groups	Sources attributed to or labelled as anti-GM groups.
Religious spokespeople	Religious groups, spokespeople and churches.
Māori spokespeople	Māori spokespersons, iwi and Māori authorities.
Health/Disease groups	Individuals suffering diseases and disease advocacy groups.
Environmental/animal welfare groups	Greenpeace, Save Animals From Exploitation (SAFE).
Crown Research Institutes (CRIs)	Spokespeople and officials representing CRIs.
Regulatory authorities	Government appointed authorities for example, environmental Risk Management Authority (ERMA).
Lobby groups	Life Sciences Network (LSN).
Social issue groups	Groups such as Society for the Protection of the Unborn Child (SPUC).
International organisations	International organisations and their representatives for example, The United Nations (UN.)
Royal Commission	RCGM members and appointed spokespeople.
Legal representatives	Lawyers and legal representatives at the RCGM.
Unaffiliated individuals	Identified sources without affiliation to any of the above.
Other	Includes all other sources including unidentified sources.

The information recorded in this section of the coding schedule describes the most frequently cited news source types in the reportage of the GM issue in New Zealand.

The final part of the coding schedule was used to record the value stance of cited sources with regard, first, to GM and, secondly to the theme the cited source discussed.

First, source citations were read and coded according to whether or not, in the view of the writer, the source citation was pro, anti or neutral with regard to its position on GM. Beginning with pro-GM statements examples of pro-GM and anti-GM statements are illustrated below:

Pro-GM: “a greater leadership role for governments in promoting biotechnology as a source of future prosperity.” (Scientists warn on gene bans, 1999).

Pro-GM: “The new technology was “critical” to improving New Zealand’s economic base and protecting the environment from pests.” (Samson, 2000c).

Anti-GM: “Commercial cropping of genetically engineered canola in Otago-Southland will damage New Zealand’s image, Green Party co-leader Jeanette Fitzsimons warns.” (Gibb, 1999).

Anti-GM “The Government needs to show its commitment to the clean and green image of New Zealand and make the moratorium into a legally binding permanent ban.” (Moratorium on GMOs extended, 2001).

Where a source did not make a clear statement either supporting or opposing GM the statement was recorded as neutral.

Secondly, each source citation related to particular themes was read to ascertain whether the citations appeared to be positive, negative or neutral concerning the theme under discussion. The coding instructions for the thematic content and the stances taken are included in Table 18, Appendix 5. The results of this analysis illustrate firstly, the value stance of source citations towards GM and secondly the value stance of source citations on the themes they discussed in the reportage being examined.

3.2.9 Coding Decisions

In addition to ensuring that only stories concerned with the GM debate were analysed (see Section 3.7.3) a number of other important coding decisions were made. The first of these concerned the attribution of indirect citations to sources.

The attribution of direct citations to a source is relatively simple due to the convention of using speech marks to identify where a news source has spoken. However, indirect citations are not as clearly demarcated unless words such as ‘said’ or ‘says’ are used. To simply record indirect citations just by coding the manifest content when the words ‘said’ or ‘says’ are used is too simplistic; often a more interpretive reading of the text indicates that sources

are paraphrased by journalists without the journalist clearly identifying this fact. As Krippendorff (2004) argues, content analysts are not merely those who extract content from data but rather they are interpreters throughout all the stages of the research process, including the ascription of content to categories. In Krippendorff's (2004) view, as long as these interpretations are made in a replicable and valid manner they meet the definition of content analysis.

Therefore, each story was read in an interpretive manner to ascertain where indirect citations had been paraphrased. The paraphrases either directly preceded or followed the identifiable direct or indirect citation. To reiterate, simply categorising these paraphrases as non-sourced content would be an inaccurate record of the influence news sources have had in the reporting of the GM issue. Therefore, where it appears probable that the text is a paraphrase of a source, the volume was measured and attributed to that source. For example, this article illustrates how this interpretative strategy operates, and the use of bold type and italics is explained below:

No guarantees from gene-food giants

The world's first substantial inquiry into genetic modification began in Wellington yesterday with a concession by two genetic engineering multinationals that it was impossible to guarantee containment.

Two of the "big six" multinationals put their case on the first day of the 14-week Royal Commission on Genetic Modification. They emphasised that it was impossible to give absolute guarantees in any endeavour.

Any risks were negligible, they said.

First up before the commission was Aventis SA -- a newly-formed merger of Rhone-Poulenc and AgrEvo.

Aventis argued that modified production would benefit the world's huge population -- six billion, and growing rapidly.

The company's public affairs head, Naomi Stevens, said that future crops would be resistant to drought, cold and damp and foods would have improved nutrition and shelf life.

There would be plants that would combat anaemia, child blindness and juvenile diabetes and protect against heart disease and cancer, she said.

The next company, DuPont, accepted there were public concerns about the technology.

"While much of these concerns arise from misinformation or alarmist exaggeration, we nevertheless believe that we should proceed with caution," it said.

"A scientifically impeccable process is needed and as much information as possible should be made available publicly."

"In these circumstances, we consider that a regulatory regime must be established and robustly administered." Both companies faced tough cross-examination from the Green Party, Greenpeace, an organic industry group and the Nelson GE-free Awareness Group.

An Aventis product safety manager, Robert MacDonald, was asked about the effect of any escape on organic groups' ability to certify their products as free of genetic modification.

He said that more controls "would be required." He conceded that cross-pollination and cross-hybridisation could occur from his company's modified canola to related species.

Pressed on the effectiveness of regulatory requirements that plots be separated from related species by 400 metres, he said, "rare pollination events can occur at greater distances, yes."

To questions about the need for long term clinical testing to rule out allergenic effects from modified foods on humans, Ms Stevens said she was "not sure" these would provide a complete answer.

DuPont United State representative Clive Holland said that, to date, no introduced dna had been transferred into meat or milk from an animal feeding on a modified product.

"But we can't give you guarantees, particularly with crops, because nothing in life is risk free," Professor Holland said.

"But all our data shows we are comfortably way above the line on safety."

Asked if his company would be liable should something go wrong, he said: "Most of us use automobiles. Do we hold the automobile company liable for providing safe products, absolutely tested?"

"I feel we all have the freedom to operate and choose."

In its submission, Aventis approved of strong regulatory processes but argued strongly against the high costs of hearings and duplications between approval and monitoring authorities.

It recommended a national biotech strategy to help New Zealand "realise the potential benefits" of biotechnology.

DuPont said modified crops could increase productivity, reduce pesticide use, reduce insect harm where pesticides were not used, provide new products such as fuels, polymers and pharmaceuticals, and add nutritional value.

Opportunities for New Zealand included increased-energy oil corn for stock, low-bloat clover and lucerne, pest control and herbicide-tolerant varieties of corn, and an expansion of soy protein and fibre products (Samson, 2000b)

While most of the article can be easily coded according to the five sources, Aventis, Dupont, Naomi Stevens, Robert Malcolm and Clive Holland, the last paragraph (in italics) is not easily identifiable. However, it is probably a paraphrase of Dupont's submission and is measured and coded accordingly.

Using this story example again, the second coding decision can be described. The first three paragraphs of this article (in bold type) refer to a joint statement made by both Aventis and Dupont. In cases where a source citation was attributable to more than one source the volume of the statement was measured, the topic being discussed identified, and then the volume was divided equally between the sources and coded against the topic identified. In this case the volume was equally divided between Aventis and Dupont against the sub-topic Containment (Table 2).

The final coding decision discussed here concerns how source citations were coded according to themes. Where possible, source citations were read and, where the primary theme of a statement was clear, the statement was coded accordingly. In some cases where sources appear to invoke more than one theme, an inflexible reading of the text would determine the themes being discussed, measure them, and then code the citation according to those themes. However, although some sources did use or allude to more than one theme, an interpretive reading of the text revealed that their intent was to use one theme to argue for and support their primary theme of discussion. These supporting themes are often sandwiched between definitive statements concerning the primary theme of discussion. To treat these statements as separate themes would undermine the source's discursive intent; in these cases the source statement was coded under the primary theme in order to retain the intent of the speaker. For example, the following source statement by Joyce D'Silva of the Save Animals from Experimentation Campaign is coded as a story concerning Morality, with the sub-theme

Ethical Regulation. D'Silva's statement was in defence of the group's position when answering questions from John Forman, representing the Lyposomal Disease group, a group that perceives approved animal experimentation as an ethical method to find cures for disease.

Animal rights group defends moral stand

You represent a society we would all have the deepest compassion for, and we don't believe animals come before people. We believe that animals and people both count.

Repeated hormone injections to induce super ovulation, artificial insemination, then laparotomy operations (cuts through the side of the animal to enable the oviduct to be pulled out for the flushing out of the ova), and later jugular blood drawing. "It's extremely painful and extremely distressful..." ("Animal rights groups", 2001.)

A rigid reading of this passage would result in the second paragraph being placed under GM science (Table 2). However, a more interpretive reading of the paragraph indicates that it is intended to bring attention to unethical research requiring, from the group's point of view, more stringent regulation in order to reduce cruelty to animals. Therefore, the first and second paragraphs are coded under Ethical regulation (Table 2).

Another example is the decision about the following statement made by Smith, a scientist working in the Waikato region:

Crops here in next three years

HortResearch group general manager Garth Smith today said the Royal Commission on Genetic Modification report released in Wellington yesterday had the potential to change the face of scientific research in the Waikato. "It has really brought it all to a head and we can move forward from here."

"There were great opportunities in dairying, forestry and horticulture. We could see GM crops in the Waikato within the next three to five years."

"I think it's a huge opportunity for the area to undertake some of the work that has been going on overseas and I think in time we will see some major efforts undertaken ..." (Boyes, 2001).

While the second paragraph appears to indicate that these opportunities may be economic, the whole statement begins and ends with the ability of scientists to continue with and initiate larger GM research projects in the Waikato. Therefore, as the more interpretive reading of this statement suggests that Smith is celebrating the possibility of increased GM research rather than how much such research will generate in monetary terms, the reportage is categorised under GM science (Table 2).

In other cases some sources would explicitly invoke more than one theme rather than allude to or apparently use one theme to support their position as in the two cited cases. To try to subsume or force the source's statement under one theme would result in a distortion of the speaker's discursive intent and a loss of valuable data. The intent of this study is to find how the GM debate was discussed and to understand what themes were discussed in conjunction with each other and by whom.

It could be argued that these cases constitute a blended or mixed category; however, a decision was made against using such categories. While blended categories do indicate where themes are invoked together, an important distinction between themes can be lost along with valuable information related to the relative weightings given to each theme. Thus, using blended categories would compromise one of the central questions of the thesis, to discover which themes were dominant in the discourse and the relative weightings given to each.

Therefore, where a source clearly invoked two themes it is important that the coding captures this in a manner that maintains reportage integrity and theme distinction. In the example below William Rolleston of the Life Sciences Network discusses two distinct themes as indicated in bold type. The first three paragraphs are GM/Organics and the last three paragraphs are discussing Economic regulation (Table 2). In cases such as these the space was measured for each theme and coded accordingly.

GE could be organics boon hearing told

Organic food could one day be genetically engineered, the Royal Commission on Genetic Modification was told this week.

If New Zealand wholeheartedly adopted genetic science it would not mean the end of the organics industry, Dr William Rolleston said on behalf of pro-GM lobby group Life Sciences Network.

**"I put it to you that in the future organic agriculture will use GM technology,"
Dr Rolleston told the four commissioners in Wellington....**

He said genetically modified organisms should not be banned out of fear they would contaminate organic crops.

**Once an experiment to implant or remove a particular gene had been approved,
other similar work should not have to go through the approval process all over
again.**

**Using the example of a firm which imports sheep semen, Dr Rolleston said the
company drew up an importation standard and could continue importing the
semen under that standard.**

**"That's certainly one method you could use to streamline future [GM]
applications," he said. (Beston, 2000)**

The above illustrates one of the more straightforward cases where the separation of themes by the source is easily discernible. In other cases the combining of themes is more complex, yet an apparent part of the discourse. Another rule was developed to ensure that the coding captured the discursive intent of the source while still maintaining the discrimination between themes. In the example discussed below the source clearly identifies two themes, yet in some parts of the discourse they are inextricably joined together. Where parts of the discourse were clearly discernible as only belonging to one theme they were measured and coded accordingly. Alternatively, when the source is discussing both themes simultaneously, either in combining or giving background reasons to support statements made, the area was measured and divided equally between the two themes.

In the example below, Dr Cowan, when explaining the need for GM research into the control of possums, discusses the economic and ecological consequences of the current, out-of-control NZ possum population, invoking both themes as illustrated in the second paragraph (shown in bold). After this paragraph, Dr Cowan invoked the theme of Economics and Environment separately. At the end of the article, also in bold, a section gives facts about possum numbers, the possible efficacy of GM to control these numbers and why alternative solutions such as trapping were not working. It can be deduced from an interpretive reading of this section that Dr Cowan provides these facts to illustrate how the economic and ecological damage caused by possums will be overcome. Therefore, these facts are part of

the discursive strategy used to discuss both the economic and environmental themes simultaneously and therefore, the paragraphs were measured and divided equally between the two themes.

Genetic research vital in war on possums, hearing told

Genetic research is vital if the estimated 60 million possums in New Zealand are to be controlled, the Royal Commission on Genetic Modification has been told.

Giving evidence for the Landcare crown research institute yesterday, possum research leader Phil Cowan described possums as New Zealand's No 1 vertebrate pest, economically and ecologically.

Dr Cowan said that the possum population had been estimated at 60 million to 70 million, though the increase in controls during the past five years had probably reduced this figure by about 10 million to 15 million.

The total cost of possum damage was believed to be between \$80 million and \$100 million a year.

Extensive use of 1080 poison -- about 2 1/2 tonnes a year -- was the main weapon against possums, but the poison's use was raising "significant" concerns.

"A major problem could arise if this poison becomes unacceptable to New Zealand's major trading partners," Dr Cowan said.

Dr Cowan said trade problems could also arise if New Zealand did not reduce tuberculosis in livestock.

If importing countries used no-tariff trade barriers to discriminate against our meat and dairy products, there would be a potential loss to New Zealand in export earnings of \$1.3 billion.

Possums were not only responsible for native forest canopy defoliation but were sufficiently serious predators of native birds to threaten the survival of some species.

"Despite all attempts to control them, they now occupy more than 95 per cent of New Zealand and, in many habitats they occur at densities up to 20 times those in their native Australia."

Landcare, believing a mix of conventional and genetic controls could be the answer, was using the new technology in research into ways to immunise female possums, by blocking fertilisation with modified proteins. It was also evaluating ways of carrying the proteins to possums' immune systems.

Landcare's submission also referred to investigations into the use of modified microbes to reduce wasp densities, as well as work under way to counter the growing threat of stoats.

Under cross-examination, Dr Cowan said that encouraging possum harvests by trappers had not proven successful. "In the 1980s animal harvests reached a peak of about 4 million skins," he said.

"You would probably have to kill at least 10 or 18 million a year to start a general decline." (Samson, 2000a)

With these coding decisions in place the coding schedule was then piloted.

3.2.10 Testing the Coding Schedule and Reliability

As Hansen et al. (1998) note, it is important that the finalised coding schedule is tested against a small sub-sample of the data. They argue there are four possible problems that can arise through a poorly designed coding schedule:

- 1) the possibility of confused macro and sub-categories,
- 2) inadequate differentiation of categories leading to most of the data being coded under one category,
- 3) an overly differentiated coding schedule that may mean many boxes remain blank and;
- 4) confused units of analysis that leads to an inability to relate different categories to each other at the time of analysis (Hansen et al., 1998).

In addition to testing the coding schedule it is also necessary to check the reliability of the coding being conducted. The writer was the sole coder for the thesis and clearly written

coding instructions and rules that could readily be followed by another coder are available. These instructions and rules can be found in sections 3.2.8.2 and 3.2.9 and Table 18, Appendix 5. These coding rules and instructions proved sustainable over time, with a test of sustainability being conducted on 10% of the stories being recoded over 18 months after the original coding. The result of this test illustrated that across the combined coding categories the recoding had an 82.7% agreement with the original coding, which is well within acceptable limits according to Krippendorf (2004).

3.2.11 Data Preparation and Analysis

In accordance with the suggestion of Hansen et al. (1998), the data was analysed using a statistical computer package as it is argued that the use of such packages offers the researcher more flexibility to manipulate and analyse large amounts of data. Also, when analysing data the researcher, while being focussed on answering the research questions, should also be open to the possibilities afforded by unexpected trends occurring in the data. Therefore, the flexibility of analysis offered by using a computer package was also an advantage in this respect.

The data was entered into an SPSS 15 database and this aided in conducting frequencies and bi-variate and multi-variate cross-tabulations.

3.2.12 Summary

Content analysis is a frequently used technique to study the reportage of biotechnology and GM and is, therefore, an appropriate technique for this study. This section has addressed the limitations of content analysis and has described how the technique is used in this study. The next section goes on to explain how the interview methodology was used in this thesis.

3.3. Interview Methodology

3.3.1 Introduction

This section begins by explaining the choice of the method and this is followed by a description of the interview participants. The interview questions are then outlined, before the section describes how the resulting interviews were analysed. The section concludes by examining the limitations of the method.

The choice of any methodology is dependent upon the purpose of the research and the questions being asked (Locke, 1989 in Seidman, 2006). As this study in part asks how journalists and their scientific sources experienced being involved in the reporting of the GM debate, the use of in-depth interviews is an appropriate method. As Rubin and Rubin (2005) argue, “interviewing is about obtaining interviewees’ interpretations of their experiences and their understanding of the world in which they live and work” (p. 36). Therefore, interviewing is a suitable method to analyse how journalists and scientific news sources interact with one another in the reporting GM debate. In particular, the interviews were conducted to answer the following sub-questions:

4. How did scientists and journalists perceive the reporting of the GM debate?
5. How did the journalists and scientists perceive their relationship with one another in the reporting of the GM debate?

3.3.2 Why Interviews?

It is first necessary to define what is meant by the term interview as it can be used to describe a number of differing forms of gathering data (Seidman, 2006). First interviews can be differentiated according to whether they are structured or unstructured. Structured interviews are often used in survey research and consist of all participants being asked a series of identical questions. In contrast unstructured or qualitative interviews are unique conversations where, “researchers match their questions to what each interviewee knows and is willing to share” (Rubin & Rubin, 2005, p. 4).

The aim of the qualitative interview is to discover the meanings and perceptions actors give to the processes and events in which they are involved. In this case the interviews allow journalists and scientific news sources to put forward their perspectives on the GM debate and their experience of being involved in the news reporting process.

Rubin and Rubin (2005) have developed a schema of nine different types of qualitative interview that are differentiated along two dimensions: “breadth of focus (narrow or broad) and subject of focus (meaning or description)” (p. 5). The choice amongst these different interview types will depend upon the object of the research and the questions asked. In this case a number of investigative interviews were conducted. According to Rubin and Rubin (2005) investigative interviews are narrowly focussed and deal with events or processes. As such they are well suited to analyse how journalists and scientific news sources experienced

their part in the reporting of the GM debate and their interactions with one another during this process.

3.3.3 Interview Participants

The research aimed to interview a number of journalists involved in the reporting of the GM debate between January 1, 1998 and February 28, 2002 and also to interview a number of scientific news sources cited in those stories. Rubin and Rubin (2005) argue that participants should be both experienced and knowledgeable, and that in disputes like the GM debate potential participants can be identified through watching television or reading newspapers. This was the approach taken, with most of the scientific participants being identified through citations found in newspaper stories or through watching television news. The journalist participants were found in a similar manner by reading the by-lines on the GM stories being analysed. In the case of one journalist a snowballing technique was used, as her name came up in a number of interviews as a knowledgeable and experienced source and, therefore, it was decided to include her as an interview participant. The term participant is used to reflect the, “active involvement that occurs in an in-depth interview” (Seidman, 2006, p. 14).

Most of the identified participants had busy schedules and worked for large organisations. In discussing access to participants from large organisations, Buchanan, Boddy and McCalman (1988) argue for the researcher taking an opportunistic approach to gain access. They also offered five pieces of advice on negotiating such access:

First allow for this to take time. Second, use friends and relatives where possible. Third use non-threatening language when explaining the nature and purpose of your study. Fourth, deal positively with respondents’ reservations with respect to time and confidentiality. Fifth offer a report of your findings (p. 56).

As the researcher was a novice to the field of biotechnology and genetic modification and also knew no one working in the field, the use of friends or relatives or indeed sponsors was not an option to gain access to the possible participants identified. Therefore, once identified, the possible participants were written to directly, inviting them to take part in the research. The letter outlined the purpose of the research, the probable length of the interviews, 40 to 45 minutes, and the general areas of interest for the research. The issues of confidentiality and consent were also covered in the letter. Those wishing to take part were asked to make

contact with the researcher. Where a response was not received within 14 days, a follow-up phone call was made.

All participants contacted granted the researcher an interview. This was an exceptional result and not only indicated the generosity of those interviewed but may have also indicated the importance of the topic to those willing to be participants. Interviews were arranged to suit the participants' schedules, with some interviews being rescheduled due to unforeseen circumstances. As Buchanan et al. (1988) state, "the practice of field research is the art of the possible" (p. 55) and, therefore, interviews were conducted as soon as opportunities presented themselves.

In all, 11 interviews were conducted; five with experienced science writers covering the GM debate, four with scientists involved in genetic modification research and cited in GM news stories, and two with members of Life Sciences Network (LSN), a pro-GM science lobby group convened to promote the case for GM during the Royal Commission. A list of the participants is shown in Table 4 below.

Table 4: Interview Participants in the Research

Name	Occupation	Experience
Anne Beston	Environmental journalist – New Zealand Herald newspaper	16 years as a journalist, with three years as an environmental journalist
Dr Tony Connor	Scientist – Lincoln University and Crop and Food	21 years working in the field of genetic modification
Dr Paula Jameson	Professor Plant Biology - Dept. of Molecular Biosciences, Massey University	13 years working in the field of genetic modification of plants
Veronica Meduna	Science journalist - Radio New Zealand	Nine years as a newspaper and radio science journalist
Dr William Rolleston	Medical Practitioner – Chairman of the Life Sciences Network	10 years involvement in the biotechnology industry
Alan Samson	Science journalist – <i>The Dominion</i> newspaper. (Currently employed at Massey University in the Journalism program)	30 years as a journalist, with 10 years experience as a science journalist
Dr Barry Scott	Professor Molecular Genetics – Dept. of Molecular Biosciences, Massey University	23 years working in the field of genetic modification
Aaron Smale	Journalist – Manawatu Standard	Four years as a journalist
Anna Wallace	Rural/Science journalist – Manawatu Standard	23 years as a journalist
Dr Ian Warrington	Plant physiologist, Professor of Horticulture, Massey University, 2002 – CEO of Hort. Research during Royal Commission of Inquiry on Genetic Modification, 2001	35 years as a plant physiologist
Francis Weavers	Executive director - Life Sciences Network	Involved with the Life Sciences Network from its beginning in 1999; previously worked as a journalist

As shown above, the professional experience of the scientists ranged between 35 and 13 years. The latter figure only represented Dr Jameson’s involvement with GM per se, as her overall scientific career spans a longer period. Also as shown above, the journalists’ industry experience ranged between 30 and four years. Both of the Life Sciences Network participants had been with the organisation since its inception in 1999.

The interviews were all face-to-face and scheduled for approximately 40 - 45 minutes, but in reality, most were 60 to 70 minutes in length. Most interviews were conducted at the interviewee's place of work, with one interview conducted at the interviewee's home. One interview had to be rescheduled a number of times due to the ill health of the interviewee concerned, and one interview was cut short due to prior commitments for the interviewee. All interviews were tape recorded and later transcribed by the researcher and an assistant. Once transcribed all interviewees were given a copy of the transcript and invited to veto any part. No interviewee altered any part of their transcript.

3.3.4 Interview Questions

Developing questions is a critical part of the interview process. Initially the researcher must think about the topic under investigation and what it is they wish to understand, and, therefore, what questions should be asked of the participants (Glesne & Peshkin, 1992).

Patton (2002) identifies six different types of questions that can be asked of participants about any given topic in the past, present and future tense. These are experience/behaviour, opinion/value, feeling, knowledge, sensory, and background/demographic questions. The most useful types of questions for this study were experience/behaviour (what they have done and do), opinion/value (about their opinions and values) and background/demographic (identifying characteristics of the person, for example, their experience in their chosen field).

Each interview began by outlining how each interview would proceed, first, asking about the length of time the participant had been working in his or her particular position. This question served a number of purposes. First, it was a relatively non-threatening question which aided in establishing rapport. Next it established the experience of each participant and avoided the common mistake of immediately asking about a hot topic before rapport was established (Glesne & Peshkin, 1992).

As semi-structured, investigative interviews were used, interview schedules or guides were developed. A copy of the schedule is contained in Appendix 2. However, the question order did not always remain the same as sometimes participants in their reply to one question answered a following question. As Seidman (2006) argues the main job of the interviewer, "is to listen actively and to move the interview forward as much as possible by building on

what the participant has begun to share” (p. 81). Strict adherence to an interview schedule would have impeded this process.

Once each question set had been drafted it was checked and revised, with each question being checked for clarity and neutrality. Glesne and Peshkin (1992) argue that where possible, interview questions should be piloted; therefore, the question schedule for scientists was piloted in an interview with a researcher from Massey University, before being taken into the field and some minor adjustments were made to the wording. It was agreed that this interview was not to be included in the results of this thesis. However, the question schedule for journalists was not able to be piloted in the same manner, and these questions were revised after the first interview, with some rewording adjustments being made. Glesne and Peshkin (1992) note that when questions cannot be piloted before beginning interviews, the first few interviews can be used as a basis for making adjustments.

As stated, the first question while establishing the knowledge and experience of the participant also aided in the establishment of rapport. Rapport in interviewing reduces the distance and anxiety, and increases the trust between the researcher and participant thereby leading to more successful interviews (Glesne & Peshkin, 1992). While there is no set of steps to achieving rapport (Glesne & Peshkin, 1992), researchers whose appearance and actions are appropriate to the setting and who actively listen with empathy to what the participant is saying will more likely gain rapport (Buchanan et al., 1988; Rubin & Rubin, 2005). It is important to note that to gain rapport with a participant does not mean that the participant necessarily has to like you. As Glesne and Peshkin (1992) argue, “a relationship characterized by rapport is marked by confidence and trust but not necessarily by liking” (p. 94).

3.3.5 Analysing Interview Data

Miles and Huberman (1994) describe three approaches to qualitative data analysis: interpretive, social anthropological and collaborative social research. In this thesis the interpretive approach was taken where the interview data was analysed in order to interpret the, “meanings made by both the social actors and the researcher” (Miles & Huberman, 1994, p. 8) during the course of the interview.

Patton (2002) states, “interpretation involves explaining the findings, answering ‘why’ questions, attaching significance to particular results, and putting patterns into an analytical framework” (p. 438). The researcher must decide whether the interview data will be analysed using a case study approach, where a case study is written for each individual, or whether a cross-case analysis is conducted, where answers are grouped together from, “different people to common questions, or analysing different perspectives on central issues” (Patton, 2002, p. 440). This research uses the latter technique, examining answers to the common questions asked in the interview guides. This analysis led to the identification of a number of themes discussed by participants and these are described in the next chapter.

3.3.6 Limitations of Interview Research

Like any methodology interviews have their limitations and are subject to a number of critiques. First there is some debate about the applicability of the standard concepts of reliability and validity to qualitative research (Mason, 2002). This does not mean that such criteria should be ignored but rather that their application needs to be carefully thought out. For research to be reliable the method needs to be consistently applied, and for it to have validity it must measure the concepts under observation (Mason, 2002).

As argued by Fontana and Frey, (2003), interviewers are not neutral but are rather active participants in the exchange by the way they construct the material, the questions they ask and the demeanour they carry into an interview. It is argued that these factors can affect the validity of the data gathered. However, research has found that interviewer characteristics have relatively small effects on the validity of the data gathered (Singer & Presser, 1989). Seidman (2006) also argues that:

rather than decrying the fact the instrument used to gather data affects this process, we say the human interviewer can be a marvellously smart, adaptable, flexible instrument who can respond to situations with skill, tact and understanding (p. 23).

Other factors that may affect the validity of data gained through interviews are the possibility that the respondent gives answers they feel please the interviewer or the answers given are affected by the faulty memory of the interviewee (Fontana & Frey, 2003). Despite these limitations, the data gathered from interviews can give in-depth meanings to concepts not available to survey questions or content analysis, although these results are not able to be generalised to a wider population (Babbie, 2007).

Interviews are also critiqued for the unreliability of their findings. As Babbie (2007) notes, while interview data can be very rich, it is also very personal and how it is interpreted may differ from one researcher to another due to their own personal biases. In this research the researcher tried to retain a neutral position with regard to GM despite being constantly asked where they stood on the issue.

Finally, interviews are regarded by some to be unethical because, knowingly or unknowingly, the tactics used manipulate the respondents “while treating them as objects or numbers rather than human beings” (Fontana & Frey, 2003, p. 90). While this research adhered to the Massey University code of ethics by ensuring that interviewees were given the right to privacy, protected from harm and that they gave their informed consent, it went further by giving interviewees the opportunity to veto any part of the resulting interview transcript before it was reported in this document.

While the interviewer in this research endeavoured to reduce the effects of interviewer bias by consistent delivery of questions, it is accepted that the characteristics of the interviewer may have affected the validity of the resulting data. It is also accepted that the interviewer’s own biases, despite trying to keep an open mind on the topic, could have affected the interpretation of the data and that other researchers may have drawn different conclusions. Finally, the interviews in this research were limited by the time availability of interviewees.

3.3.7 Summary

Interviews were a suitable method to investigate how journalists and scientific news sources perceived the reportage of the GM debate and their part within that reporting. This section has illustrated how the 11 investigative interviews were conducted and the approach taken in analysing the data obtained, whilst also outlining the limitations to this methodology. The next section describes how the two methods of content analysis and interviews were used to triangulate the research.

3.4 Triangulation

The term triangulation refers to the use of different methods in a research study to strengthen the results of that study (Patton, 2002).

Four basic types of triangulation are said to exist:

- (1) *data triangulation* – the use of a variety of data sources in a study, for example, interviewing people in different status positions or with different points of view;

(2) *investigator triangulation* – the use of several different evaluators or social scientists;

(3) *theory triangulation* – the use of multiple perspectives to interpret a single set of data; and

(4) *methodological triangulation* – the use of multiple methods to study a single problem or program, such as interviews, observations, questionnaires, and documents (Denzin, 1978 in Patton, 1987, p. 60, italics in original).

This research used data triangulation by interviewing scientific news sources and journalists, each having different status and points of view on the reporting of GM. In addition, methodological triangulation was used by combining content analysis and interviews, thereby producing two different types of data. It is recognised that the use of different methods of inquiry or data sources may produce differing results; however, as Patton (2002) contends, while the point of triangulation is to test for consistency of results, where this does not occur, “understanding inconsistencies in findings across different types of data can be illuminative” (p. 248).

There exist a number of critiques of triangulation and according to Ritchie (2003) there are two recurrent key points to these critiques. The first is from a philosophical standpoint that ontologically, “there is no single reality or conception of the social world to ascertain and that attempting to do so through the use of multiple sources of information is futile” (Ritchie, 2003, p. 44). The second key point is that all methods produce specific types of data and to expect these different data types to agree perfectly is unreasonable (Ritchie, 2003). Despite these criticisms Seale (1999) argues that triangulation “if used with due caution can enhance the credibility of a research account by providing an additional way of generating evidence in support of key claims” (p. 61). In this research the use of content analysis and interviews gives a greater depth and richness to the analysis. While triangulation does not necessarily add to the validity of the study, it does offer a crystallization or multi-faceted view of the GM debate (Richardson, 2003). In addition, the use of multi-methods may give some possible insights into the motivations and views of some of the actors involved in the reporting of the debate.

3.5 Summary

This chapter has described how content analysis was used in this study, outlining the different coding categories and how they were formulated. Furthermore, the interview methodology

used in the study and with the interview participants was described. The methods of analysis used for both methodologies were also discussed along with a discussion of the limitations of each method. Finally, the chapter described how these two methods of analysis are used to triangulate the data.

Chapter Four

Findings

4.1 Introduction

This chapter presents an overview of the results of the content and interview analysis described in Chapter 3, Methodology. The results and their implications will be discussed in the subsequent chapter. First, the content analysis investigates how the issue of genetic modification was reported in the newspaper coverage in six New Zealand newspapers between January 1, 1998 and February 28, 2002. In particular, it examines the major themes reported, the types of news sources most frequently cited and the overall tone of the reportage. The definitions and rationale for the source and theme categories are described in Chapter 3 in tables 2 and 3 respectively. The coding instructions for the tone of reportage are described in Chapter 3, section 3.2.8.2 and Appendix 5.

Secondly, the chapter presents the results of 11 interviews conducted with five experienced science writers covering the GM debate, four scientists and two representatives of the Life Sciences Network frequently cited in the newspaper coverage. As noted, these interviews provide a deeper context and background for the newspaper coverage, thus, overcoming one of the major limitations of the content analysis methodology, that is its inability to access the motivations and perceptions of those involved in the construction of the manifest content examined (Kaid & Wadsworth, 1989). In particular, the participants throw light on the source/journalist relationship. A brief conclusion draws major findings from both methodologies together before the discussion in Chapter 5.

4.2 Content Analysis Results

After a brief description of the sample the analysis begins by examining the salience given to the issue by the sampled newspapers. The salience of the issue was determined by an analysis of the distribution of stories across the newspapers, followed by an analysis of which newspaper sections the stories appeared in and how much space they were given. As noted in Chapter 3, section 3.2.8.1, the section a news story appears in can indicate how much importance the media place on it (Zoch & Turk, 1998), and the volume or space given to headlines and columns can be an indication of its importance to the media (McQuail, 1989).

Finally, the section explores the authorship of the stories in order to ascertain how much repetition occurred in the reporting of the issue.

This is followed by an analysis of how the reportage volume was distributed across the time period between January 1, 1998 and February 28, 2002. This analysis results in the creation of seven distinct stages of the reportage based on the volume shifts illustrated by Figure 1 below. These volume shifts are linked to a number of key events and these are briefly outlined and will be discussed in more detail in the following chapter.

An analysis of how the volume of source citations on particular themes and sub-themes changed across these seven stages is then presented. This analysis was conducted by first, measuring the amount of space given to each theme and sub-theme and then calculating these results as a percentage of all themes in each stage. This analysis illustrates how the GM issue was framed and which themes were most prevalent in each stage.

Next, the sources described in Chapter 3, Table 3, are examined to find how they were distributed across the seven stages. Citations from each source type were measured and then calculated as a percentage of all source citations across each stage. As stated in Chapter 2, section 2.6, sources influence how scientific issues are framed with GM being no exception (Nisbet & Lewenstein, 2002). This analysis answers one of the research questions concerning which types of sources dominated the coverage.

Finally, an analysis of the values stance of source citations is presented. Firstly, source citations were read to ascertain whether they had a pro, anti or neutral value stance towards GM. Then an analysis of source citations was conducted to find whether they had a positive, negative or neutral bias towards the themes and sub-themes discussed.

4.2.1 The Sample

In all, 738 newspaper items were analysed for the period January 1, 1998 – February 28, 2002. As discussed in the previous chapter, this time period was chosen because it encapsulates the early development of the debate from 1998 to the establishment of the Royal Commission on Genetic Modification, and the subsequent announcement of the Government's policy decision based on the Commission's findings before its decline to a lower level of prominence in February 2002. The stories were sampled from six newspapers

described in Chapter 3, section 3.2.5.1. The distribution of these items across the six newspapers is shown in Table 5 below.

Table 5: Distribution of Genetic Modification News Stories and Volume by Newspapers January 1, 1998 – February 28, 2002

Newspaper	Percentage of Total Items	Number of Items	Percentage of Total Volume (cms ²)	Volume (cms ²)
<i>The Dominion</i>	29.3	216	34.8	30707.82
<i>New Zealand Herald</i>	21.1	156	25.3	22362.23
<i>Otago Daily Times</i>	21.0	155	17.3	15320.74
<i>The Press</i>	15.0	111	13.1	11582.73
<i>Waikato Times</i>	10.3	76	5.2	4583.93
<i>Manawatu Standard</i>	3.3	24	4.3	3294.21
Totals	100.0	738	100.0	87851.66

The majority of stories, just over 85%, were published by the four metropolitan dailies, *The Dominion*, *The Press*, *The New Zealand Herald* and the *Otago Daily Times*. *The Dominion* published the greatest percentage of stories at slightly below 30% and correspondingly had the highest volume of reportage. Reasons why this result may have occurred will be explored in the next chapter.

4.2.2 Story Placement

As shown in Chapter 3, section 3.2.8.1, where a story appears in a newspaper indicates how important the issue is on the news media agenda. When analysed, nearly all, 93.5% (n = 690), were published in the news pages. Only 3.7% (n = 27) stories were published on the front pages. The other stories were published in the business pages 2.4% (n = 18) and the international pages 0.4% (n = 3).

4.2.3 Authorship of Genetic Modification Newspaper Stories

As noted in Chapter 3, section 3.2.8.1, the authorship of the stories was also analysed to indicate how much repetition of stories was occurring through the use of the NZPA service. It is argued that this repetition gives insight into the limitations of the news media in producing original stories, and may also point to certain regional biases concerning the originality of stories. The authorship of stories is illustrated in Table 6 below.

Table 6: Authorship of Genetic Modification Newspaper Stories January 1, 1998 – February 28, 2002

Author type	Number of Stories	Percentage of Total Stories
Journalist	392	53.1
Journalist and NZPA	10	1.4
NZPA	165	22.4
International author	26	3.5
No author	145	19.6
Total	798	100.0

The above table illustrates that just over half of the stories were authored by an identified journalist. Of the rest of the stories nearly a quarter (22.4%) of the stories were sourced from the NZPA with a smaller amount (1.4%) being a combination of NZPA and original author. The rest of the stories, just under a fifth, had no author.

Further analysis of this data using cross tabulations found that the *Otago Daily Times*, *The Press* and *Waikato Times* had the highest use of NZPA stories followed by the *New Zealand Herald* and *The Dominion* which used the least. *The Manawatu Standard* used no NZPA stories when reporting the issue. The full results of these cross-tabulations are shown in Appendix 3.

4.2.4 The Volume of Coverage

As noted in Chapter 3, section 3.2.8.1, the space given to an issue is another indication as to its importance in the news media agenda. Figure 1 below illustrates the volume of newspaper space given to the GM issue over the time period examined.

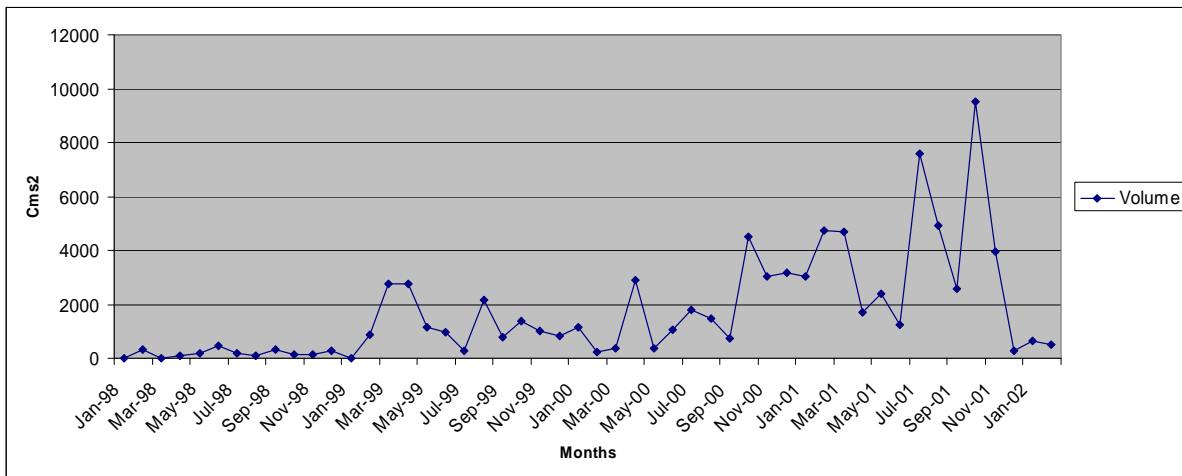


Figure 1: Newspaper Reportage of the Genetic Modification Debate from January 1, 1998 – February 28, 2002 by Story Volume (cms²)

As illustrated in Figure 1 the issue of genetic modification was not really part of the news media agenda in the first year under investigation, having very little newspaper space allocated to it. The issue began to have increased newspaper space devoted to it from February 1999. The volume given to the issue fluctuated between February 1999 and October 2000 with peaks of coverage appearing in April and September of 1999 and May 2000. The space given to the issue increased strongly from October 2000 reaching a peak in October 2001, which was over ten times the volume recorded in February 1999. The space given to the issue then rapidly declined, reaching levels below those recorded in February 1999 by the end of February 2002.

A further examination of Figure 1 indicates that the volume of space given to the GM debate appears to increase and decrease in a series of seven distinct blocks or stages. The first stage, Stage I, appears between January 1998 and January 1999 and is represented by a nearly flat line indicating the GM debate was not very newsworthy at this time. Stage II between February 1999 and July 1999 reached a peak in volume in March and April before the issue declined again in July. Stage III increased in volume in August 1999 before steadily declining to be nearly nil in February 2000. The fourth stage, Stage IV, had peaks in April

and July before declining in September of that year. Stage V begins with a sharp rise in volume in October of 2000 which was the highest volume given to the issue to that date. The volume remained at higher levels before declining in April 2001, with the stage ending in June 2001 at a slightly higher level than that of September 2000. The next stage, Stage VI, saw the volume rapidly increase in July 2001 and then again in October when it reached its highest level of the period examined. The seventh and final stage, Stage VII, saw a rapid decline in volume in November 2001 after which the issue again started to show a flat line from December 2001 to the end of February 2002. However, the volume level was still slightly higher than that recorded in Stage 1 between January 1998 and January 1999.

The increases in volume within and between the stages are due to a number of specific events occurring at these times. These results indicate that the New Zealand reportage is event driven and is consistent with similar findings from overseas research (Nisbet & Lewenstein, 2002).

These events and the resulting stages and their significance to the distribution of sources and themes discussed will be examined in the next chapter. The next section examines how the different themes described in Chapter 3, Section, 3.2.8 were distributed across these different stages.

4.2.5 The Themes Over the Stages of the GM Debate

This section examines how the GM debate was framed in terms of the themes that were used in the newspaper stories across the stages of the debate. Figure 2 below illustrates how the major themes described in Chapter 3, section, 3.2.8.2, Table 2 were distributed across the stages of the debate as a percentage of all themes in each stage.

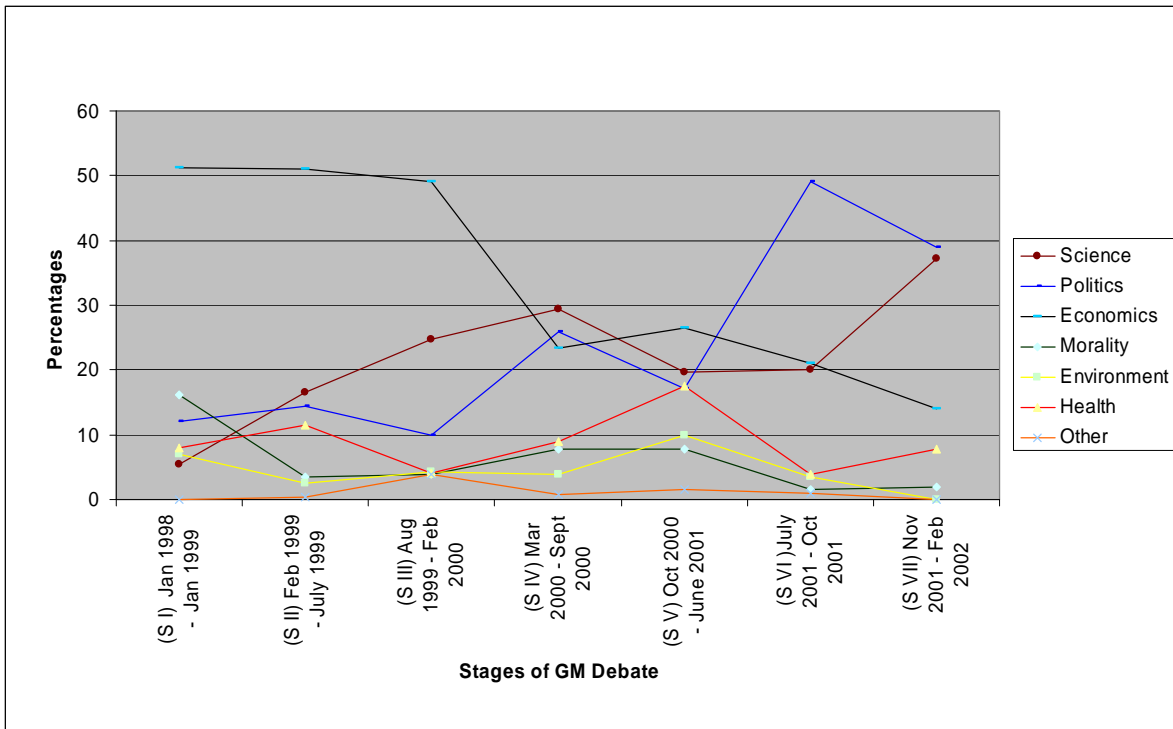


Figure 2: Major Themes of the Genetic Modification Debate as a Percentage of the Total Volume of Reportage (cms²) Across the Stages of the GM Debate

A breakdown of the actual volume of these themes in cms² is available in Appendix 6. The development of the above categories is described in Chapter 3, section 3.2.8.2.

As there were significant variations in the volume of coverage over the different stages of the debate, the percentages illustrated in Figure 2 above require further clarification. Therefore, Table 7 below illustrates the total volume for each stage, as well as the volume of each theme during each stage and their corresponding percentage.

Table 7: Total and Percentage Volume cm² of Themes Across the Stages of the GM Debate

Themes	Stages of GM Debate															
	Stage I		Stage II		Stage III		Stage IV		Stage V		Stage VI		Stage VII		Totals	
	Vol. cm ²	%	Vol. cm ²	%	Vol. cm ²	%	Vol. cm ²	%	Vol. cm ²	%	Vol. cm ²	%	Vol. cm ²	%	Vol. cm ²	%
Science	101.82	5.5	1229.50	12.1	1467.23	51.2	2111.24	16.1	4585.97	7.1	3964.43	8.0	1534.44	0.0	14813.63	100
Econo.	955.39	16.6	3795.73	14.4	2900.97	51.1	1683.54	3.5	6150.16	2.6	4126.69	11.4	508.99	0.4	20121.47	100
Politics	225.39	24.8	1066.44	10.0	591.34	49.0	1868.41	3.9	3967.04	4.3	9711.44	4.1	1416.02	3.9	18846.08	100
Ethics	300.09	29.4	261.03	26.0	229.46	23.4	553.58	7.7	1780.53	3.8	295.77	9.0	70.96	0.7	3491.92	100
Enviro.	133.02	19.7	193.53	17.1	257.5	26.5	273.26	7.7	2295.89	9.9	699.05	17.5	0.00	1.6	3852.25	100
Health	149.16	20.0	847.25	49.1	246.34	21.0	643.16	1.5	4059.53	3.5	776.58	3.9	285.19	1.0	7007.12	100
Other	0.00	37.2	29.26	39.0	229.89	14.0	52.52	2.0	394.89	0.0	199.48	7.8	0.00	0.0	906.04	100
Totals	1864.87		7422.74		5922.73		7185.71		23234.01		19773.44		3634.60		69038.01	

As Figure 2 illustrates, the three main themes of Science, Politics and Economics had the highest percentage of the volume of source citations in all seven stages. The percentage volume of Science as a theme fluctuated across the seven stages. The theme only registered 5.5% of the volume of all themes in Stage I. This increased to 16.6% (Stage II), 24.8% (Stage III) and 29.4 % (Stage IV), where Science was the largest theme by volume in that stage. The theme decreased in volume to 19.7% (Stage V) and 20.0% (Stage VI), before increasing in volume to 37.2% (Stage VII). Previous research found the reportage of GM episodic (Nisbet & Lewenstein, 2002), based on the occurrence of discrete events, and the dominance of certain themes in different stages can also be linked back to particular events occurring within those stages. In the case of Science, the large volume of reportage it received in Stage IV can be linked back to the public hearings of the Royal Commission of Inquiry on Genetic Modification which were occurring in that period.

The theme of Politics received 12.1% of the volume of all themes in Stage 1, 14.4% (Stage II) and 10.0% (Stage III). The volume of the theme increased to 26.0% of all themes in Stage IV, where it was the second largest theme by volume in that stage. The volume of the theme dropped to 17.1% (Stage V) before rising sharply in volume to 49.1% (Stage VI) where it was the largest theme by volume in that stage. The theme decreased in the volume of reportage to 39.0% in the final stage (Stage VII) although it was the largest theme by volume in that stage. The large increase in Stage VI can again be linked back to particular events occurring in that time period; namely the announcement of the Royal Commission's findings on July 31, 2001 and the Government's policy announcement regarding those findings on October 31, 2001. The intervening time between these events was also a time of major political division and public protest over the issue.

Economics was the largest theme by volume in the first three stages, beginning at 51.2% (Stage I), 51.1% (Stage II) and 49.0% in Stage III. The theme declined in volume in the following stages 23.4% (Stage IV), 26.5% (Stage V), 21.0% (Stage VI) and to its lowest level of volume percentage, 14.0%, Stage VII. The prominence of Economics in the first three stages of the debate cannot be linked back to any particular events but is connected to a number of contextual factors, including a number of food scares overseas. These factors will be discussed in the following chapter.

Of the other four themes only two, Morality and Health, rose above 10% of the volume of all themes in any stage. Morality reached 16.1% of the percentage volume of all themes in Stage

I and then decreased below 10% of the percentage volume of all themes for all the following stages. The theme of Health reached 11.4% of the volume of all themes in Stage II and 17.5% in Stage V. The limited prominence of these issues across the stages has similarities to previous findings of other studies and will be examined further in the next chapter.

The theme of Environment never reached over 10% of the volume of all themes in any stage. The highest percentage of volume reached by this theme was 9.9% in Stage V.

The Other themes category was very small, only reaching one percent or more of the total volume of themes in Stages III (3.9%), V (1.6%) and VI (1%). This category contained themes unrelated to the GM debate but were part of larger stories linked to the debate. A few examples of the type of themes included in this category were comments about a member of the public who had sat through all the hearings of the Royal Commission, a discussion of New Zealand's 'clean green' image by a marketing professor, the aspirations of the Rural Women's lobby in New Zealand and the future challenges facing supermarkets, over and above whether or not they should market genetically modified food.

4.2.6 Sub-themes Across the Stages of the GM Debate

While the above analysis describes how the main themes were distributed across the stages of the GM debate, it does not clarify the specific issues of concern and how these altered over the course of the debate. Therefore, a further analysis of the sub-themes described in Table 2, Section 3.2.8.2, more specifically highlights the areas of concern. As noted in Chapter 3, these sub-themes were developed by using categories from previous research and testing these against a sub-sample of 50 stories to create a number of mutually exclusive sub-themes as described in Table 2, Section 3.2.8.2.

4.2.6.1 Science Sub-themes

As Science was the major theme it was analysed first according to sub-themes, and the results of this analysis are shown in Figure 3 below. All sub-themes were developed to be mutually exclusive as described in section 4.2.6 above.

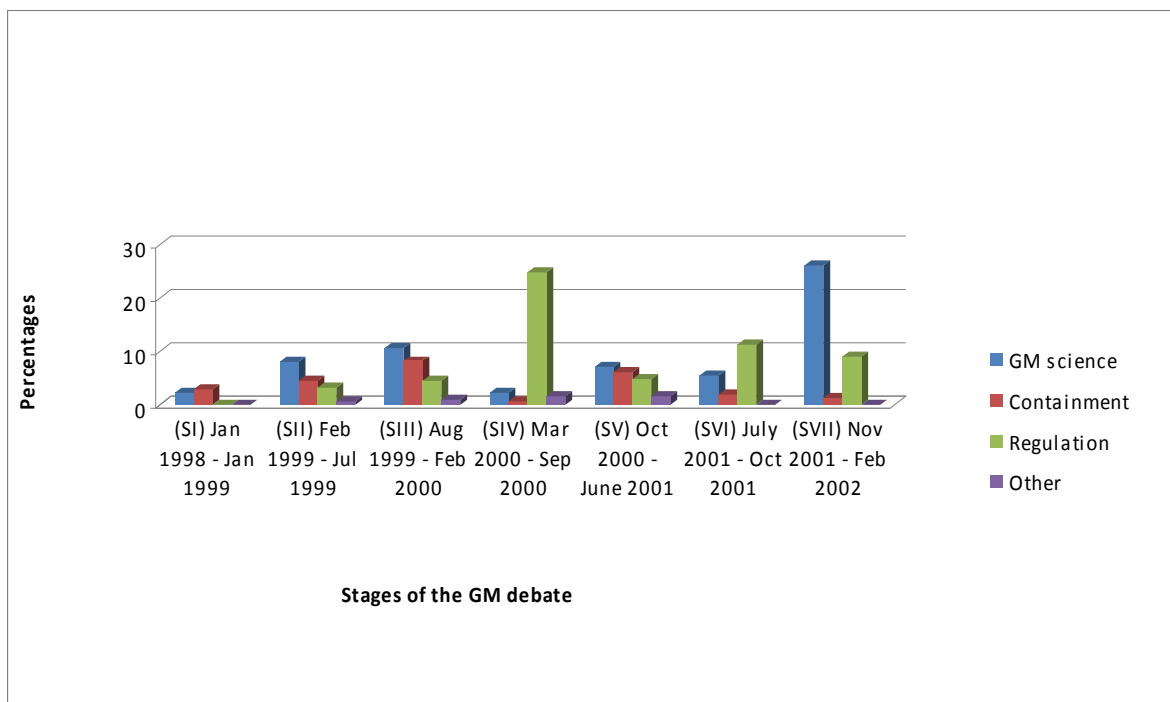


Figure 3: Science Sub-themes as a Percentage of the Total Theme Volume

As illustrated, GM science, Containment and Science regulation had the largest percentage of the volume of all Science sub-themes across the stages of the debate. The sub-theme GM science had the highest volume of all the science sub-themes in four of the stages (Stages II, III, V and VII). Furthermore, GM science had the highest volume of all the science sub-themes in any one stage, Stage VII, reaching 26.4%. Science regulation had the highest volume of the science sub-themes in two stages, Stage IV reaching 24.7% and Stage VI at 8.9%. As shown in Figure 3, Containment had the highest volume in only one stage, Stage I at 3.1%. The highest volume reached by Containment was 8.7% of all sub-themes in Stage III. The Other category was the combination of the Rigour and Loss of scientists sub-themes. Individually these two sub-themes reached less than 5% of the volume of all sub-themes or less than 500cm². Therefore, these sub-themes were not an important issue in terms of the news media agenda and were combined into an Other category. This protocol was used for the following sub-theme categories. A complete breakdown of the sub-themes placed in the Other category is recorded in Appendix 7.

The prominence of GM science as the largest of the Science sub-themes reflects the fact that at its core, the GM debate is a scientific issue. The issues of containment and scientific regulation illustrated a strong and ongoing concern on the part of scientists and pro-GM lobby groups about the science of GM becoming overly regulated. These concerns reflected

concerns of overseas counterparts that have existed since the first successful rDNA experiments. These concerns will be discussed in the next chapter.

4.2.6.2 Political Sub-themes

Politics was the next largest theme and, therefore, the next to be analysed by sub-themes. The results of this analysis are shown in Figure 4 below.

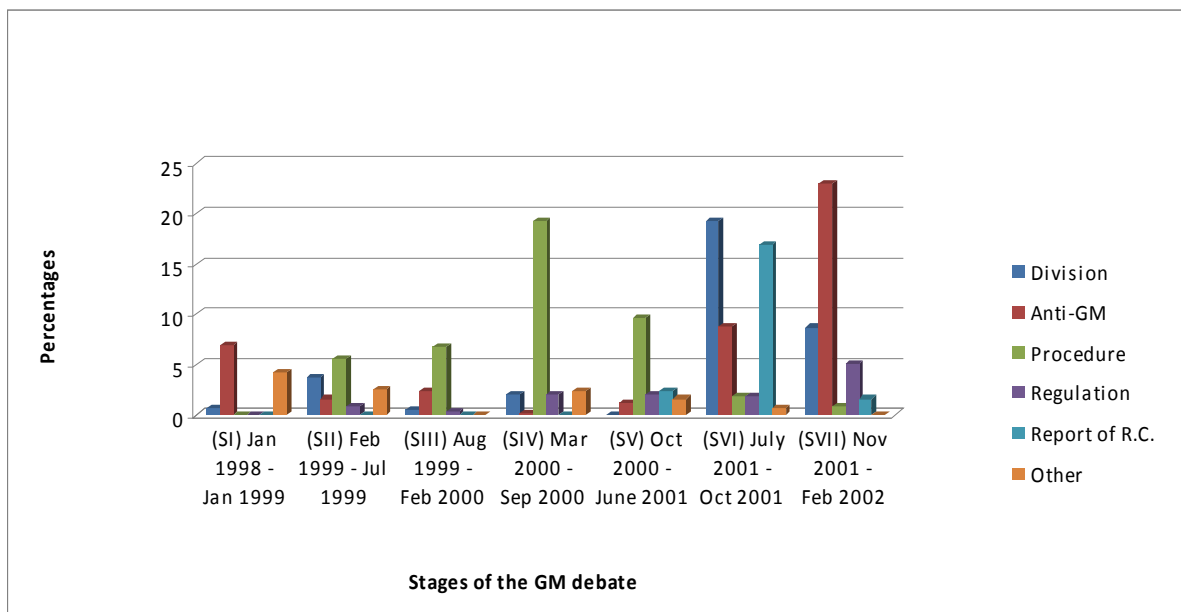


Figure 4: Political Sub-themes as a Percentage of the Total Theme Volume

The political sub-theme of Political procedure had the highest volume of all the political sub-themes in four of the stages (Stages II, III, IV and V). The highest level of volume reached by this sub-theme was 19.2% in Stage IV and this was the highest volume reached by any political sub-theme, in any stage. The Anti-GM activism sub-theme had the highest volume of political sub-themes in two stages, Stage I at 7.0% and Stage VII at 22.9%. The sub-theme of Political division had the highest volume of all political sub-themes in Stage VI at 19.2%. The only other political sub-theme to gain more than 10% of the volume was the Report of the Royal Commission at 16.9% in Stage VI. However, this sub-theme did not really appear until Stage V. The sub-themes of Balance and Political process were combined into the Other sub-theme variable. For full results of these latter sub-themes refer to Appendix 7.

There was widespread opposition to GM in New Zealand and politically this opposition was spearheaded by the Green Party (Greens) calling for a Royal Commission of Inquiry in their 1999 general election campaign. The post-election result saw the Greens gain parliamentary seats, creating a situation where the centrality of the sub-themes of anti-GM activism,

Political procedure, Political division and Report of the Royal Commission was not unexpected, and this result will be examined in greater depth in the following chapter.

4.2.6.3 Economic Sub-themes

Economics was the next largest theme and its sub-themes were the last to be analysed in this manner. Figure 5 below shows the results of this analysis.

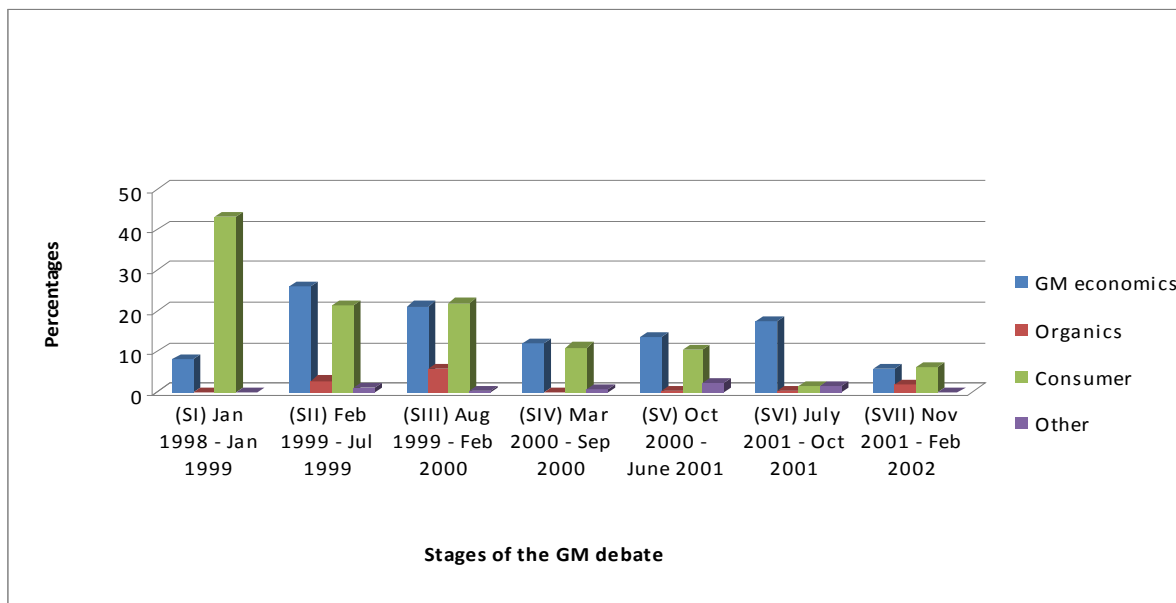


Figure 5: Economic Sub-themes as a Percentage of the Total Theme Volume

As Figure 5 illustrates, GM economics had the highest volume of all economic sub-themes in four stages (Stages II, IV, V and VI). The highest volume reached by this sub-theme was 26.0%, in Stage II. The Consumer choice sub-theme had the highest volume in three stages (Stages I, III and VII). The highest volume gained by this theme was in Stage I at 43.1% and this was the highest volume of any economic sub-theme.. The only other economic sub-theme to reach more than 5% of the volume of all sub-themes was Organics at 5.7% in Stage III. The sub-themes of GM/Organics and Economic regulation did not reach above the 5% of the volume of all sub-themes and were therefore, combined into the Other category. A complete breakdown of these themes can be found in Appendix 7. These results illustrate the major concerns people had about GM food and its labelling. They also indicate the interest in the economic implications of GM and also its possible effects on organic farming. These issues will be expanded upon in the next chapter.

The remaining themes of Morality, Environment, Health and Other were not analysed according to sub-themes because only Morality and Health reached more than 10% of the

volume of all themes in any of the stages, as shown in Figure 2 above. Therefore, an analysis of these themes by sub-theme would have shown that most of the sub-themes were below the 5% volume threshold. A breakdown of these themes by sub-themes is included in Appendix 7.

The previous two sections have illustrated how the GM debate was constructed according to the themes of source statements and un-sourced material, showing that Science, Economics and Politics were the main themes or themes highlighted throughout the newspaper coverage of the debate. The themes of Morality, Health and Environment were much less prevalent with only two reaching more than 10% of the volume of all themes in only three stages. There were a number of prevalent sub-themes across the stages of the debate and these were GM science, Science regulation, GM economics, Consumer choice, Political procedure, Political division, Anti-GM activism and the Report of the Royal Commission. In some cases these sub-themes only dominated one or two stages, with an example of this being the Report of the Royal Commission that was most prominent in Stage VI. In contrast the sub-themes of Consumer choice and GM economics were more prominent over a longer period of time. The implications of these results will be discussed in Chapter 5.

Previous research (Hall et al., 1978; Nisbet & Lewenstein, 2002) has argued that news sources play an important role in influencing the manner in which issues are reported in terms of the themes that are discussed, or which themes are given little or no coverage. Thus, part of the research examined which sources were prominent in the reportage of the New Zealand GM debate. The results of this analysis are described in the next section.

4.2.7 Source Use Over the Stages of the GM Debate

As noted in Chapter 2, section 2.12, previous research has found that newspaper stories concerned with biotechnology were dominated by scientific, industrial and political sources (Kohring & Gorke, 2000; Nisbet & Lewenstein, 2002; Pfund & Hofstadter, 1981). It is the interest of the current research to examine what types of sources dominated the New Zealand newspapers stories on genetic modification. These source categories are described in Chapter 3 in Table 2.

Before moving on to the analysis of how the different source types were distributed across the stages of the debate it is useful to describe the percentage of sourced to un-sourced material contained in the newspaper stories examined. The comparison of un-sourced to sourced material found that material either directly or indirectly quoted by sources was 65.4%

of all the newspaper stories with un-sourced material comprising the other 34.6%. This equals a ratio of 1.89:1 of sourced to un-sourced material.

With this ratio in mind an analysis was conducted of how these news sources were distributed in terms of the volume of their citations throughout the debate, the results of which appear in Figure 6 below.

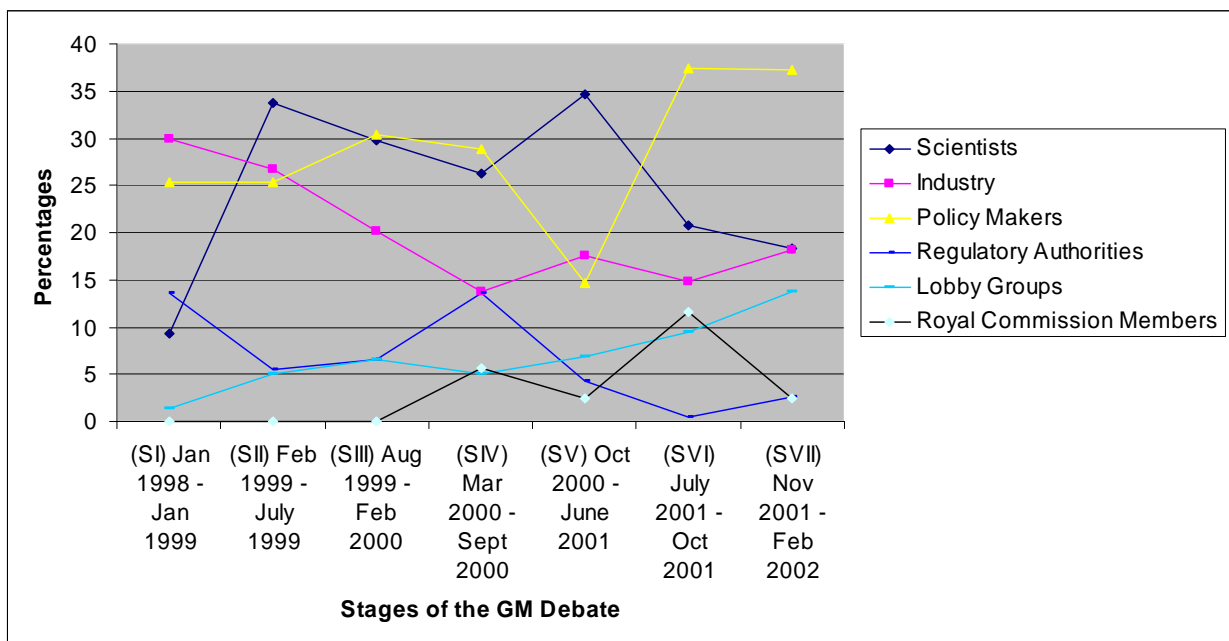


Figure 6: News Sources as a Percentage of the Total Volume of all Source Citations Across the Stages of the GM Debate

As shown in Figure 6 the three major newspaper sources cited across the stages of the GM debate, in terms of the volume of all citations, were scientists, industry spokespeople and policy makers. A full breakdown of the actual volume of source citations is given in Appendix 8. For ease of analysis the industry category is a composite variable constructed as a combination of industry and Crown Research Institutes (CRIs) spokespeople (see Chapter 3, Table 3). While CRIs do engage in scientific research they do so under a commercial mandate set down by the Government, and, therefore, act in accordance with commercial motives. The category of policy makers is composed of two groups, politicians and government officials (see Chapter 3, section 3.2.8.2, Table 3). The government officials recorded in this category were often spokespersons for particular ministers and, therefore, were part of the political structure. Also shown are the only source categories that reached more than 10% of the total volume of source citations across the stages of the GM debate. These were regulatory authorities, lobby groups, and Royal Commission members. The

lobby groups category is composed of three groups illustrated in Chapter 3, Table 3: anti-GM groups, lobby groups and social issue groups. All other source types described in Table 3 represented less than 10% of the volume of source citations across the stages of the GM debate. These latter sources included Māori, religious, environmental, animal welfare and health/disease groups along with international organisations, legal representatives, other unaffiliated individuals and others. The implications of this pattern of news source use will be discussed in the next chapter.

While these results and those of the previous section on source distribution illustrate the most frequently reported themes and most commonly cited news source types, they do not illustrate the overall tone of the reportage towards the GM technology and/or the themes reported. Therefore, the next section examines the tone of the reportage to examine whether it was positive or negative with regard to GM and the themes discussed.

4.2.8 Tone of Source Citations

As noted in Chapter 2, Section 2.12, previous research, both quantitative and qualitative, has found that newspaper sources included in the coverage of GM or biotechnology stories have had a predominately positive bias towards GM or biotechnology. One of the questions for this research was whether this pro-GM tone was evident amongst the news sources used in the New Zealand newspaper coverage of the GM debate. As already outlined in Chapter 3, Section 3.2.8.2 source citations were read and coded according to whether or not the source citation was pro, anti, neutral or undisclosed with regard to its position on GM. Table 8 below illustrates the analysis of news source citations with regard to stances they took towards GM.

Table 8. Percentage of GM Bias of Source Citations by Source Types

Source Type	GM Stance			Total
	Pro-GM	Anti-GM	Neutral	
Scientists	14.9% (n=329)	2.5% (n=55)	4.7% (n=104)	22.1% (n=488)
Industry spokespeople	10.7% (n=236)	2.9% (n=64)	5.8% (n=127)	19.4% (n=427)
Policy makers	4.0% (n=89)	7.0% (n=153)	19.5% (n=431)	30.5% (n=673)
Religious spokespeople	0.1% (n=3)	0.4% (n=9)	0.9% (n=21)	1.4% (n=33)
Māori spokespeople	0.3% (n=6)	1.8% (n=40)	0.4% (n=9)	2.5% (n=55)
Health and disease groups	1.7% (n=38)	0.1% (n=3)	0.2% (n=5)	2.0% (n=46)
Environment/Animal welfare groups	0.05% (n=1)	2.55 (n=57)	1.0% (n=21)	3.6% (n=79)
Regulatory authorities	0.05% (n=1)	0	3.65% (n=80)	3.7% (n=81)
Lobby groups	2.75 (n=61)	4.2% (n=92)	1.25% (n=28)	8.2% (n=181)
Royal Commission members	0.6% (n=14)	0	2.7% (n=58)	3.3% (n=72)
Legal	0	0.1% (n=2)	1.3% (n=28)	1.4% (n=30)
Other	0.2% (n=4)	0.5% (n=12)	1.2% (n=25)	1.9% (n=41)
Totals	35.35% (n=782)	22.05% (n=487)	42.6% (n=937)	100.0% (n=2206)

The above table illustrates that just over 40% of all cited sources had a neutral position on GM. The next largest group of source citations were in favour of GM at just over 35%. Source citations against GM reached slightly higher than 22% of all citations.

As shown in Table 8, when analysed in terms of news source types, the citations from scientists (14.9%) and industry spokespeople (10.7%) were the most in favour of GM. No other news source type had citations in favour of GM above 5%. Policy makers (7.0%) and lobby groups (4.2%) were the news source types most likely to have citations opposing GM. No other news source type had citations opposed to GM above 4%. Policy makers (19.5%) had the largest percentage of citations displaying a neutral position with regard to GM. Industry sources (5.8%) were the other group most likely to have citations with a neutral position towards GM. Citations illustrating a neutral position from other news source types did not reach over 5% of all citations

As shown, the majority of citations had a neutral position on GM, with policy makers having the largest number of such citations. This result probably indicates the highly political nature of the debate with some groups being reluctant to take a particular position before the outcome of the Royal Commission of Inquiry. However, scientists and industry spokespeople were strongly in favour of GM, arguing they had no reluctance in stating their position. The implications of these findings will be discussed in the next chapter.

As described in Chapter 3.8.2.2, the second way in which the value stance of source citations was measured was by reading each source citation to ascertain whether they had a pro, anti, or neutral value stance towards the sub-theme under discussion. The results of this analysis describe the overall value stances taken by different source types on the sub-themes discussed in the reportage examined.

Following the structure outlined in section 4.4, the value stance of source citations towards particular sub-themes are only reported if they reached 5% or more of all source citations in a given stage. The full results of this analysis are contained in Appendix 4.

Following the order set out above in section 4.2.6.1 the first statistics presented are of the value stance of source citations concerned with Science sub-themes. Citations concerning the GM science sub-theme were nearly evenly split between those in favour of it (39.7%) and those with a neutral position (40.5%). The news sources types with the majority of

favourable citations towards GM science were scientists and industry spokespersons. Citations from policy makers were mixed, with 5.7% positive citations, negative citations 6.0% and neutral citations at 6.5%. Lobby groups had the next highest percentage of citations on GM science, with most, 6.5% holding a negative value stance on the sub-theme. These results seem to reflect those reported earlier, with scientists and industry spokespeople taking a positive position towards GM science. The split between policy makers may reflect the political divide between the Green Party and others. The negative position of lobby groups indicates that these citations were dominated by citations from the anti-GM lobby groups contained in this category.

The other two prominent Science sub-themes were Containment and Science regulation. Just over half of all source citations pertaining to Containment had a positive value stance with citations from scientists (16.3%) and industry spokespersons (21.7%) being the most prominent, again illustrating the pro-GM bias of these groups. The citations of policy makers (5.4%) and regulatory authorities (5.4%) also illustrated a positive value stance towards Containment. The two source groups with the highest percentage of citations with a negative value stance towards Containment were policy makers (9.8%) and industry spokespersons (8.7%). The source groups with highest levels of citations with a positive value stance towards Science regulation were policy makers (14.8), scientists (5.2%) and industry spokespersons (4.8%). Those source groups with highest levels of citations with a negative value stance on Science regulation were scientists (27.0%), industry spokespersons (5.2%), policy makers (4.8%) and lobby groups (4.4%). Scientists were six times more likely to be against Science regulation than for it. The results for policy makers on this sub-theme again illustrate the political split between the Green Party and other parties. Also the results indicate the split between certain industry spokespersons, for example, the organics industry versus scientific research industries such as the CRIs. The lobby group result shows that on this sub-theme the pro-GM lobby groups' citations were in the majority. These results will be discussed further in the next chapter.

Again following the order established in Section 4.2.6.2, citations regarding political sub-themes were the next to be analysed. As noted in Figure 4, anti-GM activism had the highest volume of citations in any one stage. Positive and negative citations on Anti-GM activism were nearly equally divided with positive citations equalling 39.4% and negative citations 40.2%. The two source types most likely to have source citations in favour of anti-GM activism were policy makers (14.6%) and lobby groups (14.6%), indicating that these

citations were from the Green party and anti-GM lobby groups. The groups with the highest number of citations against Anti-GM activism were scientists (11.6%), policy makers (12.4%), lobby groups (6.6%) and industry spokespersons (6.6%).

While the sub-theme of Political procedure had the highest number of citations in four stages, no value stance result is available for the sub-theme due to the manner in which it is coded. For a source citation to be coded under the sub-theme Political procedure it was necessary that the citation merely discussed political procedures, for example, the procedures of the Royal Commission of Inquiry, without judging whether these procedures were either positive or negative. Therefore, by definition, citations coded under this sub-theme could have no value stance (see Appendix 4).

As shown in Figure 4, the sub-theme of Political division had the highest volume of citations in one stage. A positive citation for Political division supports the idea that political division does exist over the GM issue. A negative citation for Political division supports the idea that no political division exists over the GM issue. When analysed accordingly, the majority of citations were negative towards Political division, indicating that the majority of those sources quoted (48.3%) believed that no political division existed with regard to GM. Policy makers were the largest group to have citations regarding this sub-theme, with (44.7%) having negative citations. This means that the majority of policy makers supported the view that political division did not exist on the GM issue. This result appears to belie the obvious differences over GM between the Green Party and other parties in parliament. This seeming disparity will be discussed in the following chapter.

Following the order of analysis established in Section 4.2.6 above, the final political sub-theme analysed here is the Report of the Royal Commission. The majority of citations, just over 45%, were in favour of the report. The two largest source types to have citations favouring the report were policy makers (15.5%) and scientists (12.5%). Policy makers were also the largest source type to have citations against the report (9.3%). The apparent split between policy makers again points to the differences between the Green Party and other parties in Parliament with regard to the place of GM in New Zealand society, and these differences and their possible impacts on the resulting reportage will be discussed in more detail in the next chapter.

Following the order established in section 4.2.6.3 the next group of sub-themes to be analysed in this manner were the Economic sub-themes, and GM economics as illustrated in

Figure 5 had the highest volume of source citations of all economic sub-themes in four of the seven stages. The majority of source citations on this sub-theme were positive (58.5%) indicating that sources believed GM would enhance the New Zealand economy. The source types most likely to have positive citations on GM economics were industry spokespersons (30.1%), scientists (12.1%), policy makers (9.7%) and lobby groups (3.1%). Sources expressing citations with a negative value stance on GM economics (21.2%), believed that the adoption of GM would have a negative effect on New Zealand's economy. The three source types most likely to express a negative value stance on this sub-theme were industry spokespersons (8.0%), policy makers (5.9%) and scientists (3.5%). This apparent contradiction illustrates that within the source types there existed opposing divisions and this will be explored in the next chapter.

As illustrated in Figure 5, the sub-theme of Consumer choice had the highest volume of source citations for all economic sub-themes in two stages and indeed had the highest volume of citations of any economic sub-theme in Stage I. Over half (56%) of all citations on this sub-theme were in favour of more consumer choice with regard to GM foods. This result illustrates the strong preference for consumers to be able to choose between GM and non-GM food. The source types with citations most in favour of Consumer choice were industry spokespersons (20.2%), policy makers (19.1%) and lobby groups (5.4%). Just over 6% of citations were against Consumer choice and the majority of these were from policy makers. The differences between those policy makers for Consumer choice and those against it will be discussed in the next chapter. The remaining citations had no bias towards Consumer choice.

As illustrated in Figure 5 the only other economic sub-theme to gain more than 5% of the volume of all citations was Organics. The majority of (91.6%) citations on this issue had a positive value stance. The source type with citations most in favour of Organics were industry spokespersons (62.5%). It must be noted that the majority of such citations came from those representing the organics industry.

The other three themes of Morality, Health and Environment as already noted in Figure 2 rarely gained more than 10% of the volume of source citations in any one stage of the debate and, therefore, they were not analysed at the level of their respective sub-themes. While these themes were only a small percentage of the overall coverage, it is interesting to note the

value stances of the citations on these themes and so an analysis of this was conducted. The full results of this appear in Appendix 4.

In terms of the Morality sub-themes it was found that the majority of citations (77.0%) discussing Ethical consideration were in favour of such considerations being taken when making decisions about the application of GM technologies. The source types most likely to have positive citations on this sub-theme were scientists (23.0%) and industry spokespersons (14.8%), Religious spokespersons (12.2%) and Māori spokespersons (12.2%). There existed only one source citation that was negative towards Ethical consideration.

When examining whether or not sources believed that GM transgressed moral values, the majority of source citations (65.1%) were positive, arguing that these sources believed that GM did indeed transgress moral values. The source types most likely to have a positive citation with regard to Ethical transgression were Māori spokespersons (16.3%), policy makers (11.6%), environmental and animal welfare groups (11.6%) and religious spokespersons (9.3%). Just over a quarter (25.7%) of source citations regarding Ethical transgression had a negative value stance indicating that those sources did not believe that GM transgressed moral values. No one source type was more likely to have this value stance than another.

Finally the majority of source citations (82.0%) discussing the issue of Ethical regulation had a positive value stance. Source citations with a neutral or negative value stance on Ethical regulation were equally divided at 9.0% each. Therefore, overall, sources speaking about the ethics of GM felt that more consideration was needed in terms of the ethical implications of GM, with some believing that it transgressed moral and ethical values, while others argued that there was a need for ethical regulations with regard to the application of GM technology.

The last two major themes of Environment and Health illustrated that over half (53.3%) of source citations on Environmental effects were negative; arguing that many believed that GM would have an adverse effect on the environment. Just under a third (29%) of source citations had a positive value stance with regard to Environmental effects arguing these sources believed that GM would have a positive effect on the environment. The other 20% of source citations had a neutral value stance. In contrast 61.5% of source citations had a positive value stance on the sub-theme Health effects indicating that many sources believed that GM would have positive effects on people's health. These two results are very similar to results found in European studies and this will be discussed in the next chapter.

4.3 Results of the Interview Analysis

The relationship between the news media and scientists is the subject of much research (Dunwoody, 1999; Peters, 1995). As already noted in Chapter 2, section 2.2, scientists often believe that the news media misrepresent their science and, therefore, some refuse to interact with the media. However, as Petersen et al. (2005) note, this situation of blame is not as transparent as some scientists would like to suggest, with scientists deliberately trying to control the frame in which their particular science is reported. This is especially the case for biotechnology or GM with Krinsky (1982) noting the strategies used by scientists, since the first rDNA techniques became public, to try to control how the resulting debate was framed in the news media.

As Petersen et al. (2005) argue the reporting of science is a struggle between different *claim makers* to have their version of reality accepted in order to influence public policy. One large group of claim makers in the GM debate is comprised of the scientists involved in such research. As found by Nisbet and Lewenstein (2002) scientists are one of the largest source groups represented in the news media with reference to the GM debate. The results of the content analysis shown above illustrate a similar pattern. Therefore, the research sought to find how sources, in particular, scientific sources, thought the GM debate had been reported by the New Zealand press and how they had found their experience as news media sources.

As explained in Chapter 3, Section 3.3.5 the interviews were analysed using a cross-case analysis where the participants' answers to the questions were grouped together and a number of themes identified. The results of this analysis are described below, beginning with the scientists.

4.3.1 Scientists' Interviews

As stated, scientists often believe the news media misrepresent the science they conduct and, in this regard, biotechnology and GM are no exception. Following the interview questions outlined in Appendix 2, this section describes the results of the interviews with scientists to illustrate their perceptions of being a source for the press and also how they believed the press had actually reported the issue. The interview process and the subsequent data analysis are explained in detail in Chapter 3 in section 3.3.

The six interviews reported in this section were carried out with four scientists: Dr Tony Connor, Crop and Food; Dr Paula Jameson, Massey University, Dr Barry Scott, Massey University; and Dr Ian Warrington, former Head of the Crown Research Institutes, currently

with Massey University. The final two interviews were with two representatives of the pro-GM lobby group, the Life Sciences Network (LSN), Dr William Rolleston and Mr Francis Weavers. The LSN had been explicitly set up for and funded by a number of scientific and research organisations involved in GM research. Therefore, their viewpoints were combined with those of the scientists due to their pro-science and pro-GM stance. A full list of the participants is shown in Chapter 3, Section 3.3.3 in Table 4. The views of the scientists are reported under three themes. The first of these themes was the scientists' views of the GM reportage.

4.3.2 Scientists' Views of the GM Reportage

The views of the scientists with regard to science reporting in general terms were somewhat mixed. Two of the scientists believed that in general newspaper reporting of science was not done well, with Scott stating, "I think the quality of science reporting in the newspapers in New Zealand is very, very poor [and] I think that it has deteriorated in recent years" (personal communication, July 26, 2002). Warrington supported this view saying, "if they [the public] are going to pick up the *Manawatu Standard* or *The Dominion*, I don't think most of the readers are going to worry about reading a feature page [about science] from whoa to go. So what is left is pretty skimpy stuff..." (personal communication, November 25, 2002). However, one scientist did recognise that there were "one or two science reporters in the country and I'd say some of those articles have been well researched ..." (Jameson, personal communication, July 2, 2002).

When specifically speaking about the reporting of the GM issue, some of the scientists felt that the news media had improved their reporting over the past five years or the period from 1997 – 2002. Connor stated, "I think as time has gone on over the past five years I have seen a progression [as] people are getting more used to asking what I think are the more correct questions ..." (personal communication, July 25, 2002). Warrington said, "the media have done a better job in the last five years than previously in bringing people up to speed with the debate, with the technical aspects of what's going on" (personal communication, November 25, 2002).

However, these scientists recognised explicitly or implicitly that the debate had mainly been portrayed in terms of GM food production:

[GM food is] the real concern for people and that's come through clearly in the Royal Commission; where when it comes to GM and medicine, medical products

there's much wider acceptance of GM in the lab. But when scientists start screwing around with crops and potentially food this is where the debate has focussed and where the issues have really arisen (Scott, personal communication, July 26, 2002).

The other scientists, while not as explicit, all spoke about GM food and crops to varying degrees. The concerns about GM food had been exacerbated in the view of one scientist due to the pictures used by some media outlets. In her view some of these pictures amounted to a "type of pictorial scaremongering", and she gave an example of a cartoon depicting a tomato containing a baby and placenta (Jameson, personal communication, July 2, 2002).

The possible reason for this preoccupation with GM food was, in the view of Warrington, because the public:

had become dislocated from knowledge about their food supply. They want food, they want it now, they want it cheap, they want it year round but it's got to be environmentally friendly, it's got to be organic etc, but they have no idea what that means (personal communication, November 25, 2002).

In the view of Warrington, stem cell research and the possibilities of cloning had negatively affected the public's perception of GM and GM food to the point that:

what people are saying is, well I actually wouldn't mind if you came out with strawberry that tasted better but if that means that somebody could clone themselves I don't want you to touch the technology at all (personal communication, November 25, 2002).

Another possibility for the negative reaction against GM food prevalent in the news media coverage was given by Scott who suggested that it was:

A consequence of the way these crops were generated in the U.S., principally for agronomic purpose ... like herbicide resistance, insect resistance. [They were] not generated for potential human nutritional benefit. There clearly is a problem here and there's been an anti-big business attitude and partly deserved by companies like Monsanto ... [who] just released this and did not provide any information for the public (Scott, personal communication, July 26, 2002).

This rather one-faceted reporting of the issue concerned Scott as he believed that other issues were not being well reported. One example was the issue of GM vaccines:

There will be vaccines that are recombinant in the very near future and that's going to be a big issue for New Zealanders to have to understand and the media are not preparing the ground particularly well (personal communication, July 26, 2002).

Although Scott did note that in other areas there had been some positive reporting of the use of GM for medical purposes.

Another scientist was concerned that the reporting appeared to illustrate an apparent misunderstanding by the news media of terminology with reference to field trials and possible release of GM into the wider environment. According to Jameson, the news media had incorrectly reported a number of statements made by politicians, including the Prime Minister, about a moratorium on field trials and the possibilities of full commercial release of GM. Jameson had felt strongly enough about these reported statements to write a press release arguing that politicians and the news media needed to get the terminology right. She said that this was:

such a high profile issue that it is absolutely essential that the media gets this terminology right. Because these terms mean something very specific in the law and so they must be very careful how they use these terms (personal communication, July 2, 2002).

While not disagreeing with these points, Warrington empathised with “journalists that tried to figure it out for themselves and come to a conclusion”, as the scientific debates surrounding GM were quite sophisticated (personal communication, November 25, 2002). He thought that “journalists have quite rightly allowed the debate to become public but have stopped short of trying to draw the conclusion, where in fact it is difficult to draw one anyway, even scientifically” (Warrington, personal communication, November 25, 2002).

These comments show that most of the scientists felt that the standard of reportage was not high and yet they recognised that some journalists were reporting the complex debate quite well. However, the scientists interviewed expressed disquiet that some news sources cited in the reportage were being incorrectly identified as scientific sources when in fact they did not have any of the correct qualifications for such designations. These concerns came as a result of asking how journalists should report controversy.

4.3.3 News Media Source Selection

As noted in Chapter 2, section 2.11, previous research has highlighted the possible dangers of overly cooperative scientists being used as news media sources. This worried two scientists interviewed, raising the problem about some scientific sources being reported as if they were experts in the field. Connor stated:

I have seen people speak up about plants and they're not even a plant scientist. A molecular biologist speaking about pollen dispersal without really understanding anything about the reproductive biology of plants (personal communication, July 25, 2002).

These concerns were echoed by Scott when asked how the news media should report the apparent dispute between scientists about GM. He stated:

I think first, journalists should check their [scientists'] qualifications. There is a very outspoken scientist who is reported as being a molecular biologist when in fact they have no credentials whatsoever in molecular biology. I think there's a need to establish some sort of scientific credibility for people (Scott, personal communication, July 26, 2002).

While not scientists, both interviewees from the Life Sciences Network (LSN) also raised the issue that a number of scientists were talking outside their area of expertise during the debate. They said the problem was that when a "scientist says something that immediately, as far as the public is concerned, s/he has a greater degree of credibility on any science issue" (Weavers, personal communication, October 17, 2002). Furthermore, Rolleston said:

What [journalists have] got to try and do is sort out where people are actually coming from and where their expertise actually lies. If you look at the debate you should [also] look at the people, the scientists who are talking about anti-GM and then ask yourself, What sector are they talking anti-GM about and what sector are they actually experts in? (personal communication, July 3, 2002).

Jameson believed the media before reporting needed to do "a bit of background research and approach the likes of ANZFA (Australian New Zealand Food Authority) and do a bit of their own comparing and contrasting..." (personal communication, July 2, 2002).

According to the scientists interviewed, the solution to the issue of scientists being reported speaking outside their field was for journalists to identify those scientists qualified to speak on the issues and for scientists themselves to adhere to the code of ethics of the Royal Society

which recommends, “that scientists should not speak outside their area of expertise...” (Connor, personal communication, July 25, 2002). However, as the analysis of the journalists’ interviews will show, it was not always easy for some journalists to make these judgments.

4.3.4 *Scientists’ Experience as News Media Sources*

While scientists who like to interact with the media on a variety of issues do exist, as noted at the beginning of this section, more often scientists are reluctant sources. However, this was not the case for those interviewed for this study who had been chosen because they had all been sources in the coverage of the GM debate. Therefore, in addition to exploring how these sources perceived the coverage of the debate, the study also sought to examine how they had found their experience as news media sources during that time. Examining this would give further insight into how the source/journalist interaction influenced the framing of the debate. The results of this question found some very different views and experiences amongst the scientists with regard to their interactions with journalists.

In responding to the question of how he had found his experience as a news media source Connor stated that:

it was very daunting to start with; talking to print is okay but early on I was quite terrified by it and you [become concerned] about making general statements that might upset your peers. For example, was I representing them correctly? What would their opinions be? You don’t want to be misrepresented by your peers ... you want to be respected. I think we want to be respected by our peers, that is why we publish. Over the time I’ve seen myself misquoted quite frequently or the thing twisted, but I’ve learnt to wear it on the chin (personal communication, July 25, 2002).

While Connor was now quite comfortable with being a media source, Scott, while expecting to be engaged by the media, had a different view on the way in which the media should be dealt with, he said:

The more I engage, the more my response generally was, “What is it you’re wanting to do? Where are you coming from?” I’ll be quite assertive with some journalists saying “What is your intention? If your intention is to sensationalise this well, then go away; I’m not going to talk to you, end of interview. But if you really want to get a balanced view, then I’m happy to talk to you. I’ve told my colleagues to be

equally assertive with reporters because quite honestly I have been fed up with them preying on us for tittle-tattle and sensational type stuff, without really any intention of getting underneath and getting to know the core of it. (personal communication, July 26, 2002).

Warrington stated that in the past he had been quite assertive with reporters, although not on the GM issue, telling reporters not to bother him again. However, in his view this approach gained little apart from some minor self-satisfaction. Also it did not happen often, as the reporters, “know that in the end you’re a useful source for them and if you close that door you *do* close it” (Warrington, personal communication, November 25, 2002). With regard to the GM issue his experience as a source had been mainly positive, although he did treat, “some reporters in some national papers quite carefully” (Warrington, personal communication, November 25, 2002).

Although these two scientists did point to some negative experiences, they and the other scientists interviewed had found their interactions with journalists fairly positive. This was also reflected in the fact that most felt that in the main they had been quoted accurately and fairly. Warrington in talking about his interactions with reporters remarked:

In fact I think what happened was that I developed a trust that they would contact me for a reliable quote ... a balanced quote, a sensible statement about something and equally I developed a trust that they would not misuse that in any way (personal communication, November 25, 2002).

Connor also reported this apparent rapport between journalists and scientists saying that in the case of one journalist, “who I get on really well with... he calls at home all hours of the night for a comment and it’s no problem at all” (personal communication, July 25, 2002). The journalist/scientist relationship will be explored further when reporting the interviews with journalists in the next section.

4.3.5 Journalists’ Interviews

As illustrated in Chapter 2, section 2.11, previous research has shown the relationship between scientists and journalists to be a difficult one, with journalists often finding scientists to be reluctant news sources. Therefore, interviews were used to explore whether this pattern occurred in the New Zealand context with regard to the GM debate, and also to find how the journalists had found reporting the GM debate as a whole. Therefore, in line with the

interview questions outlined in Appendix 2 this section describes the results of the interviews with the chosen journalists. The interview process and the subsequent data analysis are explained in detail in Chapter 3 in section 3.3.

The interviews reported on in this section as noted, were carried out with five journalists, Alan Samson, *The Dominion*, Anna Wallace, *Manawatu Standard*, Anne Beston, *New Zealand Herald*, Aaron Smale, *Manawatu Standard* and Veronica Meduna, Radio New Zealand and ex-newspaper journalist. A full list of the participants is shown in Chapter 3, Section 3.3.3 in Table 4. The journalist interviews are also reported under a number of thematic headings beginning with their experience in the field.

4.3.6 Journalistic Experience

The lack of experience and/or lack of science education amongst those journalists reporting on science are given as reasons for the inaccuracies that appear in the news media's reporting of science (Friedman, 1986). Therefore, each journalist was asked about his or her experience as a journalist and educational background. On average the journalists had 16 years of experience as journalists and an average of eight years experience in reporting science. The journalists' experience is shown in Table 4, Chapter 3, section 3.3.3.

In terms of education only one journalist had any formal education in science, holding a post-graduate degree in microbiology. Two other journalists held degrees from the social sciences while the others had gained polytechnic diplomas in journalism. Once their experience and levels of educational achievement were established, journalists were asked how they had found reporting on the GM issue.

4.3.7 Reporting GM

The journalists were asked whether the GM issue had been different to other issues on which they had reported. Most believed that the issue was very complex, with Samson stating, "It's probably been more difficult just because of the complexity of the subject and papers are enjoined to have their copy written so that 12 year olds can understand it. You can see the clash" (personal communication, October 17, 2002). Another said, "it's very complicated. There are other stories that are complicated but I think sometimes in its complexity and understanding what it's all about is different" (Wallace, personal communication, November 7, 2002). In addition, Wallace noted that:

Each side of this argument has got a case and that to me is interesting. The other interesting thing [is] when you talk to the scientist and you see how they've put their

life's work into this, [it] means so much to them [but] I think one of the things that scientists get is a bad rap ... science has become bad ... it's almost become evil and I think trying to dispel that notion is also very interesting. We seem to take a very ... almost unscientific view of things and science un-science has become the Holy Grail (personal communication, November 7, 2002).

This comment points to the crisis of faith in science that was mentioned in the introduction and will be discussed in the next chapter.

Another journalist, rather than labelling the issue as complex, argues that it was not simply a one-off scientific issue; it was ongoing, saying:

There are ethical, commercial and political issues in it and it's just something that most people would have some view on but not necessarily an opinion. Genetic engineering is close to the hearts of people because it's on your table ... in your life so much more than climate change or any of those bigger issues are (Meduna, personal communication, February 11, 2003).

Samson also noted that in the reporting of GM:

Newspapers very early got wary of the protests and they were generally played down. For instance, our newspaper made a conscious decision generally not to show pictures of the protest or the signs and mock pictures and all this kind of thing, and if you go through the files I think you'll find little coverage of these things. As a paper we decided the only way to cover this whole GM issue was to stick as closely as possible to the Commission hearings and we ignored 90% of all the lobbying that went around it (personal communication, October 17, 2002).

As illustrated most of the journalists believed the GM issue to be complex and it had to be simplified for the media audience. How then did journalists simplify the issue, while at the same time balancing the requirements of scientific accuracy and the scientific community?

4.3.8 Simplifying the Science

While all the journalists felt that the issue had to be simplified, one journalist said that news media "didn't want to be seen to dumb the story down too much" (Beston, personal communication, November 8, 2002). The journalists interviewed had a number of strategies

to balance the need to simplify the science whilst still maintaining the scientific accuracy expected by scientists. One journalist said:

I think you go and talk to the scientist and you try from your point of view to talk back to them about it and using the simple language that you will use in a newspaper ask “Have I got this right?” So if the scientist can explain it to you and you can explain it back, then I think you try and put that in the story (Wallace, personal communication, November 7, 2002).

Smale sometimes gave his *copy* to scientific sources before going to print. He stated:

there’s a general rule amongst journalists that you don’t give your copy to a source to read. In the area of science I would make exceptions simply because I want to get it right (personal communication, October 15, 2002).

Samson noted the differences between scientists and journalists. He argued:

scientists deal in probabilities, we deal in certainties and facts and dramatic announcement. News comes first; a reporter must always think of what the most interesting thing that is going to grab your attention or the most important thing. But a reporter also has ethical responsibilities and the longer I was in journalism the more ethical I became. The danger is when you’re young and trying to prove yourself and you will shout and scream and try and get the big story. The older you get I think you do think it through more carefully. I would always be reluctant to perpetrate a falsehood ... I wouldn’t. Once you have the news you must explain the news and you must make it explainable and that is the difficulty (personal communication, October 17, 2002).

While recognising the need for accuracy and ethical treatment of the news Meduna also recognised that sometimes these could be threatened or compromised by:

the journalistic tradition of balance where you’d always be tempted to report something and bring an opposing view. That’s an easy way to balance a story by just looking for somebody who opposes [an issue] or somebody who creates a bit of controversy or just has a different view. That is where it often clashes because it’s not really balanced. It’s just one of the journalistic traditions that’s become established and we feel I can’t just say this because there is bound to be somebody out there who doesn’t like it so bring them in (personal communication, February 11, 2003).

However, when this was done in science stories “the scientist involved feels like they have been attacked (Meduna, personal communication, February 11, 2003).

4.3.9 The Scientist/Journalist Relationship

The last two journalists have pointed to the relationship between journalists and scientists. This relationship has often been quoted as two different cultures coming together and this causes friction between the two groups (Dumanoski, Farland & Krimsky, 1999; McIlwaine, 2001; Reed, 2001). As already illustrated, the scientists interviewed had mixed feelings about their relationships with journalists. Wallace believed that scientists were not “publicity hungry”, and were “often very reluctant to talk to the media”. Moreover, Wallace found that some scientists could be very difficult to understand, stating, “I think you can’t just ring up and talk to them for ten or twenty minutes and get a story. It takes going up there and chatting to them for at least an hour or something like that (personal communication, November 7, 2002).

While scientists appeared at times to be reluctant, Samson believed that, as sources, scientists had improved since the late 1990s when the Crown Research Institutes were established. According to Samson, “suddenly funding became an issue and it helped them to be in the public eye often, and certain scientists became very media savvy; others didn’t” (personal communication, October 17, 2002). In his view scientists have improved as sources and yet Samson qualified this by noting that scientists, “may have gone backwards since the PR have taken over”. Wallace agreed with Samson that scientists were improving as news sources saying they were “learning rapidly”. She also believed that they were “managed quite well by their communication and public affairs units” (personal communication, November 7, 2002).

When asked how well scientists understood the needs of journalists, Samson said, “I think they understand it, I think they distrust it. They know we want the big story, the big breakthrough which they’re sometimes reluctant to give [because] they are scared to be misrepresented” (personal communication, October 17, 2002). To illustrate this point Samson mentioned the Lyprinol affair already described in Chapter 2, section 2.11. Despite these types of problems Samson believed that when scientists came to trust a journalist they were as good as any other news source (Samson, personal communication, October 17, 2002).

While journalists believed that scientists had improved as sources, they did find scientists' need to qualify their statements as difficult. Smale found scientists' tendency to deal in probabilities frustrating, noting that scientists:

will give me an answer but they will always be qualifying it to death. Journalists want things in black and white, clear statements. Scientists will say one thing but then they'll modify everything they say by other things [like] it's dependent on this or I can only comment on this and you might want to talk to so and so. They will qualify what they say because it's not as simple as the journalist would always like it to be (Smale, personal communication, October 15, 2002).

Finally, given the concerns of scientists about some of their peers speaking outside their area of expertise, journalists were asked how they contacted their scientific sources. Beston said:

scientists are a small group in New Zealand. We haven't spent a lot on science and this is not America or Britain and the shining lights are few and it's the usual suspects. You also get to know them and who to ring up. Some of the CRIs have very good public relations people who will tell you who to contact about what (personal communication, November 8, 2002).

The other journalists interviewed supported these comments, mentioning the limited numbers of scientists in New Zealand and that the CRIs and universities had good public relations departments. Samson also noted that covering the Royal Commission had led him to new sources. They also used existing sources to put them in contact with others. Smale also noted that their newspaper has a contact list and that, "once you find a good contact you often tend to go back to them if 1) they're knowledgeable in their area and 2) they're good talkers" (personal communication, October 15, 2002).

4.3.10 Source Credibility

When asked how they judged whether or not a source was credible or if they were talking to the right people, journalists had some differing responses. In the view of Samson a credible source was one who had "position, authority and came up with the goods" (personal communication, October 17, 2002). Other journalists pointed to the fact that some sources had vested interests and it was their job to recognise these in order to utilise credible sources that were not unduly biased in their responses. Smale, in trying to ensure he was talking to a credible source, tried to establish, "who they work for and who's paying the bills." In speaking about scientists working for CRIs, Smale stated:

I don't think it undermines their credibility completely but they have a vested interest in making money out of GM. I mean they've got contracts [or are] competing for contracts...genetic modification is obviously going to be big money (personal communication, October 15, 2002).

In order to try to ensure the credibility of a source, Smale tried to “gently take a bit of a people's advocate line when I'm questioning anyone. Trying to put questions to them from the other side of the fence just to keep them on their toes and it often produces good citations as well” (personal communication, October 15, 2002).

Beston also questioned sources carefully to test their credibility. She tested a source's credibility by asking “subtle questions along the way to find out how much they know about the area and you can quickly tell if you're wasting your time. If that's the case then you make another phone call” (Beston, personal communication, November 8, 2002).

Wallace said:

the thing with science is you've got to trust them to a certain extent because how would I know? I mean I don't know what they know. Sometimes people's reluctance to talk gives them credibility, sometimes people's dire need to talk ... has the opposite effect. I guess it is intuition, knowing [and] your knowledge of people ... (personal communication, November 7, 2002).

Meduna took a wider view on what made a source credible, saying:

It depends on the kind of story. If it's a story where I'm after people expressing their concerns then anybody is credible. Because if somebody has a concern then that's about it, no matter how much they know or understand about it. If we're talking about new technologies like GE anybody who's worried has a valid concern and, therefore, [they are] a credible source. If I'm attacking the same story trying to explain what the technology is about and what the benefit versus risk assessment would be ... then of course you're looking for independence and you know the less credible source would be somebody who works for a commercial outfit. You can deal with that by saying this is somebody who works for Monsanto of this world and it is clear that their perspective will be skewed towards the commercial benefit. Equally I will have the same caution with somebody who works for an NGO or somebody who is just involved as an activist without actually being paid for it. Finding somebody who is truly independent is difficult if not impossible in a small

place like NZ. Even a scientist working for a Crown Institute will have a slightly commercial perspective (personal communication, February 11, 2003).

Therefore, while this journalist had a slightly wider view of what made a source credible she agreed with the other journalists that they had to be aware of sources with vested interests and treat them with caution and this illustrates that when it came to vested interests journalists did attempt to hold these individuals to account.

4.3.11 Press Releases

The final question put to journalists was whether or not they used press releases. Ericson et al. (1989) found that journalists are very wary of using documents such as press releases and were more likely to contact the sources directly to verify the statements being made. Therefore, journalists interviewed were asked whether they were inclined to use press releases or not in writing their stories. Samson best summed up the responses of all the journalists when he said, “I would very rarely just use a press release. All press releases have phone numbers at the bottom; I would generally ring up someone and have a talk to them...” (personal communication, October 17, 2002).

Despite the journalists trying to avoid the use of press releases and to ensure the credibility of their sources, some of the journalists reported that they had been accused of writing unbalanced stories. Beston said, “some of the science has been interesting and I have been accused by the anti-GM lobby of bias because I have given space to scientists and not them” (personal communication, November 8, 2002). Similar accusations were also levelled at Samson who was accused of bias while attending the Royal Commission hearings because at one point he had passed someone’s phone number to a member of the Life Sciences Network.

4.3.12 Summary

The interview analysis illustrates that the scientists interviewed, on the whole, felt that the news media had not reported the GM debate well. Their biggest concern was that some sources being quoted were not qualified to speak on the issue, and all of them either explicitly or implicitly believed that the debate had centred about the issue of GM food. In terms of their experience as news sources and their relationship with journalists most had found their experience reasonably positive and some were quite comfortable in their role as news

sources. Others on the other hand were quite forthright in their dealings with journalists, refusing at times to co-operate.

The journalists interviewed had felt that the GM issue was a complex one to report as it was multi-faceted. They found the scientists' need to constantly qualify their research frustrating as they needed to have facts to report. However, on the whole the journalists did not find scientists any more difficult to deal with than other news sources, with some believing that scientists had improved as sources in more recent times. Finally, the journalists were not inclined to use press releases, preferring instead to contact the sources of the releases directly. These results along with the results of the content analysis are now discussed.

Chapter Five

Discussion

5.1 Introduction

The newspaper content analysis presented in Chapter 4 illustrated that the reportage of the genetic modification debate, published by *The Dominion*, *The Press*, *Otago Daily Times*, *New Zealand Herald*, *Waikato Times* and *Manawatu Standard*, had a pro-GM bias because of the sources used by journalists and, further, was dominated by a limited number of themes and news source types. Other potential news source types, for example, religious, Māori or environmental spokespeople, and themes such as Morality and Environment, were less represented. The pattern continued throughout the period examined, January 1, 1998 to February 28, 2002, despite the presence of the Royal Commission on Genetic Modification (RCGM). As noted in Chapter 3, section 3.2.8.2, part of the Royal Commission's warrant was to consult with the public in order that they could clearly express their views on GM including those views which pertained to ethical, cultural and environmental perspectives (Royal Commission on Genetic Modification, 2001).

The discussion chapter explores these findings in relation to previous research, and with reference to the literature about the public understanding of science and the news media. The chapter then discusses the results of the interview analysis, which showed a number of points of tension and accommodation between journalists and scientists. The interview findings are explored in relation to previous research and with reference to writings about the coming together of two professional cultures - journalists and scientists.

The chapter is based on the research questions established in Chapter 1, Section 1.7, pg. 14 and aims to discuss the findings in relation to these questions. Therefore, the first section of this chapter discusses how the reportage was distributed between January 1, 1998 and February 28, 2002. As noted this time frame included the beginning of the GM debate in 1998 and concluded four months after the Government announced its policy decision on GM based on the Royal Commission's recommendations.

5.2 Distribution of the Reportage

As illustrated in Chapter 4, Figure 1, the distribution of the volume of reportage can be divided into seven distinct stages. These stages, as explained in Chapter 4, Section 4.2, were

the result of the reporting of certain discrete events, for example, the discovery of GM food in New Zealand supermarkets in 1998, and the establishment and progress of the Royal Commission between 2000 and 2001 amongst others. Once the Royal Commission had been established the interest in GM steadily increased, especially with regard to GM food, the possible medical uses of GM and the economic implications for New Zealand if GM technology were adopted.

The event-led or episodic nature of the New Zealand reportage is consistent with U.S. findings (McInerney, Bird & Nucci, 2004; Nisbet & Lewenstein, 2002; Pfund & Hofstadter, 1981). Nisbet and Lewenstein (2002) argue that while biotechnology or GM may ride high on the media agenda for, “a specific week or month surrounding major focussing events ... it still rests rather modestly on the media agenda compared to other political issues or even science and technology related developments” (p. 384).

Across the four year period investigated, 738 hard news stories were published on the debate. Very few of these (3.7%) were published on the front pages of the newspapers analysed. The majority of these front page stories, 59%, occurred in Stage VI (the period immediately following the Royal Commission) when the findings of the Royal Commission were given to the Government on July 31, 2001, and up to and including the Government’s subsequent announcement of its GM policy on October 31, 2001 based on those findings. The Government’s decision and large protests against GM, marked this as a highly newsworthy period and probably accounted for the larger number of front page stories at this time. Otherwise, the GM debate did not create many front page stories, possibly indicating that journalists and/or editors did not consider the story newsworthy enough to receive a high profile.

In addition to the small number of front page stories, nearly a quarter of the stories were sourced through the NZPA electronic news service, indicating that newspapers were either unwilling to assign reporters to the issue, or, due to limited resources, they were unable to assign reporters to the story. The experience of Samson, *The Dominion* newspaper journalist, supports this last point. In his interview, Samson said that he had a struggle to successfully convince his editor that the issue was important enough, in terms of its long term impact on New Zealand, that he should attend the Royal Commission hearings on a daily basis (personal communication, October 17, 2002). Because newspapers were unwilling or unable to assign reporters to the issues, the resulting repetition of stories through the NZPA did limit

the number of potential news sources cited, while at the same time giving more exposure to those sources already cited in the original stories.

The result is not surprising because, as already noted, Leitch (1992) found that New Zealand newspapers relied heavily on the NZPA in the writing of stories, and she predicted that this reliance would not only limit the number of news sources but would also see a reduction in the number of journalists. Norris, writing ten years later, confirms these predictions arguing that the concentration of ownership of New Zealand newspapers has led to a number of newspapers being closed or amalgamated resulting in, “less diversity and a diminished range of opinion” (Norris, 2002, p. 48). He argues that, “readers of *The Press* in Christchurch will be unaware that they are reading an article published the day before in *The Dominion*, or that a number of stories have been written by *Dominion* reporters” (Norris, 2002, p. 48). Rosenberg (2008) in his survey of New Zealand news media ownership agrees, arguing that the increasing concentration of such ownership in New Zealand, “does not provide a variety of voices. Rather, it provides sameness of voices for fear of driving off advertisers and mass audiences” (p. 61). As will be discussed below, the results of the content analysis reported in Chapter 4 illustrate the limited range of news sources cited in GM stories across the four years of coverage.

In terms of reportage on the Royal Commission a number of *The Dominion's* stories were sourced through the NZPA and repeated by other newspapers analysed. As noted, Samson of *The Dominion* was one of only two journalists attending the Royal Commission hearings daily, the other being Veronica Meduna of Radio New Zealand, also an interviewee for this thesis. Despite both journalists believing the topic to be of high importance, it was destined to remain low on the news media agenda in terms of front page stories and continued to be reported in an event-led manner.

However, there was a large difference between how these two journalists were able to report the Royal Commission hearings. Samson, working for *The Dominion* newspaper, had very tight deadlines in which to write his stories. Leaving the Commission at the close of day, often between 4-5 pm, he would then return to *The Dominion* offices and, “would generally be expected to have stories through by 6.30 - 7 pm at the latest” (personal communication, October 17, 2002). These tight deadlines were because his stories were to be printed on the early pages so that editors could then concentrate for the rest of the evening on breaking news or the major stories of the day (Samson, personal communication, October 17, 2002). In

contrast Meduna, working for public service broadcaster Radio New Zealand, submitted at least two stories per day for two different news programmes, as well as being able to feed items into the major news bulletin at 10 am each morning. In addition, on particularly busy days at the Royal Commission, Meduna was able to submit additional stories directly from the Royal Commission (personal communication, November 12, 2008). While both journalists had deadlines, it appeared that Meduna, working in the public broadcasting environment, had tighter deadlines due to the number of stories she had to submit. However, many of these stories were shorter as they were written for news bulletins. In contrast, when it came to stories for her weekly science programme she had more time to research them before they were broadcast. In comparison, Samson had little time to research his stories because of the tight deadlines that result from the commercial imperatives and practical realities of publishing a daily newspaper.

The news media's reporting of issues in an event-led manner has also been found in previous research (Nisbet & Lewenstein, 2002). Tuchman (1978) found that the news media concentrate on events, avoiding analysis of, or making structural links between events. Gans (1979) has also found that complicated stories are not reported because it is believed that such stories over-burden the audience and, therefore, journalists are reluctant to cover such issues. The concentration on events and the reluctance to report complex issues has also been found by Pfund and Hofstadter (1981) in their analysis of the reporting of biomedical innovations. They argue that, "as technical aspects of biomedical research become intertwined with policy considerations, science reporting must represent this complexity if it is to provide an accurate picture to the public" (1981, pp. 138-139).

The lack of an accurate picture of the complexity of scientific issues like GM may not be the only result of event-led reporting. Dunwoody and Griffin (1993) argue that event-led reporting places limitations on how an issue is framed. First, "it allows sources to control the process and the frames", and secondly, "it absolves journalists from attending to the big picture" (Dunwoody & Griffin, 1993, p. 47).

The issue of GM is multi-faceted and Meduna noted this complexity in her interview, Chapter 4, Section 4.3.6. Scott, the Massey University scientist, in his interview, Chapter 4, Section 4.3.1, also remarked that the issue was complex. However, as noted, he believed the reportage had not captured this complexity. Also some of the scientists interviewed suggest that the overall quality of science reporting in newspapers was poor, although the quality of

reporting on the GM debate had been improving (Jameson, 2002; Scott, 2002; Warrington, 2002, personal communications). These combined observations appear to illustrate the limitations of event-led reporting and, as will be discussed below, this is shown by the narrow number of themes present in stories reporting the GM debate. Also the possible reasons for the major concern with GM food found in the reportage will be discussed when the themes are examined.

The pattern of reportage also seems to indicate that the issue was only considered newsworthy while it was characterised by controversy and conflict. Conflict, as McGregor (2002) argues, is one of the new, news values. By framing the issue in terms of conflict, journalists can report the issue in terms of opposing viewpoints, thus, adhering to the journalistic ideals of balance and objectivity. As illustrated in Chapter 4, Figure 1, there were large peaks in the reportage in July (7573.75 cm²) and October 2001 (9525.10 cm²) and these illustrate the importance of conflict as a news value. The Royal Commission announced its findings on July 31, 2001 and there was much debate and conflict between various parties in July 2001, prior to and when these findings were announced. The conflict peaked again in October as the Government was nearing its policy announcement based on the Royal Commission's findings, due on October 31, 2001. Many groups in this period were trying to lobby Government to either reject or accept GM. There were a number of anti-GM protests at this time with possibly the largest being a march by Māori that arrived at Parliament on October 31, 2001. Ruper (2002), in her analysis of New Zealand newspaper coverage of the Royal Commission, also found that the issue was often framed in terms of conflict between the Government and environmentalists.

After the Government's policy announcement there was a large drop in the volume of reportage, with the volume only reaching 252.98 cm² in December 2001. This sharp decline appears to indicate the issue was no longer considered newsworthy as the conflict around it had subsided. A similar pattern of coverage has also been found by Kitzinger and Reilly (1997) in their examination of risk reporting. They found that when it appears that a government has made a decision on an issue, the news media seem to accept this as a signal that the controversy surrounding the issue has been resolved and, therefore, the issue loses its newsworthiness.

In summary, the GM debate was reported by newspapers in an event-led manner and did not appear to be a high profile issue given the low number of front page stories devoted to the

debate. Samson of *The Dominion*, in his interview seemed to confirm this by noting he was the only newspaper journalist to report on a daily basis the Royal Commission, the biggest single event regarding GM in the period analysed (personal communication, October 17, 2002). Furthermore, just under a quarter of all stories reporting the GM debate were published using NZPA releases, demonstrating that other newspapers were either unable or unwilling to commit resources to report on the Royal Commission. Finally, the reporting of the issue dropped suddenly after the Government announced its policy on GM on October 31, 2001, suggesting that this event signalled that the issue had been resolved in the eyes of the news media. The next section discusses how this event-led coverage and the heavy reliance on NZPA releases, in conjunction with other factors, led to the reportage being dominated by a small number of source types.

5.3 News Media Sources in the GM Debate

As illustrated in Chapter 4, Figure 6, the reportage of the GM debate was dominated by three main news source types throughout all seven stages of the debate. These were policy makers, scientists and industry spokespeople, making up 73.2% of the total volume of source citations across the period examined. The result is consistent with previous research which found these three groups dominate as news sources in the reporting of biotechnology in the U.S. and Europe (Hyde, 2006; Kohring & Gorke, 2000; Nisbet et al., 2003; Nisbet & Lewenstein, 2002; Pfund & Hofstadter, 1981).

Policy makers or government sources are consistently identified as major news sources used by journalists. Such sources are easily accessed, being built into the routines of journalists because they are perceived as credible (Davis, 2000; Gans, 1979; Miller & Reichert, 2000; Sigal, 1973; Tuchman, 1978). Moreover, in the case of the GM debate, policy makers were involved in many of the key issues of the debate. Policy makers were responsible for decisions concerning the labelling of GM food, the setting up of the Royal Commission, and the organisation of the moratorium on GM field trials, while the Royal Commission was in progress, and finally they were the final arbiters of the policy decision based on the Commission's findings. In addition, the opposition to GM was spearheaded by members of Parliament from the New Zealand Green Party. Therefore, policy makers were logical news sources for journalists in the reporting of the debate. Overall policy makers comprised just over 28% of the total volume of source citations across the whole period analysed.

The highly political nature of the debate may also account for why scientists, in what is ostensibly a scientific debate, were not the primary news sources as found in previous studies (Nisbet & Lewenstein, 2002). Despite this, scientists were still the second largest type of news source, making up just under a quarter of the volume of citations in the reportage.

There are a number of possible reasons for the reliance on scientists as sources. First, according to Dornan, “science is seen as an avenue of access to assured findings, and scientists – in the dissemination of these findings - as the initial sources” (1990, p.51). Furthermore, the complexity of science and GM, which journalists, unless they have an adequate scientific background, find difficult to understand, means they have to rely on scientists as sources (Friedman, 1986; Goodell, 1985; Hornig-Priest, 2001). As one journalist admitted, her lack of expertise meant that she had to trust the information scientists gave her and this means it would be difficult for this journalist to act in a watchdog role holding scientists to account for their work.

Therefore, in terms of science information, scientists are seen as experts and often act as sources of facts and explanation for journalists, thereby enhancing their likelihood of being cited and their credibility as news sources. Their position as experts also means that scientists are likely to become regular contacts for journalists and this entrenches their position as regular news sources. However, the credibility of scientists as news sources is not solely reliant on their position as experts. As noted, Samson believed that credible sources were those people who were in positions of authority and who gave him the information required. Here Samson appears to be talking about sources that are, “good talent because they have been proven to be articulate and concise” (Sedorkin & McGregor, 2002, p. 10). Conrad (1999) supports this, arguing that journalists perceive good sources to be articulate, accessible, willing to take calls, and give time for an interview. As noted, this can lead to some scientists being continually cited, as found by Eide and Ottosen (1994) in the Norwegian context. The close relationships between journalists and their regular science sources may also make it difficult for journalists to maintain their objectivity and hold these scientists to account concerning their work. In addition, the preference for articulate scientists as sources suggests that journalists might not perceive less articulate scientists as credible, resulting in the views of these scientists going unreported.

In contrast, Crewdson (1993) suggests that the credibility of scientists is not based upon their position as experts or ability to be articulate, but is reliant on a bias that exists amongst some

journalists perceiving science as a positive force in society. This attitude, according to Hornig-Priest (2001), illustrates the rhetorical strength that scientific authority has in our society and for some journalists. As noted in Chapter 2, the positive attitude towards science does not hold true for all groups in society. It is not clear whether the journalists interviewed in this research were swayed by the rhetorical strength that scientific knowledge seems to hold.

These factors, the rhetorical strength of scientific authority, the lack of knowledge among some journalists and the heavy reliance on articulate, regular scientist news sources makes it increasingly difficult for journalists to openly question these sources. This does have some drawbacks. As one journalist admitted in her interview, her lack of knowledge led her to unquestioningly accept what scientists told her (Wallace, personal communication, November 7, 2002). Potentially leaves scientists in a strong position to influence the framing of the science reported. This seems to be supported by observations in the U.S. context where it has been found that citations obtained from scientists often, “tend to be reported uncritically unless an overt controversy has erupted” (Hornig-Priest, 2001, p. 10). Other studies have found that journalists often rely on scientists and researchers for these citations to the exclusion of other sources (Conrad, 1999). As will be discussed below, this also appears to be the case in this research with other source types being marginalised.

The prominence of scientists in Stage V (October 2000 to June 2001) is probably due to their strong presence as Interested Persons (IPs) at the formal hearings of the Royal Commission on Genetic Modification. *The Dominion*, the only newspaper to report daily on the formal hearings of the Commission, decided that it should be reported like a court case or as the news event of the day. This decision matched the way the Commission was conducted, with the retired Chief Justice heading the Commission requiring that all evidence presented should be tested under cross-examination by lawyers representing interested parties at the Commission (Campbell, 2004). It was believed that the balance of opposing viewpoints would occur over the course of a week’s reporting (Samson, personal communication, October 17, 2002). However, given the prevalence of scientists presenting to the Commission, it is likely that their evidence dominated the reportage and, therefore, they were in a stronger position to frame the debate. As will be shown later in the chapter, the reportage in this stage of the debate was strongly pro-GM. As only one newspaper journalist reported the Commission’s hearings on a daily basis these stories were picked up by other newspapers

from the NZPA, often without alteration. Thus, the views or statements of these sources were merely reported again, reinforcing their framing of the debate.

The third most frequent type of news source found in the reportage was industry spokespeople and this again is consistent with the findings of earlier studies (Nisbet & Lewenstein, 2002; Pfund & Hofstadter, 1981). As illustrated in Chapter 4, Figure 6, the volume of citations from industry spokespeople dominated the reportage at 22% in Stage I (January 1998 to January 1999), the beginning of the debate, and then steadily declined to average just below 20% of the volume of source citations in the last three stages. However, as shown in Figure 6, they were the second largest source group, at just over 26%, of source citations in Stage V (October 2000 to June 2001) when the Royal Commission was hearing evidence and, as will be discussed later, this has implications for the themes reported during these hearings.

Previous studies have found that industry spokespersons have often been news sources with regard to new GM developments and/or the economic prospects of GM (Krimsky, 1982; Nisbet & Lewenstein 2002). Just over one third of the times that industry spokespersons were cited, they were talking about Consumer choice, a major economic sub-theme concerning the labelling of GM food. The frequency of the Consumer choice sub-theme appears to be similar to previous research by McInerney et al. (2004), analysing the U.S. news media, and finding much higher levels of newspaper coverage of GM food after the Monarch butterfly scandal in 1999. This issue arose after a study published in *Nature* had found that Monarch butterfly larvae fed on milkweed, their natural food source when dusted with pollen from GM Bt-corn, had a number of problems. The larvae, “ate less, grew more slowly and suffered higher mortality rates than larvae reared on leaves dusted with untransformed corn pollen or on leaves without pollen” (Losey, Rayor & Carter, 1999, p. 214). It is important to note that the Monarch butterfly became a symbol in posters and stickers used by the GEFree Aotearoa/New Zealand campaign. The coverage declined sharply after the September 11 attacks in 2001. The apparent concerns of the New Zealand public during the period investigated over the possible negative effects of eating GM food was demonstrated by a public survey that found “57-58% of respondents in general felt negatively towards the use of gene technology in food production, of which a quarter felt extremely negatively” (Gamble, Muggleston, Hedderly, Parminter & Richardson-Harman, 2000, p. 36). As noted, it was the discovery of GM food in New Zealand that appeared to be the catalyst for the GM debate. The possible reasons for the frequency of the Consumer

choice sub-theme will be explored in more depth when the themes of the reportage are discussed.

The controversy over GM food also illustrates an interesting parallel between the reporting of the New Zealand GM debate and the reporting of the original recombinant DNA (rDNA) controversy in the late 1970s. Both began with controversy over the possible adverse effects of GM technology. The rDNA debate began with the possible risk of what might be unleashed in terms of disease through the pursuit of certain classes of experiments (Krimsky, 1982), while the New Zealand debate began with the possible negative health effects of eating GM food (Motion & Weaver, 2002).

The prominent place of industry spokespeople in the reportage of GM is probably the result of the changing nature of scientific research, moving towards what Gibbons et al. (1994) label Mode 2 knowledge production or more applied science. The establishment of Crown Research Institutes (CRIs) in 1992, “as Government-owned businesses with a scientific purpose” (Ministry of Research, Science and Technology, 2008, ¶ 1), can be seen as part of the move in New Zealand towards this mode of knowledge production. The New Zealand Foresight policy (Harvey, 1999), as already mentioned in Chapter 2, also points to the Government’s support for increasing scientific and technological innovation to increase New Zealand’s economic prospects. It was often the case that GM was discussed in terms of its potential economic benefits and this made those involved in the development of GM natural news media sources.

However, while some spokespeople from government and industry saw GM as a positive for New Zealand’s economy, some other industry spokespersons, mainly representing those from the organics industry, saw GM as a potential threat to the New Zealand economy. The issue of organics, as will be discussed below, was given limited coverage. Many other people were concerned with the possible negative effects of the technology for the environment and health, as well as its ethical implications. Hornig-Priest (2001) argues that these concerns may only continue to rise because much of the GM research is conducted by private corporations, for example, Monsanto and Aventis, or profit-based government institutions, for example, New Zealand’s CRIs. Because of its commercially sensitive nature, much of the research conducted by these companies may never be published. The possible lack of disclosure has led to concern and protest against GM product, especially GM food (Hornig-Priest, 2001). Scott (personal communication, July 26, 2002) noted that the manner in which

GM crops had been developed and released had led to an anti big business attitude which he felt was deserved by some companies like Monsanto. Despite these oppositions it is important to note that the majority of citations on the sub-theme GM economics by industry spokespeople were positive, meaning that these sources believed that GM would benefit the New Zealand economy. The overall tone of the reportage will be discussed later in the chapter.

The frequency of policy makers, scientists and industry spokespeople as news sources resulted in other potential news sources having less representation. As shown in Chapter 4, Figure 6, only three other types of news sources reached more than 10% of the total volume of source citations in any stage. While policy makers, scientists and industry spokespeople were always above 10% of source citations, in all stages, the other three source types to be discussed below only reached more than 10% of the volume of source citations, in particular, stages. These rises were due to events that occurred during those stages. The source types in question were regulatory authorities gaining just over 13% of the volume of all source citations in stage I (January 1998 to January 1999), the beginning of the debate, and just over 13% in Stage IV (March 2000 to September 2000). Royal Commission members reached just over 11% in Stage VI (the period immediately following the Royal Commission) and lobby groups reached just under 14% in Stage VII (the period following the Government's policy announcement on GM). The events that led to these source groups reaching more than 10% of the volume of sources cited in these different stages are now discussed.

In the case of regulatory authorities, the discovery of GM food in New Zealand in 1998, Stage I (January 1998 to January 1999), resulted in calls for such food to be labelled. Any decision for such labelling comes under the auspices of the Australian and New Zealand Food Authority (ANZFA). Therefore, ANZFA representatives were logical sources for journalists when reporting this issue and were cited accordingly in stories reporting on the sub-theme of Consumer choice published in this stage. The prominence of these officials may also be a result of there being lack of highly visible scientists who opposed GM food, questioning its safety and desirability. Had these types of scientists been available it is likely the media may have also turned to them to give their stories more 'balance'.

In Stage IV (March 2000 to September 2000) two events occurred that made another regulatory authority, the Environmental Risk Management Authority (ERMA), an obvious news source for stories reporting these events. The first event was the discovery by ERMA

that a number of university laboratories conducting GM experiments did not meet the standards of the Hazardous Substances and New Organisms Act (HSNO) 1996, leading to some being temporarily shut down (University gene work, 2001). The discovery meant that ERMA officials were sought out as news sources. The second major event was ERMA's approval of the controversial experiment to place human genes in cows in order that a protein would be produced in their milk that had the potential to cure multiple sclerosis (MS) (Samson, 2000d). Again ERMA officials were asked to explain their decision to approve the experiment.

As noted, Royal Commission members made up just over 11% of the volume of news sources cited in coverage in Stage VI (the period immediately following the Royal Commission). Given that the Commission delivered its findings to the Government on July 31, 2001, this may not be a surprising result. The political controversy surrounding GM and the findings of the Commission were very newsworthy events and, therefore, Commission members were sought out to speak about the Royal Commission's findings and their own involvement as Commission members.

Finally, despite an apparent large scale opposition to GM in New Zealand, examples of which were given in Chapter 1, pg. 1, lobby group sources reached just under 14% of the volume of sources cited in only one stage, Stage VII (the period immediately following the Government's policy announcement on GM). The category of lobby groups, as acknowledged in Chapter 4, Section 4.2.7, is composed of anti and pro-GM groups as well as social issue groups. Lobby groups were above 10% of the volume of source citations in Stage VII because of an attack made by an anti-GM group on some experimental GM crops at Lincoln University in January 2002. It could be argued that the apparent lack of representation of Lobby groups is merely a reflection of the amount of coverage they actually received. However, it is argued here that a number of factors actually restricted the representation these groups received in the reportage. One such factor was the editorial decisions made by some newspapers to deliberately downplay protests. One journalist in his interview stated, "papers very early got wary of the protests and they were generally played down. For instance, our newspaper which I worked on made a conscious decision not to show pictures, generally, of the protest and the signs and the mock pictures and all this kind of thing" (Samson, personal communication, October 17, 2002). Beston (personal communication, November 8, 2002) from the *New Zealand Herald* also suggested that some protest was deliberately played down by her paper (personal communication). Further

analysis suggests these decisions resulted in pro-GM lobby groups gaining a larger percentage of citations in four of the seven stages of the GM debate. These decisions, therefore, skewed the overall tone of the coverage.

Moreover, such editorial decisions limit the chances of anti-GM groups being heard in the news media. Hornig-Priest (2001) argues that, to be effective, activist groups have to generate substantial media attention, for example, through protest action. Yet even in doing so, “they must overcome the media’s implicit presumption that their positions are (almost by definition) beyond the pale of rational thought” (p. 3). As already stated, Louw (2003) argues that groups who threaten the status quo or that which is considered sensible are not likely to be represented for fear of offending the wider audience. It appears that in the case of the newspapers examined here, anti-GM groups did not overcome these barriers.

Of all the other news source types shown in Chapter 3, Table 3, only environmental/animal welfare groups registered more than 5% of the volume of source citations and this was only in Stage V (October 2000 to June 2001) when the Royal Commission hearings were being held. Other sources representing Māori, religious and health interests all registered below 5% of the volume of source citations, in all stages. The result is consistent with the findings of earlier studies which found these types of sources were consistently given less representation in newspaper coverage of biotechnology in Europe, Australia and the U.S. (Hornig, 1995; Hyde, 2006; Nisbet et al., 2003; Nisbet & Lewenstein, 2002; Petersen, 2001; Pfund & Hofstadter, 1981).

However, given the presence of the Royal Commission, it may be expected or hoped that potential news sources representing environmental, animal welfare, Māori, religious and health interests may have received more space in the reportage. As Wynne (1982) notes, Royal Commissions have become a formal setting for conflict over matters of public policy. Yet there were a number of factors operating at the time of the Royal Commission that made it unlikely that less represented groups representing environmental, animal welfare, Māori, religious or health interests would achieve increased coverage.

The first of these factors was the privileging of scientific knowledge by the Royal Commission. Rogers-Hayden (2004) argues that the Royal Commission privileged, “rational scientific administrative discourse”, resulting in, “interest groups separated from publics presumably separating ‘facts’ from opinions” (p. 219). Doyle and McEachern (2008) also argue:

There is a certain kind of authority that attaches itself to the ‘independent’, ‘public’ or ‘expert’ inquiry; this gives recommendations some standing that may sanction developments under conditions that would make continued opposition seem at best unreasonable and churlish (p. 257).

As suggested above, arguments based on environmental, spiritual or health perspectives are not seen as equal to scientific knowledge. Indeed, “discourses that are not science based are deemed ‘private’ concerns” (Rogers-Hayden & Campbell, 2003, p. 524). As a result these arguments are often dismissed as emotional or anti-technology and so not taken seriously. Wynne (2001), in his review of the way risk of genetically modified organisms (GMOs) is conceived, agrees, arguing that when the risks of GM crops are considered, expert perceptions of these risks are seen to be objective, while public concerns over these risks are seen to be subjective and emotionally based. It appears that the Royal Commission worked on a similar premise by preferring rational scientific discourse. In so doing other types of discourse were given less representation, and in the view of Rogers-Hayden (2004), few groups with Interested Person (IP) status arguing for these perspectives would have found it easy to do so. A definition of IPs was given in see Section 1.4, p. 9. The arguments from environmental, animal welfare, Māori, health and religious groups may well be perceived as private concerns, as many were based on spiritual and emotive arguments rather than scientific ones. However, as Wynne (2001) notes, consistently marginalising these types of concerns only leads to further the public mistrust of science. Also it must be noted that the marginalisation of Māori perspectives is not new in New Zealand, with journalistic routines and a lack of cultural diversity amongst newsroom staff being given as reasons for the lack of coverage of Māori and issues of interest to them (Abel, 2004).

Therefore, the privileging of scientific rationality and the subsequent decision of the Royal Commission to proceed cautiously with GM gave strength to the views of scientists, and suggested that further opposition to GM was unreasonable. The heavy reliance on science news sources during Stage V (October 2000 to June 2001) may point to the acceptance of this view by the press.

These less represented interest groups may be further disadvantaged in having their views heard at the Royal Commission and in subsequent newspaper coverage because of a possible inability to participate at the Royal Commission. Rogers-Hayden (2004) argues that smaller volunteer organisations like environmental groups or religious organisations may have found

it difficult to gain Interested Party (IP) status because the Royal Commission's, "restrictive timelines presumed hierarchical organisational structures, limiting member consultation time and creating additional obstacles to participation for groups relying mainly on volunteers and small budgets" (p. 219). Tucker (2003) supports this view arguing that the restrictive timelines were an obstacle to these groups trying to gain IP status. Tucker (2003) notes, too, that only one advertisement, taken out in 22 daily newspapers on July 29, 2000, was ever published notifying interested groups to register their interest to become IPs. Some groups that were declined IP status criticised this lack of advertising and also the fact that it was difficult to gain further information or clarification about the process of applying for IP status (Tucker, 2003). Tucker's (2003) analysis of those groups gaining IP status found that 59% were in favour of GM in contrast to 30% that were opposed to GM. Further analysis revealed that of those groups declined IP status 12.4% were in favour of GM while 63.4% were opposed to GM.

The small volume of citations from these groups, Environmental/Animal Welfare groups (5.4%), Māori (3.9%), Health groups (4.2%) and Religious spokespersons (3.1%), in Stage V (October 2000 to June 2001), the period of the Royal Commission hearings, does suggest that such groups lacked representation at the Royal Commission and may also illustrate the difficulty those present had in articulating their viewpoints in terms of the rational scientific discourse preferred by the Royal Commission.

These groups may have also found it difficult to have their views heard through their lack of resources. As Rogers-Hayden (2004) notes, many anti-GM groups were grassroots organisations with volunteer staff and limited financial resources. In contrast, the main pro-GM lobby group, the Life Sciences Network (LSN), was well financed with the backing of 60 organisations, including Meat, Dairy and Wool boards, growers associations, science, research and medical organisations and commercial companies including Monsanto (Comrie, 2005). The LSN also had a full-time staff including an ex-journalist who provided "regular and proactive stories and features for the media (Comrie, 2005, p. 31). Moreover, the organisation regularly gave public addresses on the subject of GM to a number of organisations as well as providing spokespeople "with resources and coaching to give them confidence and credibility to speak in public situations on issues to do with GM" (Wevers, 2004, p. 5). This illustrates the stark difference between LSN, a well funded, pro-GM organisation and those at the more grassroots level opposing GM. Of course not all GM

opposition came from such groups and Greenpeace and the Green Party, who have greater resources, did spearhead the anti-GM campaign.

However, being well resourced is not a guarantee of success in gaining media exposure for a group and their alternative viewpoints. As already illustrated, the ideas of these groups are sometimes seen as extreme or offensive to the wider audience and are therefore, not published (Hornig-Priest, 2001, Louw, 2003). Even when they do gain media coverage they are often referred to as “radicals, ecoterrorists, vandals or saboteurs” (Eyck & Williment, 2003, p. 147). As an example, during the course of the debate the Green Party were referred to as Luddites in two newspapers. The first reference was published in a feature article in *The Press* (Luke, 2001) and the second reference was found in an editorial article published in *The Dominion* (Good science, not emotion, 2001). While features and editorials were not part of the sample analysed, these two articles seem to suggest that journalists and editors believed that the views of the Greens and others opposed to GM were irrational and beyond what is considered sensible. This may point to the reasons behind the editorial decision to not report the actions of protestors and may also explain the lack of representation of those opposed to GM and their viewpoints.

The final reason why these groups may not have received more coverage of their submissions to the Royal Commission was the fact, as already described, that only *The Dominion* and Radio New Zealand actually covered the Royal Commission hearings on a daily basis. Both organisations were both given special thanks for their consistent coverage by the Royal Commission in its report (Royal Commission on Genetic Modification, 2001).

The lack of other newspaper journalists attending the Royal Commission suggests that the Commission and possibly the GM issue as a whole were not deemed newsworthy enough for other newspapers to commit their resources to it. Rather, the other papers used selected stories by Alan Samson, made available through the NZPA, in order to report on the Royal Commission hearings. Given that most of the formal hearings of the Royal Commission were held in Wellington, other newspapers may have considered the expense of sending a journalist to cover the hearings too much. Therefore, had Samson not insisted on attending and reporting on the Royal Commission daily, the less represented groups speaking about environmental, animal welfare, Māori, religious, and health issues may have had even less coverage of their submissions to the Royal Commission. Indeed, these groups may have received even less coverage if it had not been for the presence of the Royal Commission.

This is due to the suggestion that their views were seen as irrational by some journalists and editors and therefore they may have gone unreported if it had not been for the presence of the Commission and *The Dominion's* decision to report it as a court case where all views would be voiced. Furthermore, there appeared to be few alternative events concerning GM throughout the period where such groups would have constituted logical sources for the media. When this is combined with the media bias against their views, the likelihood of such groups receiving media coverage looks dim.

In summary, it can be seen that the New Zealand reportage is very similar to that found in previous research (Hornig, 1995; Hyde, 2006; Nisbet et al., 2003; Nisbet & Lewenstein, 2002; Petersen, 2001; Pfund & Hofstadter, 1981), with policy makers, scientists and industry spokespeople being the most frequently cited news sources. Of the other source types, only three managed to gain more than 10% of all source citations and this occurred only in some stages. It is argued here that anti-GM lobby groups and other potential news sources representing environmental, animal welfare, Māori, religious and health interests received less representation because of a number of factors including editorial decisions, journalistic practices, lack of resources, Royal Commission processes and the seeming lack of news media interest in the Royal Commission hearings and the GM issue as a whole. The combination of these factors led to certain issues and viewpoints being given more salience than others. As McCombs (2004) notes, by giving salience to certain issues the news media set the agenda of public opinion. Therefore, newspapers, both intentionally through their editorial decisions, and unintentionally by following normal journalistic practice, set the agenda about which news sources and aspects of the GM debate should be considered important. The next section discusses how this process occurred by examining which themes and sub-themes gained ascendance during the reporting of the GM debate.

5.4 Themes, Sub-themes and Tone of Reportage

As illustrated in Chapter 4, Figure 2, the reportage was dominated by three main themes: Economics, Science and Politics. The result is consistent with findings of previous research, which has found science and economics to be the most frequent themes in the reporting of biotechnology (Kohring & Gorke, 2000; Nisbet & Lewenstein, 2002; Petersen, 2001). The prominence of Politics, especially in Stage VI (the period immediately following the Royal Commission), was a defining feature of the New Zealand reportage as was the prevalence of certain sub-themes.

This section discusses each of these three main themes and in turn examines the prominent sub-themes of each and their relation to the events and concerns occurring in New Zealand at the time. As part of this discussion, the overall tone of the reportage on these themes and sub-themes is examined. The section then goes on to discuss the less prominent themes and the implications of this lack of representation. Finally, the similarities between this reportage and the reporting of the early rDNA debate are discussed. All the themes and sub-themes discussed are described in Chapter 3, Table 2.

The discussion of the themes, sub-themes and tone of the reportage is important because “the processes and events that take place in the policy sphere, and the groups that compete in the political system, are not only mirrored (or covered) in media but also shaped by the media” (Nisbet & Lewenstein, 2002, p. 361). As illustrated in Chapter 2, the media shape policy debates through their ability to set the agenda of public opinion by giving salience to particular issues, as well as highlighting particular aspects of those issues. In addition, news source selection and adherence to news values means that particular viewpoints get more coverage than others and this again reinforces the manner in which the news media can shape policy debates. Therefore, the themes and tone of the reportage illustrate the concerns of policy makers and those competing to influence the policy making process, while also indicating the overall results of the policy debate.

As shown in Chapter 4, Figure 2, the first three stages of the GM debate, January 1, 1998 to February 28, 2000, were dominated by the theme of Economics, ranging between 51% and 49% of all themes over this period. The debate about the economic implications of GM was an ongoing issue, with different groups suggesting that GM would be an economic boon to New Zealand. This type of argument was put forward by Dr Alan Freeth, CEO of Wrightsons, a large New Zealand agricultural company, suggesting that New Zealand should “not miss the GE bus” if it were to retain its competitive advantage in terms of agricultural production (Fox, 2000, p. 14).

Other groups, especially the Greens and spokespersons from the organics industry, argue that New Zealand’s adoption of GM could threaten exports to wealthy European markets which were rejecting GM crops. These fears appeared supported in a report released by the Ministry of Environment in August 2001 which states that New Zealand’s adoption of GM could threaten its “clean, green image”, costing the country billions of dollars (Langdon, 2001, p. 1). These arguments and counter arguments were present throughout the period

examined but they were secondary to a much larger issue that was included as a sub-theme of Economics, that of GM food.

The largest economic sub-theme during the period examined was Consumer choice. Consumer choice as shown in Chapter 3, Table 2 was primarily concerned with the ability of consumers to choose whether or not they ate GM food and whether such food should be labelled. As already noted, the frequency of this sub-theme is similar to the results of McInerney et al. (2004), which found increased coverage of GM food in U.S. newspapers following the Monarch butterfly controversy in 1999. As noted, the coverage of GM food then declined sharply after the September 11, 2001 attacks on the World Trade Center and the Pentagon. In New Zealand, the sub-theme of Consumer choice gained prominence in 1998 rather than 1999. Yet the pattern of coverage was similar to that found by McInerney et al. (2004), with the sub-theme dropping to below 5% of all themes in Stage VI (July to October, 2001). While world events may have influenced the decline of Consumer choice as a sub-theme in the New Zealand reportage, it is also likely that the political debate about the outcome of the Royal Commission and the subsequent Government policy decision based on the Commission's findings was a sufficient explanation for the lack of coverage on this sub-theme at the time.

While McInerney et al. (2004) point to the Monarch butterfly controversy as the initiating event for the increased coverage on GM food found in U.S. newspapers, this does not explain the increased coverage in New Zealand newspapers that began in 1998. Although as noted, the Monarch butterfly did become a symbol for the GEFree Aotearoa/New Zealand campaign after 1999. The GM debate and frequency of the Consumer choice sub-theme began in 1998 with the discovery of GM food in New Zealand (Weaver & Motion, 2002). However, it is evident that concern over GM food was already present in New Zealand with a small number of stories on the subject appearing in 1997. Also a Private Member's Bill introduced into Parliament with the purpose of making it compulsory to have GM foods labelled was rejected that same year. The concerns over GM food were widespread, with the Associate Health Minister admitting he had received, "hundreds of letters from people telling me their concerns" (Crichton, 1998, p. 3). Greenpeace had also suggested that there was, "deep public concern over the genetic engineering of food" (Modified foods labelling bill rejected, 1997, p.2). As already explained in Chapter 3, section 3.2.5.2, 1998 was a logical starting point for data collection because all the newspapers to be analysed were then able to be sourced and the events that occurred in that year clearly marked GM as an issue of public concern.

There are a number of possible reasons for the widespread concern over GM food that was reflected in the reportage of the Consumer choice sub-theme from 1998. First, New Zealand entered the worldwide debate about GM quite late in comparison to other countries (Rogers-Hayden, 2004). By this time concerns about GM food and food safety as a whole were already an international issue and this was reflected in the stories that appeared prior to 1998. Many European countries in 1995 invoked the precautionary principle with regard to GM foods, in effect banning their importation (Campbell, 2000). The genetic modification of food was not the only concern over food safety at this time. First, the BSE or mad cow disease crisis was still being reported quite strongly in British newspapers (Washer, 2006) with people becoming quite concerned about eating products that may have contained British beef extracts. In addition, there had been a large outbreak of *E.coli* 0157 infections in Scotland in 1996 causing the deaths of 20 people. The outbreak was traced to poor hygiene procedures used by Scottish butchers (Pennington, 1998). Therefore, the discovery of GM food being sold in New Zealand supermarkets heightened the public's concerns about the possible adverse health effects of these foods and added to an already existing international debate over GM food and food safety as a whole.

These earlier events and concerns also meant that the concerns over GM food and its labelling satisfied a number of news values (Galtung & Ruge, 1965; McGregor, 2002) including: continuity, meaningfulness, emotion, negativity and conflict. The events outlined above meant the topic already had continuity. The issue was also meaningful as the arrival of GM food on New Zealand supermarket shelves appeared to have removed choice from consumers about the consumption of such foods. The ability to choose what food we eat is also a very personal one and can create a lot of emotive debate. Finally, the concerns and debates about the safety and desirability of GM food also meant that the issue had the elements of negativity and conflict. When these news values are combined it can be seen that the issue is a very newsworthy one and this may account for the prominence of the Consumer choice sub-theme throughout the period analysed.

Another factor that might also account for the continued focus on GM food was the presence of the Green Party (Greens) in Parliament after the 1999 General Election. The Greens were opposed to GM food and crops believing that, while GM may have a role to play in medicine, GM experimentation should be confined to the laboratory (Fitzsimmons, 2000). The Greens' entry into parliament also meant that Sue Kedgley, a well-known food safety campaigner, and other Green MPs became institutional and credible news sources. As such they became

part of the regular news beat for journalists (Davis, 2000; Gans, 1979; Miller & Reichert, 2000; Sigal, 1973; Tuchman, 1978). This position meant the Greens could more easily bring the issue of GM food and their particular viewpoint onto the news media agenda. Also their opposition to GM food was at odds with other political parties, for example, the National and ACT parties, and this increased the conflict that characterised the issue, again satisfying the news value of conflict.

The tone of reportage on this particular sub-theme was largely positive, with 55% of sources, especially industry spokespeople and policy makers, being in favour of consumers being able to choose whether or not they ate GM food. As pointed out in Chapter 4, Section 4.2.8, just over 6% of sources, mainly policy makers, were not in favour of Consumer choice. The negative source citations attributed to policy makers about Consumer choice in 1998 were due to a small number of statements made by New Zealand First MP, Tuariki Delamare, the Associate Minister for Health, during 1998 and 1999. In December 1998 he threatened to reject the decision by ANZFA to label GM foods as he believed labelling to be too costly and that it could contravene international trade agreements (Bell, 1998). He was soon to reverse this decision, in March 1999, arguing that he now supported labelling (Perry, 1999). Other opposition to Consumer choice was registered by a very small number of industry groups and regulatory authorities, the latter of which advised Mr Delamare in his position as Associate Health Minister. Analysis of the rest of the sources speaking about Consumer choice (38.5%), found that they were neutral on this sub-theme.

The concerns over GM food continued throughout the rest of the GM reportage as shown in Chapter 4, Section 4.2.8, with Consumer choice showing just above 10% of all themes in stages IV and V (March 2000 to June 2001) before dropping below 5% of all themes in Stage VI (the period immediately following the Royal Commission), finally rising just above 5% in Stage VII (November 2001 to February 2002). Stage VI, where Consumer choice was at its lowest level, saw the Royal Commission presenting its findings to the Government on July 31, 2001 and the Government deliberating for three months before announcing its policy on GM on October 31, 2001. During the deliberation there was a substantial amount of lobbying and protest concerning the desirability of adopting GM technology in New Zealand. The debate was probably the reason that the focus shifted strongly from Consumer choice to GM economics, the second largest economic sub-theme throughout the GM reportage.

GM economics was concerned with the possible economic impacts on the New Zealand economy if it were to adopt GM technology. As indicated in Chapter 4, Section 4.2.8, nearly 60% of the reportage on GM economics was positive, indicating that the majority of sources felt that GM would benefit the New Zealand economy. The positive view was reflected by the three main source types, with industry spokespeople being the most in favour of adopting GM, followed by scientists and policy makers and then pro-GM lobby groups. The positive tone of the reportage on this sub-theme is consistent with findings of previous research into newspaper reporting of biotechnology in the U.S. and Europe (Kohring & Gorke, 2000; Nisbet & Lewenstein, 2002). A small percentage of these three main source groups of industry spokespeople, scientists and policy makers, along with representatives from environmental/animal welfare groups, took a negative stance towards GM economics. These groups account for the 20% of the reportage on the GM economics sub-theme having a negative tone. These results illustrate the political division that existed between the Green Party, having a negative stance toward GM and preferring to promote organic production, and the Government and other political parties, having a more favourable view of the possible economic benefits of adopting GM. The industry spokespersons negatively viewing GM's economic effects were mainly from the organics industry or other industries feeling the pursuit of GM could harm international markets, for example, the New Zealand Kiwifruit industry (Henderson, Weaver & Cheney, 2007). The latter point was also made by some scientists and members of environmental/animal welfare groups believing that GM actually threatened New Zealand economically.

Organics was the only other economic sub-theme that gained more than 5% of all themes in the reportage and this only occurred in Stage III (August 1999 to February 2000), illustrating that organic farming was not an important issue on the news media agenda. This appears similar to the findings of previous research into the coverage of biotechnology, where the issue of organic farming was not recorded as an issue of note (see Kohring & Gorke, 2000; Nisbet & Lewenstein, 2002), suggesting that it was also not a prominent issue in newspaper coverage in America and Europe. Rupa (2007b), in an analysis of New Zealand newspaper editorials between July 2001 and July 2002, found they downplayed the importance and legitimacy of organic farming, with editors referring to it as, "so-called organic farming" (p. 603). The low levels of reportage of Organics as a sub-theme and the tone of the editorials appear to illustrate that it was not deemed a newsworthy topic.

Therefore, the largest economic sub-theme in the reportage, Consumer choice, reflected the ongoing concern with GM food, and that such food should be labelled in order that consumers could choose whether or not to eat it. Secondly, GM was seen by most sources to be of potential economic benefit to the New Zealand economy and this was consistent with previous research (Nisbet & Lewenstein, 2002). The economic issues surrounding organic farming versus GM production did not appear to rate highly on the news media agenda.

Science was the next largest theme, being the most prominent theme from Stage II until Stage IV representing the period February 1999 to September 2000, and ranging between 16% and 29% of all themes in those stages. The topic was nearly equal to Economics, at just under 20% in Stage VI (the period immediately after the Royal Commission) and to Politics, at just over 37% in Stage VII (the period after the Government's policy announcement on GM). Only in Stage I (January 1998 to January 1999) was Science not very prevalent and this is possibly due to stories during that stage being dominated by concerns over GM food and its labelling. The strength of Science as a theme matches previous research in both Europe and America that found Science was the most prominent theme in newspaper coverage of biotechnology. Kohring and Gorke (2000) found coverage of GM science ranged between 53% and 28% of all themes in newspaper coverage in the U.S., United Kingdom, France and Germany through 1991–1996. In their analysis of U.S. elite press coverage of biotechnology from 1970 to 1999, Nisbet and Lewenstein (2002) also found that Science and Economics were the largest themes reported across the whole period.

As shown in Chapter 4, Figure 3, the largest Science sub-theme was GM science and this result, as noted above, is consistent with previous research by Kohring and Gorke (2000) that found scientific issues surrounding GM were the most prominent in newspaper coverage of the topic in the U.S., France, Great Britain and Germany. Also, given the GM debate was primarily one about the science of GM and the possible benefits and risks it may have on human health and the environment, it is not surprising that GM science was the primary sub-theme.

Just over 40% of the reportage was in favour of GM science, with scientists (22.2%) and industry spokespeople (7.9%) being the two largest groups taking this stance, again highlighting their positive bias towards GM. Slightly less than 40% of the reportage did not contain an opinion on GM science expressed by a news source. Less than 20% of the reportage contained a negative view towards GM science and this opposition came from three

main groups. The first were anti-GM lobby groups at 6.5%. They were followed by Green Party politicians at 4.7%, again highlighting the political divide between the Greens and other political parties. The final group against GM science were scientists at 4.7%. The scientists represented in this group were small in number and included the likes of Arpad Putzai, a well known anti-GM scientist and a witness at the Royal Commission.

The next largest Science sub-theme, as illustrated in Chapter 4, Figure 3, was Science regulation. The sub-theme was most prominent in Stage IV (March 2000 to September 2000) and was driven by two events. As noted, the first was the discovery by ERMA of a number of university laboratories engaged in GM research which did not meet the standards of the HSNO Act 1996 and were subsequently shut down. At the same time, two scientists were also disciplined for their conduct with regard to regulations governing GM research ('Serious' GE breach, 2000). Science regulation was also prominent because of the decision to allow human DNA to be placed in cows at the Ruakura research facility. In Stage VI (the period immediately following the Royal Commission), Science regulation was also an issue in the news with pro-GM lobby groups and scientists lobbying government for less restrictive regulations on research while it was deliberating on the Royal Commission's findings.

Action by scientists in New Zealand to try to reduce regulation is similar to moves by scientists in the U.S. during the original rDNA debate. Scientists in the U.S. were the first to raise concern over the safety of certain classes of rDNA experiments and actively worked with the National Institutes of Health (NIH) to produce a series of guidelines to regulate these experiments (Krimsky, 1982). However, when it became apparent that public interest groups and dissident scientists were attempting to further strengthen the regulations on genetic experimentation by lobbying Congress, scientists in favour of the research mobilised to block such moves and in fact moved to weaken the very regulations they had worked to form (Krimsky, 1982). They achieved this in two ways, first by directly lobbying Congress with the support of their host organisations, and secondly, others worked against critics by releasing studies illustrating the benefits of rDNA research, for example, Genentech's announcement of the first genetically modified human insulin producing bacteria (Krimsky, 1982).

While New Zealand scientists may not have gone to the same lengths as their U.S. counterparts, they did appear to mobilise to ensure that GM research was not overly regulated in New Zealand. They were aided in this task by the pro-GM lobby group the Life Sciences

Network (LSN). The LSN aimed to seek, “an outcome from the Royal Commission which will give the Government the necessary level of comfort to continue to promote and invest in the current biological science construct including research, development and application of biotechnology including GMOs” (Life Sciences Network, 2008, ¶ 6). The mobilisation of scientists combined with the public relations strategy of the LSN seems to have succeeded, with some of the regulations governing GM research being relaxed after the Royal Commission, and this is shown in the appearance of Science regulation as a prominent sub-theme in Stage VII (the period after the Government’s policy announcement on GM). In addition, the issue of regulation raised some strong debate between scientists and ERMA representatives and, therefore, was subsequently framed in terms of conflict a common news media frame (Semetko & Valkenburg, 2000). As shown in Chapter 4, Section 4.2.8, scientists were one of the largest source types both for and against Science regulation, illustrating that there was some split between scientists over the regulation of GM research. Those scientists against decreasing GM regulation were often overseas scientists and well known opponents of GM, some of whom presented evidence at the Royal Commission, for example, Arpad Putzai. However, as shown in Chapter 4, Section 4.2.8, five times more scientists cited in the coverage were against further regulation (64.5%) than those for further regulation (12.5%). The presentation of scientists in this manner could suggest that those in favour of further regulation held dissident views compared to the apparent mainstream, positive, scientific consensus about GM. If so, the result is similar to that found in U.S. elite press coverage of biotechnology where the views of dissident scientists were often marginalised (Nisbet & Lewenstein, 2002). When examining other source types both for and against Science regulation, again evident was the political split between the Green Party, at 43.6% of all sources supporting further regulation, and the other political parties that did not favour such moves, at 11.4%. The tone of the Science regulation sub-theme also illustrated the split between industry spokespeople. Those representing the organics industry felt that regulations were not stringent enough and more were needed; this group made up 14% of all those sources calling for further regulation. In contrast, other industry representatives, feeling that GM research was vital to the economy and current regulations were sufficient if not overly restrictive, made up 8% of all those sources against further regulation. Despite the opposition of both the Greens and those representing the organics industry, as discussed above, regulations governing GM research were relaxed in January 2002.

An interesting point here is that lobby groups were two-to-one against further regulation, illustrating that the pro-GM lobby group sources dominated citations on the Science regulation sub-theme. The editorial decision made by newspapers not to report anti-GM group protest may account for the dominance of pro-GM lobby groups (Samson, personal communication, October 17, 2002).

Closely related to the sub-theme of Science regulation was Containment and, as illustrated in Figure 3, this sub-theme was most prominent in Stage III (August 1999 to February 2000) at just under 10% of all themes; Containment also reached just above 5% of all themes in Stage V (October 2000 to June 2001). Stage III saw newspapers publish a number of stories concerning the proposed experiment to place human DNA in cows, and also stories about the possible escape of genetically modified salmon at New Zealand King Salmon Limited in Marlborough. In Stage V (October 2000 to June 2001), as might be expected, the issue of containment with regard to field trial or commercial applications of GM was raised by various parties at the Royal Commission hearings. Most scientists and industry spokespeople were in favour of the current regulations with regard to containment, yet the Green Party, and spokespeople from the organics industry, did not believe them to be sufficient to protect the environment and organic crops from GM contamination.

In summary, the largest sub-theme within Science was GM science, with most sources being in favour of it. Those against it revealed the political split between the Green Party and other political parties, and also illustrated the rift between organic producers believing GM a threat to their industry and other industry spokespeople seeing GM as a potential benefit for their organisations and to the New Zealand economy as a whole. These splits were also evident in the sub-themes of Science regulation and Containment, with the majority of scientists and industry spokespeople being in favour of current containment regulations and against any further regulation of GM research. These results parallel those found by Krinsky (1982) in his study of the original rDNA debate.

While the results of the Science theme are consistent with earlier research, the theme of Politics demonstrated the unique political situation that existed in New Zealand at the time of the GM debate. Politics and its sub-themes illustrate the strong divisions between those for GM and those against it. As noted in the introduction, the Green Party spearheaded much of the anti-GM protest, and Green MPs' presence in Parliament meant that they became prime

sources for the news media. Moreover, due to the Green Party's support for the Government, any apparent division between the two parties over GM was a newsworthy conflict.

Therefore, it may not be surprising that anti-GM activism was the largest political sub-theme in any stage, showing very strongly in Stage VII (the period after the Government's policy announcement on GM) at 22.9%, marking the sabotage of GM crops in January 2002, three months after the Government's policy announcement. It should be noted that after Stage I (January 1998 to January 1999), anti-GM activism remained at a very low percentage of the overall themes, rising only again in Stage VI (the period immediately following the Royal Commission) when the Royal Commission announced its findings and the Government deliberated on its policy decision. The lack of coverage may be due to the editorial decisions made by some newspapers not to cover protests or releases from anti-GM groups. However, in Stage VI the protest was large scale, making it very newsworthy and, therefore, difficult for the news media to ignore.

The tone of this sub-theme was evenly split between those in favour of anti-GM activism (32.4%) and those against it (32.4%). The rest of the sources cited on this issue did not take a stance (35.2%). Those in favour of anti-GM activism were mainly Green Party MPs and anti-GM groups; the most prominent groups against anti-GM activism were other party policy makers, scientists and pro-GM lobby groups. These results clearly illustrate the polarised nature of the debate.

While Political procedure was the next largest sub-theme, as explained in Chapter 3, Section 3.2.8.2, this was a neutral category with no sources being recorded as taking a stance on this issue. Therefore, there is no bias to discuss in this instance, although it is useful to note how importantly people viewed the necessity to see that procedures were carefully formulated and followed to allow fairness and balance for all parties. This was particularly evident in Stage IV (March 2000 to September 2000) when the procedures governing the Royal Commission on Genetic Modification were being formulated; in this stage Political procedure was recorded at just below 20% of all themes.

Political division was the next largest sub-theme and illustrates that there was a clear division between the Green Party and the Government and other opposition parties with regard to GM. The presence of the sub-theme Political division fits neatly with the conflict news value and this may also be a reason that this sub-theme was prominent, yet despite the apparent conflict and division between the Greens and other political party politicians, an analysis of

the value stance of citations made by policy makers did not indicate any political division existed. The results illustrated that nearly 48% of policy makers did not indicate that any political division existed, while 33% of citations from policy makers appeared neutral, with only 19% of citations suggesting that any political division existed. These results may be explained by the fact that the Greens had pledged to support the Labour-led minority Government; therefore, Labour and Green MPs may have deliberately tried to project an appearance of unity to the public.

The final sub-theme of Politics was the Report of the Royal Commission. As illustrated in Chapter 4, Section 4.2.8, most of the reportage on this sub-theme showed that the majority of sources were in favour of the Commission's findings which recommended that New Zealand proceed cautiously with GM. Scientists and policy makers were the sources most in favour of the findings. Of those scientists talking about the Royal Commission, nearly 73% were in favour of its findings compared with only 18% against. Just over 43% of policy makers talking about the Report of the Royal Commission were in favour of its findings, with just over 30% being neutral and 24% being against the Commission's findings. This latter group consisted mainly of Green MPs, again highlighting the political division between the Greens and other political parties.

The theme of Politics, more than any other, demonstrated the strong divide that existed over GM issues in New Zealand. The sub-themes of anti-GM activism and the Report of the Royal Commission clearly illustrated this divide between those opposed to GM, primarily the Green Party, and those in favour of it: scientists, the Government and other political parties. However, the sub-theme of Political division, where this divide might be expected to be most visible, seemed to indicate that the majority of sources did not indicate that any political division existed. As explained, this is possibly due to the political agreement between the Greens and the Labour Party that the Greens would support the Government on issues of confidence and supply.

The frequency of the themes of Economics, Science and Politics, which made up 90.2% of all themes in the reportage, came at the cost of other themes being less represented. The themes of Health and Morality were the only other themes to reach more than 10% of all themes in any stage.

The theme of Health, as indicated in Chapter 4, Figure 2, was 11.4% of all themes in stage II and 17.4% of all themes in Stage V. The first of these stages saw a number of stories

published on the planned experiment to place human DNA in cows, along with a number of stories on GM food and its possible effects, both positive and negative, on human health. In Stage V, six stories reported the submissions given by members of health advocacy groups at the Royal Commission hearings. These groups included Lyposomal Diseases New Zealand, Diabetes Youth New Zealand, the Cystic Fibrosis Association of New Zealand and the New Zealand Organisation of Rare Diseases. Each of the groups made a case for the need for continued GM research in the hope of finding cures for rare genetic disorders and other diseases. In some cases the representatives of these groups were the parents of children with rare disorders and these stories had a strong human interest factor. Petersen (2001) found that these types of stories served, “as an introduction and lead-in to a discussion about proposed or ongoing genetic research or a new genetic discovery” (p. 1259). In these cases, the stories were used as an argument for the need to continue or expand GM research in New Zealand. Also, in reporting the plight of such families, the stories had an element of emotion and McGregor (2002) argues, “the more an event exhibits an emotional sub-text the more likely that it will be selected as news” (p. 118). The elements of emotion and human interest in these stories may have helped to elevate the theme of Health above 10% of all themes in Stage V.

The rise of Health as a theme is consistent with research by Bauer (2005a) finding that by 1999 medical biotechnology became more positively reported by European newspapers than agri-food biotechnology. Scott also noted this in his interview when he states, “when it comes to GM and medicine and medical products, there’s much wider of acceptance of GM in the lab” (personal communication, July 26, 2002). As Motion and Weaver (2005a) note, part of the Life Sciences Network public relations campaign to promote GM pointed to the advances in genetic medicine and how it was already helping people with diabetes.

However, while agri-biotechnology in terms of GM food seemed to be firmly rejected by members of the New Zealand public, many of those in the agriculture industry felt that the use of GM in agriculture was vital for New Zealand if it were to remain competitive on the world market. As already mentioned, this pro-GM stance is encapsulated in the story headline, “Let’s not miss the GE bus, says Wrightson chief” (Fox, 2000, p. 14). The acceptance of agricultural genetic modification appears to be at odds with the findings of Bauer (2005a) and indicates the strong reliance of the New Zealand economy on the export of agricultural produce and the fear amongst some that, without adopting GM, New Zealand would be at a clear disadvantage.

The theme of Morality was the only other theme to rise above 10% of all themes in any stage. Occurring in Stage I the rise above 10% was based on one story arguing for the New Zealand public to become involved in formulating ethical regulations for the use of GM. Given the small number of stories in the stage this result is not really indicative of the treatment of the theme of Morality as a whole and, as shown in Chapter 4, Figure 2, after Stage I, Morality as a theme remained below 10%. The result is also consistent with the findings of previous research (Nisbet & Lewenstein, 2002) and indicates that the wider issues of the GM debate were not really addressed by the news media. Hornig-Priest (2001) also found that in the U.S. the press did not publish stories that featured complaints about GM food on religious grounds. Religious sources in the reportage analysed in this thesis only made up 0.7% of all sources across the period analysed and this may also account for the low level of reportage on ethical and moral issues associated with GM applications.

The final theme of Environment had little coverage, never gaining 10% or more of all themes. The most coverage it gained was in Stage V (October 2000 to June 2001) when the Royal Commission hearings took place, suggesting that the Royal Commission may have increased this theme's press exposure. Yet, as argued in Section 5.3 above, there were a number of factors working against environmental groups being heard at the Commission. Alternatively, the low amount of reportage of this theme could be because the subject of the environmental impact of GM could not fit within the normal frameworks of reporting environmental issues. Anderson (1997) argues that for an environmental story to be published it will have one or more of the following three intrinsic factors: it will be event centred; there will be a strong visual content and it will easily fit within the 24-hour news cycle. Events such as these also meet the news values of frequency and visualness, increasing their newsworthiness and likelihood of being reported (Galtung & Ruge, 1965; McGregor, 2002). In the case of GM in New Zealand there were no environmental events associated with GM during the period analysed, nor were there any stories about GM and the environment with a strong visual content. However, the Environment theme was at its highest level during Stage V when the Royal Commission hearings were in progress. This higher level coverage may be because the Royal Commission hearings fitted within the 24-hour news cycle and, therefore, the coverage of submissions met the news value of frequency. Finally, the environmental stories that were published were often speculative about the possible benefits or threats to the environment that could occur should GM be adopted by New Zealand. Such stories were not event based with accompanying verifiable

facts and, therefore, they did not fit the normal criteria of hard or *spot* news stories; this may account for the limited reportage of environmental issues concerned with GM. These results are again consistent with U.S. research, where it was found that environmental issues and environmental spokespeople did not receive much coverage in the newspaper reportage of biotechnology (Hornig-Priest, 2001; Nisbet & Lewenstein, 2002).

The overall results of the thematic analysis show that the reportage was dominated by concerns about economics, science and politics. The tone of these themes and their respective sub-themes show a strong bias towards GM and a relaxation of the regulation on research whilst also illustrating the political division between the Greens and the majority of other political parties. It also showed a divide between the organics industries and other industry groups, with the former group seeing GM as a threat to its markets and the latter group feeling that New Zealand would be hindered in competing on the world market if it should reject GM technology. The position of scientists against the regulation of GM science is reminiscent of the earlier rDNA debate where scientists lobbied to weaken regulations governing GM research in the U.S. (Krimsky, 1982). Finally, the frequency of these three issues saw ethical and environmental issues having little coverage and, while health issues did gain some prominence in two stages, this was probably largely due to the public's acceptance of medical uses for GM and the human interest and emotional impact of the stories.

These thematic results, combined with the event-led reporting and the domination of political, scientific, and industrial news sources, illustrate that the GM debate was reported in a manner that, despite some strong opposition, reflected the views of those dominant interests in favour of GM. The pattern of reportage also resulted in less representation for other potential news sources that opposed GM and/or wished to highlight the wider ethical and social issues that could arise from the adoption of GM science. The pattern is not new and Hornig-Priest (2001), describing the situation in America, argues that the press, "tends to represent the point of view of large institutions...including the point of view of corporate and institutional stakeholders" (p. 2). As noted in section 5.3, there were a large number of factors that led to those groups opposed to GM receiving less representation. Reese (1990) suggests, by neutralising dissent and naturalising the dominance of institutional sources, the news media enable the hegemonic dominance of those interests. The dominance of political, scientific and industrial sources and the limited representation of other potential news sources in the reportage analysed results in a pro-science hegemony, a hegemony that may only be

disrupted by the occurrence of extremely negative events, and in the case of GM this has not occurred in New Zealand.

As shown, one of the most frequently cited types of news sources in the reportage were scientists; this group was heavily involved in the reporting of the debate. The next section discusses the results of the interviews with some of these scientists and journalists involved in the reporting of the issue to explore how they perceived the reporting of the debate and their part within it.

5.5 Scientists and Journalists

5.5.1 Interviewee Experience

The four scientists interviewed all worked for universities and were involved in the genetic modification of plants. They were very experienced in the area of GM, with the least experienced having worked for 13 years in the area of genetically modifying plants. Combined, these scientists had a strong knowledge of GM, the issues surrounding it, and its place in the New Zealand context.

Most of the five journalists interviewed were very experienced, with the least experienced being in the job for four years. However, in terms of their qualifications only one, Veronica Meduna, had a science degree. Two had degrees in the social sciences and the others had diplomas in journalism. While the journalists interviewed are in no way a representative sample of all New Zealand journalists these results are comparable with results found in Canada where only 20% of the Canadian journalists interviewed held a science degree or had undertaken some undergraduate science courses (Saari, Gibson, & Osler, 1998). Metcalfe and Gascoigne (1995) found that in Australia only about 6% of the journalists they surveyed reported on science issues. While they were often better educated than other journalists, with many holding university degrees, these degrees were not normally in scientific disciplines. The apparent lack of scientific knowledge amongst journalists is sometimes given as the reason for the appearance of the inaccuracies in science reporting (Friedman, 1986).

Only two of the journalists were specialist science reporters, with the rest being general reporters. Eide and Ottosen (1994) in their study of science reporting in Norway, a country of comparable size to New Zealand, found that science was not a regular news beat and only 5% of the journalists interviewed reported science on a regular basis. Even then, these

reporters were expected to report on other fields. Saari et al. (1998) also found that only 20% of Canadian journalists identified as science journalists covered science on a full time basis.

These similarities suggest that the journalists reporting on GM in New Zealand may have similar qualifications and experiences to their overseas counterparts reporting on science. How they and the scientists interviewed perceived the reporting of the GM debate is now discussed.

5.5.2 The Reportage: Scientists' and Journalists' Views

The views of scientists on the reporting of GM were reported in Chapter 4, section 4.3.1. Two scientists believed that on the whole New Zealand newspapers did not report science well arguing that unless science was reported in a feature article the public would not really understand much from reading about science in the hard news stories that are the focus of this thesis. This view seems to support researchers that have found scientists critical of the media's reporting of science (Dunwoody, 1999; Goodell, 1985; Reed & Walker, 2002; Rowan, 1999). However, it was acknowledged by another Massey University scientist that some stories were well researched (Jameson, personal communication, July 2, 2002).

In terms of the GM debate most of the scientists felt that the news media's reporting of the issue had improved over time, with journalists asking, in the scientists' view, more correct questions (Conner, personal communication, July 25, 2002). In so doing, it was felt that the media had been explaining the GM debate well in terms of the technical issues (Warrington, personal communication, November 25, 2002). These perceptions indicate that most of the scientists interviewed had specific views on how the issue should be reported and on the whole felt that newspapers had begun to improve their reporting of GM, yet, the reporting still required improvement before the scientists interviewed would be satisfied with its quality.

Most of the scientists believed that a lot of the reporting was concerned with GM food and, as already discussed, the content analysis supports this belief. The scientists also argued that in general the public had a negative perception of GM food and that there were a number of factors operating that produced this perception. The first of these, in the view of one scientist, was because, in general, the public did not understand how their food was produced and while they wanted cheap, organic and environmentally friendly food they did not understand how this could be achieved. In terms of GM food it was believed that the public's concerns over the possibilities of other biotechnological techniques such as cloning and stem-

cell research had exacerbated their fear of such food, to the extent that they would rather not accept better tasting fruits and vegetables if it came at the expense of scientists being able to clone human beings.

Another scientist believed the reason that the public had a negative view of GM food was due to the manner in which this food had been foisted upon the public with no information being given. Such moves had led to a negative attitude towards big business, especially towards companies like Monsanto that marketed GM crops.

Given that for most of the wider public the news media become their primary source of science information after leaving school (Einsiedel & Thorne, 1999; Malone et al., 2000; Nelkin, 1995), it is conceivable that these demands and perceptions concerning food, cloning and stem-cell research are based, at least partially, on news media reports. Through their selection and presentation of news, the media make some issues and events more salient than others and thereby set the agenda of public opinion as to which issues are considered important (McCombs, 2004). Cronholm and Sandell (1981) also argue that the news media set the agenda of public opinion on what are to be considered important scientific issues. With the media playing such an important role in informing the public about science, the concerns over genetic modification amongst the public suggest that the media have successfully set this issue on the agenda of public opinion. Further, the public concerns were about particular aspects or techniques of genetic modification, for example, GM food, cloning and stem-cell research, with other medical applications being more readily accepted. This situation suggests that not only were the media successful in setting the primary level agenda on genetic modification, but that they were also successful in setting the second level agenda by suggesting which attributes or aspects of the technology the public should consider important. Therefore, through their agenda setting function, the news media may in fact be partially responsible for generating the negative views amongst the public of GM food, stem-cell research and cloning. One scientist interviewed agreed with this by suggesting that the pictures and cartoons used by some media outlets may have caused further fear amongst the public.

The fear and confusion among the public may have been strengthened due to the news media's misrepresentation of the possibility of GM crops being grown commercially in New Zealand. As noted in the previous chapter, it was felt by Jameson that the newspapers'

confusion of contained field trials and full commercial release only served to add to public confusion and fear of GM crops.

According to Hornig-Priest (1999) the reporting of GM can either be framed in terms of the latest in a long series of benign applications of scientific knowledge or, “as the ultimate Frankenstein threat to life as we know it” (p. 96). When it came to agricultural uses of GM the news media could frame the interest in such technology as “springing less from a desire to eliminate human hunger than from corporate profiteering and an irresponsible impulse to tinker” (Hornig-Priest, 1999, p. 96).

It appears, in reviewing the scientists’ interviews, they felt the news media’s portrayal of GM food fell more into the Frankenstein and corporate greed frames than into the frame of GM simply being the continuation of benign scientific experimentation. These frames had led to a very one-faceted reporting of GM, in the scientists’ opinion, and left, in the view of one scientist, other important issues unreported for example, recombinant vaccines (Scott, personal communication, July 26, 2002). As Turney (1998) argues, such frames polarise debate and do not allow other possibilities to be considered.

In the view of journalists the issue was very complicated and this had made the issue more difficult to report because of its many facets. Moreover, one journalist felt that people on both sides of the argument had a case and this added to the complexity and interest in the issue. However, this was not a view shared by all journalists, or at least their editors, because as one journalist noted, his newspaper made an editorial decision to ignore the anti-GM protests (Samson, personal communication, October 17, 2002). As indicated by the content analysis this decision appeared to limit the ability of those involved in such protests to become news sources.

Wallace (personal communication, November 7, 2002) also raised another interesting point. In her view the GM debate was also accompanied by an anti-science attitude, scientists were treated badly and, in the view of some, science had become almost evil. Wallace seemed to imply that part of her job as a journalist was to try to dispel that notion (personal communication, November 7, 2002). The anti-science attitude noticed by Wallace is also discussed by Broks (2006) who argues that since the 1980s science had come under increasing scrutiny and criticism, scientists felt they were under attack, and an anti-science movement was beginning to form.

5.5.3 Accuracy and Balance

The debate was also complex to report because the science had to be simplified by journalists and this was not always easy (see Chapter 4, section 4.3.7). In the process of simplifying the science, inaccuracies could occur that could alienate the journalists' scientist news sources. According to Flatow, O'Leary, Rodgers, Schneider and Trotter (1986), inaccuracy has often been used as a reason by scientists for not engaging with the news media. To avoid these problems the journalists employed a number of strategies to ensure that while simplifying the science for their readers they maintained scientific accuracy.

The first of these strategies was to spend time with the scientist and ensure that the journalist explained what they understood the scientist had said in the simple language of the newspaper and when agreement was reached between the scientist and journalist about what had been said then that was what was published in the newspaper. The other strategy was for journalists to actually give their copy to the scientist before going to print. According to the journalist concerned there was a general rule among journalists not to give advance copy to their sources. However, in the case of science stories this rule was willingly broken to ensure the accuracy of the story. This situation appears to put the scientists in quite a strong position to frame the issue and puts into question the journalists' ability to hold the scientists to account in these cases.

The need to report science accurately was also at play when the journalists were asked about the use of press releases. All the journalists interviewed said that they would not use a press release without first talking directly to the people issuing it, in order to ascertain the credibility of the source and the information. Despite these strategies, one journalist was concerned that accuracy could be threatened or compromised by the journalistic need for balance. The pressure for journalistic balance is driven by the need for journalists to appear objective in their reporting. As argued in Chapter 2, journalistic objectivity does not exist and is rather an ideal that journalists strive for to try to show that they have reported the facts in an unbiased manner (Altschull, 1995; Tuchman, 1978). To show this objectivity, "requires that a journalist suspend her analytical judgement, this time to give equal space to competing points of view regardless of their likelihood of being correct" (Dunwoody, 1999, p. 72). This problem was recognised by one of the journalist interviewees, who understood that the accuracy and balance of a story was not necessarily achieved by simply finding someone who had an opposing or differing view on an issue. Indeed, at times the drive for balance when

writing a science story could have a negative impact on the scientist/journalist relationship because the former may feel they had been attacked in the resulting article.

As noted, inaccuracy has often been cited as a reason for the reluctance of scientists to engage with journalists. This reluctance is not without foundation as Singer (1990) in the U.S. context found that two-fifths of the stories she analysed had some form of error. However, the scientists interviewed for this thesis believed that they had in the main been cited accurately. Hansen and Dickinson (1992) in their study of scientific sources also found that accuracy was not seen as a major problem. One scientist did note he had often been misquoted but seem to accept this as part of his engagement with the media and did not deter him from continuing to engage with journalists. However, scientists did have one area of concern related in some ways to accuracy and this was the issue of source credibility.

5.5.4 Source Credibility

A number of scientists and Life Sciences Network (LSN) members interviewed demonstrated a concern over the lack of credentials of supposedly scientific sources cited in the reportage on GM. These scientists and the LSN members argued that a number of the scientists cited in the GM reportage were actually speaking outside their area of expertise. It was believed that occurred because when a person claimed they were a scientist it automatically gave them credibility to speak on scientific issues. The apparent innate credibility that scientists have for the news media again appears to illustrate what Hornig-Priest (2001) terms the rhetorical strength that science and scientists have in society.

In the view of the scientists and members of the LSN interviewed, New Zealand journalists were not checking carefully enough the credentials of the scientists they were quoting. Rolleston (personal communication, July 3, 2002) of the LSN suggested journalists needed to understand what stance people were taking with regard to GM and what their expertise was actually in. Sedorkin and McGregor (2002) agree suggesting that, where possible, journalists should research their prospective interviewees, as this will enable them to know when news sources are, “avoiding the question, or evading the truth” (p. 24).

The journalists interviewed did take the issue of source credibility seriously, using various techniques to ensure they were talking to a credible source. When asked about source credibility the journalists’ responses indicated the differences of journalistic experience among them. Samson, the most experienced journalist in terms of years of service and as a science reporter, argued that credible sources were those with position and authority and who

were articulate. While on the surface this may seem a rather glib answer it probably hides the fact that due to his experience in the field Samson already had a number of well-established and credible contacts. Beston, another experienced reporter, used subtle questions while interviewing scientists to test their credibility; in contrast, Wallace admitted that she had a certain trust in scientists because of her own lack of knowledge in the area being reported. Wallace judged a source's credibility based on his or her reluctance to talk and also on her own intuition and knowledge of people.

The journalists interviewed often contacted public relations (PR) units to find scientist sources for their stories. Most of the journalists also noted that the Crown Research Institutes (CRIs) and universities had good PR units that suggested which scientists to contact with regard to a particular story. For the journalists these recommendations appeared to confirm the credibility of the scientist suggested.

Another aspect of source credibility that was important for journalists to investigate was the issue of bias. Smale, the least experienced journalist of the journalists interviewed, did not mention scientific expertise when discussing credibility; rather, he argued that it was a journalist's responsibility to utilise sources that were not unduly biased in their responses. In order to do this Smale tried to ensure he established who sources worked for and what their vested interests were. While Smale did not think working in the GM industry undermined a source's credibility completely, it did illustrate that those sources had a vested interest in the industry and that needed to be acknowledged. Meduna in her interview also acknowledged a journalist's need to recognise the vested interests of news sources. She suggested this was particularly important when reporting the GM debate because of lobbying accompanying the debate. She also recognised that trying to discover a truly independent source in a small country like New Zealand was very difficult.

As indicated, journalists used a number of different strategies to establish the credibility of their sources, appearing to take the issue seriously. Despite these efforts, in the view of the members of the LSN and scientists interviewed, mistakes were still made. If scientists were cited speaking outside their area of expertise during the debate, one possible reason for this is proposed by Nelkin (1995) when discussing the U.S. context. She suggests journalists are somewhat vulnerable to their scientific sources and that less experienced reporters may have difficulty assessing the experience of scientists, their knowledge of particular areas and ultimately their reliability as sources. However, in the case of the journalists interviewed,

inexperience was not a major concern and, therefore, it cannot adequately explain why some scientists may have been cited speaking on topics they had no training in. If indeed this did occur, two other possible reasons may explain why.

The first reason, despite journalists' assurances of ensuring a source's credibility, is that they tend to return to sources they have found useful in the past (Eide & Ottosen, 1994). Smale in his interview appeared to confirm that he used cooperative sources on a regular basis (personal communication, October 15, 2002). Given the time constraints that journalists are under, this strategy may be useful and yet it might lead to journalists at times asking these cooperative scientists to speak on an area that is actually outside their area of expertise. While there is no evidence of this in the interviews conducted it did appear that many of the journalists continued to return to articulate and well established sources. As noted, this can have a number of undesirable results including inaccurate reporting and source-led journalism (Eide & Ottosen, 1994; Fumento, 1993; Nelkin, 1995).

The second reason that some scientists are cited speaking outside of their area of expertise is due to the complexity of the GM issue. When asked whether the GM issue was different to others they had reported, a number of the journalists remarked that it was a complex issue with many facets; faced with this complexity journalists are tempted to listen to and cite scientists appearing to speak with authority on the issues.

However, Connor in his interview noted that some scientists are complicit in the errors being made. He argued that in speaking outside their area of expertise these scientists are not adhering to the code of ethics of the Royal Society which states that members as part of their duty to act with professionalism should amongst other things, "not present themselves as experts outside their areas of expertise" (Royal Society of New Zealand, 2009, Section 3, ¶ 6). In his view if scientists adhere to this standard some of the issues of credibility would be resolved (Connor, personal communication, July 25, 2002).

The scientific community's insistence that scientists only speak on their own area of expertise in order to maintain the credibility and accuracy of the scientific information reported, may in fact conceal a more self-serving agenda with the scientific community attempting to ensure that only mainstream views of science are reported. Dunwoody et al. (1986) note that journalists are more likely to cite mainstream scientists and that media organisations are more likely to send reporters to, "legitimated institutions, where reporters will be more apt to run into mainstream scientists than fringe scientists" (p. 7). This is likely to result in scientists

with alternative views being marginalised. Moreover, the continued use of institutional, scientific sources may privilege scientific arguments above those based upon environmental and ethical concerns, leaving such issues being reported in a very limited manner or not being reported at all.

5.5.5 The Scientist/Journalist Relationship

While scientists did hold concerns about source credibility they did feel that on the whole they had found their own personal experiences as news sources positive. While all could relate some negative experiences with some journalists they felt that most of the time they had been treated well.

In the past the relationship between journalists and scientists has often been likened to a clash between two different cultures with differing professional values (Dumanoski et al., 1999; McIlwaine, 2001; Reed, 2001). Alternatively some writers suggest that scientists and journalists are on the way to developing a shared culture (Dunwoody, 1999). Dunwoody (1999) speaking about the U.S. context argues that scientists are beginning to realise the potential of media visibility to secure funding and to legitimise their work not only in, “the eyes of the public, but also in the eyes of other scientists” (p. 74). Moreover, the move to Mode 2 science (Gibbons et al., 1994) with its ever-closer relationships between scientists and industry, has seen these groups realising the potential marketing power of media visibility for their research and any products that may be developed as a result (Dunwoody, 1999). However, as Hornig-Priest (2001) argues, the close ties between science and industry can sometimes result in commercial interests hiding scientific research from public scrutiny until a commercial product is marketed. This can lead to public backlashes against such products, and GM food may be an example of this, as Scott appeared to believe in his interview.

When the comments of the scientists interviewed are analysed, it appears that some scientists have a close relationship with journalists and what may be considered the beginnings of a shared culture. For example, despite often being misquoted, Connor indicated in his interview that he had developed a close relationship with at least one journalist who would often contact him for a comment.. Warrington also noted that over time he had developed a mutual trust with journalists that he would supply them with useful quotes and that he in turn would be well represented.

However, Warrington also noted that in the past some relationships with journalists had been problematic and that he had even closed the door on some. Although he noted that this did not happen often as journalists needed him more than he needed them. The latter comment illustrates the power imbalance in the relationship. Dunwoody argues that, while the relationship between journalists and scientists may be “becoming more equitable, it is the scientists who maintain the lion’s share of power” (1999, p. 75) because they hold the information journalists require. This situation again calls into question the ability of journalists to truly act as watchdogs by calling these scientists to account. As shown by Warrington’s comment, if journalists do call scientists to account it may result in having no further access to the scientist concerned and given the small numbers of scientists in New Zealand this could cause serious problems for the reporting of science.

Scott in his interview seemed to understand this last point only too well and was very assertive when interacting with journalists, only dealing with those he felt were going to write, in his view, a balanced story and one that did not sensationalise the issue. As noted, he also advised his colleagues to use the same strategy (personal communication, July 26, 2002).

These results illustrate that the relationships between the scientists and journalists interviewed were mixed. While some scientists appeared to be beginning to develop a shared culture (Dunwoody, 1999) with some journalists, another scientist was very assertive in his dealings with journalists and illustrated more of the clash of cultures between the two groups (Dumanoski et al., 1999; McIlwaine, 2001; Reed, 2001).

The idea that the relationship was like a clash of two different cultures was reinforced by some of the comments made by the journalists interviewed. As Wallace noted, in her experience scientists did not seek publicity and were, “often reluctant to talk to the media”. The observation is consistent with the findings of Dunwoody (1986) who argues that, “scientists are part of a culture that still remains relatively indifferent to the public understanding of their work” (p. 8). The attitude is partially reflected in the feelings towards journalists that Scott exhibited in his interview.

However, the most experienced journalist had actually found that scientists had improved as sources since the establishment of the Crown Research Institutes in the late 1990s. He considered this was a result of the sudden need for scientists to attract funding and many had realised that in order to do this they needed a public face on their work. As noted above, the recognition by scientists that media publicity was useful to gain funding is one of

Dunwoody's (1999) conditions for the formation of a shared culture between journalists and scientists.

The need for funding had meant that some scientists had learned how to engage with the media, coming to understand the needs of journalists. It was believed that some scientists were learning the needs of journalists rapidly and sometimes that was due to good management of scientists by their host organisations' public relations units. However, not all journalists were in favour of public relations units, feeling that they had actually caused scientists to lose some of their ability to deal with journalists.

While some scientists had begun to understand the needs of journalists, in the view of Samson, they did not trust journalists or the reporting process. As noted in Chapter 4, section 4.3.8 he cited the Lyprinol affair as an example of how this mistrust formed. This example and others like it have made scientists wary of being misrepresented and their work being reported inaccurately by the news media. As already noted, inaccurate reporting is often cited as a reason for scientists being reluctant to engage with the media. However, in the view of Samson trust could be established and when it was scientists were no different to any other news source type.

While the journalists reported an improvement in scientists as news sources, there was one area where the professional values of these two groups continued to clash, and this was the persistent need for scientists to qualify their statements. The journalists interviewed argued that they dealt facts, and unambiguous statements. This allowed journalists to report issues clearly and succinctly within the limited amount of space that is provided in a newspaper column. Therefore, journalists required statements that fitted with news values that will, in their view, make a story more newsworthy, for example, dramatic announcements may fulfil the news value of unexpectedness. Being able to report the facts without any qualification enables journalists to report issues in an unambiguous manner. As noted in Chapter 2, section 2.4, unambiguity is one of the news values proposed by Galtung and Ruge (1965). Galtung and Ruge (1965) argue that unambiguous stories are more likely to get published. Therefore, journalists became frustrated when scientists gave them answers with a large number of qualifying statements attached, as this often meant that the story could not be reported in unambiguous terms, thereby limiting its likelihood of being published. However, it was evident, despite his frustration, that one journalist understood that scientists qualified their statements because the science was not as clear cut as journalist might like it to be.

These results illustrate that the scientists, while disappointed in the quality of the reportage on the GM debate, were very aware that it had been strongly framed in terms of GM food. The scientists also felt that this framing did leave some important issues under-reported and that this may have negative effects in the future for the public understanding of certain issues related to GM. Journalists had found GM very complex and this had made the issue more difficult to report than other issues they had covered.

The interview results also illustrate that those scientists and journalists interviewed had a mixed experience in their relationships with one another. There are some indications that the beginnings of a shared culture is developing between some of the scientists and journalists. The recognition by some scientists of the benefits to their funding of having a greater media profile and also by the close relationships that had developed between particular scientists and journalists interviewed illustrates this point.

However, the close relationships developing between some journalists and scientists brings into question whether journalists will be able to uphold their watchdog role for fear of harming these relationships by publishing stories that may cast their sources in a negative light. The watchdog role is also brought into question due to the fact that some journalists openly admitted that their lack of knowledge meant that they unquestioningly accepted what scientists said, thus placing scientists in a stronger position to shape the resulting reportage. This situation may be alleviated by insisting that journalists who report on science and their editors have a science background. This solution has been suggested by other writers (Anderson, 1992; Reed, 2001). While courses for science journalists exist in the United States and Australia (Dunwoody, 1993; Metcalfe & Gascoigne, 1995) no such course is currently taught in New Zealand to the writer's knowledge. To try and emulate the courses that exist in Australia and the United States in a media market as small as New Zealand may not be feasible. Even if such courses were established, the small size of New Zealand's media market may mean that many of the graduates from such courses may not find employment as science journalists. Finally, the ability of journalists to enact their watchdog role was also thrown into question by particular scientists realising how much journalists needed their comments and they used this to their advantage by only allowing journalists who would write stories that they approved of to interview them.

While close relationships have developed between some journalists and scientists there are some indications that there still remains a clash of values between the two groups and

reluctance on the part of some scientists to engage with journalists. This was illustrated by the fear of some scientists of being misrepresented and also their concerns over some scientists being reported speaking outside their areas of expertise. For journalists there was a level of frustration with the consistent need by scientists to qualify the answers they gave. These continued frustrations may mean that the relationship remains a fractious one and this may mean that closer relationships between the two groups may never eventuate. While some may decry this situation it may actually be beneficial to journalists being able to better hold scientists to account.

5.6 Summary

In summary, the chapter has discussed a number of key findings illustrating that New Zealand newspapers reported the GM debate in a similar manner to their counterparts in Europe, Australia and the U.S. by favouring the pro-GM discourse of institutional sources while marginalising alternative issues and viewpoints (Kohring & Gorke, 2000; Nisbet & Lewenstein, 2002; Petersen, 2001). Policy makers, scientists and industry spokespeople, the most dominant news sources in the coverage, appeared to strongly influence how the GM debate was reported in terms of the themes discussed, and thereby influenced the public agenda on GM. The three most prominent themes were Politics, Science and Economics. The theme of Politics, in contrast to previous studies, illustrated the highly politicised nature of the GM debate in New Zealand. The sub-themes of Politics also indicated the strong divisions that existed over the desirability of GM use in New Zealand. The public concern over GM food and its labelling which began the GM debate in 1998 was reflected in the frequency and strength of the economic sub-theme of Consumer choice. Some interviewees believed that the concentration on this sub-theme meant that other important issues that the public needed to be aware of were under reported, for instance, GM vaccines. Other potential themes often received limited reporting, including issues concerning the environment, health and moral concerns around particular applications of GM, again illustrating the lower representation of sources reflecting these interests. This suggests that the newspapers analysed did not report the issue in a socially responsible manner and this will be discussed in the next chapter.

Following from this, the analysis of the interviews with journalists and scientists found that scientists did not believe that the quality of newspaper coverage, in terms of its depth and understanding of GM, was very high, although most feel the issue was reported well in terms of accuracy. The interviews also indicate that while on the whole journalists and scientists

interact well, with some having quite close relationships, tensions still remain between these two professional groups (Dumanoski et al., 1999; McIlwaine, 2001; Reed, 2001). These tensions may in fact be beneficial in not allowing journalists to get too close to their scientist sources and therefore, they will be better able to uphold their watchdog role.

These tensions include reluctance on the part of some scientists to engage with journalists because they feel their work is trivialised by journalists seeking scandal and drama. Scientists are also concerned that some scientists reported are speaking outside their area of expertise. Journalists, while acknowledging that scientists are improving as news sources, still find the need for scientists to qualify their statements frustrating. The next chapter examines these findings in terms of their implications for the interface between the news media and science, the public understanding of GM and the relationship between journalists and scientists in New Zealand.

Chapter 6

Conclusions

6.1 Introduction

The focus of the research is the media coverage of the New Zealand genetic modification (GM) debate between 1998 and February 2002. This debate offered a unique opportunity to explore how this controversial scientific issue was reported by the New Zealand media. While other research has examined a number of different aspects of the GM issues in New Zealand (Ashwell & Olsson, 2004; Cronin & Jackson, 2004; Henderson, 2005; Rogers-Hayden, 2004; Rupa, 2002; Weaver & Motion, 2002) this research explored how the reportage was structured in terms of the sources cited, themes reported and the overall tone of the reportage. In addition, the research examined the perceptions of scientists and journalists involved in the reporting of GM to explore their perceptions of the reportage and their relationship with one another.

As outlined in Chapter One, the broad question guiding the research asked, “How did New Zealand newspapers report the GM debate?” The six sub-questions were:

1. Who were the most frequently cited sources in the reportage?
2. What themes were most frequently reported on?
3. What stance did the different news source types take on the themes reported?
4. How did scientists and journalists perceive the reporting of the GM debate?
5. How did journalists and scientists perceive their relationship with one another in the reporting of the GM debate?
6. What are the implications for the news media, news sources and the New Zealand public’s understanding of GM and science more generally?

Chapter 4 reported the results of the content and interview analyses and Chapter 5 discussed these results and addressed the first five research sub-questions. The aim of this chapter is to consider the final research question: What are the implications for the news media, news sources and the New Zealand public’s understanding of GM and science more generally?

This chapter begins by summarizing the findings of the content and interview analyses. These findings will be discussed in terms of science and the media, and media theory. Firstly, the overall limitations of the research are outlined in the next section.

6.2 Limitations

The limitations of the specific methodologies used in the research are acknowledged in Chapter 3, sections 3.2.2 and 3.3.6. This section examines the methodologies' limitations separately whilst also making some general observations.

The content analysis focussed on all the hard news stories published in the six newspapers over the period under investigation and, therefore, represents the total population of these types of stories. The reasons for only selecting hard news stories for analysis are given in Chapter 3, section 3.2.5.3. It is acknowledged that only examining hard news stories is a limitation of the research as these type of stories by their nature are event-led and do not allow for a more in-depth investigation of an issue or event. In-depth explorations of issues are normally found in feature articles. However, when collecting the data only a very small number of feature articles were found, 7 or 0.9%. Therefore, the decision was made to concentrate on hard news stories which are a more representative example of the media's treatment of the issue.

While many of the content analysis categories were based upon previous research (Kohring & Gorke, 2000; Nisbet & Lewenstein, 2002) other categories were based upon the reading of a sample of stories and constructed to reflect the unique nature of the New Zealand data. These categories are influenced by the researcher's focus and interests.

The concentration solely on newspaper coverage of the debate means that it only represents one facet of the media coverage of the GM debate. Radio, television and other print media coverage may have approaches at variance with the newspaper reportage. The interview with Meduna of Radio New Zealand illustrated the variance between reporting the GM debate for radio, versus reporting it for newspapers. However, it is argued that newspapers represented the most consistent media coverage of the GM debate during the period examined. The content analysis was applied rigorously to the total population of hard news stories during the period and makes a contribution to understanding how this debate was reported by the New Zealand media.

The potential effect of the interviewer on the reliability and validity of the interview data are recognised (Seidman, 2006). However, following Mason (2002), the questions were designed to measure the concepts in question and the questions were put to each interviewee in a consistent manner to increase the reliability of the resulting data. Further, due to time constraints and limited resources those interviewed are a small sample of the possible interviewees for the research.

6.3 Summary of Findings

There are five major findings. First, the reporting of the GM debate was event-led and lacked the complexity that characterises the GM issue. As noted this first finding may be a partial artefact of the decision to select only hard news stories for analysis. The second major finding was that policy makers, scientists and industry spokespeople were the most frequently cited news sources while other potential news sources were less represented or were not reported at all. Third, the reportage was source driven; Economics, Science and Politics were the most frequently reported major themes and this appeared to reflect the domains and interest of the most frequently cited sources. Other potential themes received limited coverage. Fourth, the overall stance of the reportage was pro-GM and positive towards those themes that supported the adoption of GM. Finally, the relationships between scientists and journalists were on the whole positive, although some tensions relating to the conflicting needs of the two groups are evident.

6.3.1 Content Analysis

The content analysis of the reportage between January 1998 and February 2002 illustrates how the GM debate was covered by the news media. As noted above, the debate was reported in an event-led manner and this meant that some of the more complex issues received only superficial treatment. For example, moral implications of particular GM applications were given little coverage. Further, issues concerning particular medical advances, such as the development of GM vaccines, which may soon be in widespread use, were given no real coverage. These omissions gave rise to criticism from some of the scientists interviewed that suggested that the quality of newspaper coverage of GM was low and that the public would remain relatively uniformed about GM if newspaper reports were their only source of information (Scott, 2002; Warrington, 2002, personal communications).

The quantitative data also shows a strong reliance on institutional or traditional primary definers (Hall et al., 1978), as news sources, with policy makers, scientists and industry

spokespeople being the most frequently cited sources across the whole period. Other potential sources were less represented or not reported at all.

In the case of anti-GM groups, deliberate editorial decisions by some newspapers not to cover protests may have hindered their representation in the reportage. Protest for some groups is often the only way they can gain media attention (McCombs & Shaw, 1977). The newspapers' decisions to not cover these protest actions go some way to support the theory that groups involved in acts of civil disobedience come to be seen as less credible than those taking a more moderate stance which negatively affects the ability of such groups to influence public policy (Danielian, 1992; Hornig-Priest, 2001).

Other groups, representing the interests of Māori, religious, environmental, animal welfare and health/disease advocates, were also given limited representation through a combination of editorial decisions, routine journalistic practices and processes of the Royal Commission. While the Royal Commission's procedures including its tight deadlines for the registration of Interested Persons (IPs) and its preference for rational scientific discourse, may have limited the representation of some groups, it is argued that without the Royal Commission the less represented groups identified in the analysis may have received even less media coverage. This is due to the indications that their views were considered irrational and beyond what was considered reasonable by editors and journalists alike.

These factors have resulted in the news media reporting a limited number of potential sources, thus, limiting the viewpoints that entered the public sphere. This pattern of news source use seems to have reinforced the hegemonic dominance of the more traditional primary definers, policy makers, scientists and industry sources and this pattern has also been found in the U.S. context (Hornig-Priest, 2001). Where smaller interest groups were reported, it was often to give the story balance and to satisfy the news value of conflict by which some of the issues were framed.

Finally, the content analysis data revealed that the reportage predominantly favoured GM, despite the opposition evident in the protests and division that existed in New Zealand over the issue. The reportage supported the views of the majority of the most frequently cited sources that GM was good science and would benefit the New Zealand economy. These views were also reflected in the number of scientists and industry spokespeople who were against further regulation of GM research. Moreover, the pro-GM nature of the reportage was illustrated by the support these sources gave to the findings of the Royal Commission

that argues that New Zealand should proceed with caution in the use of GM (Royal Commission on Genetic Modification, 2001).

The ensuing policy decision by the Government, accepting many of the Commission's findings, and the later relaxation of certain regulations governing research into GM, suggest that these pro-GM sources were successful in lobbying the Government to obtain a policy outcome that supported their viewpoint. In contrast, it is argued that those groups opposed to GM were disadvantaged in their attempts to influence the policy direction of the Government with regard to GM, because they could not gain prominent media coverage. As Danielian (1992) argues, access to the media is necessary for groups wishing to place their concerns on the agenda of public opinion.

In summary, the content analysis data reveals that the reportage of the New Zealand GM debate is similar to previous research in the U.S. and Europe with traditional primary definers favouring GM gaining most of the coverage, resulting in reportage that had a strong prejudice towards GM (Kohring & Gorke, 2000; Nisbet & Lewenstein, 2002). This came at the exclusion of other groups, many of which questioned the need for or desirability of GM technology. One group probably favoured by this outcome were scientists and this may have been due to some of the factors inhibiting journalists from exercising their watchdog role with this group of news sources. However, the interview analysis suggested that they were not always comfortable in their role as sources or with the media coverage of the topic.

6.3.2 Interview Analysis

Scientists and journalists held differing views on how the GM debate was reported. Scientists believed that the quality of the reportage was poor and that the public would gain little understanding of GM through what they read in newspapers. Journalists believed that GM was a complex issue to report due to its many facets. The journalists were also concerned about simplifying the complexity of the science too much.

While some writers have suggested that journalists and scientists are moving towards the development of a shared culture (Dunwoody, 1999) the results found do not entirely support this. Overall, the two groups appeared to be happy with their interactions with one another. Scientists believed that they were generally reported accurately, though not comprehensively, and journalists believed that scientists had improved as news sources over time, although some felt that public relations units may cause this to take a backwards step. However, there were indications of particular tensions that argue there may be some way to go before a truly

shared culture is developed. Firstly, scientists were concerned that the media were reporting scientists speaking as experts on issues outside their area of expertise. In contrast, journalists found the need for scientists to constantly qualify their statements frustrating, as this conflicted with the journalists' desire for clear, "factual" statements.

The last factor working against the development of a shared culture between the scientists and journalists interviewed was the indication that there still exists a power imbalance between the two groups. Journalists are perhaps overly reliant on scientists for information, possibly leaving scientists in a more powerful position to frame the resulting stories. There a number of possible reasons for this situation. First, journalists are subject to tight deadlines and this may not give them time, as suggested by Sedorkin and McGregor (2002), to thoroughly research an issue before interviewing a news source. Secondly, as shown in one of the interviews, the lack of science training amongst journalists can lead to a scientist's comments being uncritically reported (Metcalf & Gascoigne, 1995). The likelihood of uncritical reporting is enhanced due to scientists often being the only source of information that journalists have access to regarding certain scientific developments. Therefore, it is unlikely that journalists will publish stories that alienate their scientist sources. This point is not lost on two of the scientists interviewed. As their interviews indicated, publishing stories they were unhappy with did result in the scientists being no longer willing to cooperate with the journalists involved. As noted this does not bode well for journalists trying to uphold the ideal of the Fourth Estate and ultimately puts into question the news media's ability to act as a facilitator of democratic debate about science.

Therefore, while the two groups expressed a level of satisfaction with their interactions with one another, areas of tension still exist between them. More importantly because the journalists remain overly reliant on scientists for information, it means that scientists are in a strong position to frame the issues. This imbalance can lead to science being reported uncritically and if this situation is to be overcome, a more equal relationship needs to be developed. To do so it is argued that journalists require more time for research and also that they have better training in science.

6.4 Implications for the News Media

The news media claim that they act as watchdogs over those in power and to uphold the principles of the theory of social responsibility in order to claim legitimacy for their place in society. However, the content analysis findings of this thesis show that the newspapers did

not meet the standards of social responsibility, especially when it came to representing the diversity of viewpoints present on the GM debate. Nor can they really claim to have exercised their watchdog role in a robust manner. Through their reporting of the GM debate in an event-led manner, newspapers' selection of sources was unbalanced. This style of reporting favoured the pro-GM stance of the primary definers while limiting the space given to alternative voices. Moreover, by choosing to not report protests of anti-GM groups, newspapers exercised a form of censorship which is here argued to go against the democratic ideals of the theory of social responsibility. By exercising this type of censorship, the views of those in favour of GM were not challenged by alternative viewpoints, nor were the reading public made aware of, or given the opportunity to read these alternative views. This situation suggests that on this issue New Zealand newspapers did not act as facilitators of democratic debate on the GM issue, rather their reporting acted to support the pro-GM cause. Also, almost by default, it appears that the New Zealand press appear to accept that arguments based on environmental and ethical grounds are irrational and not worthy of serious consideration when it comes to reporting the differing viewpoints that exist on an issue. This mentality requires change if the news media is to retain any hope of being regarded as a credible source of information and an instrument for the furtherance of democratic debate about science in society. Given the current financial pressures on the news media it is imperative that they retain this credibility.

However, the lack of alternative viewpoints being reported is not entirely the fault of the news media. As illustrated by Tucker (2003), the structure of the Royal Commission also limited the number of alternative views, especially anti-GM views, represented in that forum. Given *The Dominion's* decision to report the Royal Commission in the manner of a court case this meant that the reporting was limited to the viewpoints of those given "interested person" (IP) status at the Commission. While this decision may have been a logical one for the newspaper, the results of the content analysis suggest that in the future journalists may wish to cast a wider net to more fully represent the views available on a particular issue under investigation by a Royal Commission of Inquiry.

The decision not to report anti-GM protests leads to an imbalanced use of news sources and threatens the newspapers' claims to being legitimate arbiters of information and instruments of democracy. To continue to make this claim, newspapers should in the future pursue a more balanced reporting of such issues. The balance being spoken of here is not the mere finding of an alternative voice to show a story is balanced but rather a more full investigation

of the topic where alternative views can be read and judged by the audience. Here it is argued that more feature articles be written on such issues or that hard news stories are more carefully balanced, with alternative voices being given as much space and prominence to articulate their viewpoint. This may require editors to become better educated about science so that they can edit science stories in a manner that allows the multiple viewpoints to be heard (Reed, 2001). However, the inclusion of more voices should not come at the cost of those voices being given negative labels thus giving their associated views marginal status. If these changes are made more balanced stories will be made available to the audience and this will support the newspapers' claims to be upholding the principles of social responsibility. In turn a greater diversity of views will be heard.

Furthermore, the interview analysis suggested that the journalists interviewed were in a difficult position to exercise their Fourth Estate role in holding their scientist sources to account. There were a number of reasons for this. First, was knowledge among some of the scientists that journalists were reliant on them for information and some were not reluctant to exercise their power to ensure that the journalists they talked with were going to report the issue in a manner which they favoured. Another reason was the lack of scientific training among some journalists, which meant they had to implicitly trust the information given to them. Even if journalists wished to exercise their watchdog role, their lack of knowledge may mean that they did not know which questions to ask to fulfil this role. While extra training in science may alleviate this problem, such training does not yet exist in New Zealand. Also, given the small size of the New Zealand market and the current pressures on the education system it is unlikely that such training will be established anytime soon. This does not bode well for the future of science journalism in New Zealand. Finally, the small number of scientists in New Zealand had also led to some journalists and scientists having close working relationships and if these relationships are to be maintained journalists may be reluctant to write stories that cast the scientists concerned in a negative light. The pro-GM stance found in the content analysis and the positive feelings amongst some of the scientists regarding their treatment as sources does suggest that some of these factors may have been at play in the reporting of this issue. The impacts of these factors and the news media's apparent inability to report a larger diversity of views on the news sources are now discussed.

6.5 Implications for News Sources

The reportage had a strong pro-GM bias and, therefore, the majority of the most frequently cited sources, policy makers, scientists and industry spokespeople should be satisfied by this

outcome as it supported their viewpoint as well as confirmed their place as primary definers. While scientists were still concerned with quality of the reporting, these concerns are beginning to be addressed by moves such as the establishment of the Science Media Centre in Wellington in July, 2008. The Centre was set up with the aim, “to promote accurate, bias free reporting in science and technology by helping the media work closely with the scientific community” (Science Media Centre, 2008, ¶ 1). If used appropriately the Centre and other innovations such as the Ministry of Research, Science and Technology’s, “Connecting Science with New Zealanders” programme, may be able to satisfy a number of concerns raised in this thesis. First, they may improve the accuracy and quality of science reporting by the news media. Second, they may ensure that the scientists cited in news media coverage are in fact speaking about their area of expertise. Finally, if the information is indeed bias free, journalists will not have to be so concerned with the scientists’ motivations for speaking to them. However, given the Government’s drive to develop a knowledge economy, the bias free nature of the information may be questionable. As noted by Meduna, it is difficult to find a truly independent scientist in New Zealand. Scientists working for Crown Research Institutes will have commercial imperatives guiding their work and many university scientists may also be working on projects externally funded by government or private enterprise. The interviews revealed that at least one university scientist interviewed was involved in research funded by a large company. Therefore, while the Science Media Centre may increase the accuracy of science reporting, if journalists do not address the motivations of those scientists they come in contact with, then these scientists and the science they represent may still be reported in an uncritical manner. It may also be the case that Science Media Centre may actually develop closer relationships between journalists and scientists and this may again put pressure on journalists to abandon their watchdog role.

While initiatives such as the Science Media Centre may satisfy the needs of government and scientists by improving the overall quality of science reporting and in giving scientists a stronger voice, it does little to improve media access for groups similar to those who received limited or no representation in the GM reportage. Groups opposed to GM or those wishing to raise issues about GM, or indeed other scientific and technological developments based on environmental, health and moral grounds, do not have easy access to the media. They often lack sufficient resources or media skills to gain such access. Therefore, these groups lack recognition by journalists as credible sources. Moreover, as Hornig-Priest (2001) argues, even when these types of groups gain media attention, “they must overcome the media’s

implicit presumption that their positions are (almost by definition) beyond the pale of rational thought” (p. 3). As a few editorials and feature articles suggested this was indeed how the views of these groups were regarded by some editors and journalists. The analysis also illustrated that those groups using protest to gain media attention actually found that this strategy worked against them, with newspapers choosing to ignore these actions. If protest is no longer a useful avenue to gain media attention, then the future looks bleak for these groups trying to voice alternative viewpoints in the media. Indeed their viewpoints may have limited access to the public sphere and, therefore, robust debate about how science should be used in New Zealand society will be almost impossible. While the Royal Commission did promote a space for these groups to air their views, the Commission’s procedures and preference for scientific discourse meant that this space was a small one and public debate was limited. In addition, the news media’s apparent lack of interest meant that the end result is a situation that does not fulfil the democratic ideals of the social responsibility the news media claim to represent. Hornig-Priest (2001) argues that without public debate the public may react with an uninformed backlash against GM.

6.6 Implications for the Public Understanding of Science

This thesis cannot speak directly to the accuracy of the reporting of GM science during the GM debate. However, some observations can be made. The newspaper coverage was event-led and reported the GM debate, in the main, in terms of GM food, economics and politics. Often the issues were reported as a series of conflicts between differing parties thereby polarising the debate. This type of reporting did little to reflect the complexity of the GM issue or reveal the diversity of opinion that existed. Therefore, in terms of understanding the science and the issues, it appears that the public were not served well by the newspaper reporting of the debate. The lack of diversity of views presented in the reportage is also of concern. As Chapter 2 suggests, for members of the public to participate in modern democratic society they should have a civic scientific literacy (Miller, 1998). One element of this scientific literacy is that the public should have a basic scientific vocabulary to read competing views in the media (Miller, 1998). Whether the New Zealand public has such a vocabulary is open to debate, yet assuming citizens have such literacy, they could not exercise it in the manner envisaged by Miller (1998) as they were not offered the diversity of competing views available on the GM issue to read. This situation may have been compounded by the pressures that appeared to impede journalists from enacting their watchdog role when it came to reporting the views of scientists.

6.7 The Science/journalist Relationship

The interviews with scientists and journalists reported on in this thesis indicate that there still exist areas of tension between the two groups. Journalists find scientists' need to constantly qualify their answers frustrating. Scientists are still concerned with what is, in their view, the overall poor quality of science reporting, along with journalists citing scientists speaking outside their areas of expertise. While initiatives like the Science Media Centre may answer the concerns of scientists by delivering a better quality of reporting and the right scientists being cited, it may do little to alleviate the frustrations of journalists with scientists' need to qualify their answers. This concern may only improve with the development of closer working relationships between the two groups as they come to understand each other's needs. However, while the interviews conducted here were small in number, the development of these types of relationships does not appear likely in the near future.

More importantly, the question must be asked whether the development of closer relationships is actually desirable. As argued, if the relationships between journalists and their sources are too close it may hinder the journalists' ability to hold those sources to account. In terms of science it may also make it difficult for journalists to report disagreements and controversies that may exist about some scientific issues because they may fear upsetting their scientist source/s. If this is the case then the public understanding of science could again suffer because of the limited viewpoint being presented.

The mixed results found in this thesis suggest that further research needs to be conducted into the scientist/journalist relationship in New Zealand and also what effect public relations units are having on these relationships.

6.8 Conclusion

The aim of this study was to explore how newspapers reported the GM debate, in particular, examining the overall tone of the reportage and also which news source types and themes were most frequently reported. The findings suggest that New Zealand newspapers reported GM in very similar ways to their overseas counterparts, with their promotion of GM at the expense of particular groups and their viewpoints. This has implications for how science in more general terms is accepted in society. The findings do not bode well for New Zealand if it is to truly have a democratic debate about the place of science in society. While some initiatives have been taken to improve the reporting of science in New Zealand, other initiatives are needed in order that the media can be seen to represent the full range of

diversity of opinion that exists concerning the place of science in the wider society. This will mean a change of attitude among journalists and editors with regard to their treatment of arguments that are based on environmental or ethical grounds. In addition to this, barriers need to be removed to allow journalists to more strongly hold scientists and other sources to account, in an effort to more accurately portray the complexities of scientific issues and act as an agent to encourage true democratic debate about science in our society. To not do so will result in certain groups feeling disenfranchised from the scientific policy-making process concerning science and society and increases the risk of certain sections of the public distrusting science and those who practise it. More importantly for the media to continually report issues in the manner found in this thesis will bring into question their credibility and ability to facilitate democratic debate in New Zealand.

References

- Abel, S. (2004). All the news you need to know? In L. Goode & N. Zuberi (Eds.), *Media studies in Aotearoa/New Zealand* (pp. 183-196). Auckland: Pearson.
- Allen, T. (2000). The environmental costs of genetic engineering. In R. Prebble (Ed.), *Designer genes: The New Zealand guides to the issues and facts about genetic engineering* (pp. 61-69). Wellington: Dark Horse.
- Altschull, J. H. (1995). *Agents of power: The media and public power*. New York: Longman.
- Anderson, A. (1997). *Media, culture and the environment*. London: Routledge.
- Anderson, I. (1992) Don't blame the messenger. *Search*, 23(10), 299
- Anderson, L. (2000). *Genetic engineering, food, and our environment: A brief guide*. Carlton North: Scribe Publications.
- Animal rights group defends moral stand. (2001, February 19). *The Dominion*, p. A14.
- Ashwell, D., & Olsson, S. (2004). Political party issue or party credibility contest? An analysis of rhetoric in the debate on genetic modification, leading up to the 2002 General Election in New Zealand. *Communication Journal of New Zealand*, 4(1), 45-63.
- Attacks on crops hurt NZ - lobby. (2002, January 14). *The Waikato Times*, p. A2.
- Babbie, E. (2007). *The practice of social research (11th ed.)* Belmont: Thomson Wadsworth.
- Baran, S. J., & Davis, D. K. (2006). *Mass communication theory: Foundations, ferment and future (4th ed.)*. Belmont: Thomson Wadsworth.
- Barney, R. D. (1986). The journalist and a pluralist society: An ethical approach. In D. Elliott (Ed.), *Responsible journalism* (pp. 60-80). Beverly Hills: Sage Publications.
- Bauer, M. W. (2005a). Distinguishing red and green biotechnology: Cultivation effects of the elite press. *International Journal of Public Opinion Research*, 17(1), 63-89.
- Bauer, M. W. (2005b). Public perceptions and mass media in the biotechnology controversy. *International Journal of Public Opinion Research*, 17(1), 5-21.

- Beckie, H. J., Hall, M. J., & Warwick, S. I. (2001). *Impact of herbicide-resistant crops as weeds in Canada*. British Crop Protection Conference-Weeds. Brighton, United Kingdom: British Crop Protection Council.
- Bell, A. (1994). Media (mis)communication on the science of climate change. *Public understanding of science*, 3, 259-275.
- Bell, C. (1998, July 17). Genetic foods labelling 'difficult, costly'. *The Dominion*, p. A15.
- Benbrook, C.M. 2003. Impacts of genetically engineered crops on pesticide use in the United States: The first eight years. *Biotech InfoNet*, Technical Paper No. 6, Nov 2003, Retrieved November 10, 2009.<http://www.biotech-info.net/technicalpaper6.html>
- Berelson, B. (1952). *Content analysis in communication research*. New York: The Free Press of Glencoe.
- Berger, A. A. (2005). *Media analysis techniques (3rd ed.)*. Thousand Oaks: Sage Publications.
- Berkowitz, D. (1992). Who sets the media agenda? The ability of policymakers to determine news decisions. In J. D. Kenamer (Ed.), *Public opinion, the press, and public policy* (pp. 81–102). Westport: Praeger Publishers.
- Berridge, M. (2000). Genetic engineering for human health. In R. Prebble (Ed.), *Designer genes: The New Zealand guide to the issues, facts and theories about genetic engineering*. (pp. 85-96). Wellington: Dark Horse.
- Beston, A. (2000, November 4). GE could be organics boon hearing told. *The New Zealand Herald*, pp. A4-5.
- Billington, B., & Bibby, B. (1991). *Survey of attitudes to, and understanding of science and technology in New Zealand*. Wellington: Ministry of Research, Science and Technology.
- Bodmer, W. (1985). *The public understanding of science*. London: Royal Society.
- Bonfadelli, H. (2005). Mass media and biotechnology: Knowledge gaps within and between European countries. *International Journal of Public Opinion Research*, 17 (1), 42-62.

- Bonfadelli, H. (2002). The Internet and knowledge gaps: A theoretical and empirical investigation. *European Journal of Communication*, 17(1), 65-84.
- Boyes, N. (2001, July 31). Crops here in next 3 years. *Waikato Times*, p. 1.
- Boykoff, M. T., & Boykoff, J. M. (2003). Balance as bias: Global warming and the U.S. prestige press. *Global Environmental Change*, 14, 125-136.
- Brewer, J. & Hunter, A. (1989). *Multimethod research: A synthesis of styles*. Newbury Park: Sage publications
- Broks, P. (2006). *Understanding popular science*. Maidenhead: Open University Press.
- Brown, J. D., Bybee, C. R., Wearden, S. T., & Straughan, D. M. (1987). Invisible power: Newspaper news and sources and the limits of diversity. *Journalism Quarterly*, 64, 45-54.
- Brown, T. J. (2000). Spiritual and ethical considerations. In R. Prebble (Ed.), *Designer genes: The New Zealand guide to the issues, facts and theories about genetic engineering* (pp. 111-118). Wellington: Dark Horse
- Bryant, J. & Thompson, S. (2002). *Fundamentals of media effects*. New York: McGraw-Hill Higher Education.
- Bucchi, M. (1998). *Science and the media: Alternative routes in scientific communication*. New York: Routledge Taylor & Francis Group.
- Buchanan, D., Boddy, D., & McCalman, J. (1988). Getting in, getting on, getting out, and getting back. In A. Bryman (Ed.), *Doing research in organizations* (pp. 53-67). London: Routledge.
- Bud, R. (1991). Biotechnology in the twentieth century. *Social Studies of Science*, 21(3), 415-457.
- Bullock, C. F. (2008). Official sources dominate domestic violence reporting. *Newspaper Research Journal*, 29(2), 6-22.
- Calls for inquiry into genetically modified food. (1999, March 13). *The Dominion*, p. A1.
- Campbell, H. (2004) Organics ascendant: Curious resistance to GM. In Hindmarsh, R. and

- Lawrence, G. (Eds.) *Recoding nature: Critical perspectives on genetic engineering*. Sydney: University of New South Wales Press
- Campbell, H. (2000). The future of New Zealand's food exports. In R. Prebble (Ed.), *Designer genes: The New Zealand guide to the issues, facts and theories about genetic engineering* (pp. 71-84). Wellington: Dark Horse.
- Carman, J. (2004). Is GM food safe to eat. In R. Hindmarsh & G. Lawrence (Eds.), *Recoding nature: Critical perspectives on genetic engineering* (pp. 82-93). Sydney: University of New South Wales Press Ltd.
- Christians, C. G. (1986). Reporting the oppressed. In D. Elliott (Ed.), *Responsible journalism* (pp. 109-130). Beverly Hills: Sage Publications Ltd.
- Cobb, R. W., & Elder, C. D. (1981). Communication and public policy. In D. D. Nimmo & K. R. Sanders (Eds.), *Handbook of political communication* (pp. 391-416). Beverly Hills: Sage Publications.
- Coleman, R., & McCombs, M. (2007). The young and agenda-less? Exploring age-related differences in agenda setting on the youngest generation, baby boomers, and the civic generation. *Journalism and Mass Communication Quarterly*, 84(3), 495-508.
- Comrie, M. (2005) Gaining government support: Life Sciences Network and the GE issue. In Galloway, C. & Kwansah-Aidoo, K. *Public relations issues and crisis management*. Southbank, Vic.: Thomson Social Science Press
- Comrie, M. (2002). Spin in the news. In J. McGregor & M. Comrie (Eds.), *What's news?: Reclaiming journalism in New Zealand*. Palmerston North: Dunmore Press.
- Comrie, M. (2000). Mussel bound: The New Zealand media and the launch of lyprinol. *International Communication Bulletin*, 35(3), 12-16.
- Comrie, M. (1999). Television news and broadcast deregulation in New Zealand. *Journal of Communication*, 49(2), 42-54.
- Comrie, M., & Fountaine, S. L. (2005). Retrieving public service broadcasting: Treading a fine line at TVNZ *Media, Culture & Society*, 27(1), 101-118.

- Conrad, P. (1999). Uses of expertise: Sources, quotes, and voice in the reporting of genetics in the news. *Public Understanding of Science*, 8(1), 285-302.
- Crewdson, J. (1993). 'Perky cheerleaders': By accepting research reports without adequate checking science writers do a disservice to the public. *Nieman Reports*, 47(4), 11-16.
- Crichton, S. (1998, December 18). Ministers want gene food labelled. *The Dominion*, p. A3.
- Crisp, D. W. (1986). Scientists and the local press. In S. M. Friedman, S. Dunwoody & C. L. Rogers (Eds.), *Scientists and journalists: Reporting science as news* (pp. 73–80). New York: The Free Press.
- Cronholm, M., & Sandell, R. (1981). Scientific information: A review of research. *Journal of Communication*, 32(2), 85-96.
- Cronin, K., & Jackson, L. (2004). *Hands across the water: Developing dialogue between stakeholders in the New Zealand biotechnology debate: A project for the Ministry of Research, Science and Technology (MORST) 'Dialogue' Programme*. Wellington: Victoria University.
- Danielan, L. (1992). Interest groups in the news. In J. D. Kennamer (Ed.), *Public opinion, the press, and public policy*. (pp. 63–80) Westport: Praeger Publishers.
- Davenport, S., & Leitch, S. (2005). Agoras, ancient and modern, and a framework for science-society debate. *Science and Public Policy*, 32(2), 137-153.
- Davis, A. (2000). Public relations, news production and changing patterns of source access in the British national media. *Media, Culture & Society*, 22(1), 39-59.
- Dearing, J.W. (1995). Newspaper coverage of maverick science: Creating controversy through balancing. *Public Understanding of Science*, 4, 341-361.
- Dornan, C. (1990). Some problems in conceptualizing the issue of "Science and the media". *Critical Studies in Mass Communication*, 7(1), 48-71.
- Doyle, T., & McEachern, D. (2008). *Environment and politics (3 ed.)*. London: Routledge.

- Dumanoski, D., Farland, W. H., & Krimsky, S. (1999). Science in the public arena: A panel discussion. In S. M. Friedman, S. Dunwoody & C. L. Rogers (Eds.), *Communicating uncertainty: Media coverage of new and controversial science* (pp. 167-178). Mahwah: Lawrence Erlbaum Associates.
- Dunwoody, S. (1999). Scientists, journalists, and the meaning of uncertainty. In S. M. Friedman, S. Dunwoody & C. L. Rogers (Eds.), *Communicating uncertainty: Media coverage of new and controversial science* (pp. 59–80). Mahwah: Lawrence Erlbaum Associates.
- Dunwoody, S. (1993). *Reconstructing science for public consumption: Journalism as science education*. Geelong: Deakin University Press.
- Dunwoody, S. (1986). The scientist as source. In S. M. Friedman, S. Dunwoody & C. L. Rogers (Eds.), *Scientists and journalists: Reporting science as news* (pp. 3-16). New York: Free Press.
- Dunwoody, S., & Griffin, R. J. (1993). Journalistic strategies for reporting long-term environmental issues: A case study of three Superfund Sites. In A. Hansen (Ed.), *The mass media and environmental issues* (pp. 22–50). Leicester: Leicester University Press.
- Dunwoody, S., & Ryan, M. (1987). The credible scientific source. *Journalism Quarterly*, 64, 21-27.
- Durant, J., Bauer, M. W., & Gaskell, G. (Eds.). (1998). *Biotechnology in the public sphere: A European sourcebook*. London: Science Museum.
- Edelson, E. (1979). The President's letter. *Newsletter of the National Association of Science Writers*, 28(4), p. 13.
- Eichelbaum, T., Alan, J., Fleming, J., & Randerson, R. (2001). *Report of the Royal Commission on Genetic Modification*. Wellington: Royal Commission on Genetic Modification.
- Eide, M., & Ottosen, R. (1994). 'Science journalism' without science journalists: notes on a Norwegian media paradox. *Public Understanding of Science*, 3(4), 425-434.

- Einsiedel, E., & Thorne, B. (1999). Public responses to uncertainty. In S. M. Friedman, S. Dunwoody & C. L. Rogers (Eds.), *Communicating uncertainty: Media coverage of new and controversial science* (pp. 43-58). Mahwah: Lawrence Erlbaum Associates.
- Entman, R. M. (1993). Framing: Toward clarification of a fractured paradigm. *Journal of Communication*, 43(4), 51-58.
- Environmental News Network. (2001). Debate steams over GM golden rice, *Environmental News Network*, 4 (April). Retrieved December 15, 2007, from http://www.enn.com/news/enn-stories/2001/04/04042001/rice_42868.asp
- Ericson, R. V., Baranek, P. M., & Chan, J. B. L. (1989). *Negotiating control: A study of news sources*. Toronto: University of Toronto Press.
- Evans, D. (2000). Ethics and genetics. In R. Prebble (Ed.), *Designer genes: The New Zealand guide to the issues and facts about genetic engineering* (pp. 27-35). Wellington: Dark Horse.
- Ewen, S., & Pustzai, A. (1999). Effect of diets containing genetically modified potatoes expressing Galanthus nivalis lectin on rat small intestine. *The Lancet*, 354, 1353-1354.
- Eyck, T. A., & Williment, M. (2003). The national media and things genetic: Coverage in the New York Times (1971-2001) and the Washington Post (1997-2001). *Science Communication*, 25(2), 129-152.
- Fitzgerald, R. (2001). *Setting up and running commissions of inquiry*. Wellington: Department of Internal Affairs.
- Fitzsimmons, J. (2000). The nuclear-free issue of the 21st century. In R. Prebble (Ed.), *Designer genes: The New Zealand guide to the issues and facts about genetic engineering* (pp. 187-196). Wellington: Dark Horse
- Flatow, I., O'Leary, D. S., Rodgers, J. E., Schneider, S. H., & Trotter, R. J. (1986). What makes a good science story: A panel discussion. In S. M. Friedman, Dunwoody, S. & Rogers, C. L. (Ed.), *Scientists and journalists: Reporting science as news* (pp. 103-116). New York: The Free Press.

- Fleming, D. (Ed.). (2000). *Formations: A 21st century media studies textbook*. Manchester: Manchester University Press.
- Fletchers target tree genetics. (1999, April 8). Fletchers target tree genetics. *The Press*, p. A27
- Fontana, A. & Frey, J.H. (2003) The interview: From structured questions to negotiated text. In Denzin, N.K. & Lincoln, Y.S. (Eds.). *Collecting and interpreting qualitative materials (2nd Ed.)* Thousand Oaks: Sage Publications
- Fountaine, S. L. (2002). *Women, politics and the media: The 1999 New Zealand general election*. Unpublished doctoral dissertation, Massey University, Palmerston North.
- Fox, A. (2000, August 4). Let's not miss the GE bus, says Wrightson chief. *The Dominion*, p. A14.
- Friedman, S. M. (1986). The journalist's world. In S. M. Friedman, S. Dunwoody & Rogers, C.L. (Eds.), *Scientists and journalists: Reporting science as news*. (pp. 17-41). New York: The Free Press.
- Friedman, S. M., Dunwoody, S. & Rogers, C.L. (eds.). (1999). *Communicating uncertainty: Media coverage of new and controversial science*. London: Lawrence Erlbaum Associates
- Friedman, S. M., Dunwoody, S., & Rogers, C. L. (Eds.). (1986). *Scientists and journalists: Reporting science as news*. New York: The Free Press.
- Fumento, M. (1993). *Science under siege: Balancing technology and the environment*. New York: William Morrow and Company.
- Galtung, J., & Ruge, M. (1965). The Structure of foreign, news. *Journal of Peace Research*, 2(1), 64-90.
- Gamble, J., Muggleston, S., Hedderley, D., Parminter, T., & Richardson-Harman, N. (2000). *Genetic engineering: The public's point of view*. Palmerston North: HortResearch.
- Gamson, W. A., & Modigliani, A. (1989). Media discourse and public opinion on nuclear power: A constructionist approach. *American Journal of Sociology*, 95(1), 1-37.

- Gans, H. J. (1979). *Deciding what's news: A study of CBS Evening news, NBC Nightly news, Newsweek and Time*. New York: Pantheon Books.
- Gant, C., & Dimmick, J. (2000). Making local news: A holistic analysis of sources, selection criteria, and topics. *Journalism and Mass Communication Quarterly*, 77(3), 628-638.
- Gibb, J. (1999, April 14). Modified canola threat to NZ image. *Otago Daily Times*, p. A3.
- Gibbons, M., Limoges, C., Nowotny, H., Schwartzman, S., Scott, P., & Trow, M. (1994). *The new production of knowledge: The dynamic of science and research in contemporary societies*. London: Sage Publications.
- Gitlin, T. (2003). *The whole world is watching: Mass media in the making and unmaking of the New Left*. Berkeley: University of California Press.
- Glesne, C., & Peshkin, A. (1992). *Becoming qualitative researchers: An introduction*. White Plains: Longman Publishing Group.
- Good science, not emotion. (2001, October 19) *The Dominion*. p. 8.
- Goodell, R. (1985). Problems with the press: Who's responsible? *BioScience*, 35(3), 151-157.
- Gregory, J., & Miller, S. (1998). *Science in public: Communication, culture, and credibility*. Cambridge: Basic books.
- Hager, N. (2002). *Seeds of Distrust: The story of a GE cover-up*. Wellington: Craig Potton Publishing
- Hall, S., Critcher, C., Jefferson, T., Clarke, J., & Roberts, B. (1978). *Policing the crisis: Mugging, the State, and law and order*. London: MacMillan Education.
- Hansen, A., Cottle, S., Negrine, R., & Newbold, C. (1998). *Mass communication research methods*. New York: New York University Press.
- Hansen, A., & Dickinson, R. (1992). Science coverage in the British mass media: Media output and source input. *Communications*, 7(3), 365-377.
- Harcup, T., & O'Neill, D. (2001). What is News? Galtung and Ruge revisited. *Journalism Studies*, 2(2), 261-280.

- Hartley, J. (1994). *Understanding news*. London: Routledge.
- Harvey, S. (1999, December). *Foresight or foreclosure? An examination of the New Zealand Foresight Project*. Paper presented at the conference of the Association for Active Educational Researchers. Melbourne: Australia.
- Henderson, A. (2005). Activism in "Paradise": Identity management in a public relations campaign against genetic engineering. *Journal of Public Relations, 17*(2), 117-37.
- Henderson, A., Weaver, C. K., & Cheney, G. (2007). Talking 'facts': Identity and rationality in industry perspectives on genetic modification. *Discourse Studies, 9*(9), 9-41.
- Heritage, J. (1999). Health: Meningitis fear over GM food. Retrieved 28/8/2007, 2007, from <http://news.bbc.co.uk/1/hi/health/328578.stm>
- Hijmans, E., Pleijter, A., & Wester, F. (2003). Covering scientific research in Dutch newspapers. *Science Communication, 25*(2), 153-176.
- Hil, R., & Hocking, B. (2004). Genes for crime: Do they fit? In R. Hindmarsh & G. Lawrence (Eds.), *Recoding nature: Critical perspectives on genetic engineering* (pp. 163–176). Sydney: University of New South Wales Press.
- Hilgartner, S. (1990). The dominant view of popularization: conceptual problems, political uses. *Social Studies in Science, 20*(3), 519-539.
- Hindmarsh, R. (2008). *Edging towards a bioutopia: A new politics of reordering life and the democratic challenge*. Crawley: University of Western Australia Press
- Hindmarsh, R. & Du Plessis, R. (2008). The new civic geography of life sciences governance: transitions and trajectories in Australia and New Zealand. *New Genetics and Society, 27* (3) pp. 175-180.
- Hindmarsh, R., & Lawrence, G. (Eds.). (2004). *Recoding nature: Critical perspectives on genetic engineering*. Sydney: University of New South Wales Press.
- Ho, M. (2004). Foreword: Science, ethics and nature. In R. Hindmarsh & G. Lawrence (Eds.), *Recoding Nature: Critical perspectives on genetic engineering* (pp. 15-20). Sydney: University of New South Wales Press.

- Ho, M. (1998). *Genetic engineering: Dream or nightmare?: Turning the tide on the brave new world of bad science and big business*. Dublin: Gateway.
- Holdrege, C., & Talbott, S. (2008). *Beyond biotechnology: The barren promise of genetic engineering*. Lexington: The University of Kentucky Press.
- Hollings, J., Lealand, G., Samson, A., & Tilley, E. (2007). The big NZ journalism survey: Underpaid, under-trained, under-resourced, unsure about the future - but still realistic. *Pacific Journalism Review*, 13(2), 175-197.
- Hornig, S. (1995). Information equity, public understanding of science, and the biotechnology debate. *Journal of Communication*, 45(1), 39-54.
- Hornig, S. (1990). Science stories: Risk, power and perceived emphasis. *Journalism Quarterly*, 67(4), 767-776
- Hornig-Priest, S. (2001). *Grain of truth: The media, the public and biotechnology*. Lanham: Rowman and Littlefield Publishers.
- Hornig-Priest, S. (1999). Popular beliefs, media, and biotechnology In S. M. Friedman, Dunwoody, S. & Rogers, C.L. (Ed.), *Communicating uncertainty: Media coverage of new and controversial science* (pp. 95-112). London: Lawrence Erlbaum Associates
- Hutchings, J. (2004). Tradition and test tubes: Maori and GM. In R. Hindmarsh & G. Lawrence (Eds.), *Recoding nature: Critical perspectives on genetic engineering* (pp. 179-191). Sydney: University of New South Wales Press.
- Hyde, J. (2006). News coverage of genetic cloning: When science journalism becomes future oriented speculation. *Journal of Communication Inquiry*, 30(3), 229-250.
- Irwin, A., & Wynne, B. (1996). *Misunderstanding science?: The public reconstruction of science and technology*. Trowbridge: Redwood Books.
- Jha, S. (2007). Exploring internet on the coverage of social protest: content analysis comparing protest coverage in 1967 and 1999. *Journalism and Mass Communication Quarterly*, 84(1), 40-57.
- Johnson-Cartee, K. S. (2005). *News narratives and news framing: Constructing political reality*. Lanham: Rowman & Littlefield Publishers.

- Kaid, L. L., & Wadsworth, A. J. (1989). Content analysis. In P. Emert & L. L. Barker (Eds.), *Measurement of communication behaviour* (pp. 197-217). New York: Longman.
- Kava, R. (1999). Hot potatoes: Cold research. Retrieved May 17, 2002, from http://www.acsh.org/press/ed_archives99.html
- Keane, J. (1991). *The media and democracy*. Cambridge: Polity Press.
- Kennamer, J. D. (1992). Public opinion, the press, and public policy: An introduction. In J.D. Kennamer (Ed.), *Public opinion, the press, and public policy* (pp. 1-18). Westport: Praeger Publishers.
- Kitzinger, J., & Reilly, J. (1997). The rise and fall of risk reporting: Media coverage of human genetics research, 'False memory syndrome' and 'Mad cow disease'. *European Journal of Communication*, 12(3), 310-350.
- Kitzinger, J., & Williams, C. (2005). Forecasting science futures: Legitimising hope and calming fears in the embryo stem cell debate. *Social Science and Medicine*, 61(3), 731-740.
- Kohring, M., & Gorke, A. (2000). Genetic engineering in the international media: Analysis of opinion-leading magazines. *New Genetics and Society*, 19(3), 345-363.
- Kolbe, R.H., & Burnett, M.S. (1991) Content-analysis research: An examination of applications with directives for improving research reliability and objectivity. *The Journal of Consumer Research*, 18(2), 243-250.
- Kreuzer, H., & Massey, A. (2005). *Biology and biotechnology: Science, applications and issues*. Washington: ASM Press.
- Krimsky, S. (1982). *Genetic alchemy: The social history of the recombinant DNA controversy*. Cambridge Massachusetts: The MIT Press.
- Krippendorff, K. (2004). *Content Analysis: An introduction to its methodology (2nd ed.)*. Thousand Oaks: Sage Publications.
- Kuypers, J. A. (2002). *Press bias and politics: How the media frame controversial issues*. Westport: Praeger Publishers.

- Lacy, S., & Coulson, D. C. (2000). Comparative case study: Newspaper source use on the environmental beat. *Newspaper Research Journal*, 21(1), 13-25.
- Langdon, C. (2001, August 21). GM could cost NZ billions, says report. *The Dominion*, p. 1.
- Leitch, S. (1992). Sources of discontent. In M. Comrie & J. McGregor (Eds.), *Whose news?* (pp. 153–160). Palmerston North: Dunmore Press Limited.
- Life Sciences Network. (2007). Life Sciences Network members list. Retrieved April 16, 2007, from <http://www.lifesciencesnetwork.com/memberslist.asp>
- Life Sciences Network. (2008). Archives. Retrieved December 2, 2008, from <http://www.lifesciencesnetwork.com/educationarchives.asp>
- Locke, L. (1989) Qualitative research as a form of scientific inquiry in sport and physical education. In Seidman, I. (2006) *Interviewing as qualitative research: A guide for researchers in education and the social sciences (3rd ed.)*. New York: Teachers College, Columbia University.
- Losey, J.E.; Rayor, L.S. & Carter, M.E. (1999) Transgenic pollen harms monarch larvae. *Nature*, 399, 214.
- Louw, E. (2005). *The media and political process*. London: Sage.
- Luke, P. (2001, August 8). Spotlight on Greens over genetic testing response. *The Press*. p. 9.
- Lyons, K. (1997). Boffins, science fiction and new journalism. *New Zealand Journalism Review*, 5, 11-14.
- Malaghan Institute of Medical Research, (2007). *Malaghan Institute of Medical Research Annual Report 07*. (Annual report 2007) Wellington: Malaghan Institute of Medical Research.
- Malatesta, M., Biggiogera, M., Manuali, E & Rocchi, M.B.L. 2003. Fine structural analyses of pancreatic acinar cell nuclei from mice fed on genetically modified soybean. *European Journal of Histochemistry*. 47(4) pp. 385-388.
- Malone, R. E., Boyd, E., & Bero, L. A. (2000). Science in the news: Journalists' constructions of passive smoking as a social problem. *Social Studies of Science*, 30(5), 713-735.

- Mason, J. (2002). *Qualitative researching (2nd Ed.)*. London: Sage Publications.
- Mazur, A. (1981). Media coverage and public opinion on scientific controversies. *Journal of Communication*, 31(2), 106 -115.
- McCombs, M. (2004). *Setting the agenda: The mass media and public opinion*. Cambridge: Polity Press.
- McCombs, M., & Ghanem, S. (2001). The convergence of agenda setting and framing. In S. D. Reese, Gandy, O. H., & A. E. Grant (Eds.), *Framing public life: Perspectives on media and our understanding of the world* (pp. 67-82). Mahwah: Lawrence Erlbaum and Associates.
- McCombs, M., & Shaw, D. L. (1977). Agenda-setting and the political process. In D. L. Shaw & M. McCombs (Eds.), *The emergence of American political issues: The agenda-setting function of the press* (pp. 149-156). St Paul, MN: West.
- McGregor, J. (2002). Terrorism, war, lions and sex symbols. In J. McGregor & M. Comrie (Eds.), *Whats news?: Reclaiming journalism in New Zealand* (pp. 111-125). Palmerston North: Dunmore Press Ltd
- McIlwaine, S. (2001). Science and journalism: A Mexican standoff? *Australian Journalism Review*, 23(2), 167-188.
- McInerney, C., Bird, N., & Nucci, M. (2004). The flow of scientific knowledge from lab to the lay public: The Case of genetically modified food. *Science Communication*, 26(1), 44-74.
- McQuail, D. (1987). *Mass communication theory: An introduction*. London: Sage.
- Metcalf, J., & Gascoigne, T. (1995). Science journalism in Australia. *Public Understanding of Science*, 4(4), 411-428.
- Miles, M. B., & Huberman, A. M. (1994). *Qualitative data analysis: An expanded source book (2nd Ed.)*. Thousand Oaks: Sage Publications.
- Miller, C. (2000). Genetically modified conservation. In R. Prebble (Ed.), *Designer genes: The New Zealand guide to the issues, facts and theories about genetic engineering* (pp. 51–60). Wellington: Dark Horse.

- Miller, D. (1993) Official sources and 'primary definition': The case of Northern Ireland. *Media, Culture and Society*, 15: p. 385-406.
- Miller, J. D. (1998). The measurement of civic scientific literacy. *Public Understanding of Science*, 7(3), 203-223.
- Miller, M. M., & Riechert, B. P. (2000). Interest groups strategies and journalistic norms: news media framing of environmental issues. In S. Allan, B. Adam & C. Carter (Eds.), *Environmental risks and the media* (pp. 45-54). London: Routledge.
- Miller, S. (2001). Public understanding of science at the crossroads. *Public Understanding of Science*, 10(1), 115-120.
- Millstone, E., Brunner, E., & Mayer, S. (1999). Beyond 'substantial equivalence'. *Nature*, 401, 525-526.
- Ministry of Research Science and Technology. (1990). *Promoting science discussion document*. Wellington: Ministry of Research, Science and Technology.
- Ministry of Research Science and Technology. (2006). *Science for New Zealand: An overview of RS&T system 2006* (pp. 1-25).
- Ministry of Research Science and Technology. (2008). *Crown Research Institutes*. Retrieved 27 November, 2008, from <http://www.morst.govt.nz/rst-links/crown-research-institutes/>
- Modified foods labelling bill rejected. (1997, October 23). *The Dominion*, p. A2.
- Mooney, C. (2004). Blinded by science: How 'balanced' coverage lets the scientific fringe hijack reality. *Columbia Journalism Review* 43(4), 26-35.
- Moratorium on GMOs extended (2001, August 28). *The Press*, p. A2.
- Motion, J., & Weaver, C. K. (2005a). A discourse perspective for critical public relations research: Life Sciences Network and the battle for truth. *Journal of Public Relations*, 17(1), 49-67.
- Motion, J., & Weaver, C. K. (2005b). The epistemic struggle for credibility: Rethinking media relations. *Journal of Communication Management*, 9(3), 246-255.

- Nelkin, D. (1987). *Selling science: How the press covers science and technology*. New York: W. H. Freeman and Company.
- Nelkin, D. (1995). *Selling science: How the press covers science and technology (Rev ed.)*. New York: Freeman.
- Nerone, J. C. (Ed.). (1995). *Last Rights: Revisiting four theories of the press*. Illinois: University of Illinois Press.
- New Zealand Press Association, (2009, February 2). *About NZPA*. Retrieved February 2, 2009, from <http://www.nzpa.co.nz/>
- Newspaper Advertising Bureau, (2008). 2008 Newspaper readership survey & circulation results [Electronic Version], 1. Retrieved 26 March 2009 from <http://www.infonews.co.nz/news.cfm?l=1&t=138&id=33510>.
- Nisbet, M. C., Brossard, D., & Kroepsch, A. (2003). Framing science: The stem cell controversy in an age of press/politics. *Press/Politics*, 8(2), 36-70.
- Nisbet, M. C., & Lewenstein, B. V. (2002). Biotechnology and the American Media: The policy process and the elite press, 1970 to 1999. *Science Communication*, 23(4), 359-391.
- Norris , P. (2002). News media ownership in New Zealand. In J. McGregor & M. Comrie (Eds.), *What's news?: Reclaiming journalism in New Zealand* (pp. 33-55). Palmerston North: Dunmore Press Ltd.
- Norris, P., & Carroll, S. J. (1997, November). *The dynamics of the news framing process: From Reagan's gender gap to Clinton's soccer moms*. Paper presented at the Southern Political Science Association Annual Meeting, Norfolk, Virginia.
- Nottingham, S. (2002). *Genescapes: The ecology of genetic engineering*. London: Zed Books.
- Patterson, C. (2004, December 28). New Zealand at risk despite alert system. *The Dominion*, p. A3.
- Patton, M. Q. (2002). *Qualitative research and evaluation methods (3rd ed.)*. Thousand Oaks: Sage Publications.

- Patton, M. Q. (1987). *How to use qualitative methods in evaluation*. Newbury Park: Sage Publications.
- Pennington, H. (1988). Dining with death. In S. Griffiths & J. Wallace (Eds.), *Consuming passions: Food in the age of anxiety* (pp. 24–33). Glasgow: Bell & Bain.
- Perry, K. (1999, March 10). Doctors rap Govt on food stance. *The New Zealand Herald*, p. A2.
- Peters, H. P. (1995). The interaction of journalists and scientific experts: Co-operation and conflict between two professional cultures. *Media, Culture and Society*, 17(1), 31-48.
- Petersen, A. (2001). Biofantasies: genetics and medicine in the print news media. *Social Science & Medicine*, 52(1), 1255-1268.
- Petersen, A., Anderson, A., & Allan, S. (2005). Science fiction/science fact: Medical genetics in news stories. *New Genetics and Society*, 24 (3), 337-353.
- Pfund, N., & Hofstadter, L. (1981). Biomedical innovation and the press. *Journal of Communication*, 31(2), 138-154.
- Philips, E. B. (1976). Novelty without change. *Journal of Communication*, 26(4), 87-92.
- Popovich, M. (1986). Scientists and journalists: Reporting science as news. In S. M. Friedman, S. Dunwoody & C. L. Rogers (Eds.), *Scientists and journalists: Reporting science as news* (pp. 31-32). New York: The Free Press.
- Powell, L., & Self, W. R. (2003). Government sources dominate business crisis reporting. *Newspaper Research Journal*, 24(2), 97-106.
- Prebble, R. (Ed.). (2000). *Designer genes: The New Zealand guide to the issues, facts and theories about genetic engineering*. Wellington: Dark Horse.
- Prescott, V.E., Campbell, P.M., Moore, A., Mattes, J., Rothenberg, M.E., Foster, P.S., Higgins, T.J.V. & Hogan, S.P. 2005. Transgenic expression of bean α -Amylase inhibitor in peas results in altered structure and immunogenicity. *Journal of Agricultural Food Chemistry*, 53 (23) pp. 9023-9030.
- Price, V., & Tewksbury, D. (1997). News values and public opinion: A theoretical account of media priming and framing. In G. A. Barnett & F. J. Boster (Eds.), *Progress in*

- communication sciences: Advances in persuasion*, 13, (pp. 173–212). Greenwich, Connecticut: Ablex.
- Pritchard, D. (1992). The news media and public policy agenda. In J. D. Kennamer (Ed.), *Public opinion, The press, and public policy* (pp. 103–112). Westport: Praeger Publishers.
- Reed, R. (2002). From 'gee whiz' to 'shock-horror': The limited frameworks of science journalism. *Australian Journal of Communication*, 29(3), 43-58.
- Reed, R. (2001). (Un-) Professional discourse?: Journalists' and scientists' stories about scientists in the media. *Journalism* 2(3), 279-298.
- Reed, R., & Walker, G. (2002). Listening to scientists and journalists. *Nieman Reports*, 56(3), 45-46.
- Rees, J. (2001, September 3). Anti-GM cause unites colourful crowd. *The New Zealand Herald*, p. A7
- Reese, S. D., Gandy, O. H., & Grant, A. E. (2001). *Framing public life: Perspectives on media and our understanding of the social world*. Mahwah: Lawrence Erlbaum Associates.
- Richardson, L. (2003). Writing: A method of inquiry. In Denzin, N. K. & Lincoln, Y.S. (Eds.). *Collecting and interpreting qualitative materials (2nd ed.)*. (pp. 499–589). Thousand Oaks: Sage Publications.
- Rissler, J., & Mellon, M. (1996). *The ecological risks of engineered crops*. Cambridge, Massachusetts: The MIT Press.
- Ritchie, J. (2003) The applications of qualitative methods to social research. In Ritchie, J. & Lewis, J. (Eds.) *Qualitative research practice: A guide for social science students and researchers*. (pp. 24-46). London: Sage publications.
- Roberts, N. S., & Levine, S. (1996). Bias and reliability: Political perceptions of the New Zealand media. In J. McGregor (Ed.), *Dangerous democracy: New media politics in New Zealand* (pp. 197 - 209). Palmerston North: The Dunmore Press.

- Rogers-Hayden, T. (2004). *Commissioning genetic modification: the marginalisation of dissent in the Royal Commission on Genetic Modification*. Unpublished Doctoral dissertation, University of Waikato, Hamilton, New Zealand.
- Rogers-Hayden, T., & Campbell, J. R. (2003). Re-negotiating science in environmentalists' submissions to New Zealand's Royal Commission on Genetic Modification. *Environmental Values*, 12(4), 515-534.
- Rogers-Hayden, T., & Hindmarsh, R. (2002). Modernity contextualises New Zealand's Royal Commission on Genetic Modification: A discourse analysis. *Journal of New Zealand Studies*, 1(1), 41-62.
- Rosenberg, B. (2008). *News media ownership in New Zealand*. Christchurch: Campaign Against Foreign Control of Aotearoa.
- Rowan, K. E. (1999). Effective explanation of uncertain and complex science. In S. M. Friedman, S. Dunwoody & C. L. Rogers (Eds.), *Communicating uncertainty: Media coverage of new and controversial science* (pp. 201-224). Mahwah: Lawrence Erlbaum Associates.
- Royal Commission on Genetic Modification. (2001). *The Report of the Royal Commission on Genetic Modification*. Wellington: Printlink.
- Royal Society of New Zealand. (2008, 13/8/2008). *Code of ethics*, from http://www.rsnz.org/directory/code_ethics.php#1
- Rubin, H. J., & Rubin, I. S. (2005). *Qualitative interviewing: The art of hearing data (2nd Ed.)*. Thousand Oaks: Sage Publications.
- Rupar, V. (2002). Keeping our options closed: The dominance of the conflict storytelling frame in media coverage of the Royal Commission's report on genetic modification in New Zealand. *Political Science*, 54(2), 59-68.
- Rupar, V. (2006). How did you find that out? Transparency of the newsgathering process and the meaning of news: A case study of New Zealand journalism. *Journalism Studies*, 7(1), 127-143.

- Rupar, V. (2007a). *Investigating the journalistic field: The influence of objectivity as a journalistic norm on the public debate on genetic engineering in New Zealand*. Unpublished doctoral dissertation. Waikato University, Hamilton.
- Rupar, V. (2007b). Newspapers' production of common sense: The 'greenie madness' or why should we read editorials. *Journalism*, 8(5), 591-610.
- Russell, C. (1986). The view from the national beat. In S. M. Friedman, Dunwoody, S & Rogers, C. L. (Ed.), *Scientists and journalists: Reporting science as news* (pp. 81–94). New York: The Free Press.
- Saari, M.-A., Gibson, C., & Osler, A. (1998). Endangered species: science writers in the Canadian daily press. *Public Understanding of Science*, 7(1), 61-81.
- Salleh, A. (2008). The fourth estate and the fifth branch: the news media, GM risk and democracy in Australia. *New Genetics and Society*, 27 (3), 233-250.
- Salleh, A. (2001). Science in the media: The good, the bad and the ugly. *Australian Science Teachers' Journal*, 47(4), 28-37.
- Samson, A. (2000a, October 20). Genetic research vital in war on possums, hearing told. *The Dominion*, pp. A1 & 3.
- Samson, A. (2000b, October 17). No guarantees from gene-food giants. *Dominion*, p. A2.
- Samson, A. (2000c, November 1). NZ can't afford to be GM free-scientists. *The Dominion*, p. A11.
- Samson, A. (2000d, July 26). Human gene use in cows cleared. *The Dominion*, p. A6.
- Samson, A. (1999, March 12). Greens say they may strike at crops again. *Dominion*, p. 1.
- Schacter, B. (1999). *Issues and dilemmas of biotechnology: A reference guide*. Westport, Connecticut: Greenwood Press.
- Schlesinger, P. (1990). Rethinking the sociology of journalism: Source strategies and the limits of media-centrism. In M. Fergusson (Ed.), *Public communication the new imperatives: Future directions for media research* (pp. 61-83). London: Sage Publications.

- Schneider, S. H. (1986). What makes a good science story?: A panel discussion. In S. M. Friedman, Dunwoody, S & Rogers, C. L. (Ed.), *Scientists and journalists: Reporting science as news* (pp. 215–222). New York: The Free Press.
- Schudson, M. (2001). The objectivity norm in American journalism. *Journalism*, 2(2), 149-170.
- Schultz, J. (1998). *Reviving the fourth estate: Democracy, accountability and the media*. Cambridge: Cambridge University Press
- Schutt, R.K. (2009). *Investigating the social world: The process and practice of social Research*. Los Angeles: Pine Forge Press
- Science Media Centre. (2008). Science Media Centre. Retrieved December 8, 2008, from <http://www.sciencemediacentre.co.nz/>
- Scientists warn on gene bans. (2000, October 25). *The New Zealand Herald*, p. A10.
- Seale, C. (1999). *The quality of qualitative research*. London: Sage Publications.
- Sedorkin, G., & McGregor, J. (2002). *Interviewing: A guide for journalists and writers*. Crows Nest: Allen & Unwin.
- Seidman, I. (2006). *Interviewing as qualitative research: A guide for researchers in education and the social sciences (3rd ed.)*. New York: Teachers College, Columbia University.
- Semetko, H. A., & Valkenburg, P. M. (2000). Framing European politics: A content analysis of press and television news. *Journal of Communication*, 50(2), 93-109.
- Seralini, G., Cellier, D. & Spiroux de Vendomois, J. 2007. New analysis of a rat feeding study with a genetically modified maize reveals signs of hepatorenal toxicity. *Journal of Environmental Contamination Toxicology*, 52 (4) pp. 596-602.
- 'Serious' GE breach. (2000). (2000, April 18) *Otago Daily Times*, p. 3.
- Sessions, L. A. (2003). *Verification and balance in science news: How the New Zealand mass media report scientific claims*. Unpublished PhD, Canterbury University, Christchurch.

- Shapiro, R. (1999). How genetic engineering will save our planet. Retrieved May 17, 2002, from
<http://kea.massey.ac.nz/search/tfuturist/tfuturist/1,5,5,B/l856&F=tfuturist&1,1,1,0>
- Sigal, L. V. (1973). *Reporters and officials: The organization and politics of newsmaking*. Lexington: D.C. Heath and Company.
- Simpson, J., & Weiner, E. (Eds.). (1997). *Oxford English dictionary. Additions series*. Oxford: Oxford University Press.
- Singer, E. (1990). A question of accuracy: How journalists and scientists report research on hazards. *Journal of Communication*, 40(4), 102-116.
- Singer, E., & Endreny, P. (1987). Reporting hazards and their benefits and costs. *Journal of Communication*, 37(3), 10-26.
- Singer, E. & Presser, S. (1989). *Survey research methods*. Chicago: Chicago University Press
- Soloski, J. (1989). News reporting and professionalism: Some constraints on the reporting of the news. *Media, Culture and Society*, 11(2), 207-228.
- Southward, C., & Howard-Clarke, M. A. (2000). Why RAGE? In R. Prebble (Ed.), *Designer genes: The New Zealand guide to the issues and facts about genetic engineering* (pp. 165-177). Wellington: Dark Horse.
- Statistics New Zealand (2002) 2001 census of population and dwellings. *Population and dwelling statistics*. Wellington: Statistics New Zealand
- Tankard, J. W., & Ryan, M. (1974). News source perceptions of accuracy of science coverage. *Journalism Quarterly*, 51(2), 219-334.
- Taylor, C. A., & Condit, C. M. (1988). Objectivity and elites: A creation science trial. *Critical Studies in Mass Communication*, 5(4), 293-312.
- Tester, M. (2001). The dangerously polarized debate on genetic modification. *British Food Journal*, 103(11), 785 - 790.

- Tichenor, P. J., Olien, C. N., Harrison, A., & Donohue, G. (1970). Mass communication systems and communication accuracy in science news reporting. *Journalism Quarterly*, 47(4), 673-683.
- Tolbert, C. T., & McNeal, R. S. (2003). Unraveling the effects of the internet on political participation? *Political Research Quarterly*, 56(2), 175-185.
- Tuchman, G. (1972). Objectivity as strategic ritual: An examination of newsmen's notions of objectivity. *The American Journal of Sociology*, 77(4), 660-679.
- Tuchman, G. (1976). Telling stories. *Journal of Communication*, 26(4), 93-97.
- Tuchman, G. (1978). *Making news: A study in the construction of reality*. New York: The Free Press.
- Tucker, C. A. (2003). *Contaminated democracy: A discourse analysis of the submissions to the Royal Commission on Genetic Modification*. Unpublished Masters thesis, Massey University, Palmerston North.
- Turney, J. (1998). *Frankenstein's footsteps: Science, genetics and popular culture*. New Haven: Yale University Press.
- University gene work shut down. (2000). (2000, April, 13) *The Dominion*, p. 23.
- Wahl-Jorgensen, K. (2001). Letters to the editor as a forum for public deliberation: Modes of publicity and democratic debate. *Critical Studies in Media Communication*, 18(3), 303-320.
- Wanta, W. & Ghanem, S. (2007). Effects of agenda setting. In Priess, R.W., Gayle, B.M., Burrell, N, Allen, M & Bryant, J. *Mass media effects research: Advances through meta-analysis*. Mahwah, New Jersey: Lawrence Erlbaum Associates.
- Washer, P. (2006). Representations of mad cow disease. *Social Science and Medicine*, 62(2), 457-466.
- Watson, J. D. (2000). The debate on genetic engineering. In R. Prebble (Ed.), *Designer genes: The New Zealand guide to the issues and facts about genetic engineering* (pp. 19-26). Wellington: Dark Horse.

- Weaver, C. K., & Motion, J. (2002). Sabotage and subterfuge: public relations, democracy and genetic engineering in New Zealand. *Media, Culture & Society*, 24(3), 325-343.
- Welch, M., Weber, L., & Edwards, W. (2000). "All the news that's fit to print": A content analysis of the correctional debate in the New York Times. *The Prison Journal*, 80(3), 245-264.
- Wevers, F. (2004) Approved use of GE is safe – Life Sciences Network campaigns on GE *PRINZ Award Case Study* as published on <http://www.prinz.org.nz> (members section).
- Whitney, D. C., Fritzler, M., Jones, S., Mazzarella, S., & Rakow, L. (1989). Geographic and source biases in network television news 1982 - 1984. *Journal of Broadcasting and Electronic Media*, 33(2), 159-174.
- Wimmer, R. D., & Dominick, J. R. (2003). *Mass media research: An introduction (7th ed.)*. Belmont: Thomson Wadsworth.
- Wynne, B. 2006. Public engagement as a means of restoring public trust in science – hitting the notes, but missing the music? *Community Genetics* 9 (3), 211-220.
- Wynne, B. (2001) Creating public alienation: Expert cultures of risk and ethics on GMOs. *Science as Culture* 10 (4), 445- 481.
- Wynne, B. (1982). *Rationality and ritual: The Windscale Inquiry and nuclear decisions in Britain*. Bucks: British Society for the History of Science.
- Yin, J. (2008). Beyond the four theories of the press: A new model for the Asian and world press. *Journalism communication monographs*, 10(1), 5-62.
- Ziman, J. (1991). Not knowing, needing to know and wanting to know. In B. V. Lewenstein (Ed.), *When science meets the public* (pp. 13-20). Washington: American Association for the Advancement of Science.
- Zoch, L. M., & Turk, J. V. (1998). Women making news: Gender as a variable in source selection and use. *Journalism & Mass Communication Quarterly*, 75(4), 762-775.

Appendices

Appendix 1: Content Analysis Coding Schedule

Newspaper Coverage of the Genetic Modification Debate 1998 -28/2/2002

SECTION 1.

Newspaper

1. Dominion
2. New Zealand Herald
3. The Press
4. Otago Daily Times
5. Waikato Times
6. Manawatu Standard

Date-Month- Year

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Headline (copy verbatim)

Headline size (cms²)

Column size (cms²)

Section of newspaper

1. Front page
2. News pages
3. Business pages
4. International pages
5. Supplement

Authorship

1. Identified journalist
2. NZPA
3. NZPA and identified journalist
4. International journalist
5. No by-line

SECTION 2

Topic - Code and measure (cms²)

GM science

GM science and research issues

1. Value Value of GM scientific investigation
2. Containment Risks associated with the limitations of GM containment
3. Rigour Disputes over the scientific method used in GM research
4. Loss of scientists Possible loss of scientists involved in GM research
5. Science regulation Possible impacts of regulation(s) on GM research

Politics

Political issues surrounding the GM issue

1. Political process passage The political process in relation to GM for example, the of bills through parliament
2. Political division Conflict between and within political parties
3. Anti-GM activism Anti-GM activism and protest occurring outside of parliament
4. Balance Issues of bias in the RCGM proceedings
5. Political procedure Processes/and/or procedures of the RCGM and ERMA
6. Political regulation Control of GM within existing or proposed legislation
7. Report of RCGM The Report of the Royal Commission of Inquiry on Genetic Modification

<i>Economics</i>	The economic implications of utilising GM technology
1. Consumer choice	Ability of consumers to choose whether or not they eat GM food, including issues of labelling and/or food traceability
2. GM economics	Economic implications of GM
3. Organics	Economic possibilities of organic farming
4. GM/Organics	Possible coexistence and/or the future collapsing of the distinction
5. Economic regulation	Impact of GM regulation in relation to economics

<i>Ethics</i>	How GM may affect or conflict with spiritual, natural, ethical and cultural values
1. Consideration	Regard for ethical/moral values when making GM decisions
2. Ethical Transgression	Possible transgression of ethical/moral values by GM use
3. Ethical regulation	The control of GM in relation to ethical/moral values

<i>Environment</i>	The impact of GM on the environment
1. Effects	Possible effects of GM on the environment
2. Environmental regulation	Impact of GM regulation in relation to the environment

<i>Health</i>	GM and its possible impacts on human health
1. Health effects	Possible effects of GM on human health
2. Health regulation	Impact of GM regulation in relation to medicine

Source type

1. Scientist
2. Industry
3. Politician
4. Government officials
5. Anti-GM groups
6. Religious spokespeople
7. Māori spokespeople
8. Health/Disease groups
9. Environmental/Animal Welfare groups
10. Crown research Institutes
11. Regulatory authorities
12. Lobby groups
13. Social issues groups
14. International organisations
15. Royal Commission members
16. Legal
17. Unaffiliated individuals
18. Unidentified source
19. Unsourced content
20. Others

GM stance

1. Pro GM
2. Anti-GM

3. Neutral
4. Undisclosed

Value stance on topic

1. Pro
2. Anti
3. Neutral

Source name

Appendix 2 : Consent, Information and Interview Schedule Documents

Research Information Sheet

Science, the Media and the Issue of Genetic Modification

Introduction

This research is being carried out as part of the fulfilment of a PhD by:

Mr Douglas Ashwell	Professor Judy McGregor	Dr Brennon Wood
Lecturer	Supervisor	Lecturer
Massey University	Massey University	Massey University

Mr Douglas Ashwell can be contacted through the Department of Communication and Journalism, Massey University, Private Bag 11-222, Palmerston North, Ph. (06) 3569099 Ex. 2938.

A message for Mr Ashwell can also be left with the Department's secretary on (06) 3569099 Ex. 2369 or e-mail: D.Ashwell@massey.ac.nz.

The research

I invite you to take part in this research project to investigate the link between the New Zealand media and science using the current controversy surrounding genetic modification and, in particular, the Royal Commission on Genetic Modification as the focus. As part of this study I am interested in whom the media have used as sources, how they were chosen and their experience of being a news media source. Therefore, I would like to interview sources from all sides of the debate and the media themselves in order to further understand the link between sources and the media.

This research may increase our understanding of the links between the New Zealand media and science and its implications for the public's understanding of new scientific and technological discovery. I eventually hope to complete my PhD and write academic articles from this research.

Among the questions I wish to examine are:

- How has the media reported the issue of the introduction of genetically modified foods?
- Who are the media sources on this issue and how have they been selected and what influence have they had on the reporting of this issue?

In order to answer these questions I would anticipate that an interview of 40 – 45 minutes would be required. If the interviewee is willing I would like to tape the interview, but either way, I would need to take notes while they were talking. Interviewee's names will be included in the report and, therefore, there is no guarantee of confidentiality. However, all interviewees will be given a full transcript of their interview in order that they can veto any part from entering the public domain. The interview would be governed by protocols laid down by Massey University's Human Ethics Committee. This means that prospective participants in the research would have the right:

- To decline to participate
- To refuse to answer any particular questions
- The right to turn the audio tape off at any time
- To ask any questions about the study at any time during participation
- To have the right of veto before publication
- To withdraw from the study at any time
- To be given access to a summary of the findings of the study when it is concluded (though is a long term study which will take at least three years to complete)

This project has been reviewed and approved by the Massey University Human Ethics Committee, PN Protocol 01/110.

I would be grateful if you would consider this request and contact me.

Please feel free to get in touch with me if you require further information.

Douglas Ashwell

Consent form

Scientist Interview Questions

1. How long have you been involved in genetic engineering?
2. What type of projects are you involved in?
3. How well do you think people in New Zealand understand science and, in particular, genetic modification?
4. How would you describe the current debate over genetic modification?
5. Some writers argue that after leaving school most of us learn about science through the media. In your opinion what quality of science information would they receive through reading newspapers or watching television?
6. With regard to the genetic modification debate how well do you think the issues have been reported by the news media?
7. If so what was your opinion of the coverage given?
8. There appears to be some dispute amongst scientists about the desirability and even safety of GM. How do you think journalists should deal with these obvious disputes amongst scientists?
9. The media have sought your opinion in a number of stories on GM. How have you in general found your experience as a media source?
10. Do you think the journalists were well informed about the issue?

11. How were you contacted?

(If they (scientist) contacted the media is this a common thing?)

(How long have they been contacting the media?)

12. How much influence do you think you have over the final story by being a source?

13. Do you ever read the articles after they are published?

14. If so – What did you think of the articles?

(How do you think you were quoted?)

(Have you ever contacted a journalist after a story was published to point out errors?)

15. Finally what is your opinion of the Royal Commission's of enquiry's findings?

16. Did you follow any of the media coverage of the Royal Commission?

Journalist Interview Questions

1. Can you talk about your journalistic experience?
2. How long have you been involved in writing science stories?
3. Do you have a science background - for example, degree, practical experience etc?
4. Has reporting on the genetic modification debate been different to other stories you have written on?
5. Has it been necessary for you to simplify the science behind GM for your readers/listeners? Can you give me an example here?

(If yes) How do you balance the requirements of news with those of the science/scientific community?

6. How do you deal with the category of risk?
7. In your view what have been the most newsworthy stories on this issue?
8. Do you ever make use of press releases?

Waste paper bin,

Partial use/background,

Direct sourcing from press release or

Verbatim?

9. Do you check that the press release is bona fide and who sent it?
10. Do you check back with the sources quoted in the press releases?
11. Your newspaper/program covered the Royal Commission in some depth. Did you find this issue any more difficult than other stories you have reported on?
12. There is also a lot of controversy surrounding the GM issue with scientists even debating amongst themselves? How do you see your role in reporting controversial issues?
13. Many of the stories you have reported have used scientists as sources. What characterises scientists as sources – are they more cautious, nervous or media savvy?
14. Some literature seems to suggest that scientists do not understand the needs of journalists is that your experience?
15. Are scientists more difficult to work with?
16. How do you find your scientific sources for these stories?
17. In the case of scientists how do you know you are talking to the right person?
18. In your view what gives a source credibility?
19. Have your stories been edited for length or content?
20. Do you take particular care to ensure that the sub editing process does not distort your story?

21. Where it has occurred has this ever meant that a source has complained about your story?

Appendix 3: Percentage of Story Authorship by Newspaper

Table 9: Percentage of Story Authorship by Newspaper

Newspaper	Author					
	Author	NZPA	Author and NZPA	International	No author	Totals
<i>The Dominion</i>	16.3	2.9	0	1.2	8.8	29.2
<i>The New Zealand Herald</i>	15.9	1.9	0.3	0.9	2.6	21.6
<i>The Press</i>	6.9	4.8	0	0.6	3.0	15.3
<i>The Otago Daily Times</i>	9.4	8.6	1.2	0.7	0.9	20.8
<i>Waikato Times</i>	3.0	3.7	0	0.1	2.7	9.5
<i>Manawatu Standard</i>	2.6	0	0	0	1.0	3.6
Totals	54.1	21.9	1.5	3.5	19.0	100.0

Appendix 4: Source Stance on Sub-themes

Table 10: Percentage of Source Stance on Health Sub-themes

News sources stance on Health sub-themes					
News source type	Sub-topic	Percentage of sources			Totals
		Positive	Negative	Neutral	
Scientists	Health effects	29.3	11.5	5.8	45.2(n=97)
Industry		7.7	0	0.5	8.1(n=17)
Policy makers		4.3	6.2	3.8	14(n=30)
Religious spokespeople		1.0	1.0	1.0	2.7(n=6)
Māori spokespeople		1.9	1.4	0.5	3.9(n=8)
Health/Disease groups		14.4	1.4	0.5	15.9(n=34)
Environmental/Animal welfare groups		0	2.4	0.5	2.9(n=6)
Regulatory authorities		0	0	0.5	0.5(n=1)
Lobby groups		1.4	0	0.5	2.0(n=4)
Royal Commission members		1.0	0	0	0.9(n=2)
Other		0.5	0.5	0.5	1.8(n=3)
Totals		61.5(n=128)	24.4 (N=51)	14.1(n=29)	100.0(n=208)
	Health regulation				
Scientist		15.7	0	5.3	21.0(n=4)
Industry		5.3	0	10.6	15.9(n=3)
Policy maker		0	10.5	26.2	36.7(n=7)
Regulatory Authorities		0	0	10.5	10.5(n=2)
Legal		5.3	0	5.3	10.6(n=2)
Other		0	5.3	0	5.3(n=1)
Totals		26.3 (n=5)	15.8(n=3)	57.9(n=11)	100.0(n=19)

Table 11: Percentage of Source Stance on Environment Sub-themes

News sources stance on Environment sub-themes					
	Sub-topic	Percentages of sources			
News source type	Environmental effects	Positive	Negative	Neutral	Totals
Scientists		17.8	12.2	3.7	33.7 (n=36)
Industry		4.7	5.6	4.7	15.0 (n=16)
Policy makers		2.8	10.3	4.7	17.8 (n=19)
Māori spokespeople		0	3.7	0	3.7(n=4)
Environmental/Animal welfare groups		0.9	12.2	3.7	16.8 (n=18)
Regulatory authorities		0	0	0	0
Lobby groups		1.9	8.4	0.9	11.2 (n=12)
Royal Commission members		0.9	0	0	0.9(n=1)
Other		0	0.9	0	0.9(n=1)
Totals		29.0(n=31)	53.3(n=57)	17.7(n=19)	100.0 (n=107)
	Environmental regulation				
Scientist		25.0	0	0	25.0(n=3)
Industry		8.3	0	0	8.3(n=1)
Policy maker		16.8	0	8.3	25.0(n=3)
Religious groups		8.3	0	0	8.3(n=1)
Environmental/Animal Welfare groups		8.3	8.3	0	8.3(n=1)
Lobby groups		16.7	0	0	
Totals		83.4(n=10)	8.3(n=1)	8.3(n=1)	100.0 (n=12)

Table 12: Percentage of Source Stance on Morality Sub-themes

News sources stance on Morality sub-themes					
	Sub-topic	Percentage of sources			
News source type	Ethical consideration	Positive	Negative	Neutral	Totals
Scientists		23.0	0	6.8	29.8(n=22)
Policy makers		14.8	0	4.1	18.9(n=14)
Religious spokesperson		12.2	0	4.1	13.6(n=12)
Māori spokesperson		12.2	1.3	4.1	17.6(n=13)
Environmental/Animal Welfare groups		1.3	0	0	
Regulatory authorities		6.8	0	1.3	8.1(n=6)
Environmental/Animal welfare groups		1.3	0	0	1.3(n=1)
Lobby groups		2.8	0	0	2.8(n=2)
Royal Commission members		1.3	0	0	1.3(n=1)
Other		1.3	0	1.3	2.8(n=2)
Totals		77.0(n=57)	1.3(n=1)	21.7(n=16)	100.0(n=74)
	Ethical transgression				
Scientist		7.0	4.7	0	11.7(n=5)
Industry		0	7.0	0	7.0(n=3)
Policy maker		11.6	2.3	2.3	16.2(n=7)
Religious spokespeople		9.3	0	0	9.3(n=4)
Maori Spokespeople		16.3	4.7		21.0(n=9)
Health/ Disease groups		0	2.3	0	2.3(n=1)
Environmental/Animal Welfare groups		11.6	4.7	0	16.3(n=7)
Lobby group		2.3	0	2.3	4.6(n=2)
Regulatory authorities		0	0	2.3	2.3(n=1)
Other		7.0	0	2.3	9.3(n=4)
Totals		65.1(n=28)	25.7(n=11)	9.2(n=4)	100.0(n=43)
	Ethical regulation				
Scientist		13.6	9.0	4.5	
Policy makers		22.7	0	4.5	
Religious spokespeople		18.3	0	0	
Health/Disease groups		18.3	0	0	
Other		9.1	0	0	
Total		82.0(n=18)	9.0(n=2)	9.0(n=2)	100.0(n=22)

Table 13: Percentage of Source Stance on Science Sub-themes

News sources stance on Science sub-themes					
	Sub-topic	Percentage of sources			
News source type	GM science	Positive	Negative	Neutral	Totals
Scientists		22.7	4.9	22.7	50.3(n=62)
Industry		8.1	0.8	5.7	14.6(n=18)
Policy makers		5.7	6.0	6.5	18.2(n=22)
Religious spokespeople		0	0	0.8	0.8(n=1)
Māori spokespeople		0	0.8	0	0.8(n=1)
Health/Disease groups		0.8	0	0	0.8(n=1)
Environmental/Animal welfare groups		0	0.8	0	0.8(n=1)
Regulatory authorities		0	0	0.8	0.8(n=1)
Lobby groups		1.6	6.5	2.4	10.5(n=13)
Other		0.8	0	1.6	2.4(n=3)
Totals		39.7(n=49)	19.8(n=24)	40.5(n=50)	100.0(n=123)
	Containment				
Scientist		16.3	3.3	4.3	23.9(n=22)
Industry		21.7	8.7	1.1	31.5(n=29)
Policy makers		5.4	9.8	4.3	19.5(n=18)
Māori spokespeople		0	1.1	0	1.1(n=1)
Environmental/Animal Welfare groups		0	1.1	1.1	2.2(n=2)
Regulatory authorities		5.4	3.3	5.4	14.1(n=13)
Lobby groups		1.1	2.2	0	3.3(n=3)
Royal Commission members		2.2	0	0	2.2(n=2)
Other		0	2.2	0	2.2(n=2)
Totals		52.1(n=48)	31.7(n=29)	16.2(n=15)	100.0(n=92)
	Rigour				
Scientist		29.2	25.0	12.5	66.7(n=16)
Policy makers		4.2	0	0	4.2(n=1)
Lobby groups		0	20.8	0	20.8(n=5)
Other		0	8.3	0	8.3(n=8)
Totals		33.4(n=8)	54.1(n=13)	12.5(n=3)	100.0(n=24)
	Loss of scientists				
Scientist		5.3	21.0	10.5	36.8(n=7)
Industry		0	0	5.3	5.3(n=1)
Policy makers		5.3	5.3	21.0	31.6(n=6)
Lobby groups		0	26.3	0	26.3(n=5)
Totals		10.6(n=2)	52.6(n=10)	36.8(n=7)	100.0(n=19)
	Science regulation				
Scientist		5.2	27.0	4.4	36.6(n=84)
Industry		4.8	5.2	0.9	10.9(n=25)
Policy makers		14.8	4.8	13.1	32.7(n=75)
Religious spokespeople		0.4	0	0	0.4(n=1)
Māori spokespeople		0	0	0.4	0.4(n=1)
Environmental/Animal welfare groups		0.8	0.4	0.4	1.6(n=4)
Regulatory authorities		2.2	0	5.6	7.8(n=18)
Lobby groups		2.2	4.4	0.9	7.5(n=17)
Royal Commission members		0.4	0	0.4	0.8(n=2)
Other		0	0	1.3	1.3(n=3)
Totals		30.8(n=71)	41.8(n=96)	27.4(n=63)	100.0(n=230)

Table 14: Percentage of Source Stance on Politics Sub-themes

News sources stance on Politics sub-themes					
	Sub-topic	Percentage of sources			
News source type	Political division	Positive	Negative	Neutral	Totals
Scientists		0.7	0	0	0.7(n=1)
Industry		0.7	0	0	0.7(n=1)
Policy makers		31.2	17.7	44.7	93.6(132)
Māori spokespeople		0	0	3.6	3.6(n=5)
Lobby groups		0.7	0	0	0.7(n=1)
Other		0.7	0	0	0.7(n=1)
Totals		34.0(n=48)	17.7(n=25)	48.3(n=68)	100.0(n=141)
	Political process				
Industry		0	0	5.3	5.3(n=1)
Policy makers		5.3	21.0	63.1	89.4(n=17)
Lobby groups		0	0	5.3	5.3(n=1)
Totals		5.3 (n=1)	21.0(n=4)	73.7(n=14)	100.0(n=19)
	Anti-GM activism				
Scientist		0	11.6	2.2	13.8(n=19)
Industry		0.7	6.6	3.6	10.9(n=15)
Policy makers		14.6	12.4	6.6	33.6(n=46)
Māori spokespeople		2.2	0	0.7	2.9(n=4)
Health/Disease groups		0	1.5	0	1.5(n=2)
Environmental/Animal welfare groups		4.4	0	1.5	5.9(n=8)
Regulatory authorities		0	0	1.5	1.5(n=2)
Lobby groups		14.6	6.6	3.6	24.8(n=34)
Other		2.9	1.5	0.7	5.1(n=7)
Totals		39.4(n=54)	40.2(n=55)	20.4(n=28)	100.0(n=137)
	Balance				
Industry		0	2.7	0	2.7(n=1)
Policy makers		2.7	8.1	0	10.8(n=4)
Māori spokespeople		0	5.4	0	5.4(n=2)
Health/Disease groups		0	5.4	0	5.4(n=2)
Environmental/Animal welfare groups		0	24.3	0	24.3(n=9)
Lobby groups		2.7	35.2	0	37.9(n=14)
Royal commission members		13.5	0	0	13.5(n=5)
Totals		18.9(n=7)	81.1(n=30)	0	100.0(n=37)
	Political procedure				
Scientist		0	0	6.6	6.6(n=8)
Policy makers		0	0	27.3	27.3(n=33)
Religious spokespeople		0	0	0.8	0.8(n=1)
Environmental/Animal welfare groups		0	0	0.8	0.8(n=1)
Regulatory authorities		0	0	14.0	14.0(n=17)
Lobby groups		0	0	5.0	5.0(n=6)
Royal Commission members		0	0	30.6	30.6(n=37)
Other		0	0	14.9	14.9(n=18)
Totals		0	0	100.0 (n=121)	100.0(n=121)

Table 15: Percentage of Source Stance on Politics Sub-themes contd.

News sources stance on Politics sub-themes					
	Sub-topic	Percentage of sources			
	Political regulation	Positive	Negative	Neutral	Totals
Industry		8.3	0	0	8.3(n=6)
Policy makers		27.8	11.0	31.9	70.7(n=51)
Health/Disease groups		1.4	0	0	1.4(n=1)
Environmental/animal welfare groups		1.4	1.4	0	2.8(n=2)
Regulatory authorities		0	0	2.8	2.8(n=2)
Lobby groups		1.4	2.8	2.8	7.0(n=5)
Royal Commission members		2.8	0	2.8	5.6(n=4)
Other		1.4	0	0	1.4(n=1)
Totals		44.5(n=32)	15.2(n=11)	40.3(n=29)	100.0(n=72)
News source type	Report of the Royal Commission				
Scientist		12.5	3.1	1.6	17.2(n=11)
Industry		4.7	3.1	3.1	10.9(n=7)
Policy makers		15.5	9.3	20.2	45.0(n=29)
Māori spokespeople		1.6	1.6	0	3.2(n=2)
Environmental/Animal welfare groups		1.6	0	1.6	3.2(n=2)
Lobby groups		3.1	1.6	0	4.7(n=3)
Royal Commission members		4.7	0	6.3	11.0(n=7)
Others		1.6	1.6	1.6	4.8(n=3)
Totals		45.3(n=29)	20.3(n=13)	34.4(n=22)	100.0(n=64)

Table 16: Percentage of Source Stance on Economic Sub-themes

News sources stance on Economic sub-themes					
	Sub-topic	Percentage of sources			
News source type	GM economics	Positive	Negative	Neutral	Totals
Scientist		12.1	3.5	4.2	19.8(n=57)
Industry		30.1	8.0	8.0	46.1(n=133)
Policy makers		9.7	5.9	4.8	20.4(n=59)
Religious spokespeople		0	0.3	0	0.3(n=1)
Māori spokespeople		0.7	0.3	0	1.0(n=3)
Health/Disease groups		0	0	0.3	0.3(n=1)
Environmental/Animal welfare groups		0	1.8	0	1.8(n=5)
Regulatory authorities		0.3	0	0	0.3(n=1)
Lobby groups		3.1	0.7	1.4	5.2(n=15)
Royal Commission members		1.8	0	0.3	2.1(n=6)
Other		0.7	1.0	1.0	2.7(n=8)
Totals		58.5(n=169)	21.5(n=62)	20.0(n=58)	100.0(n=289)
	Organics				
Scientist		8.3	0	0	8.3(n=2)
Industry		62.5	4.2	4.2	70.9(n=17)
Policy makers		16.6	0	0	16.6(n=4)
Lobby groups		4.2	0	0	4.2(n=1)
Totals		91.6(n=22)	4.2 (n=1)	4.2(n=1)	100.0(n=24)
	Consumer choice				
Scientist		3.9	0	5.0	8.9(n=23)
Industry		20.2	1.6	18.6	40.4(n=104)
Policy makers		19.1	3.9	8.5	31.5(n=81)
Religious spokespeople		1.6	0	0	1.6(n=4)
Environmental/Animal welfare groups		1.6	0	1.6	3.2(n=8)
Regulatory authorities		3.1	0.8	1.9	5.8(n=15)
Lobby groups		5.4	0	1.6	7.0(n=18)
Royal Commission members		0.4	0	0	0.4(n=1)
Other		0	0	1.2	1.2(n=3)
Totals		55.3(n=144)	6.3(n=16)	38.4(129)	100.0(n=258)
	GM/Organics				
Scientist		12.5	0	0	12.5(n=1)
Industry		37.5	12.5	0	50.0(n=4)
Policy makers		0	12.5	0	12.5(n=1)
Lobby groups		12.5	0	0	12.5(n=1)
Royal Commission members		12.5	0	0	12.5(n=1)
Totals		75.0(n=6)	25.0(n=2)	0	100.0(n=8)
	Economic regulation				
Scientist		0	4.4	0	4.4(n=1)
Industry		34.8	4.4	8.6	47.8(n=11)
Policy makers		17.4	0	8.6	26.0(n=6)
Lobby groups		0	4.4	0	4.4(n=1)
Other		17.4			17.4(n=4)
Totals		69.6(n=16)	13.2(n=3)	17.2(n=4)	100.0(n=23)

Table 17: Percentage of Source Stance on Other Sub-themes

News sources stance on Other sub-theme					
	Sub-topic	Percentage of sources			
News source type	Other	Positive	Negative	Neutral	Totals
Scientist		0	0	6.7	6.7(n=1)
Industry		0	0	26.6	26.6(n=4)
Policy makers		0	0	6.7	6.7(n=1)
Environmental/Animal welfare groups		0	0	6.7	6.7(n=1)
Lobby groups		6.7	0	20.0	26.7(n=4)
Royal Commission members		0	0	13.3	13.3(n=2)
Others		0	0	13.3	13.3(n=2)
Totals		6.7(n=1)	0	93.3(n=14)	100.0(n=15)

Appendix 5: Coding instrument and instructions

Table 18 below shows the coding categories used for the thematic analysis. Descriptions of the themes and sub-themes categories are given in the first two columns of the table. The following columns include instructions on how to identify the value stance of source citations. The table also illustrates how, for some sub-themes, source citations could call for more or less of a particular sub-theme, or alternatively suggest that the status quo be maintained. For example, as shown in the first row of the table, a source citation could argue for more or less GM research, or suggest that the current level of GM research in the country is sufficient.

This table was used in conjunction with the coding decisions described in Chapter 3, section 3.2.9.

Table 18: Coding Descriptions of Content Analysis Theme, Sub-theme and Value Stance Categories

Topic	Sub-topic	Affirmative	Negative	More	Less	Status Quo
Science - discusses the science and research of genetic modification (GM) including issues of methodology, containment and regulation.	GM science – discusses the value and/or viability of GM scientific investigation.	Argues the scientific study of GM is good science and good for scientific progress.	Argues the scientific study of GM is not good science and not good for scientific progress.	Calls for more research into the science of GM.	Calls for less GM research.	Argues that the current research into GM is sufficient.
	Containment – discusses the risks associated with the limitations of GM containment.	Argues that the practices of GM containment are sufficient to allow field trials.	Argues that the practices of GM containment are insufficient to allow field trials.	Calls for more and/or stricter containment procedures.	Calls for less restrictive containment procedures.	Argues that current containment controls are sufficient.
	Rigour – discusses disputes regarding the scientific method used in certain research	Argues that the science under discussion has followed rigorous scientific methods.	Argues that the science under discussion has not followed rigorous scientific procedures.	Calls for more scientific rigour in the scientific investigation of GM.	Calls for less scientific rigour when conducting GM research. (Given the nature of science, this is an unlikely situation).	Argues that the current level of scientific rigour is satisfactory.
	Loss of scientists – discusses the possible loss of scientists involved in genetic experimentation and research	Argues that the loss of these scientists would not be damaging to New Zealand's scientific community.	Argues that the loss of these scientists would be damaging to New Zealand's scientific community.	Calls for more scientists to be involved or employed in GM research.	Calls for fewer scientists to be involved in GM research.	Argues that the current number of scientists involved in GM research is sufficient.
	Science regulation – discusses the impact of regulation on the practice of GM science.	Argues that the current regulations regarding GM research are good for the continuation and future direction of the research.	Argues that the current regulation regarding GM research inhibits some areas of the research.	Calls for greater regulation of GM research.	Calls for less regulation so that research can proceed more quickly.	Argues that the current regulations governing GM research are sufficient.

Topic	Sub-topic	Affirmative	Negative	More	Less	Status Quo
Politics – discusses the political environment surrounding GM including the political process, the process and issues concerning the Royal Commission of Inquiry, party political conflict and activism.	Political process – discusses the political process in relation to GM for example, the passage of bills through parliament.	Argues that the political process is good with regard to GM legislation.	Argues that the political process is not good with regard to GM legislation.	Calls are made for an increase in the political process with regard to GM.	Calls are made for a decrease in the political process with regard to GM.	Argues that the current political process is satisfactory.
	Political division – discusses political conflict between or within political parties regarding GM	Argues that there is political division about GM.	Argues that there is no political division about GM.	Calls for more political division although a logical position are unlikely	Calls for less political division over GM.	Argues that the current level of political division is good for the democratic process.
	Anti-GM activism – discusses Anti-GM activism and protest occurring outside of parliament.	Argues positively or in favour of anti-GM activism.	Argues negatively or against anti-GM activism.	Calls for greater anti-GM activism. For example, . calling for more people to attend anti-GM rallies.	Calls for people to reduce or halt their anti-GM activism.	Argues that the current level of anti-GM activism is sufficient to raise awareness.
	Balance – discusses issues of bias in the proceedings of the Royal Commission of Inquiry	Argues that the proceedings of the Royal Commission of Inquiry have been conducted in a balanced manner.	Argues that the proceedings of the Royal Commission of Inquiry have been unbalanced.	Calls for more balance in the Royal Commission’s proceedings.	It is unlikely that calls would be made for less balance in the proceedings of the Royal Commission of Inquiry; however, it is a possible position.	Argues that the current processes of the Royal Commission are sufficient and balanced.
	Political procedure – describes the processes and/or procedures of the Royal Commission of Inquiry and the Environmental Risk Management Authority (ERMA).	This category simply reports procedures without taking a position and, therefore, these categories are not applicable.				

Topic	Sub-topic	Affirmative	Negative	More	Less	Status Quo
	Political regulation – discusses the control of GM in relation to existing or proposed government legislation.	Argues for the political regulation of GM.	Argues against the political regulation of GM.	Calls for more political regulation regarding GM.	Calls for less political regulation regarding GM.	Argues that the current political regulation of GM is sufficient.
	Report of the Royal Commission – discusses the report of the Royal Commission	Argues the findings are good.	Argues that the findings are flawed.	The calls for more or less reports of the commission are not logical.		
Morality - discusses GM in terms of how it may affect or conflict with spiritual, natural, ethical and cultural values.	Ethical consideration – discusses the regard given to moral values when making decisions about GM.	Argues that the consideration of moral values is good and necessary when making decisions about GM.	Argues that the consideration of moral values when making decisions about GM has a negative effect on the continued development of the field.	Calls for more consideration of moral values when making decisions about GM.	Calls for less consideration of moral values when making decisions about GM.	Argues that the current consideration given to moral values when making decisions about GM is sufficient.
	Ethical transgression - discusses GM in relation to the possible transgression of moral values.	Argues that GM transgresses moral values.	Argues that GM does not transgress moral values.	Calls for more transgression of moral values are unlikely but logically possible.	Calls are made for less transgression of moral values.	A status quo position that states that the current level of moral transgression is satisfactory is a logical although unlikely position.
	Ethical regulation – discusses the control of GM in relation to moral values.	Argues for the moral regulation of GM.	Argues against the moral regulation of GM.	Calls for more regulation of GM to protect moral values.	Calls for less regulation of GM with regard to moral values.	Argues that the regulation of GM gives sufficient consideration to moral values.

Topic	Sub-topic	Affirmative	Negative	More	Less	Status Quo
Economics - discusses the economic issues surrounding the utilisation of GM technology, products and/or or the pursuit of GM research.	Consumer choice - discusses concerns about the ability of consumers to choose whether or not they eat GM food. This includes issues of labelling and/or food traceability.	Argues that consumers should be able to choose whether or not to eat GM food and/or that such food should be labelled.	Argues that GM foods are substantively no different than conventionally produced foods and, therefore, labelling is unnecessary and/or that labelling is too costly.	Calls for more labelling of GM food in order that consumers can make informed choices.	Calls for less or no labelling of GM food citing the prohibitive cost of such labelling or that it is unnecessary.	Argues that the current system of labelling is sufficient for consumer needs.
	GM economics – discusses the economics of GM.	Argues that pursuing GM technology will boost the income of individuals, companies and the New Zealand economy.	Argues that pursuing GM technology could damage New Zealand's economy.	Calls for increased investment in GM technology to reap the economic benefits.	Calls for less investment in GM as it could damage New Zealand's economy. For example, damaging New Zealand markets.	Argues that the current level of investment in GM is sufficient for New Zealand's economy.
	Organics - discusses the economic possibilities of organic farming.	Argues that organic farming is a growth industry, with great economic potential.	Argues that organic farming is only a small section of the agricultural market and/or that GM farming has more economic potential.	Calls for increased organic farming.	Calls are for less investment in organic farming.	Argues that the current level of organic farming is sufficient for the New Zealand economy.
	GM/Organics - discusses the possible coexistence and/or the future collapsing of the distinction.	Argues that organic and GM agriculture can coexist and/or in the future organic crops may be genetically modified.	Argues that GM and organic farming systems can never coexist together and/or that organic crops can never be genetically modified.	Calls for greater combining of organic and GM farming systems.	Calls for less or no combination of organic and GM farming systems.	Argues that the current situation is appropriate.
	Economic regulation – discusses the impact of GM regulation in relation to economics.	Argues that regulation is good and necessary to ensure that the economic benefits of pursuing GM technology can be realized.	Argues that regulation inhibits the economic potential of pursuing GM technology.	Calls for more regulation in order to realize the economic potential of pursuing GM technology. For example, the strengthening of patent or academic property rights law.	Calls for less stringent regulation to reduce the negative impact on realizing the economic potential of pursuing GM.	Argues that the current situation regarding economic regulation is appropriate.

Topic	Sub-topic	Affirmative	Negative	More	Less	Status Quo
Environment - discusses GM and the environmental issues surrounding its possible environmental effects and/or how it may be regulated to protect the environment.	Effects - discusses the possible effects of GM technology on the environment.	Argues that using GM will benefit the environment, for example, less pesticide use.	Argues that the use of GM will have a negative effect on the environment. For example, super weeds.	Calls for the increased use of GM, in order that the environmental benefits can be realized, for example, decreased pesticide use.	Calls for less or no use of GM, as it will have detrimental effects on the environment.	Argues that the current level of GM use is of no risk to the environment.
	Environmental regulation – discusses the impact of GM regulation in relation to the environment.	Argues that the regulation of GM enables the protection of the environment.	Argues that the regulation of GM is unable to protect the environment from possible GM contamination.	Calls for more regulation of GM to benefit/protect the environment.	Calls for less regulation of GM so that the environmental benefits offered by the technology can be realised. For example, the of GM to control wasps or possums	Argues that the current level of regulation regarding GM protects the environment adequately and/or allows the environmental benefits of GM to be realised.
Health - discusses GM and its possible effects on human health and/or how it may be regulated to protect human health.	Health effects - discusses the possible effects of GM on human health.	Argues that the use of GM will be beneficial to human health. For example, by finding cures to currently incurable diseases.	Argues against the use of GM as it could cause damage to human health. For example, the production of new allergens in GM foods	Calls for the increased use of GM for medical purposes.	Calls for reducing the use GM technology in medicine.	Argues that the current level of GM use for medical purposes is appropriate.
	Health Regulation – discusses the impact of GM regulation in relation to medicine.	Argues that regulation of GM will allow medical advances.	Argues that regulation of GM will inhibit medical advances.	Calls for increased regulation of GM technology for medical applications.	Calls for less regulation of GM technology for medical applications.	Argues that the current level of regulation regarding GM technology for medical applications is appropriate.

Appendix 6: Total Volume of Themes and Sub-themes Across the Stages of the GM Debate

Table 19: Total Volume of Science Sub-themes (cms²)

Volume of Science sub-themes across the stages of GM debate (cms ²)						
Stages of the GM debate	Sub-topics					
	GM science	Containment	Rigour	Loss of scientists	Science regulation	Totals
Jan 1998 – Jan 1999	44.73	57.09	0	0	0	101.82
Feb 1999 – July 1999	600.13	335.96	54.45	0	238.96	1229.50
Aug 1999- Feb 2000	641.09	492.14	63.48	0	270.52	1467.23
Mar 2000 – Sep 2000	179.03	51.65	10.56	91.94	1778.06	2111.24
Oct 2000 – June 2001	1646.66	1473.78	337.40	15.69	1112.44	4585.97
July 2001 – Oct 2001	1108.77	400.75	8.58	222.01	2224.32	3964.43
Nov 2001 – Feb 2002	957.25	54.95	0	5.10	336.14	1353.44
Totals	5177.66	2866.32	474.47	334.74	5960.44	14813.63

Table 20: Total Volume of Politics Sub-themes (cms²)

Volume of Politics sub-themes across the stages of GM debate (cms ²)								
Stages of the GM debate	Sub-topics							
	Political division	Political process	Anti-GM activism	Balance	Political procedure	Political regulation	Report of the Royal Commission	Totals
Jan 1998 – Jan 1999	14.56	80.26	130.57	0	0	0	0	225.39
Feb 1999 – July 1999	275.01	192.95	122.42	0	417.62	58.44	0	1066.44
Aug 1999- Feb 2000	32.80	0	144.81	0	397.54	16.19	0	591.34
Mar 2000 – Sep 2000	151.62	0	8.85	174.52	1382.65	150.77	0	1868.41
Oct 2000 – June 2001	0	124.61	289.25	266.02	2259.50	471.56	556.10	3967.04
July 2001 – Oct 2001	3788.59	85.58	1735.04	35.00	368.58	354.70	3343.95	9711.44
Nov 2001 – Feb 2002	316.40	0	831.64	0	27.30	184.43	56.25	1416.02
Totals	4578.98	483.40	3262.58	475.54	4853.19	1236.09	3956.30	18846.08

Table 21: Total Volume of Economic Sub-themes (cms²)

Volume of Economic sub-themes across the stages of GM debate (cms ²)						
Stages of the GM debate	Sub-topics					
	GM economics	Organics	GM/Organics	Consumer choice	Economic regulation	Totals
Jan 1998 – Jan 1999	152.44	0	0	802.95	0	955.39
Feb 1999 – July 1999	1929.08	207.58	80.40	1578.67	0	3795.73
Aug 1999- Feb 2000	1248.82	339.41	16.45	1296.29	0	2900.97
Mar 2000 – Sep 2000	851.26	0	14.19	788.68	29.41	1683.54
Oct 2000 – June 2001	3105.35	69.88	42.52	2415.03	517.38	6150.16
July 2001 – Oct 2001	3461.49	64.65	47.14	287.81	265.60	4126.69
Nov 2001 – Feb 2002	212.60	66.74	0	229.65	0	508.99
Totals	10961.04	748.26	200.70	7399.08	812.39	20121.47

Table 22: Total Volume of Morality Sub-themes (cms²)

Volume of Morality sub-themes across the stages of GM debate (cms ²)				
Stages of the GM debate	Sub-topics			
	Ethical Consideration	Ethical Transgression	Ethical regulation	Totals
Jan 1998 – Jan 1999	0	0	300.09	300.09
Feb 1999 – July 1999	242.03	19.00	0	261.03
Aug 1999- Feb 2000	169.98	59.48	0	229.46
Mar 2000 – Sep 2000	380.20	105.50	67.88	553.58
Oct 2000 – June 2001	1187.01	410.82	182.70	1780.53
July 2001 – Oct 2001	167.84	84.07	43.86	295.77
Nov 2001 – Feb 2002	43.53	27.43	0	70.96
Totals	2190.59	706.30	594.53	3491.42

Table 23: Total Volume of Environment Sub-themes (cms²)

Volume of Environment sub-themes across the stages of GM debate (cms ²)			
Stages of the GM debate	Sub-topics		
	Environmental effects	Environmental regulation	Totals
Jan 1998 – Jan 1999	133.02	0	133.02
Feb 1999 – July 1999	193.53	0	193.53
Aug 1999- Feb 2000	162.00	95.50	257.50
Mar 2000 – Sep 2000	250.15	23.11	273.26
Oct 2000 – June 2001	2137.37	158.52	2295.89
July 2001 – Oct 2001	643.36	55.69	699.05
Nov 2001 – Feb 2002	0	0	0
Totals	3519.43	332.82	3852.25

Table 24: Total Volume Health Sub-themes (cms²)

Volume of Health sub-themes across the stages of GM debate (cms ²)			
Stages of the GM debate	Sub-topics		
	Health effects	Health regulation	Totals
Jan 1998 – Jan 1999	149.16	0	149.16
Feb 1999 – July 1999	847.25	0	847.25
Aug 1999- Feb 2000	246.34	0	246.34
Mar 2000 – Sep 2000	484.11	159.05	643.16
Oct 2000 – June 2001	3790.36	269.17	4059.53
July 2001 – Oct 2001	752.21	24.37	776.58
Nov 2001 – Feb 2002	275.11	10.08	285.19
Totals	6544.54	462.67	7007.21

Table 25: Total Volume of Other Sub-themes (cms²)

Volume of Other themes across the stages of GM debate (cms ²)		
Stages of the GM debate	Sub-topics	
	Other	
Jan 1998 – Jan 1999	0	0
Feb 1999 – July 1999	29.26	29.26
Aug 1999- Feb 2000	229.89	229.89
Mar 2000 – Sep 2000	52.52	52.52
Oct 2000 – June 2001	394.89	394.89
July 2001 – Oct 2001	199.48	199.48
Nov 2001 – Feb 2002	0	0
Totals	906.04	906.04

Appendix 7: Minor Sub-themes as a Percentage of the Total Theme Volume

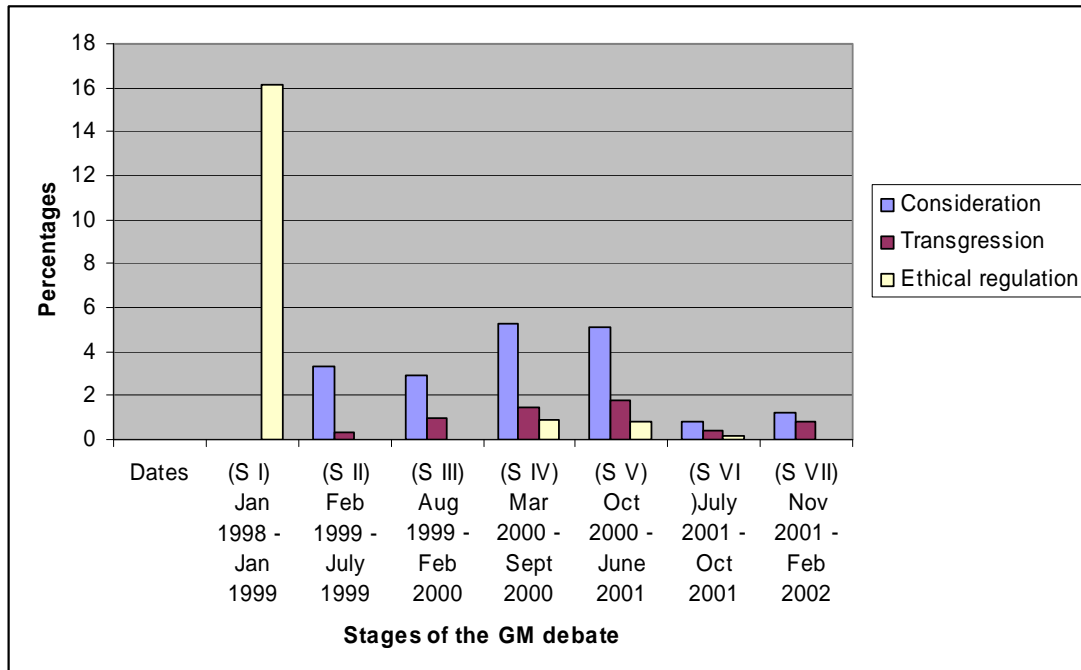


Figure 7: Morality Sub-themes as a Percentage of the Total Theme Volume

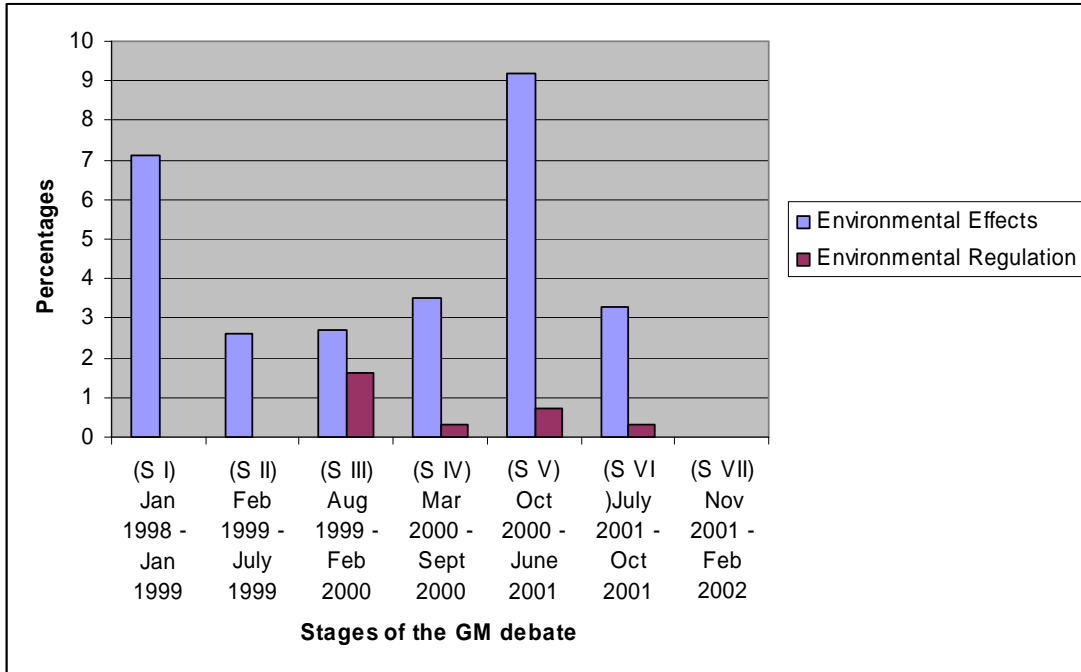


Figure 8: Environment Sub-themes as a Percentage of the Total Theme Volume

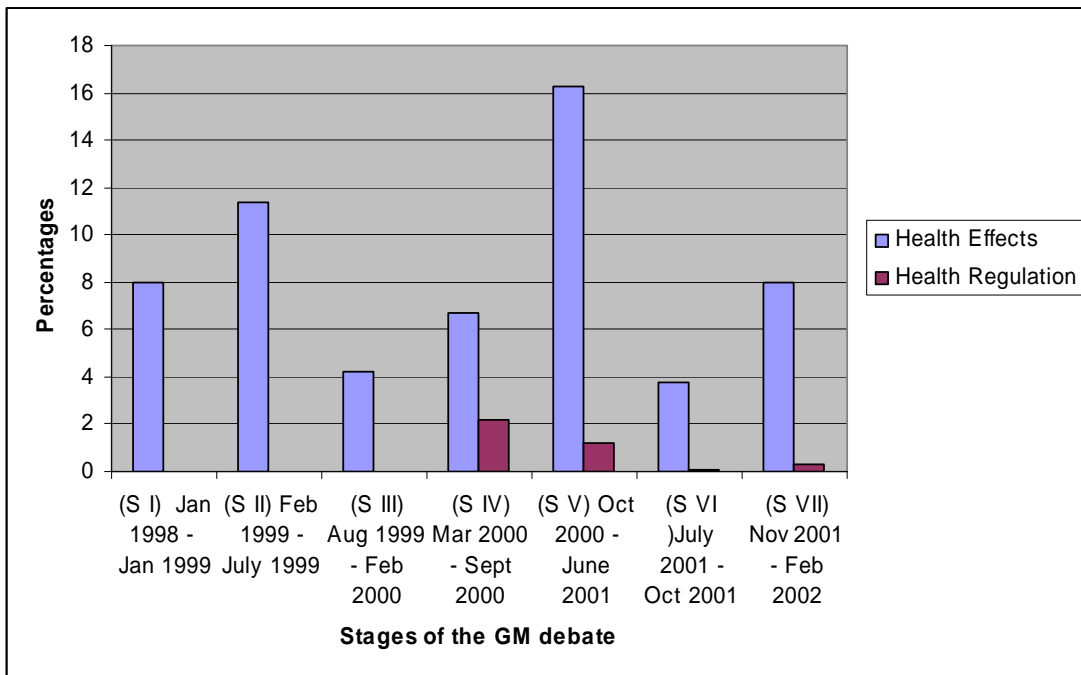


Figure 9: Health Sub-themes as a Percentage of the Total Theme Volume

The following figure illustrates the science sub-themes contained in the Other category in Chapter 4, Figure 3.

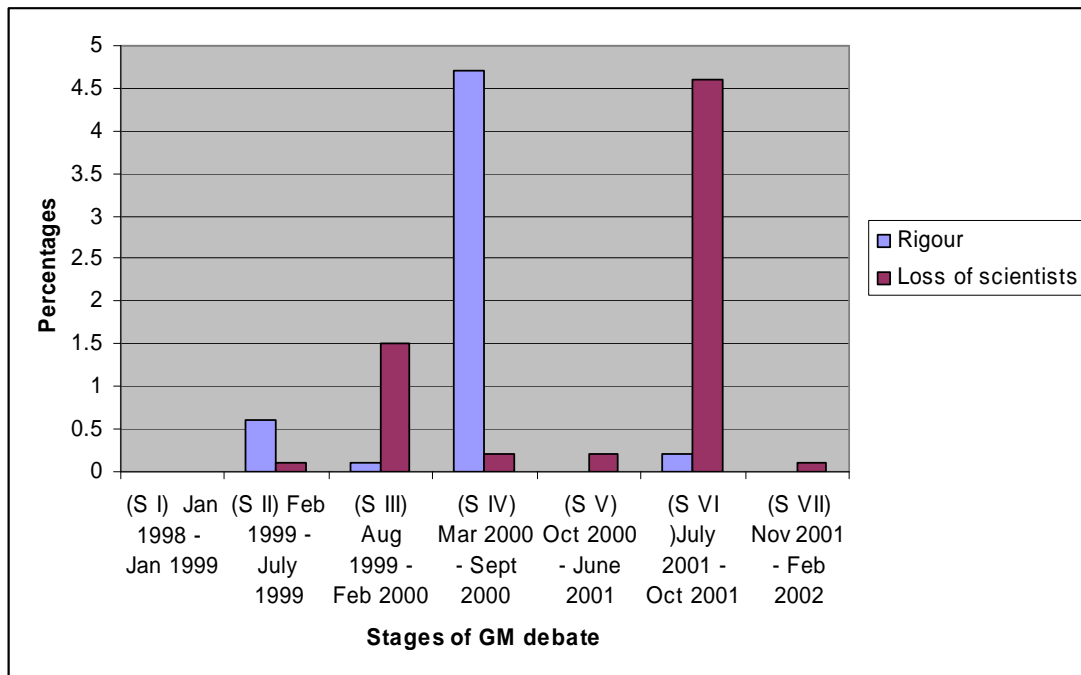


Figure 10: Rigour and Loss of Scientists, Science Sub-themes as a Percentage of the Total Theme Volume

The following figure illustrates the political sub-themes contained in the Other category in Chapter 4, Figure 4.

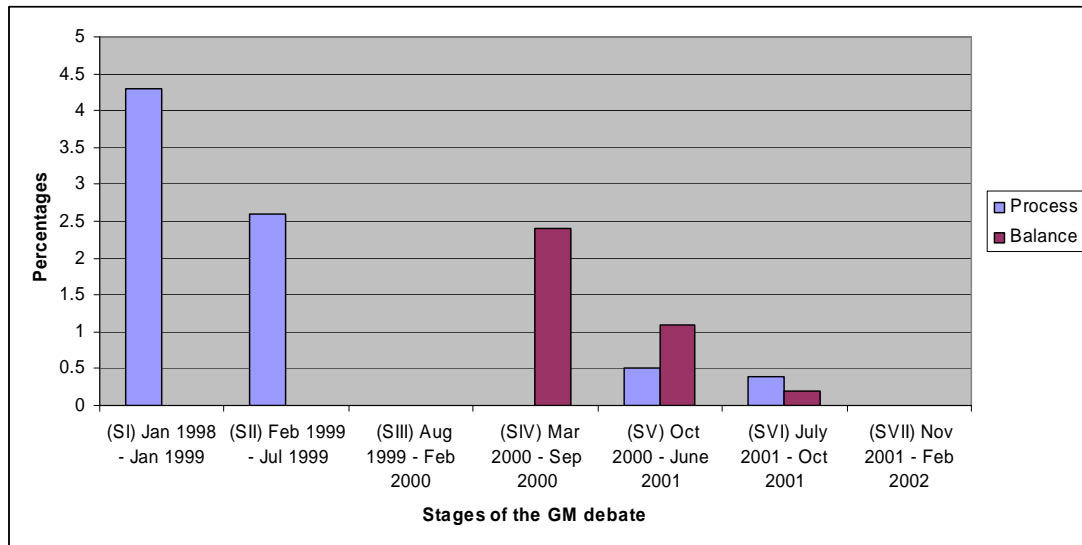


Figure 11: Balance and Political Process, Politics Sub-themes as a Percentage of the Total Theme Volume

The following figure illustrates the Economic sub-themes contained in the Other category in Chapter 4, Figure 5.

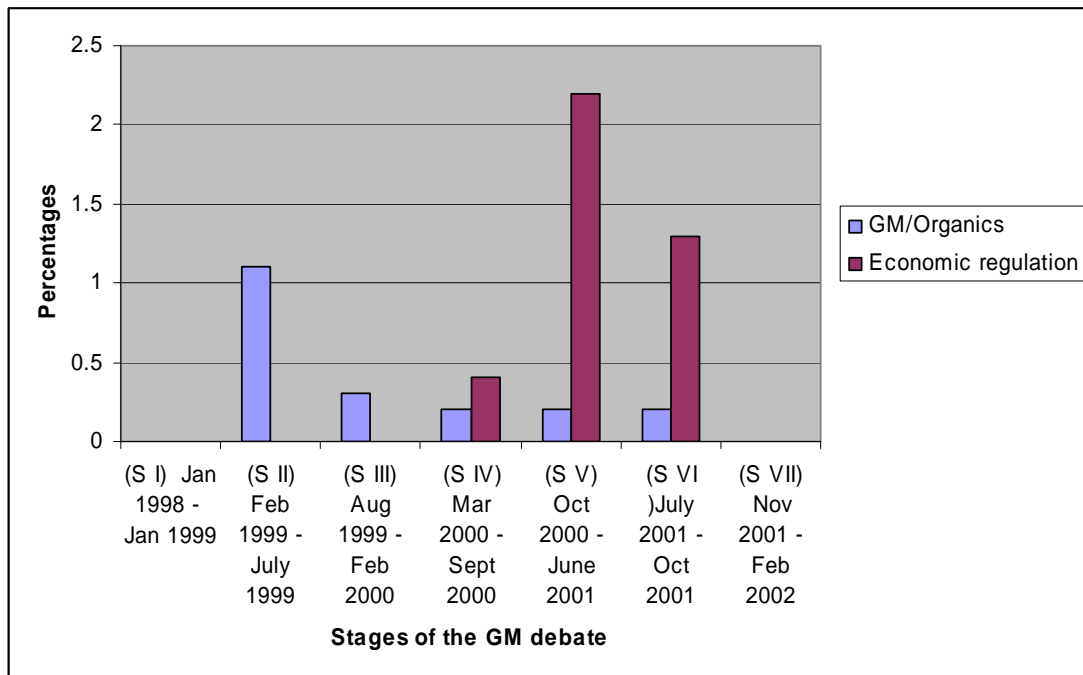


Figure 12: GM/Organics and Economic Regulation, Economic Sub-themes as a Percentage of the Total Theme Volume.

Appendix 8: Volume of all Source Citations (cms²)

Table 26: Source Citations by Volume (cms²)

Stages of GM Debate	Type of source											
	Scientists	Policy makers	Industry spokes-people	Religious spokespeople	Māori spokespeople	Health and Disease groups	Environmental and Animal welfare groups	Regulatory authorities	Lobby groups	Royal Comm. members	Others	Totals
SI: Jan 1998 – Jan 1999	132.33	424.76	361.18	0	0	0	7.52	194.19	19.61	0	285.00	1424.54
SII: Feb 1999 – Jul 1999	2045.96	1620.47	1541.61	0	60.99	0	72.13	330.81	299.58	0	85.19	6056.74
SIII: Aug 1999 – Feb 2000	1251.13	848.80	1277.68	0	32.56	50.4	78.46	275.88	278.805	0	110.18	4203.59
SVI: Mar 2000 – Sep 2000	1279.84	664.77	1407.12	60.43	107.01	19.36	29.88	664.24	264.25	274.87	94.58	4866.55
SV: Oct 2000 – Jun 2001	7426.85	3774.60	3129.93	675.44	832.98	892.71	1151.22	932.69	1448.71	526.36	683.89	21475.38
SVI: Jul 2001 – Oct 2001	3115.82	2233.00	5643.99	24.78	97.65	45.09	339.97	54.07	1417.17	1750.85	335.20	15058.13
SVII: Nov 2001 – Feb 2002	476.87	476.41	971.92	0	97.93	83.72	5.2	67.20	359.19	64.77	8.46	2611.67
Totals	15278.80	10042.81	14333.43	760.85	1229.12	1091.82	1684.38	2518.73	4087.85	2616.85	1602.50	55696.60