

Models of Controversy

Reflections on Cultural Theory and the GM Crop Debate

By

Elisabeth Louise Rushbrook

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PARK LEARNING CENTRE
UNIVERSITY OF GLOUCESTERSHIRE
PO Box 220, The Park, Cheltenham, GL50 2QF
Tel: (01242) 532721

Abstract

In the 1990s social scientists researching public perceptions of GM foods recommended the introduction of new modes of public participation to make decision-making more inclusive. This research utilises categories and concepts from cultural theory (as developed by anthropologists Mary Douglas, Michael Thompson and Steve Rayner, and political scientists Aaron Wildavsky and Richard Ellis) as tools to consider how a range of opinions, illustrated by cultural theory's ideal types, were represented within the GM crop debate. By doing so, it considers whether this approach supports the notion that greater public participation would improve inclusiveness. Furthermore, it considers how best to model the ways that individuals utilised the discourse of cultural theory's ideal types, and whether this has implications for seeking greater inclusiveness. The research is based upon 55 one-to-one interviews that were conducted with various individuals engaged in the GM crop debate in 2000, and secondary sources of data such as media coverage, electronic mailing lists and public meetings between 1996 and 2002.

It was determined that the discourses of cultural theory's ideal types were best presented along a continuum, with the hierarchists in the centre and the egalitarians and individualists at either extreme. Within the wider public debate, the media and public reflected the concerns of egalitarians, while government discourse reflected the concerns of hierarchists. By enabling the public to have a greater say in decision-making, it is asserted that decisions will favour the egalitarian outlook and will ignore the wisdom of cultural theory's other ideal types. Furthermore, since the discourse of those engaged in the debate included all but the most fatalistic comments made by members of the public, it is argued that public participation is unlikely to bring any new voices to the debate. Rather than introducing new modes of public participation, this research recommends that the government actively consults with individuals already engaged in the GM crop debate on all issues, including those of a more political nature. The aim of such an exercise would be to identify, communicate and consider the full range of opinions available so that decisions can become more fully informed, transparent and trusted.

Author's Declaration

I declare that the work in this thesis was carried out in accordance with the regulations of the University of Gloucester and is original except where indicated by specific references in the text. No part of the thesis has been submitted as part of any other academic award. The thesis has not been submitted as part of any other education institution in the United Kingdom or overseas.

Any views expressed in the thesis are those of the author and in no way represent those of the University.

September, 2002

Elisabeth Rushbrook

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Abbreviations

ABC	The Agricultural Biotechnology Council
ACRE	Advisory Committee on Releases to the Environment
AEBC	Agriculture and Environment Biotechnology Commission
ACGM	Advisory Committee on Genetic Modification
ACNFP	Advisory Committee on Novel Foods and Processes
BBSRC	Biotechnology and Biological Sciences Research Council
BMA	British Medical Association
BSE	Bovine spongiform encephalopathy
BTO	British Trust for Ornithology
CEH	Centre for Ecology and Hydrology
CND	Campaign for Nuclear Disarmament
DETR	Department of the Environment, Transport and Regions
DEFRA	Department for Environment, Food and Rural Affairs
DNA	Deoxyribonucleic acid
DTI	Department of Trade and Industry
ESRC	Economic and Social Research Council
EU	European Union
FOE	Friends of the Earth
FSEs	Farm-Scale Evaluations
GEN	Genetic Engineering Network
GM	Genetically modified
GMHT	Genetically modified herbicide tolerant
GMO	Genetically modified organism
HDRA	Henry Doubleday Research Association
HSE	Health and Safety Executive
ITE	Institute of Terrestrial Ecology (now CEH)
MAFF	Ministry of Agriculture, Farming and Fisheries
NGIN	Norfolk Genetic Information Network
NIAB	National Institute of Agricultural Botany
NFU	National Farmers Union
RSPB	Royal Society for the Protection of Birds
SCIMAC	Supply Chain Initiative on Modified Agricultural Crops
SSC	Scientific Steering Committee
WTO	World Trade Organisation

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Introduction

In November 1996 the first shipments of genetically modified (GM) soya arrived in the United Kingdom. At the time there appeared to be very little public awareness about genetically modified crops, and only a small number of organisations, such as the Natural Law Party, campaigned against them. By the end of the following year however, the number of groups actively opposing these crops had escalated dramatically, as had the extent of public concern. The public mood was reflected and fuelled by a number of factors, which included protests at supermarkets, attempts to destroy experimental releases and, perhaps most importantly, extensive coverage within the national media. As the commercial cultivation of GM herbicide-tolerant (HT) crops appeared imminent, calls for a moratorium soon became commonplace.

In July 1997 the Ministry of Agriculture, Farming and Fisheries (now the Department for Environment, Food and Rural Affairs) launched a discussion paper requesting views upon the commercial cultivation of GMHT crops. In response to this paper, the government's wildlife advisor, English Nature, announced that negative ecological impacts could result from the wide-scale cultivation of GMHT crops. Over the following year, further organisations and individuals (including the British Medical Association, Iceland Frozen Foods and Prince Charles) joined the debate, while the newly formed 'GenetiX Snowball' developed new principles and tactics for 'decontaminating' experimental sites. The concerns of these participants were broad, encompassing ethical, cultural, social, economic and political aspects, as well as those of a more scientific nature. Their analyses were primarily generic, while those of English Nature referred to the specific implications of herbicide-tolerance for biodiversity. It was these latter concerns that the government decided to investigate.

In October 1998, the government announced that the biotechnology industry had agreed to voluntarily delay wide-scale planting, which would allow scientists to conduct 'farm-scale evaluations' (FSEs). The aim of the FSEs was to determine the impact of using broad-spectrum herbicides over the crops that had been modified to tolerate them. However, despite the introduction of these evaluations, and in many cases because of them, the introduction of GM crops to the UK continued to attract a great deal of controversy.

During the late 1990s two key studies were published on public attitudes towards GM foods. The first is by Grove-White, Macnaghten, Mayer and Wynne (1997), entitled 'Uncertain World', and the second is a synthesis of work written for the ESRC Global Environmental Change Programme (1999), entitled 'The Politics of GM Food'. Basing their findings upon 9 focus group discussions held in November and December 1997, Grove-White *et al* state that the dominant reaction of most groups was negative and was 'frequently coupled with a sense of fatalism and resignation. It was unnatural' (Grove-White *et al*, 1997: 6). Following a detailed description of these groups' responses, Grove-White *et al* submit that the public's lack of trust in official bodies and political institutions is central to the GM debate. To improve levels of trust, they make a number of recommendations, stating that 'a key need' is an 'urgent and imaginative 'institutional' experiment [... that] should be aimed both at attuning industry and the government better to public sensibilities, and at advancing public involvement' (Grove-White *et al*, 1997: 31). As part of this experiment they recommend testing a number of tools, which include regional consensus conferences, regional citizen panels, focus group discussions and national workshops.

A similar message is communicated in 'The Politics of GM Food', subtitled 'risk, science and public trust' (ESRC, 1999). In this report the authors state that since 'science cannot answer all the questions', the public's concerns are not as irrational as senior politicians seem to believe. By broadening the remit of regulators to address issues of public concern, they suggest that both decision-making and levels of public trust could be improved. The authors therefore conclude that perhaps the greatest challenge is to open up policy processes so that there is 'far greater interaction with members of the public and their diverse values' (ESRC, 1999: 20). Unlike the Consensus Conference on Biotechnology in 1997 however, they state that the government must not only encourage public participation, but must also adequately incorporate their findings. Commenting upon the UK's 1994 National Consensus Conference on Plant Biotechnology, Purdue (1999) makes similar comments, while Wakeford (1998) propounds the development of citizen's juries on GM foods. Further details of these studies and a more thorough background to the GM crop controversy are provided in chapter 2.

While social science studies of the GM crop controversy have focused upon public attitudes, very little attention has been paid to those who are already engaged in the debate. However, according to cultural theory (developed by anthropologists Mary Douglas, Michael Thompson and Steve Rayner, and political scientists Aaron Wildavsky and Richard Ellis) it is important to consider every perspective if institutional arrangements are to be made truly inclusive. By using cultural theory as a tool to analyse the GM crop debate, this research considers whether new modes of public participation still appear to be the best way to improve inclusiveness.

According to cultural theorists, there are only five ways in which the world can be perceived, each with its own 'ideal type'. These have become known as the individualist, the egalitarian, the hierarchist, the fatalist and the hermit. The first four of these ideal types were devised by Douglas (1970, 1975) using her grid-group analysis, while the latter was added by Thompson (1982b). It is said that the ideal types have corresponding views about nature, society and risk, each contradicting the views of the others. For example, individualists are thought to favour a competitive society, believing that nature is robust and able to withstand numerous and intense disturbances, while egalitarians are said to favour equality, believing that nature is liable to collapse in response to human interventions. Of these ideal types, the individualists, egalitarians and hierarchists are considered to be actively trying to sway policy decisions, while the fatalists are absorbed in their day to day survival, and the hermits remain detached observers.

Cultural theorists contend that democracy is best served when all three active types are able to participate equally within policy decisions, as Ney and Thompson (1997) state:

'(...) the policy debate should include policy arguments in each of these cultural hues. Not only must they all be present; each must be given full hearing and taken seriously. A policy debate that is dominated by just one or two of these dispositions cannot be considered fair or democratic.'

(Thompson and Ney, 1997: 218)

The inclusion of all three active types is not only believed to make policy decisions fair and democratic, it is also thought to lead to more reliable outcomes. Although the perceptions of ideal types contradict one another, cultural theorists contend that each is based upon some essence of experience and wisdom (Thompson, Ellis and Wildavsky, 1990). As such, each has important knowledge to impart within the policy process. By utilising the insights of all three groups, cultural theorists assert that decision-makers are far less likely to encounter surprises in the future. With fewer surprises, and the full participation of all three active types, they also contend that a greater amount of trust can be gained. Within the context of controversial matters therefore, cultural theory is used as a tool to determine how different viewpoints contribute to the policy process, and how institutional arrangements might be made more inclusive. In order to determine whether analysing the GM crop debate with cultural theory supports calls for greater public participation, this research reflects these concerns. It considers how each type presented its perception of GM crops, how the discourse of each type was represented within the public debate and by government action, and how the policy process could be made more inclusive.

While various empirical studies have found cultural theory to be a useful tool for examining environmental controversies (see for example, Harrison and Burgess, 1994; Adams, 1995; Thompson and Rayner, 1998), there is some controversy with regard to why individuals combine the discourses of the ideal types. Many cultural theorists, including Douglas (1982), state that individuals can belong to different types within different contexts. For example, an individual could be a hierarchist at work, but an egalitarian at home, which would require him or her to adapt their discourse accordingly. However, even within a case-specific context, individuals have been found to utilise the discourse of more than one type. Often it is said that individuals are only doing so temporarily. For example, an unpopular type might 'steal' the discourse of the most favoured type in order to gain power, or they might form a temporary alliance with another type in order to boost membership. Further, it has been suggested that individuals combine the discourse of two types when they move from one type to another. These are described as the 'dynamics of change', and are illustrated by Thompson (1982b) using a three-dimensional version of the grid-group model.

Adams (1995) however, asserts that people mix their discourse to a far greater extent. To illustrate this he has devised a 16-fold typology, where cultural theory's four conceptualisations of nature lie along one axis, and its four ideal arrangements for society along the other. To demonstrate how individuals can utilise any combination of cultural theory's discourses, Adams (1995) places a number of well-known personalities and caricatures within the model's cells. Meanwhile, Ellis and Thompson (1997) state that it is perhaps more accurate to place the discourse of the three active types along a continuum. According to Ellis and Thompson (1997), empirical work suggests that the discourse of individualists and egalitarians form mirror images of each other, while the hierarchists' conceptualisation of nature is difficult to identify. As a result, they suggest that the hierarchists exist as a middle ground between the two other active types. The development of cultural theory, its application within the field of environmental controversy, and the reasons why individuals are thought to use a mixture of discourses is outlined in chapter 3.

Since there has been little empirical enquiry with regard to how individuals mix the discourses of ideal types, using cultural theory to analyse the GM crop debate has provided an opportunity to develop a better understanding of this area. By attending to the discourse of individuals, it has been possible to consider whether there were alliances between ideal types, whether individuals and organisations used stolen rhetoric, and whether individuals used the discourse of one or more types. Each of these aspects has important implications for modelling the discourses of cultural theory, but they also enable a better understanding of the strategies and power of each type, and the ways in which inclusiveness might be improved.

Since the focus of this research is upon those already engaged in the GM crop debate, interviews were sought with industry representatives, farmers, plant geneticists, ecologists, employees of non-governmental organisations (NGOs) and local campaigners. In total, fifty-five semi-structured, one-to-one interviews were conducted between March and September 2000. Tape recordings of these interviews were transcribed verbatim and analysed to determine how each of cultural theory's ideal types presented their perception of GMHT crops, and how interviewees utilised these discourses. Each of cultural theory's models were then examined to determine how best to present the discourse of these individuals, and to consider whether the favoured model has any implications for making institutional arrangements more inclusive.

In order to contextualise this research, and to understand how the discourses of the ideal types were represented within the public debate and by government action, a number of different strategies were undertaken. These included attending biotechnology conferences and local debates, following the national media coverage, reading the content of relevant websites and electronic mailing lists and becoming familiar with risk assessment procedures. It also involved reading the increasingly large number of books that have now been written on GMOs (for example, Nottingham, 1998, 2002; Kneen, 1999; McHughen, 2000; Pence, 2002). As a former participant in the GM crop debate, it has also been possible to consider the researcher as subject, as others have recommended (for example, Cohen, 1992; Roseneil, 1993). A fuller account of the methods employed and the rationale behind these is provided in chapter 4.

In chapters 5 to 8, extracts from one-to-one interviews are presented to convey how each of cultural theory's ideal types perceived the introduction of GMHT crops. In chapter 5 the individualist's view is presented, in chapter 6 the egalitarian's, and in chapter 7 the hierarchist's. Each chapter considers attitudes towards nature, the ways in which GM crops were understood, the consequences that were expected, and perceptions of other groups. The ways in which individuals utilised the discourse of each ideal type are then presented in chapter 8, followed, in chapter 9, by a discussion of how the discourse of individuals might be best modelled. In chapter 10 the representation of each ideal type within the wider public debate is discussed and compared with more private discourses. The ways in which government action reflected the concerns of each type are then examined, followed by a discussion that considers how best to make institutional arrangements more inclusive. In chapter 11 the key findings of this research are summarised, and conclusions are drawn that answer the research questions originally posed. These research questions are outlined on the following page.

Research Questions

This research was devised to answer the following questions:

1. By utilising cultural theory to analyse the GM crop debate, do new modes of public participation still appear to be the best way to make institutional arrangements more inclusive?
2. How do individuals engaged in the GM crop debate utilise the discourse of cultural theory's ideal types, and does this have implications for making decisions inclusive?

These questions were answered by satisfying the objectives listed below:

- To outline how each of cultural theory's ideal types frame the GM crop debate;
- To determine how individuals utilise the discourse of cultural theory's ideal types;
- To consider how the discourse of individuals is best modelled;
- To establish how the ideal types are represented within the wider public debate;
- To establish the extent to which government actions reflect the concerns of each type;

The GM Crop Debate in the UK

Introduction

This chapter provides background information on the GM crop debate in the UK. First, a short history of the development of genetically modified (GM) plants is provided, followed by an overview of the techniques that are employed to produce them. The regulatory framework for GM crops in the EU is then explained, as is the legal status of those GM crops grown in the UK's farm-scale evaluations (FSEs). The main stories that have featured in the UK national media, and the events that triggered the government's decision to introduce the FSEs in 1999 are then outlined. This is followed by a description of the organisation and methods of the FSEs, and a brief outline of the debate up until September 2000, when the last interviews for this research were conducted. The chapter concludes by presenting the findings and recommendations of social science research that considered public attitudes to GM crops in the 1990s. To supplement this chapter, a more detailed chronology of the events that emerged between 1996 and December 2001 is provided in appendix 1.

Creating GMHT Crops

Genetic modification involves the transfer of genetic material from one organism to another, regardless of their sexual compatibility. For example, a flounder fish gene could be inserted into a tomato to give the tomato frost resistance, or a jellyfish gene could be inserted into a wheat plant to make the plant luminous. In theory, any characteristic from any organism can be incorporated into that of another by using genetic modification. The first successfully modified organism was a GM bacterium, created by Stanley Cohen in 1973. This was followed, in 1982, by the modification of plant cells, which were grown into whole plants during the following year. Two years later, in 1985, scientists at Monsanto announced that they had successfully modified crop plants that could resist Roundup herbicide (Monsanto, 1997).

The herbicides that GM crops have predominantly been made resistant to are glyphosate (trade name 'Roundup') and glufosinate ammonium (trade name 'Liberty Link'). These

herbicides are called 'broad-spectrum' herbicides because, unlike other herbicides that kill only a narrow range of weeds, they kill almost anything green. Their role in the past has been to 'clean' fields prior to sowing, after which time combinations of other herbicides are used to combat weeds without killing the crop. With the advent of GM crops resistant to glyphosate and glufosinate ammonium, it is now possible to use just glyphosate or glufosinate ammonium both before and after sowing the crop.

Throughout the world there are now many different GMHT crops being grown commercially, including soybeans, maize, cotton, oilseed rape, sugar beet and fodder beet. These have made up a large proportion of the total area under GM crops, which has expanded from 1.6 million hectares in 1996 to over 50 million hectares in 2001 (SCIMAC, 2002). In the UK, the GMHT crops being grown in the farm-scale evaluations are fodder beet and sugar beet resistant to glyphosate, and maize and oilseed rape resistant to glufosinate ammonium. In the case of GMHT oilseed rape, this crop has been grown in field trials in the UK since 1988, and is widely cultivated in North America (DEFRA, 2001). However, none of these crops has yet attained full commercial status within the EU, as explained in the following section.

To understand how GMHT crops were produced, it is necessary to understand some basic cell biology. Unlike single-celled organisms, such as amoeba and bacteria, plants and animals are made up of millions of cells that form tissues, organs and structures such as bones or fruit. Within each of these cells there is a vast amount of coded information that specifies the precise chemistry of the organism and its pattern of development (Fincham and Ravetz, 1991). This information is stored on a long spiralling structure known as the 'double helix', which was first recognised by Watson and Crick in 1953 (McHughen, 2000). The great length of this structure means that it could become knotted or broken if it was stored in one piece. It is therefore split into several parts and carefully stored in bundles known as chromosomes (Steinbrecher, 1998).

The structure of the double helix comprises two long strands that twist around one another. These are joined with 'rungs', which are made out of two of four possible chemicals, represented by the letters A, C, G and T. The order of these letters spells instructions for making amino acids, which in turn link up to form particular proteins. It takes approximately 1000 letters to spell the code for a protein, and each protein has a specific function, such as muscle fibre, growth hormone, insulin or digestion enzyme. The section of DNA that codes for any particular protein is called a gene, and there are tens of thousands of genes in animals and plants (McHughen, 2000).

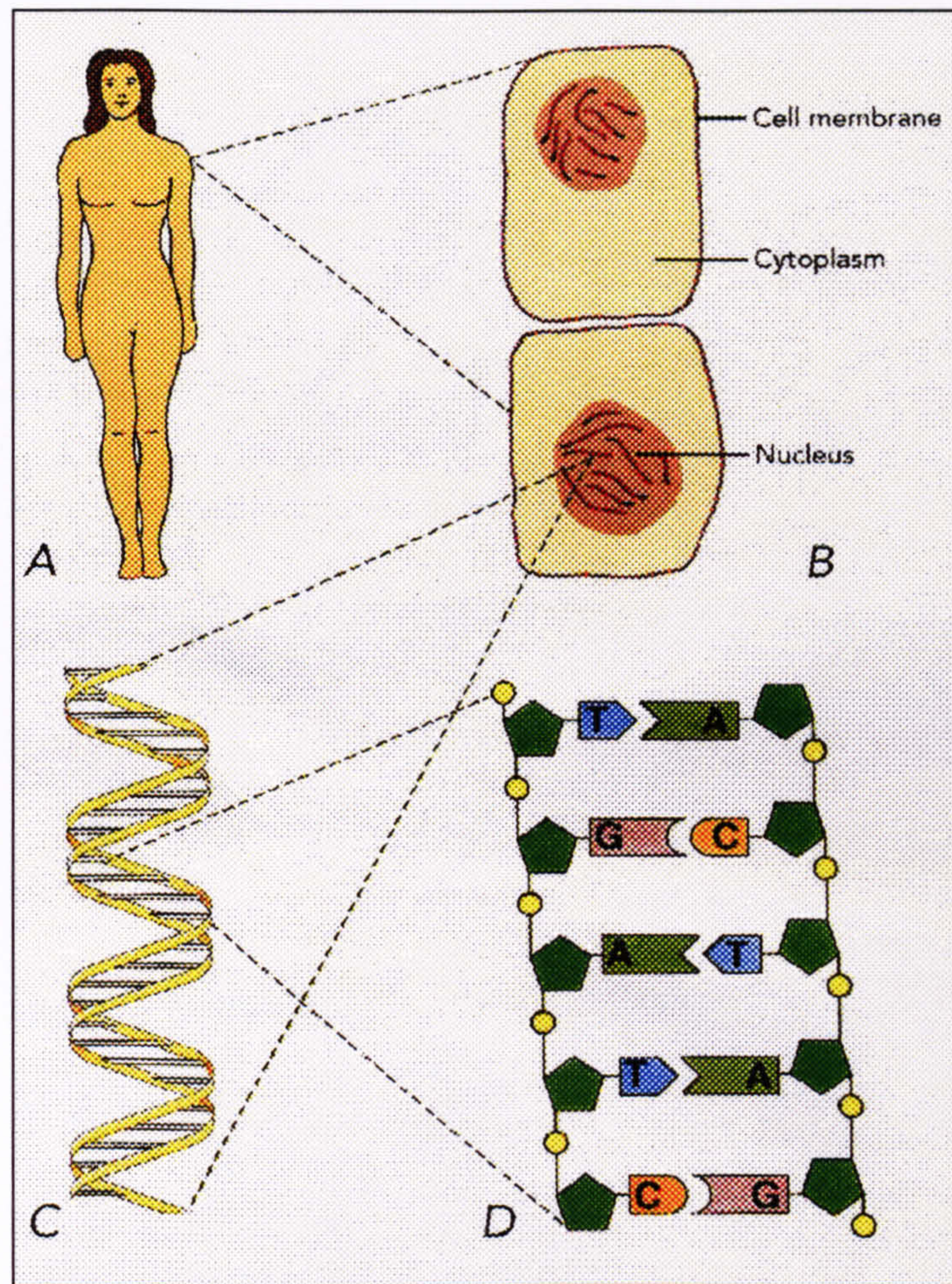


Figure 2.1. Diagram showing a simplified cell structure (A), the chromosomes within the nucleus (B), the structure of the DNA in the chromosomes (C), and the bases or ‘rungs’ of the DNA, represented by the letters A, C, G and T (Straughan and Reiss, 1996).

Each gene has three basic parts: the promoter, the amino acid sequence and the terminator. At the front of the gene is the promoter. This is the switch that activates protein synthesis, and in turn causes the gene to be ‘expressed’. Some genes need to produce protein constantly, but others are only activated by environmental factors such as light, heat or a particular chemical, or by a certain stage of an organism’s life. This means that at any one time not all genes are expressed by an organism. Furthermore, not all genes are expressed by all cells. For example, the liver requires different proteins to the brain, while roots need different proteins to leaves. Depending upon their location therefore, cells use different parts of the genetic information, even though every gene is present in the nucleus of every cell (Steinbrecher, 1998). Further along the gene, there is a sequence of DNA that translates into an amino acid sequence for protein production, as described above. This is then followed by a sequence called the terminator, which signals the end of the gene (McHughen, 2000).

In the case of the GMHT crops grown in the farm-scale evaluations, the genes conferring herbicide-tolerance have been acquired from bacteria. Although these genes come from a very different organism, their DNA sequences are well recognised by the crop plants. However, the promoter sequences belonging to the bacterium's herbicide-tolerance gene are not recognised by the crop plants. This is a common trait of promoters, which are known to be very host-specific. Scientists therefore attach a more recognisable promoter to the gene so that it can be expressed. In many cases this is a viral promoter, such as the figwort mosaic virus promoter in the case of GMHT sugar beet and fodder beet, or the cauliflower mosaic virus promoter in the case of GMHT maize (GeneWatch UK, 2000). These are used because viruses are already very adept at attacking cells and integrating their information into foreign organisms (Fincham and Ravetz, 1991; Steinbrecher, 1998).

When transferring a gene from one organism to another, it is necessary to see which plant cells have acquired the new material through genetic modification, and which have not. In order to detect a successful transfer therefore, a marker gene is used. For example, GMHT sugar beet contains the GUS gene from *E.coli*, while GMHT maize contains a disrupted copy of an antibiotic (ampicillin) resistance gene. These genes enable scientists to detect whether plant cells have acquired the new genetic material, either because the cells change colour when particular chemicals are broken down, or because they survive an application of ampicillin. Other DNA sequences can also be added alongside the desired gene, such as a gene from the pea plant, which increases the activation of herbicide tolerance (GeneWatch UK, 2000). The final sequence of DNA incorporated into a GM crop can thus originate from a wide range of organisms. For example, the genes incorporated into the GMHT oilseed rape and maize grown in the farm-scale evaluations are:

Glufosinate-tolerant Oilseed rape (Aventis)

- PSsuAra – promoter gene from thale cress (*Arabidopsis thaliana*)
- *bar* – the glufosinate tolerance gene from *Streptomyces hygroscopicus*
- 3'g7 and 3'nos – from the bacterial vector *agrobacterium tumefaciens* (remnant material from the vector used to transfer the genes)
- PTA29 – promoter gene from tobacco (*Nicotiana tabacum*)
- *barnase* and *barstar* – the male sterility and fertility restoration genes from the bacterium *Bacillus amyloliquefaciens*

(GeneWatch UK, 1999)

Glufosinate-tolerant Maize (Aventis)

- *pat* – gives tolerance to glufosinate (of synthetic origin but identical to *pat* gene of *Streptomyces viridochromogenes*)
- cauliflower mosaic virus 35 S promoter and terminator genes
- disrupted copy of the ampicillin resistance gene under control of bacterial regulatory sequences
- origin of replication sequence from the pUC plasmid

(GeneWatch UK, 1999)

In order to insert these gene sequences into a plant cell, it is first necessary to place them in a ‘package’. The package that scientists use is a ring of DNA called a *plasmid*, which is found in bacteria and some other organisms. The plasmid is cut open using enzyme ‘scissors’ (also used to remove DNA sequences from other organisms) so that the required DNA can be placed inside and sealed in using another enzyme. Once within this ring, the selected DNA can be introduced into a bacterium where it lives as a plasmid. Overnight the bacterium will replicate to produce millions of copies. However, it can also be frozen until it is needed (Brown, 1995; McHughen, 2000).

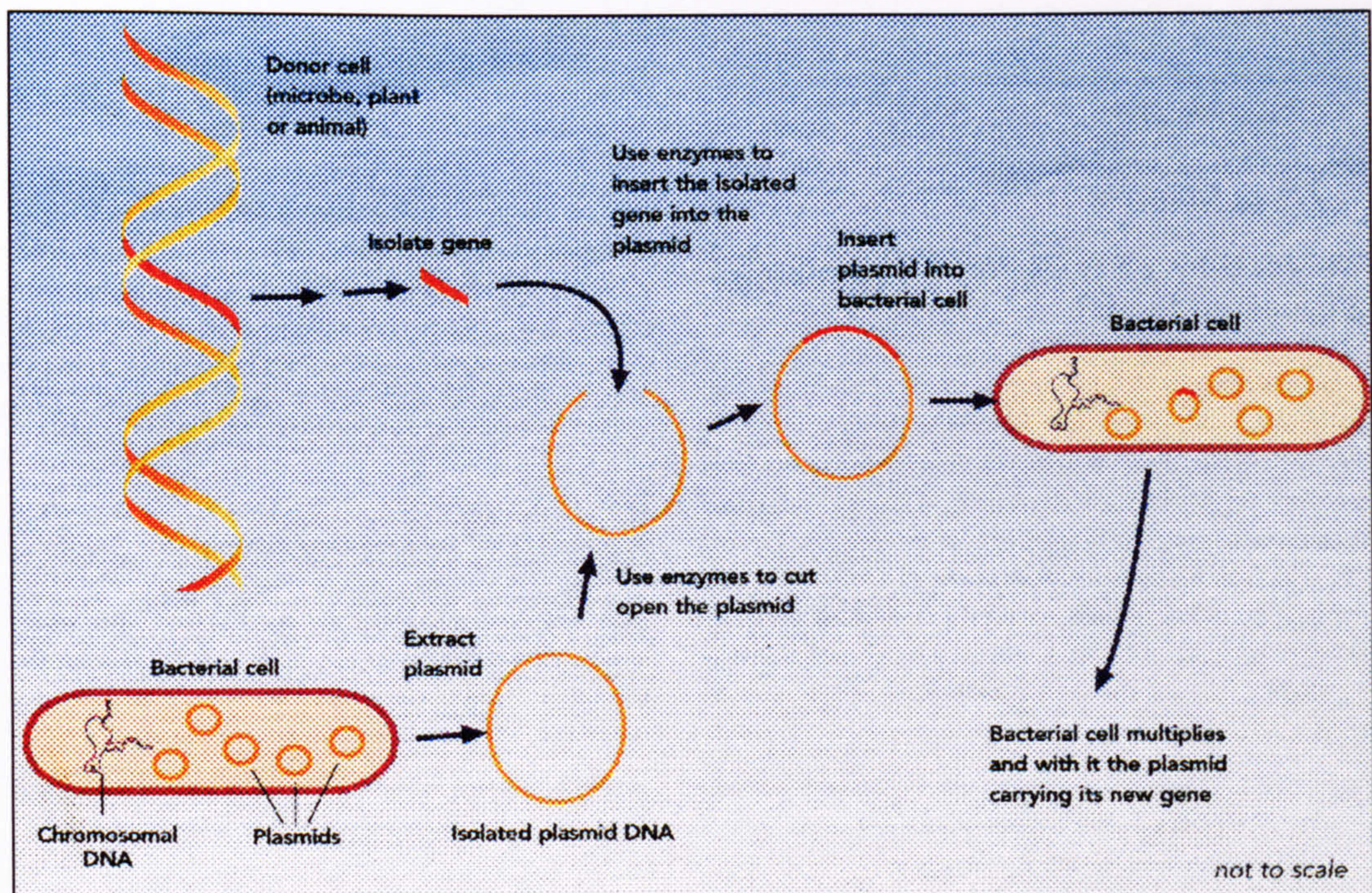


Figure 2.2. Diagram showing plasmid production (BBSRC, 1996: 17)

When the DNA is required, copies of the plasmid are extracted from the bacteria, and inserted into plant cells using one of two procedures. The first involves extracting the desired DNA from the plasmid rings, attaching it to microscopic gold or tungsten pellets, and shooting these into plant cells using gunpowder or helium gas. As the pellets move through the cells, the DNA becomes unstuck and finds its way into the cell nucleus (McHuguen, 2000). More commonly however, a soil microbe called *Agrobacterium tumefaciens* is used. This microbe attaches itself naturally to plant injuries close to the soil surface, and transports some transfer-DNA (t-DNA) through a tunnel from the bacterium cell to the plant cell. This t-DNA then goes to the nucleus of the plant cell, where it subverts the plant to produce substances that are useful to the bacteria, such as particular nutrients. As a result, the plant becomes diseased and exhibits galls. However, by disarming the bacterium of its harmful DNA, scientists have been able to introduce human-made DNA plasmids (described above) into the *Agrobacterium*. These *Agrobacterium* are applied to plant cells, where they insert the required DNA from the plasmid into the cell's nucleus (McHuguen, 2000). With either technique, a single plant cell is made to incorporate new genetic material. This can then be induced to regenerate into a whole plant, which can then be cloned or crossbred to produce more plants with the new genes in. Both techniques are illustrated in Figure 2.3 on the next page.

UK Regulations

Prior to developing GM plants in the EU, it is necessary to register each laboratory concerned under the Genetically Modified Organism (contained use) regulations 1992 (amended 1996 and 1998). These regulations require that each registered centre has a Genetic Modification Safety Committee, which reviews and advises upon future research proposals prior to submitting notification of these to the Health and Safety Executive (HSE). Each notification is reviewed by the HSE and also the Department for the Environment, Food and Rural Affairs (DEFRA), the Department of Health, the Scottish Office and the Welsh Office, as appropriate. An independent advisory committee, the Advisory Committee on Genetic Modification (ACGM), may also be consulted (Royal Society, 1998).

Once a GM plant has been developed and tested in containment, it is necessary to monitor how well it performs in an agricultural setting. Before undertaking these tests, consent must first be obtained under the UK Genetically Modified Organisms (Deliberate Release) Regulations 1992 (amended 1995 and 1997), made under Part VI of the Environmental Protection Act 1990. These regulations are the UK's implementation of the European

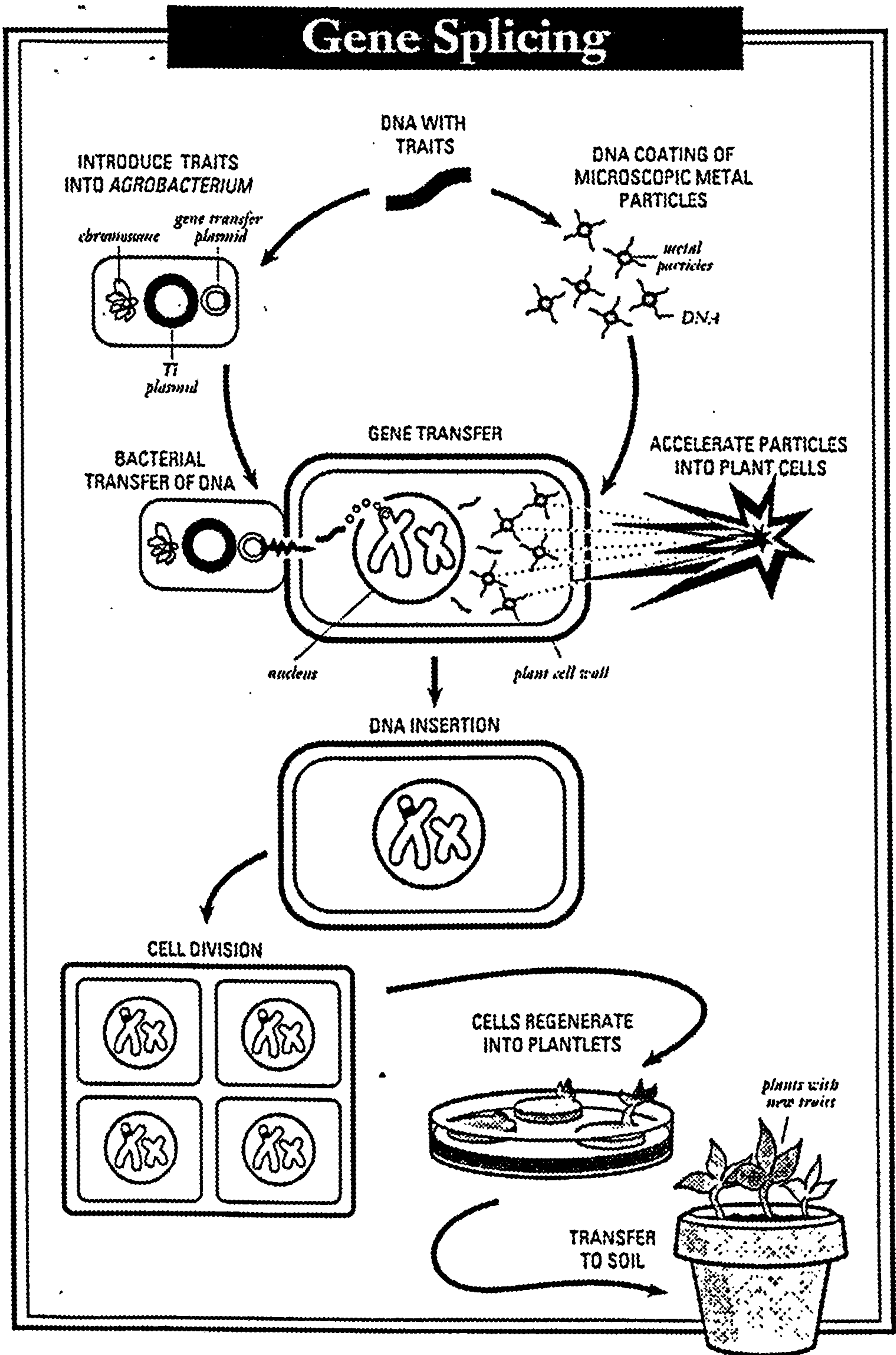


Figure 2.3. Diagram showing two common methods of gene insertion (Monsanto, 1998)

Union's Deliberate Release Directive (90/220/EEC), which is designed to ensure that full risk assessments are undertaken prior to releasing any GM material to the environment¹. Applications for an experimental release are submitted to the Secretary of State for the Environment (currently within DEFRA) under Part B of the regulations. Each submission must include a technical dossier outlining information on the GMO, the nature of the release, the environment that will be exposed and the likely risks to human health and the environment. Further information concerning monitoring, control measures, waste treatment and emergency responses may also be requested.

After a period of 90 days, the dossier is reviewed by the Advisory Committee on Releases to the Environment (ACRE), which then advises the Secretary of State for the Environment. Of key importance to ACRE are the following considerations (MacLeod and Cooper, 1999):

- Do the inserted genes make the modified crop more persistent?
- Do the inserted genes make the modified crop more invasive?
- Do the inserted genes make the modified crop more undesirable to living organisms or the environment?
- Could the inserted genes be transferred to other organisms?

If the Secretary of State is satisfied with the proposed release, a summary of the application is circulated to other Member States, whose comments must also be considered. Approval can then be granted for all or some of the sites outlined, with or without specific conditions. HSE inspectors then survey trial sites at a later stage. In some cases notification can take less than 90 days. For example, 'fast track' procedures can be used when sufficient experience has been gained with a crop species and the inserted gene. In these circumstances the notification period is reduced to 30 days. 'Simplified procedures' can also be used, which enable the applicant to outline only one site in the main application, but to add others up to 15 days before each proposed release takes place (Royal Society, 1998).

Once environmental monitoring is complete, it is necessary to apply under Part C of the Deliberate Release Regulations, so that the variety can be marketed for cultivation purposes. In addition to the information required for Part B, the regulations require information about the ecosystems that could be affected, certain conditions (such as use, handling, labelling and

¹ Directive 90/220/EEC will be replaced by Directive 2001/18/EEC in October 2002. This is intended to set common principles for risk assessment, simplify procedures when justified, and make the process more transparent (AEBC, 2001a: 71-72).

packaging) and any information derived from field trials either in Europe or elsewhere. After a period of 90 days, the application is assessed by ACRE, and then considered by the Secretary of State for the Environment. If it is decided that consent should be granted, the application is sent to the European Commission and all other Member States, where it is reviewed over a period of 60 days. After this time, if the majority conclude that the application should proceed, the Member State that received the original application grants consent to market throughout the EU. Those members who wish to restrict or prohibit the product, can only do so when representatives of Member States agree that they have justifiable reasons to believe that it constitutes a risk to human health or the environment. This also means that if new scientific information emerges, a Member State may restrict its use or sale, pending a decision at EU level (Bosworth, 1998).

Once a Member State has given a GM crop market consent therefore, it has market consent throughout the EU (unless specific restrictions have been put in place). This means that the crop can be grown on any EU site without prior notification. However, it cannot be sold for cultivation until it has been listed on either the EU Common Catalogue of Varieties or the country's own National Seed List (the same applies for conventional crops). The seed lists require that a new crop is tested by a recognised independent body, which in the UK is the National Institute of Agricultural Botany (NIAB). First, *DUS tests* (Distinctiveness, Uniformity and Stability) are carried out, which establish that there is something different about the crop, that the plants are all the same, and that the characteristics are constant. These tests are undertaken for a period of two years, after which time *VCU tests* (Value for Cultivation and Use) are undertaken to compare the new variety with existing ones. These tests determine whether the crop shows a real improvement, which does not necessarily have to be yield (BSPB, no date). If the tests are successful, a period of notification is provided so that individuals can lodge objections, which must be considered prior to granting approval. In the case of herbicide-tolerant crops, approval must also be sought for a change of use for glyphosate and glufosinate ammonium under the Control of Pesticides Regulations 1986.

If the crop is to be consumed, it must undergo further tests that comply with the requirements of the EU's Novel Food Regulation 258/97. Applications to produce food are sent to the Food Standards Agency, and reviewed by government departments, the Food Advisory Committee (for advice on labelling), the Committee on Toxicology and, most importantly, the Advisory Committee on Novel Foods and Processes (ACNFP). The approach is based upon the concept of *substantial equivalence*, which was devised by the UN Protein Advisory Group in 1982 as a way to combat the technical difficulties associated with testing whole or complex foods (Perry, 2001). Rather than testing every characteristic of the new food, it is compared with its

conventional counterpart using various agronomic, biochemical, chemical and nutritional parameters. This includes testing for known toxins in that food group and assessing the risks posed by antibiotic marker genes if present. The food is then placed in one of three categories: substantially equivalent (no more information required), different only in the modified characteristic (the new protein is evaluated for potential allergens and toxins), and not substantially equivalent (more tests required). Products made of these foods are then labelled 'contains genetically modified food' if they have at least 1% content. If production processes are considered to remove the protein and DNA however (such as in the case of vegetable oil), the product does not have to be labelled.

The legal status of GMHT crops and herbicides used in the FSEs is as follows (DETR, 2001):

Oilseed rape

There are two types of oilseed rape in the trials. One, named 'MS1RF1', was issued consent for seed production under Part C of Directive 90/220 by the UK in 1996. This oilseed rape was also approved by Member States for general cultivation and animal feed in 1997. However, the French Authorities, to whom the application was made, did not issue the consent. UK National Seed List trials are complete and the oil is approved for food use. The other oilseed rape, named 'MS8RF3', was in the final stages of the Part C consent and the National Seed List trials when the FSEs were announced in October 1998.

Maize

The GMHT maize used in the FSEs is called 'T25'. It was granted Part C consent for import, cultivation and animal feed by the French Authorities in 1998. Aventis tried to get a variety of T25 maize, called 'Chardon LL', listed on the National Seed List in September 2000. However, during the hearing it was discovered that testing was not complete. A further hearing took place in May 2002.

Sugar and fodder beet

GMHT sugar and fodder beet have been extensively trialed in the UK. They are both awaiting Part C approval for commercial cultivation.

Glyphosate and glufosinate ammonium

Following the advice of the Advisory Committee on Pesticides, ministers have given specific approvals, under the Control of Pesticides Regulations 1986, for the use of these herbicides within the FSEs. However, they will not be given full commercial approval until after the FSEs are complete.

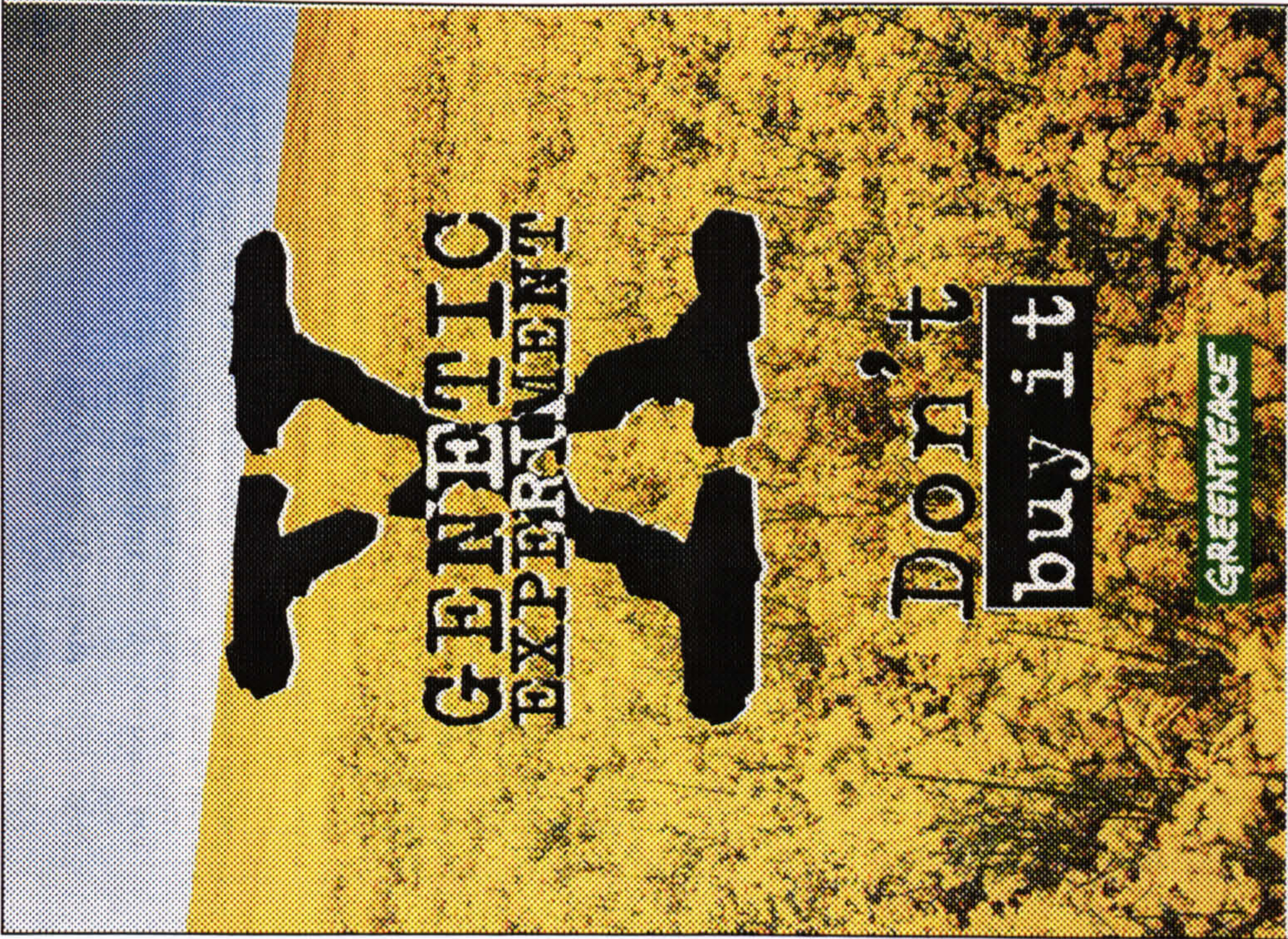
The Emergence of the GM Crop Debate

Concerns about biotechnology have been evident since its development in the early 1970s, when Paul Berg, a leading microbiologist in the US, called for a moratorium until the possible hazards had been evaluated and discussed (McHughen, 2001; Rifkin, 1998). In Britain however, the public debate about genetically modified food did not truly emerge until 1996, when Roundup Ready soybeans were cleared for importation into the EU. These crops had been grown in the US where they appeared to be causing little concern (Blumenthal, 1998), but when they were imported to Britain they sparked what was to become a massive controversy.

Interestingly, two GM products had already been sold quite successfully in the UK. The first was a vegetarian cheese containing GM chymosin, which had been introduced to supermarkets in 1992, and the second was a GM tomato puree, clearly labelled as such, which had been outselling rival brands since its introduction in 1995 (FoodFuture, 1998). It was only when GM soya beans started to arrive in Europe, during the autumn of 1996, that opponents successfully launched their campaign. Immediately Greenpeace prevented ships from docking, first in Belgium and then in Liverpool (Greenpeace, 1996). Campaigners also handed out leaflets to shoppers (for example, see figure 2.4) and disrupted checkouts by insisting that they would only purchase items that were guaranteed to be GM-free (being unlabelled they were difficult to differentiate). Since soya was such a widely used ingredient, it was feared that soon 60% of processed foods would contain GM material.

When approving GM soybeans for food use in February 1996, the EU also granted Plant Genetic Systems (PGS, now part of Aventis) permission to grow a GMHT oilseed rape for seed production purposes. For campaigners this meant that transgenic DNA could soon be polluting the UK environment as well as the food chain. Indeed, in January 1997, PGS's GMHT oilseed rape was authorised for general cultivation, animal feed and food use in the EU, as was Ciba Geigy's herbicide and insect-resistant GM maize. However, the French Authorities (to whom PGS had applied) withheld consent. Nevertheless, the growing number of campaigners were aware that small trials of GM crops were growing throughout the UK, and so started to destroy them, as individuals from Chichester described:

'On the dark of the moon in the pouring rain with the wind in our favour we joyously slopped through two fields towards our first test site disarmament. Our methods included pulling up and stomping on the crop but we later settled on our preferred method of rolling around [...]. After about an hour and with approx. 25% of the



Don't become a part of the Genetic Experiment

Our food is being tampered with in a way that it never has been before. In a global experiment with nature and with human health, scientists are taking genes from one species and putting them into another. No one knows the long-term effects of releasing this completely new genetic material into the environment or into the food chain.

Genetically manipulated soya and maize are the first two crops to be grown on a large scale and put into a wide range of everyday foods (things like bread, margarine, biscuits, cakes and chocolate). There is no benefit to consumers from these crops. Your food won't taste any better, it won't be healthier and it won't cost less. The profits from the genetic experiment go to the multinational companies who are conducting the experiment, **but the risks are borne by us and our environment.** Above all, many of the products containing genetically engineered soya will not be labelled. So, unless you are able to buy organic products, which are guaranteed not to have been genetically manipulated, you may not even know whether you are eating it or not.

The Austrian Government is taking unilateral action to ban releases of genetically manipulated organisms. The UK Government have the legal power to do the same under Article 16 of Directive 90/220.

We urge everyone who cares about what they eat to write to:

The Rt Hon John Gummer MP
Secretary of State for the Environment,
Department of the Environment,
2 Marsham St, London SW1P 3EB.

AND send a Copy of your letter to:

Angela Browning MP,
Ministry of Agriculture, Fisheries and Food,
Whitehall Place, London SW1A 2HH.

The Genetic Experiment - Don't Buy It!

*For more information, contact:
Greenpeace, Canonbury Villas, London N1 2PN.*

Figure 2.4 Leaflet distributed by Greenpeace campaigners to encourage consumers to demand GM-free food.

site disarmed we were interrupted by a flash of light from the farmhouse, so we left, having hopefully destroyed enough of the crop to render the experiment useless.”

(GEN, 1997)

In July 1997, the Ministry of Agriculture Food and Fisheries (MAFF, now part of DEFRA) announced a new discussion paper entitled: ‘Weed Control on the Farm: Management of Genetically Modified Herbicide-Tolerant Crops’. This was published ‘to stimulate discussion on the introduction of GMHT crops and on possible strategies to tackle agricultural problems that may arise’ (MAFF, 1997). Meanwhile, Greenpeace published their first report on GMOs, entitled ‘From BSE to Genetically Modified Organisms: Science, Uncertainty and the Precautionary Principle’ (Greenpeace, 1997a). This was later followed, in October 1997, by a report entitled ‘Genetic Engineering: Too Good to go Wrong?’ which outlined twelve incidents where genetic engineering had apparently failed (Greenpeace, 1997b). As the protests continued, media coverage about unlabelled GM ingredients, failing GM crops in the US (Lean, 1997) and the ecological concerns of English Nature (Hencke, 1997) soon became prevalent, as did the demand for GM-free food.

In January 1998, MAFF announced that it had received 300 responses to its discussion paper on GMHT crops, and the EU considered labelling requirements for GM foods. In addition to the pressures applied by environmental NGOs, various non-campaigning organisations also started to voice their concerns. The British Medical Association for example, announced that better risk assessments and a ban on antibiotic-resistant markers were required (BMA, 1998), while British Sugar and Iceland Frozen Foods stated that they would not use GM produce (Griffiths, 1998; Iceland, 1998). By June 1998, Prince Charles had also entered the debate, announcing that he supported the Soil Association’s aim to remove all GM ingredients from supermarket shelves. His articles in *The Daily Telegraph* on June 8th, and in the *Daily Mail* in June 1999, were considered to be very much in line with popular opinion (Prince Charles, 1998; 1999; Sylvester *et al*, 1999).

Also during 1998, activists initiated a campaign called ‘GenetiX Snowball’, for which a handbook detailing how to ‘decontaminate’ plots of GM crops was published in September (GenetiX Snowball, 1998). As time progressed, activist tactics became more overt (for example, Carroll, 1998), while other campaigners continued to write letters, distribute leaflets and discuss issues with farmers. One case that received a considerable amount of media attention in 1998 was that of organic farmer Guy Watson, who sought a High Court injunction to prevent the cultivation of GMHT maize two kilometres from his land. When his case failed in July, it was reported that protestors destroyed the crop for him (Gibbs, 1998).

With such a dramatic reaction to the introduction of GMOs, Monsanto publicly apologised for the way that Roundup Ready soybeans had been imported into the UK (for example, the UK Farmers Guardian, 1998). They then launched a £1 million advertising campaign, which enabled them to put across their own point of view in newspapers and magazines throughout the summer (for an example of these adverts see figure 2.5). It was also reported that the biotechnology industry requested that the locations of crop trials be withheld, since a large number of trial sites had now been damaged (Brown, 1998). However, both the advertising campaign and the request to withhold information failed. In June 1998 it was announced that 77% of the British public felt that growing GM crops should be banned (GeneWatch, 1998), and by August media stories about biotechnology had become a daily occurrence.

In July, the French Authorities ordered a two-year moratorium on GMHT oilseed rape (Emmott, 1999), and English Nature again announced their concerns about the effects of GMHT crops upon farmland biodiversity (English Nature, 1998). The British media grasped these stories, reporting that farmland birds could be 'wiped out' (Vidal, 1998), and that 'superweeds' could develop (Radford, 1998). However, it was the media coverage of Arpad Pusztai's research that really fuelled public concern, since it suggested that rats fed with GM potatoes for 110 days gained less weight and became less resistant to infection (for example, Hawkes, 1998a). As a result of disclosing information prior to peer review, Pusztai was suspended, while his superiors insisted that he had wrongly interpreted his data (for example, Hawkes, 1998b). During the same month it was also announced that beekeepers were concerned that honey bees would obtain GM pollen from tests plots, which could then get into honey (Craig, 1998).

The Farm-Scale Evaluations

As the controversy continued in October 1998, officials from the DETR consulted with representatives from either side of the debate. Their discussions focused upon the legality and terms of a possible moratorium, and the extra research that might be required prior to the commercial release of GMHT crops. Over the summer, the House of Lords Agriculture Select Committee also met with a wide range of individuals involved in the debate (House of Lords, 1998). The government was therefore able to consider a broad base of evidence, from which it devised a strategy that it believed could 'strengthen and improve the assessment of GM crops and the decision making process' (DETR, 2001).

IF IT WEREN'T FOR SCIENCE,
HER LIFE EXPECTANCY
WOULD BE 41 YEARS.



IN Britain, reaching forty little more than a century ago was a major achievement. Vaccinations and developments in medicine have increased our life expectancy beyond our great grandparents' dreams.

But with each new scientific breakthrough, there is always concern. Is it safe? Is it ethical? Should it be trusted? Perhaps it is human nature always to distrust new scientific advances, just because they are new.

A recent example, plant biotechnology, is currently (and rightly) the object of such scrutiny. At Monsanto, we believe plant biotechnology produces better crops, like potatoes, soybeans and corn.

These require less pesticide application, conserving scarce resources and reducing the cost to both the farmer and the environment.

Naturally, the produce of our technology is thoroughly tested for human and environmental safety. In fact, biotechnology crops undergo stringent safety testing where 'standard' ones are often not tested at all. So far, the government regulatory agencies of over 20 countries have approved Monsanto crops.

We hope you too will welcome biotechnology when you know the facts. Please ask for a leaflet at your local supermarket, write to us, call 0800 092 0401 or visit our website at www.monsanto.co.uk.

MONSANTO
Food · Health · Hope



We urge you not just to accept our word on plant biotechnology. Contact Greenpeace at 0171 865 8222 and at www.greenpeace.org.uk, or Food for Our Future at www.foodfuture.org.uk.

Figure 2.5 An advert published by Monsanto during 1998.

It was decided that a moratorium could not be introduced, because GM crops could only be revoked if new evidence had emerged under Directive 90/220 (DETR, 2001). However, a voluntary agreement was reached with members of the Supply Chain Initiative on Modified Agricultural Crops (SCIMAC),² who agreed to delay the wide-scale planting of GM crops for one year. In October 1998, it was announced that a programme would be established to assess the ecological effects of GMHT crops compared with comparable plantings of conventional crops. The aim was thus to consider the issues that had concerned English Nature. The government also announced that there would be a new cabinet committee, which would consider the wider issues through a stakeholder forum (Barclay, 1999: 12-13).

Having announced these measures, DETR scientists drew up a specification for the ecological studies, which became known as the farm-scale evaluations. The hypothesis to be tested was:

'There are no significant differences between the biodiversity associated with the management of the particular GMHT crops and the comparable non-GM crop at farm scale.'

The DETR also asked ACRE for advice on how the management of GMHT crops could be taken into account during the approval process. An ACRE sub-group was established, chaired by Professor John Beringer, which published a discussion paper on the potential wider impact on farmland wildlife in February 1999 (ACRE, 1999). At this time Michael Meacher declared that GMHT crops would not be grown until the government was convinced that GMHT crops do not damage wildlife (DEFRA, 2001).

On April 15th, it was announced that the research contracts were awarded to a consortium led by the Institute of Terrestrial Ecology (ITE, now the Centre of Ecology and Hydrology: CEH), and including the Institute of Arable Crops Research (IACR) and the Scottish Crop Research Institute (SCRI). According to English Nature, the small-scale and short duration of the farm-scale evaluations was a cause for concern (Anon, 1999). However, by May 25th the government had appointed an independent Scientific Steering Committee (SSC), whose members included representatives of English Nature, the RSPB and the Game Conservancy Trust (see table 2.1).

² SCIMAC was established in June 1998 to represent organisations within the farm supply chain (British Society of Plant Breeders, British Agrochemicals Association, National Farmers Union, UK Agricultural Supply Trade Association and British Sugar Beet Seed Producers Association).

Professor Christopher Pollock (Chair)	Research Director of the Institute of Environmental Environmental and Grassland Research
Professor Mick Crawley	Imperial College
Dr. David Gibbons	Head of Conservation Science, RSPB
Dr. Nick Sotherton	Director of Research, Game Conservancy Trust
Dr. Nicholas Aesbischer	Director of Biometrics, Game Conservancy Trust
Dr. Jim Orson	Director of Morley Research Centre
Dr. Alastair Burn	English Nature

Table 2.1. Members of the Scientific Steering Committee

Members of the SSC were required to oversee the research programme, by providing advice on sampling methodologies, data analysis, publication of results and eventually the outcome of the research. All members were expected to attend regular meetings, as were representatives of government departments funding the studies, SCIMAC, and Dr. Brian Johnson of English Nature, who each supplied additional information as required. The research consortium was asked to submit half-yearly reports to the Committee, which are published on the DEFRA website (www.defra.gov.uk), as are the minutes of all SSC meetings.

In May 1999, SCIMAC's 'Guidelines for growing newly developed herbicide tolerant crops' were also published. These include advice on crop planning, preparation for planting, crop management, harvesting, monitoring and record keeping (SCIMAC, 1999). Perhaps most significantly however, they defined the separation distances that must be observed when growing GMHT crops, as outlined in table 2.2 below. These distances, or buffer zones as

Crop type	Certified seed crops (same species)	Registered organic crops (same species)	Non-GM crops (same species)
Oilseed rape	200m	200m	50m
Sugar beet	600m	600m	6m
Fodder beet	600m	600m	6m
Forage maize	200m	200m	200m sweetcorn 50m forage maize

Table 2.2. SCIMAC separation distances for GMHT crops (SCIMAC, 1999)

they are sometimes called, have become a source of much contention. Nonetheless, they have been supported by organisations such as English Nature, who state that they are adequate for the purposes of the farm-scale evaluations, although they may need to be reviewed prior to commercialisation (Clover, 1999).

Despite the introduction of the farm-scale evaluations, and perhaps because of them, the campaign against GM crops has continued. In February 1999 the Five Year Freeze campaign was launched, signed by forty organisations 'that share the public's deep concern about genetic engineering in food and farming' (Five Year Freeze, 1999). These organisations included Friends of the Earth, The Council for the Protection of Rural England, Christian Aid, the Local Government Association (Public Protection Committee) and the Townswomen's Guild, who all agreed that the following needed to be developed:

- A system where people can exercise their right to choose products free of genetic engineering;
- Public involvement in decisions on the need for and regulation of genetic engineering;
- Prevention of genetic pollution of the environment;
- Strict legal liability for adverse effects on people or the environment from the release and marketing of genetically modified organisms;
- Independent assessment of the implications of patenting genetic resources;
- Independent assessment of the social and economic impact of GE on farmers.

A few months after the Five Year Freeze campaign was launched, seven trial sites were planted in the spring as part of a pilot for the FSEs. Each trial had one of three crops: spring oilseed rape, winter oilseed rape or maize. However, by early June one of these trials had already been destroyed, this time by the farmer, who had apparently been advised by the Soil Association that another part of his farm could lose its organic certification as a result (Fleet, 1999). Over the coming months other trials were damaged by protesters, many of whom now acted under the name of GenetiX Snowball (GenetiX Snowball, 1998). However, one of the most high profile cases involved 28 members of Greenpeace (including the Director, Lord Melchett) who damaged a 6-acre crop of GM maize in Lyng, Norfolk, at the end of July, as reported by Vidal (1999). According to media reports, such actions prompted the government to consider keeping site locations secret (Waugh and Arthur, 1999), or making one tightly controlled GM testing zone (Newton, 1999a). Nevertheless, in August 1999 four sites for winter oilseed rape were announced for the FSEs, although a farmer soon withdrew one of these, as Derbyshire (1999) reported.

Throughout 1999, various claims were made in the media, which described how pollen could survive in the gut (BBC News, 1999a), how independent scientists backed Pusztai's research (BBC News, 1999b), how industry had failed to comply with the conditions of experimental releases (Lean, 1999), and how GM crops could be linked to meningitis (Wilson, 1999). One of the more common stories however, was that the separation distances set by SCIMAC were too small. The focus of this story was upon the publication of two reports. The first was conducted by the John Innes Centre on behalf of MAFF, which concluded that 1% of organic crops in any field could become GM hybrids through cross-pollination (Moyes and Dale, 1999). The second was undertaken by the National Pollen Research Unit on behalf of FOE, and found pollen from GM oilseed rape over 4.5km from the nearest FSE site (FOE, 1999b).

In October 1999, members of the Scientific Steering Committee met to discuss the sampling protocols, as reported in their minutes on the DEFRA website (DEFRA, 1999a). According to these minutes, members were generally satisfied with the sampling protocols, but recommended a number of minor improvements. These included the use of split fields, the exclusion of earthworm sampling, the representation of a good range of farm types and a few other improvements that had yet to be finalised. In November, the government then renewed the agreement with SCIMAC, and announced that there would be no unrestricted cultivation of GM crops until the FSEs were complete in 2003. It was assured that produce from GM crop plantings would not be used in a way that could be of direct commercial benefit to the consent holders, and that plantings would be limited to between 20-25 sites per crop, totalling no more than 200 hectares spread throughout the country. It was also agreed that sugar beet and fodder beet would also be trialed (DEFRA, 1999b).

By the end of December 1999, the first interim report was published, within which the methodology was outlined (DEFRA, 1999c). In assessing biodiversity, it was recommended that the research should focus upon species groups that are indicative of long-term change higher up the food chain, such as weeds, seeds, snails, caterpillars and beetles, as presented in table 2.3. In February 2000, it appeared that SCIMAC could not provide enough sites for the FSEs. A minimum of 12-15 sites per crop was therefore agreed by the SSC, on the condition that larger samples would be obtained during the following two years (DEFRA, 2000a). These smaller quotas were filled by March, when it was agreed that the experimental protocols for all the spring-planted crops were now in place. Following criticisms during the pilot studies, the SSC also considered proposals to look at gene flow monitoring and the effects on farmland birds and mammals (DEFRA, 2000b). It was later decided that gene flow monitoring for maize and oilseed rape would be undertaken by the Central Science Laboratory, cross-pollination with wild relatives of oilseed rape would be looked at by CEH,

and the effects on birds and mammals would be considered by the British Trust for Ornithology. However, following the pilot study, this latter piece of research was cancelled.

<p>Soil seed bank;</p> <p>Arable plants: diversity, biomass and estimated seed return;</p> <p>Field margin and boundary vegetation: noting species in flower and signs of unintentional spray drift of weed-killer during its application to the field;</p> <p>Gastropods (slugs and snails): abundance, activity and diversity measures;</p> <p>Arthropods (especially insects and spiders) on vegetation: concentrating on plant bugs (Heteroptera), spring tails (Collembola), and the caterpillars of butterflies, moths, (Lepidoptera) and sawflies (related to Wasps (Hymenoptera)); diversity and biomass measures;</p> <p>Ground (Carabid) beetles and other ground dwelling arthropods: abundance and diversity measures;</p> <p>Bees and butterflies: observational studies;</p> <p>Birds and mammals: observational studies (cancelled in 2001 following the pilot study).</p>

Table 2.3. The indicators measured in the farm-scale evaluations (DEFRA, 1999c)

On March 17th 2000, Michael Meacher announced 24 new GM crop sites, which included 9 sugar beet, 3 fodder beet and 12 spring oilseed rape. Over the next few months, further sites were added to this list, bringing the total to 48 for spring-sown crops in 2000. It was also announced that scientists and government officials would be hosting a series of public meetings to discuss the FSEs, where representatives from the DETR, the research consortium, SCIMAC and either Friends of the Earth or GeneWatch would present their case. Meanwhile, six-figure grid references for each site were placed on the DETR website at least five days prior to the first date of sowing, as they were in local newspapers (GeneWatch, 1999). Information was also sent to each parish council close to a trial, and a DETR speaker was offered to those councils that wished to hold a public meeting.

Within a week of the sites being announced, it was reported that two farmers withdrew from the FSEs, while activists damaged many more sites during the summer. Stories continued to flood the media, which again tended to focus upon the impossibility of containing GM pollen. For instance, in May 2000 it was announced that 600 farms had inadvertently sown conventional oilseed rape, which had been contaminated in Canada where the nearest GM crops were 800 metres away (Meikle, 2000a); far more than the UK's 50-200 metre separation distances for oilseed rape. Two weeks later, it was reported that contaminated maize had also been sown in the UK, and that this had also happened in 1999 (Brown, 2000). Furthermore, the media announced that GM pollen had been found in honey (for example, Ingham, 2000),

which prompted the British Bee Farmers' Association to recommend that hives should be placed at least 6 miles from GM crops (FOE, 2000b). In June, the government announced that the separation distances would be reviewed, which was said to be partly as a result of the oilseed rape incident (FOE, 2000d). The government also launched the Agriculture and Environment Biotechnology Commission (AEBC), 'with a remit to provide independent strategic advice on developments in biotechnology and their implications for agriculture and the environment'. This committee formed part of the new strategic framework, and had members drawn from a diverse range of backgrounds in order to consider the broader issues (AEBC, 2001a: 5), as demonstrated in table 2.4 below. In the US meanwhile, it was reported that taco shells had to be recalled because they contained a GM maize (StarLink) that was not suitable for human consumption (see for example Carver, 2000), while in Austria it was announced that T25 maize would be banned. In the UK however, Aventis planned to put Chardon LL (a T25 maize) on the National Seed List, to which many campaigners lodged official objections.

Professor Malcolm Grant (Chair)	Professor of Land Economy, University of Cambridge
Ms Julie Hill MBE (Deputy Chair)	Programme Advisor & former Director of Green Alliance
Professor Michael Banner	Professor of moral & social theology, Kings College, London
Ms Anna Bradley	Director of the National Consumer Council
Mrs Helen Browning OBE	Organic farmer
Dr. David Carmichael	Arable farmer concentrating on seed production from combinable crops
Professor Philip Dale	Leader of the Genetic Modification & Biosafety Group, John Innes Centre
Dr. Ed Dart CBE	Chairman of Plant Bioscience Ltd
Dr Matthew Freeman	Senior Researcher at the Medical Research Council Laboratory of Molecular Biology
Mr John Gilliland	Arable farmer interested in sustainable production systems & the pioneering of non-food crops
Professor Robin Grove-White	Professor of Environment and Society, Director of the Centre for the Study of Environmental Change, Lancaster University
Dr Rosemary Hails MBE	Ecologist & Principle Scientific Officer, Centre for Ecology & Hydrology, Oxford; lecturer at St. Anne's College, Oxford
Mrs Judith Hann	Freelance broadcaster & writer who presented Tomorrow's World for 20 years

Table 2.4. Members of the Agriculture and Environment Biotechnology Commission, (AEBC, 2001b: 80-1)

Ms Chi Chi Iweajunwa	Member of executive group for NHS Direct, and member of Partners Council for National Institute for Clinical Excellence
Dr Derek Langslow	Scientist specialising in nature conservation/biodiversity
Professor Jeff Maxwell OBE	Former Director, Macaulay Land Use Research Institute
Dr Sue Mayer	Executive Director and Board Member of GeneWatch UK
Professor Ben Mepham	Director of the Centre for Applied Bioethics at the University of Nottingham; Executive Director of the Food Ethics Council
Ms Justine Thornton	Barrister specialising in environmental law
Dr Roger Turner	Chief Executive Officer, British Society of Plant Breeders

Table 2.4 continued. Members of the Agriculture and Environment Biotechnology Commission, (AEBC, 2001b: 80-1)

By July 24th 2000, it was reported that 9 of the 48 trials were damaged or destroyed, and by August the number of trials left in the FSEs was thought to be close to the minimum required by the Scientific Steering Committee. However, in August the DETR announced a further 25 sites for the winter oilseed rape evaluations. This gave those in the vicinity of crop trials more notification than before, and enabled the chairman of each council to discuss the FSEs with the Secretary of State for the Environment, Michael Meacher. Since the review of separation distances was still under consideration at this stage, it was announced that the flower heads of winter-sown oilseed rape could be removed if the distances were later extended.

In September 2000, a jury unanimously decided that 'the Greenpeace 28' were not guilty of criminal damage when they destroyed the GM maize trial at Lyng in July 1999 (see for example Wilson, 2000). Several other cases followed with the same verdict. For example, seven protestors who damaged a crop in Dorset were acquitted in June 2001, as Vidal (2000) reported, as were eleven protestors who damaged a crop in Essex (see for example Gregory, 2001). In 2001, protestors again damaged FSE sites, and organisations again asserted that the separation distances were not big enough. In January 2002, DEFRA reported that 178 sites were now being studied as part of the FSEs, of which 34 were maize, 43 spring oilseed rape, 51 autumn-sown oilseed rape and 50 beet. A further 44 sites were announced for the spring, which will be followed by a final set of sites for autumn-sown oilseed rape. These last FSE sites will be harvested in 2003, after which the results will be published. By the end of the project the research is expected to have cost almost £5.4 million (DEFRA, 2002a).

Social Science and the Politics of GM Food

During the late 1990s two key reports were published on public attitudes to GM foods. The first is by Grove-White *et al* (1997), entitled 'Uncertain World', and the second is a synthesis of work written for the ESRC Global Environmental Change Programme (1999). Following on from earlier questionnaire work (Hamstra, 1994; Eurobarometer, 1991, 1993) and psychological studies (e.g. Frewer, 1996), Grove-White *et al* conducted 9 focus group discussions that aimed to 'illuminate the deeper reasonings and contextual understandings which underpin [people's] responses' (Grove-White *et al*, 1997: 4). These focus groups were conducted during November and December 1996, when GM soya beans were just beginning to be imported into the UK. Accordingly, only half of the participants had ever heard of biotechnology, but nevertheless the dominant reaction in most groups was negative.

Within the focus groups it was reported that there was a strong feeling that biotechnology was 'meddling with nature'. Already unnatural interventions such as BSE, food additives, chemicals and industrial food systems were perceived to have shown how 'nature can strike back'. Thus, with an even more unnatural intervention such as biotechnology, the consequences were considered to be uncertain and frightening. While a minority felt that it was morally wrong to 'restructure the foundations of life', others stated that the technology could go ahead if a more cautious approach was taken. Since it was believed that the consequences could be delayed, participants stated that long-term testing was required, perhaps even over a generation, before the food could be deemed safe.

According to Grove-White *et al* (1997: 6), interference in nature illustrated how 'industry, science and technology now permeated daily life'. For participants, biotechnology was perceived to be of benefit to companies rather than consumers, and the profits of such companies were not considered reason enough to meddle with nature. Indeed, it was reported that there was a general mistrust of both industry and the government, who were thought to be more interested in promoting their mutual self-interests than in ensuring food safety. As Grove-White *et al* (1997: 17) state, 'There was a recurrent conviction that in such cases [as BSE and salmonella] government spokesmen and regulators has been biased towards industrial interests, and that scientific reassurance had been used repeatedly to mislead and withhold information from the public.' With the unannounced and unlabelled introduction of GM foods, participants again felt that they were being deceived.

Upon playing simulated radio extracts of three different voices, which were intended to suggest a regulator, an environmental or consumer group and an industry representative, Grove-White *et al* (1997: 14) determined that participants identified most with NGOs. The voice of the NGO representative was perceived to be speaking truthfully about the unnaturalness and unpredictability of biotechnology, and was considered to be the 'counterbalancing moral voice in a sea of self interest' (Grove-White *et al*, 1997: 15). Most commonly cited and supported was Greenpeace, which was deemed to be the type of organisation that would look after people's interests. Interestingly, as the report points out, this was before NGOs had started to campaign against biotechnology.

Although the dominant reaction in most groups was negative, up to a half of the participants stated that they would buy GM food, including some of those who were against it. According to Grove-White *et al* (1997: 6), this was because the participants' 'reactions were frequently coupled with a sense of fatalism and resignation.' In other words, they felt that eating GM food was inevitable. Their reasons included the belief that GM food would be cheaper, and that, as consumers, they would probably not have the time to read labels while shopping. However, their sense of inevitability lay deeper than this, since they also believed that the world was increasingly beyond their control. The financial interests of others were perceived to be too powerful to overcome, and the processes driving the technology were considered to be inaccessible. The participants thus resigned themselves to eating GM, despite the fact that it 'was likened to a lottery or roller coaster, where no-one knows what will happen be it good or bad' (Grove-White *et al*, 1997: 13).

Participants were generally not well informed about biotechnology, but neither did they trust anyone to supply the information they wanted. However, a lack of information was not considered to be the problem. Rather than providing technical data to improve public understanding, Grove-White *et al* (1997: 21) advise that 'the political process, and more particularly the established GMO regulatory framework [need] to demonstrate that the true *nature* of such concerns [...] is understood, respected and addressed to the maximum extent possible.' Since MPs were not mentioned during the focus group meetings, it was concluded that they were not able to represent people's social concerns. Further, the marketplace was not considered to be the place where public choices were made, since the participants' shopping behaviour did not reflect their true concerns. It was therefore proposed that what was needed was 'an urgent and imaginative 'institutional' experiment [...] aimed at attuning industry and government better to public sensibilities, and at advancing public involvement in the crucial range of issues raised' (Grove-White *et al*, 1997: 31).

As a means of involving the public, Grove-White *et al* (1997: 28) suggested that the following methods could be tested over a period of two years:

- Regional consensus conferences
- Regional citizen panels
- Focus group discussions targeted on specific product classes
- National workshops, aimed at distilling the findings of wider dissemination

When organising such fora, they state that it would be sensible to work independently of the government, perhaps through industry/university/NGO coalitions. Official bodies would then be invited in advance, to guarantee serious attention to the findings. By not foreclosing any issues, Grove-White *et al* (1997) state that a wider range of concerns and interests could be incorporated into policy processes, which would broaden democracy and improve levels of trust.

A similar message is communicated in ‘The Politics of GM Food: risk, science and public trust’ (ESRC, 1999). In this report it is asserted that ‘science cannot answer all questions’, partly because the debate has many ethical aspects, and partly because science is not as dependable as it might first appear. To illustrate, Wynne (1999) is said to have challenged the assumption that science can settle the GM debate by stating that (ESRC, 1999: 5):

- Genetic specimens used in tests may not be replicable when produced industrially, since existing production is more hit-and-miss than admitted;
- Crucial factors are excluded from the tests, such as the influence of birds, due to the fact that they circulate wider than the single-farm ‘laboratory’, and;
- While demanding rules are imposed on crop management for tests, no systematic assessment is made of the extent and consequences of variation from these artificial conditions in real world uses of the technology.

Indeed, the authors of this report state that ‘not much yet is known, and there may be scientific disputes about what is. Beyond this, there are all sorts of things we don’t know that we don’t know’ (ESRC, 1999: 5). Decision-making is thus said to be dealing with both uncertainty and ignorance, while risk assessments are deemed to be subjective. However, the authors assert that those within policy circles rarely examine such issues, despite the fact that BSE showed how important it is to be explicit about the limits of knowledge.

As a result of their experience with BSE, the authors declare that it is quite rational for people to mistrust the scientific approach, since 'unknown factors [...] may lead to 'surprises' in the future' (ESRC, 1999: 8). They therefore state that it is wrong to characterise the public as inaccurate and emotional, especially when the risks from GM foods can be seen to be of the same class of risk as those from BSE. For example, both are perceived to be unnatural, both show a failure of institutions to prevent them, and both are unavoidable. Furthermore, since people are unable to assess the risks themselves, the authors state that they have to base their judgements upon those who create the risks or regulate them. Thus, when the government is seen to be in favour of biotechnology, and regulators are assumed to be aligned with the government, the independence of risk assessments is questioned.

The authors also state that the public want to know how their broad range of concerns, which include need, benefits and ethics, are considered within the risk assessment process. According to this report, the regulatory remit is far too narrow and misses a number of crucial points. Among these are need and social benefits, indirect, cumulative and synergistic impacts, the wider effects upon the agricultural industry and the countryside, and the contribution to global food production and the elimination of hunger. Further, even with the introduction of the AEBC, which is intended to consider the wider issues, the authors state that 'many of the assumptions and working practices at the heart of the regulation of GM food remain intact' (ESRC, 1999: 11).

In finding a way forward, the authors state that 'it is time to experiment with new ways of making decisions on issues such as GM food' (ESRC, 1999: 13). The aim of this experiment would be to audit the full diversity of interests and values within society. By doing so, they believe that the government would restore its neutrality in the eyes of the public, that 'problem framings' would be broadened, and that regulators would be more attentive to social factors. By way of example, the authors describe work by Stirling and Mayer (1999) who used 'multi-criteria mapping'. Within this study, 12 participants from various aspects of the GM debate were asked to list all the criteria against which they would like to judge GM crops. Many of the criteria chosen lay outside the scope of official risk assessments, and not one individual had their whole range of criteria formally considered. The approach is also said to show how assumptions can affect the outcome of people's analyses. Consequently, the authors state that its utilisation could make the framing of scientific advice more transparent, and could provide an 'audit trail' for the risk assessment process.

Within their discussion about the future governance of new technologies however, the authors refer to O’Riordan (1999) and state that the only way to consider subjective and ethical factors ‘is by stages agreed mutually by a greatly expanded set of participants in the decision-making process’ (ESRC, 1999: 18). Like Grove-White *et al* (1997) therefore, they discuss a number of strategies for incorporating the public’s views, which again include focus groups, citizens’ juries, in-depth groups, consensus conferences, stakeholder decision analysis and deliberative polling. They thus conclude that:

‘The greatest challenge is to open up policy processes surrounding new technologies to far greater interaction with members of the public and their diverse values. This would involve opening decision-making to genuine participatory methods, while maintaining a central place for scientific information and analysis as it emerges.’

(ESRC, 1999: 20)

Purdue (1999) echoes these calls for greater public participation, and reiterates the assertion that they should be organised by independent bodies and that their results should be fed into the policy process. His comments emerge from his experience at the 1994 Consensus Conference on Biotechnology, which was organised by the Science Museum at the request of the Biotechnology and Biological Sciences Research Council (BBSRC). Describing how environmentalists were not consulted about the issues to be discussed or the Lay Panel selection criteria, Purdue states that environmentalists had low confidence in the process from the outset.

Purdue (1999) also alleges that the aims and objectives of the conference organisers unduly influenced the Lay Panel’s conclusions. As he states (Purdue, 1999: 86), ‘the conference was framed in terms of the deficit of public understanding that needed to be made good if science and technology is to maintain its momentum.’ Members of the Lay Panel were selected on the basis that they had no hard position for or against biotechnology. They then attended two training weekends and spent two days cross-examining a panel of experts, after which time they spent fourteen hours compiling a preliminary report. According to Purdue (1999), this report attempted to balance the experts’ viewpoints, with summaries of the opposing positions next to each question. Other than stating that labelling should be provided and patenting should be abandoned, few recommendations were given. Since the report was written, Purdue (1999) states that both industry and NGOs have used its neutrality to support their campaigns. Furthermore, he declares that the government has failed to use it in any official capacity. For Purdue (1999) therefore, the Consensus Conference was disappointing, and perhaps even a wasted effort.

Another attempt to include the public in decisions about biotechnology has received a more welcome response. Described as 'an exercise in democratic deliberation', Wakeford (1998) formed a citizens jury, which comprised twelve members of the public who were not service users or members of an interest group. During ten weekly evening sessions, held between March and May 1998, the jury cross-examined various expert witnesses, many of whom they requested themselves. The jury made many recommendations, which included the belief that GM was not necessary, that the long-term effects were unknown, that controls are too weak and that labelling and caution are required. The project was considered a success.

While the majority of social science studies of the GM crop debate have focused upon public attitudes, only Stirling and Mayer (1999) appear to have considered the views of those already engaged in the debate, and then only from a risk assessment perspective. According to cultural theory (as developed by anthropologists Mary Douglas, Michael Thompson and Steve Rayner, and political scientists Aaron Wildavsky and Richard Ellis) however, it is important that every perspective is considered if institutional arrangements are to be made truly inclusive. Indeed, cultural theorists assert that this is not only important for democratic decision-making, but also for good decision-making, since each perspective has some wisdom to impart within the policy arena. By exploring the views of campaigners, farmers, industry representatives, scientists and regulators, and by considering the work that has already been conducted on public attitudes, this research explores a diverse range of perspectives on GM crops. It then considers how each perspective has been represented in the wider public debate, and how these discourses have been reflected by government actions. By doing so, it determines the best way to make the institutional arrangements for GM crops more inclusive, and considers to what extent new modes of public participation could achieve this.

Summary

Following an overview of the science and regulatory procedures of GM crops, it was explained that although the first plot trials of GM plants occurred in the late 1980s, the public debate about GM food did not truly emerge until 1996, when GMHT soybeans were imported from America. Over the next two years, there was a vast amount of controversy and media coverage, which reached a peak during the summer of 1998. Unable to quell the public's fears, the government decided to delay the commercial release of GMHT crops, and announced a programme to assess their ecological effects, which became known as the farm-scale evaluations. However, despite, and possibly because of these evaluations, the controversy has continued. Social scientists studying public attitudes to GM crops, state that

much the problem lies in the fact that the government and industry are not trusted, and that public's concerns are not well represented within the policy arena. As a result, they assert that the government should actively engage with the public through new modes of public participation. To complement previous studies, this research focuses upon the attitudes of those already engaged in the GM crop debate, and explores the extent to which each perspective can be heard within the policy arena. By doing so, it determines the best way to make institutional arrangements more inclusive, and considers to what extent new modes of public participation could achieve this. Within the next chapter an overview of cultural theory is provided.

Cultural Theory

Introduction

This chapter provides a background to cultural theory, which this research utilises to consider how best to make the institutional arrangements for GM crops more inclusive. First a definition of cultural theory is provided, and a description of how cultural theorists perceive risk and environmental controversy. The development of cultural theory is then explained, followed by a detailed description of each ideal type. The ways in which cultural theorists have sought to understand controversial matters is then presented, as are the circumstances that they recommend in order to avoid controversy in the future. Since this research also intends to develop a better understanding of how individuals utilise the discourse of cultural theory's ideal types, the literature on this aspect of the theory is then presented in some detail. The chapter concludes by describing how cultural theory is used as a tool to analyse the GM crop debate, and by listing the research questions that have been raised in this and the preceding chapter.

Perceptions of Risk According to Cultural Theory

The cultural theory referred to in this thesis emerged from Mary Douglas's grid-group analysis, which she devised in the 1970s (for example, Douglas, 1970; 1978). It has since been developed by a number of theorists, who include anthropologists Michael Thompson and Steve Rayner, and political scientists Aaron Wildavsky and Richard Ellis. A central tenet of cultural theory is that there are only five viable ways of life; an idea that some theorists have termed the 'impossibility theorem' (Thompson, Ellis and Wildavsky, 1990: 98; Thompson, Grendstadt and Selle, 1997: 2). These ways of life are characterised by 'ideal types', which each have their own beliefs about society, nature and risk. Amongst the ideal types are the *individualists*, who favour a competitive society and believe that nature is robust and able to withstand numerous and intense disturbances; and the *egalitarians*, who voluntarily commit to a life that aims to equalise status, and who believe that nature is vulnerable and liable to collapse in response to human interventions. The beliefs of each type contradict those of the others, and yet each is certain that their view is right.

According to cultural theorists, the beliefs of each type justify the values and ideals that they prefer. For example, Douglas (1978) alleges that if society is perceived to be immoral, nature will be considered pure and good, so providing another reason to prevent society's progress:

'[...] nature represents all that is innocent and despoiled by civilisation, the obvious victim with whom the individual identifies himself. The dangers to nature will reliably muster support and sympathy, as nature pleads mutely for protection against the blind, anonymous social forces which threaten every individual.'

Douglas (1978: 25)

As the ideal types tell themselves and each other what nature is and what nature would prefer, each is seen to be trying to adapt society to their preferred future. In this way, claims about nature 'protect a system of ideas from challenge' (Douglas, 1986: 143), since it is impossible to discredit a point of view about the environment without discrediting the corresponding social context. As Douglas (1986) states, neither a particular kind of society nor conceptualisation of the environment can exist without the other. It is within this context that perceptions of risk are believed to evolve, which cultural theorists have termed 'risks-for'. This is because risks are thought to be perceived for the advancement of a desired future and desired pattern of human relations (Thompson, 1983: 237). The extent to which a risk is selected, is said to depend upon the leverage that it could provide as a stick or sanction to drive society towards these goals. Thus, egalitarians highlight those risks that justify equality and a more harmonious relationship with nature, while individualists highlight risks that justify competition and the development of new interventions. Risk is therefore seen as a way of thinking, rather than something inherent in the world. That is not to say that cultural theorists deny the physical reality of risks, but rather that they believe risks are only perceived if they are consistent with an individual's cosmology of beliefs and values.

When cultural theory was introduced to the field of technological hazard management with the publication of 'Risk and Culture' (Douglas and Wildavsky, 1982), it was 'alternately reviled and lauded' (Johnson, 1987: 147). At the time, risk assessors were still struggling with the validity of distinguishing between the objective reality of risks and irrationally perceived risks, while cultural theorists were stating that each contradictory perception of risk is rational (Johnson, 1987). Indeed, Douglas (1986: 140) pronounced that scientists should resist expecting others to perceive their 'true, systematic, objective view' of the interaction between humans and nature, and should no longer claim to be apolitical, since each perception of nature is underpinned by social preferences, and thus politics (Douglas, 1997).

The Anthropological Roots of Cultural Theory

The ideal types of cultural theory first emerged from Douglas's 'grid-group analysis' (Douglas 1970; 1978), which is based upon an adaptation of Bernstein's diagram of systems of family control (Douglas, 1970: 54-59). This work stems from the idea that structured groups develop special forms of restricted code, which shorten the process of communication and allow values and norms to be devised and enforced. When members of groups come to know each other well, they are reputed to share a 'common backcloth of assumptions which never need to be made explicit' (Douglas, 1970: 55). It is through these processes that a group's structure is said to be maintained.

Following on from these ideas, Bernstein developed a model that was intended to reflect the increasing influence of the division of labour in industrial society. To do this he chose the variables of speech and techniques of control, which he used as measures of different aspects of 'positional behaviour in families' (Douglas, 1970: 56). However, since it was the intention of Douglas to use the idea of restricted code to interpret different degrees of ritualisation, she adapted these variables, concentrating on the interaction of individuals within two social dimensions: pressure to obey rules, and membership of groups. These she named 'grid' and 'group' respectively (Douglas, 1970: 60).

Within grid-group analysis, Douglas contends that the extent to which people belong to groups determines the extent to which they experience pressure to conform. Thus, people within a strong group context obtain their whole life-support from the group, but find themselves increasingly controlled by other people's pressures, while people in a weak group context obtain none of their life-support from within a group, but are free from social pressure. To illustrate this variable Douglas drew a horizontal line, moving from weak group on the left to strong group on the right.

For the variable 'grid', Douglas drew a vertical line, moving from weak grid at the base to strong grid at the top. This variable was selected to describe the restrictions that an individual may experience by way of rules that preordain social relationships. In this way, an individual within a weak grid context would experience few restrictions, while an individual within a strong grid context would be highly restricted. These restrictions take the form of systems of classification or values, ranging from the private (weak grid), through to the shared (strong grid). For example, a high grid context, signified by rules and regulations, might insist that males do not compete in female spheres, while a weak grid context would expect individuals to negotiate their own relationships with others (Thompson and Ellis, 1997).

To form the grid-group typology, Douglas combined the vertical grid line and the horizontal group line to create four basic forms of social relationship. Each of these she represented with a particular type, commonly known as *hierarchist* (strong group, strong grid), *egalitarian* (strong group, weak grid), *individualist* (weak group, weak grid) and *fatalist* (weak group, strong grid). These were later expanded to five groups when Thompson (1982b) added the *autonomous individual* (otherwise known as the *hermit*) to the centre of the diagram, conveying that such individuals do not join groups or follow social rules.

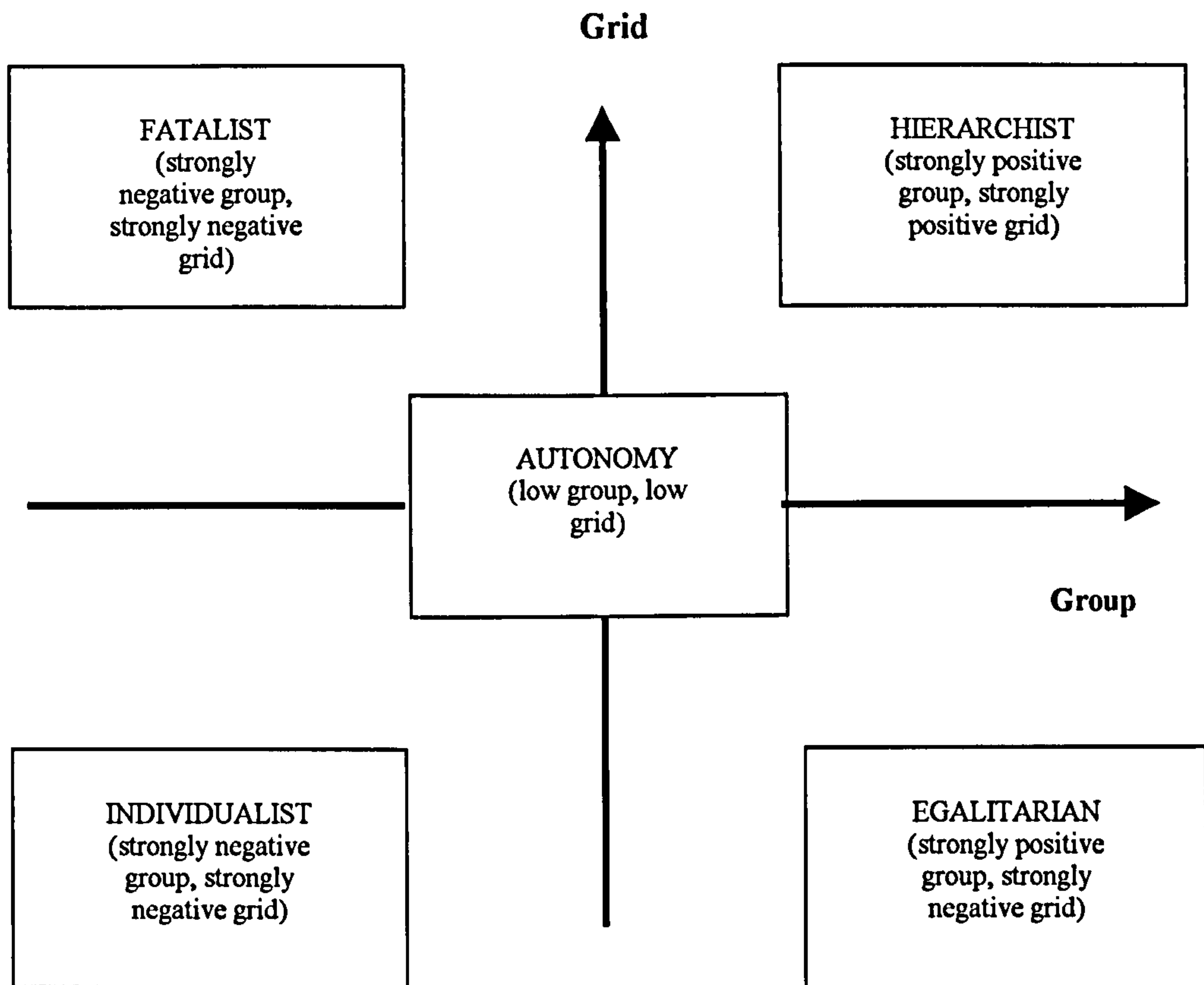


Figure 3.1. The two dimensions of sociality and the five ideal types.

According to this theory therefore, an individual learns to know about the world by becoming involved with others with whom 'shared patterns of meaning and mutually consistent values' are developed (Schwarz and Thompson, 1990: 2). As different definitions 'of the good, the beautiful and the socially desirable' are generated, it is said that individuals *know* the world according to the bias of their type, rather than *seeing* it as a young child might do (Schwarz and Thompson, 1990: 11). As Thompson (1983: 233) states, individuals perceive 'always through a cultural glass and always darkly.'

Through an ideal type's cultural screen, data are said to be assigned importance in response to institutional pressures. Thus, information that supports a 'world-view' is collected, while that contradicting it is discarded. In effect, each way of organising is considered to generate bias, which then determines what becomes fact (Thompson and Wildavsky, 1986). According to cultural theory therefore, it is not the limits of information gathering and processing that bias decisions, it is the organised bias of each form of social organisation. In this way, each type is thought to actively shed anything that contradicts its world-view, relying 'on rules of thumb, on proverbs, on sixth senses, and on other similar socially induced shortcuts' rather than actively seeking information (Thompson and Wildavsky, 1986: 279).

Although the social context of an individual's life is thought to provide a screen through which that individual can understand the world, cultural theorists state that individuals do not always retain its values and beliefs. By participating in the daily rituals of their social context, it is proposed that individuals adapt or reinforce their beliefs through the continual process of justifying their own actions, and passing judgement on those of others. As a result, individuals occasionally move from one type to another, or an ideal type adapts its discourse and behaviour to reflect widely held preferences (Thompson, Ellis and Wildavsky, 1990). Why individuals move from one type to another and how the ideal types adapt to society's preferences is discussed on pages 55-59.

An Ecological Contribution

As Douglas developed the ideal types that emerged from grid-group analysis, she started to determine how each type would perceive nature and risk (Douglas, 1978). At around the same time, ecologists Holling and Timmerman were also developing ideas about the ways in which individuals conceptualise nature, based upon the notions of stability and tolerance. According to Holling (1973), different perceptions of stability and tolerance had led to different management strategies: either by maintaining a predictable world and keeping fluctuations to a minimum (stability), or by keeping options open and maintaining heterogeneity (resilience). During the 1980s, both Holling and Thompson were working at the International Institute for Applied Systems Analysis (IIASA) in Austria, where they devised a way in which the anthropologists' 'ideas of nature' and the ecologists' 'myths of nature' could be combined, which Timmerman later contributed to (Thompson, 2002). In 1986 Holling and Timmerman presented these ideas in 'Sustainable Development of the Biosphere' (Clark and Munn, 1986).

Coining the term ‘myths of nature’, Holling (1986) illustrates how individuals perceive nature by using the iconography of a ball within a landscape. When nature is perceived to be stable, the landscape is represented by a U-shaped valley, within which the ball can roll up the sides, but will always return to the bottom. For a more resilient nature, the landscape is depicted as a series of hills and valleys, within which the ball can travel between many stable states. Meanwhile, for an unstable nature, the landscape is that of a hill or upturned basin, from which the ball can fall following the slightest disturbance. Thompson (1987) has since labelled these illustrations of nature with the terms *nature benign*, *nature perverse/tolerant* and *nature ephemeral* respectively, while adding a fourth, termed *nature capricious* (as described in Thompson and Rayner, 1998: 163). The icon that represents the myth of nature capricious depicts a featureless topography, where the ball can move anywhere at anytime. The myths of nature and their corresponding icons are now a key feature of cultural theory.

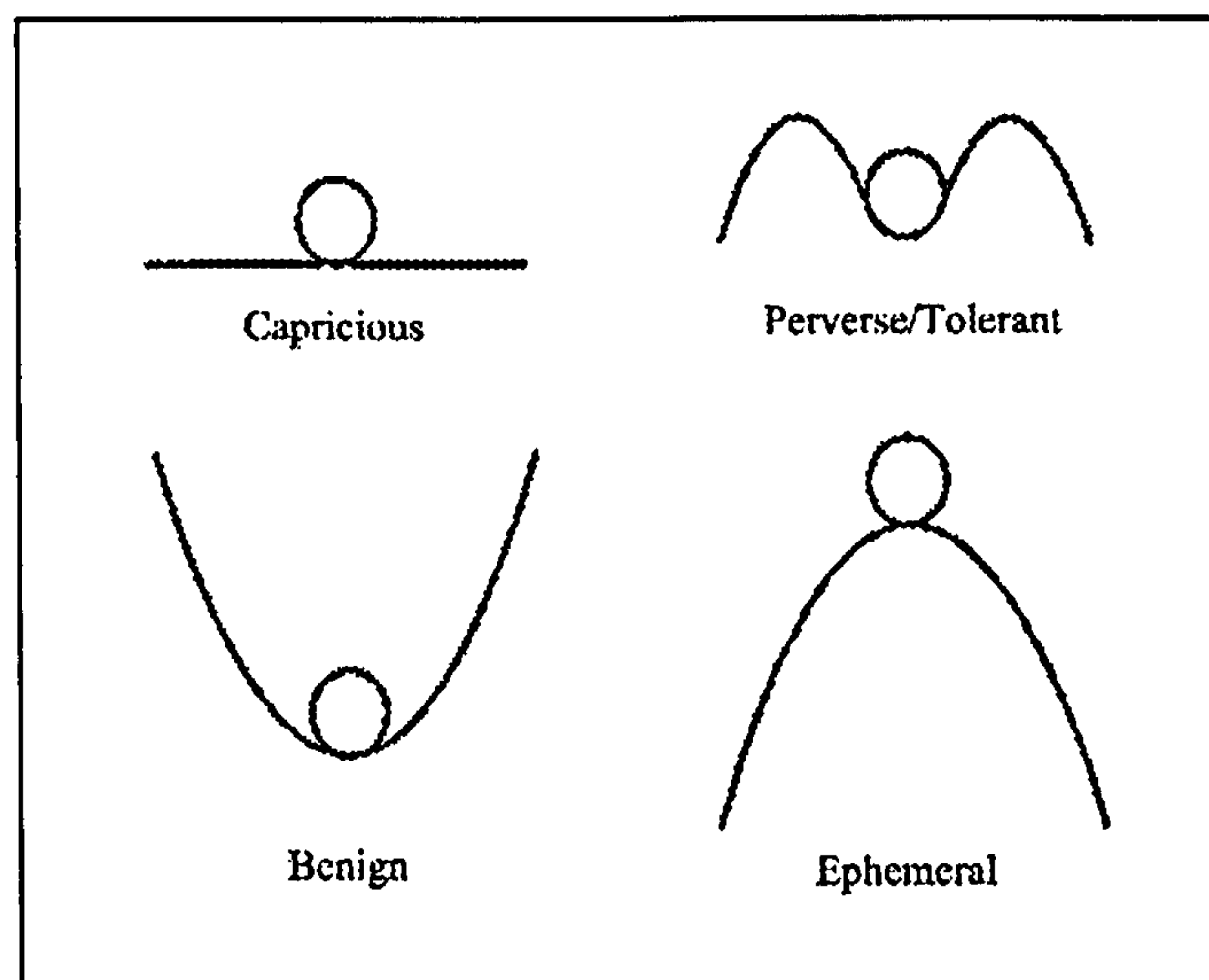


Figure 3.2. The four myths of nature used by cultural theorists (Thompson, Ellis and Wildavsky, 1990: 27).

Although cultural theory’s myths of nature are neat representations of those originally devised by Holling and Timmerman, they do not present all the perceptions of nature that the ecologists devised. Of particular interest are comparisons between nature perverse/tolerant, Holling’s (1986) ‘nature engineered and nature resistant’ and Timmerman’s (1986) ‘variable myths’. While the myth of nature perverse/tolerant is described by cultural theorists simply as nature’s ability to tolerate a certain degree of change, Holling and Timmerman present the idea that there are two versions of this myth. For example, Holling (1986) describes how some people believe that humans have sufficient knowledge to make changes (nature engineered), while others believe that there is insufficient knowledge (nature resilient).

Both Holling and Timmerman depict the landscape of nature perverse/tolerant not as a simple bowl within which the ball can traverse within limits, but as a series of hills and valleys within which the ball can move between stable states. For Timmerman, this means that the difference between people's perceptions of the 'variable' myth lies within whether they believe that the ball moves between the peaks and valleys (the conservative view of multiple stability) or that the peaks and valleys move themselves (the radical view of resilience). However, these subtleties seem to have been erased by the icon that is now widely referred to by cultural theorists, which appears to be little more than a hybrid between nature benign and nature ephemeral.

Nature Constant: A bowl-shaped valley where the ball moves due to internal and external pressures. If the bowl is infinitely large, or the rim meaningless, there is global stability. Supports trial-and-error and large-scale developments.

Nature Engineered and Nature Resilient: A landscape of hills and valleys where the ball moves between different stable states due to the pressure of internal and external forces. Nature engineered is subscribed to when individuals believe that humans have sufficient knowledge to intervene, while nature resilient is subscribed to when it is perceived that humans have insufficient knowledge.

Nature Evolving: Depicting evolutionary change, this view submits that constraining natural variability leads to fragility, and as a result the landscape changes. It thus suggests that nature is stable if it is not tampered with.

Table 3.1. Holling's (1986) myths of nature.

Myth of Stability: A bowl-shaped valley where there is no outside to the bowl, since going over the edge would destroy the theory. Individuals therefore believe that the bowl is infinitely reliable, or that the sides can be raised.

Myth of Instability: An inverted bowl depicting a very fragile system where everything that happens tends to cause the system's destruction. Management, if any, is therefore very paranoid and aims to maintain the *status quo*.

Myth of Cyclical Renewal: Nature is perceived as benign, although it has regular malignities (such as winter) that are predictable in their regularity, but not in the size of oscillations. The system may eventually and regularly return to where it began, but the cycle may also be following a spiral trajectory (perhaps masked by the greater yearly fluctuations).

Myth of Multiple Stability (also called the conservative view of multiple stability): the topography of the landscape is depicted as a number of peaks and valleys, within which the ball can move between a number of possible equilibria.

Myth of Resilience (also called the radical view of multiple stability): Again the topography of the landscape is represented by a number of peaks and valleys, but this time the peaks and valleys are also thought to move.

Table 3.2. Timmerman's (1986) myths of nature.

Schwarz and Thompson (1990: 13) meanwhile, have used Holling's 'nature resilient' and the icon of a series of hills and valleys as a *meta-myth*, which they say encompasses all the perceptions of nature as the ball moves through the landscape and changes its shape. Moreover, they present their meta-myth as 'an ever-repeating cycle of transformation' by way of Timmerman's myth of 'cyclical renewal'. However, in Timmerman's (1986) synthesis of grid-group analysis and the ecologists' myths of nature, the myth of cyclical renewal is associated with the hermit, who thinks that there is potential for controlled cycling through each zone. He also associates the fatalist with his own version of nature resilient (a moving landscape), since it is this nature that allows for the occurrence of unexpected surprises.

Such an array of terms and their different definitions has produced a complex background to cultural theory's myths of nature. Many of these differences lie within Holling and Timmerman's own work, but many others stem from the different ways in which grid-group analysis and the myths of nature have been combined. Nevertheless, the synthesis that Thompson first contributed to cultural theory clearly relates to Douglas's earlier work on perceptions of nature and risk, and is deemed a useful tool for understanding environmental controversies, as described later.

The Five Perspectives of the World

Since grid-group analysis was first devised, the perceptions of each type have been well developed by cultural theorists. How each type perceives both nature and society is described in some detail below.

The Individualist and Nature Benign

Of the five ideal types, the individualist is said to perceive nature as the most robust. According to the myth of nature benign, nature is able to withstand numerous and intense disturbances by renewing, replenishing and re-establishing the natural order each time humans intervene (Thompson and Rayner, 1998a). Taking the analogy of the ball in a landscape, many authors describe this ability to recover as nature's way of 'bouncing back'. The world according to individualists is thus perceived as an extremely forgiving place for humans, where a 'hidden hand' (the uniformly downward slope) leads people to the best possible outcome (Douglas, 1992).

In such a world as nature benign, it is said that there is no need to worry about thresholds of danger or the regulation of undesirable behaviour, because neither exists. The individualist's style of management is therefore very much *laissez faire*, with a high level of confidence in action and a resolute belief in allowing trial-and-error. As a consequence, private behaviour is maximised, while that lying within the reach of the government is minimised. Moreover, there is little sympathy for those trying to impose the precautionary principle, since this is seen as both unnecessary and restrictive upon the discovery of best solutions. Left to their own devices, individualists believe that they could produce an ever-improving community. However, this does not mean that all individuals are considered to benefit all of the time. As Thompson, Grendstad and Selle (1997) describe, some individuals may misjudge things and fail, while others may interrogate nature more successfully and gain. Even under these circumstances however, it is perceived that there is no danger of everyone losing out, and certainly not of nature being pushed beyond a threshold of danger.

The Egalitarian and Nature Ephemeral

In complete contrast to the individualist's world of nature benign, that of the egalitarian is perceived to be fragile, intricately interconnected and liable to irreversible collapse if disturbed. In the face of such catastrophic adversity, egalitarians are thought to take a cautious approach to life, 'treading lightly on the earth' and upholding the precautionary principle. As a result, trials can only be undertaken if the worst-case scenario is acceptable, and if it is certain that there will be no errors. In many cases this means that necessity becomes a key consideration for egalitarians, since without needing to intervene there is no need to risk damaging the environment even further (Thompson and Rayner, 1998a). For many following these principles therefore, nature is held in 'sacred trust'.

For those currently perceiving nature ephemeral, the environment is considered to be under threat from 'consumer society'. According to cultural theorists, egalitarians believe that the Western world is in urgent need of radical transformation, since it is controlled by individualists who care little for the earth, and hierarchists who care little for democracy. The aim of egalitarians is thus to teach others why and how to care for the earth, while simultaneously striving for real democracy, fairness, justice and rights. Until this is accomplished however, it is said that they endeavour to implement sanctions that are devised to prevent people from continuing with their individualistic and damaging activities. To achieve these ends, egalitarians are often said to work for pressure groups such as Greenpeace, or for more radical groups who have no official members or hierarchy, such as Earth First!.

The Hierarchist and Nature Perverse/Tolerant

Cultural theory's hierarchists are perceived to be regulating nature perverse/tolerant by trying to discover the line that divides nature's vulnerability from nature's stability. Hierarchists therefore seek to establish a balance between the stable world of the individualists and the unstable world of the egalitarians. Their icon depicts a landscape where the ball can traverse up and down the slope within a limited range, but beyond this the ball falls over the edge. The world for hierarchists is thus perceived to be safe within certain limits, but vulnerable if these limits are crossed.

In order to understand the limits of nature perverse/tolerant, it is essential that hierarchists seek precise knowledge, certainty and predictability. Such knowledge is not expected to prevent the occurrence of surprises, but is intended to keep surprises manageable and within the bounds of stability. It is therefore essential for hierarchists to have certified experts who are able to map and manage the boundary line between safety and vulnerability. Furthermore, these experts must be trusted so that their knowledge can be used to implement the management strategies that they devise.

The Fatalist and Nature Capricious

The fatalists, dwelling in the world of nature capricious, are considered to be unable to trust anything or anyone. They do not believe that the world can be learned about, or that it can be managed. Instead, it is said that they cope with the erratic events that are thrown their way, depending upon luck and experiencing fear and dread. This fatalistic outlook ensures that such people avoid societal debates and refrain from trying to reshape the world, since they believe that they have no control over it. Fatalists are thus considered to be the 'great risk absorbers' (Schwarz and Thompson, 1990) who experience the consequences of everyone else's actions, and become the subject of contradictory statements by egalitarians, individualists and hierarchists, who each claim to be acting in the fatalists' best interests.

The Hermit

Very little appears to have been written about the hermit in environmental controversy, perhaps because these individuals do not involve themselves in controversial matters. Only Thompson (1982b) considers this type in his paper 'The Problems of the Centre: an autonomous cosmology', where he outlines the qualities of the Sherpa society who, he asserts, have both zero grid and zero group. According to Thompson (1982b), Nepalese Sherpas do

not experience manipulation, and find it easy to tolerate others. Their culture is very easy-going and, of the groups that do exist, ritual is not apparent and membership is very open. Much of their autonomy is thought to be generated by not talking about the past and the dead (few know their own family history), avoiding social involvement that could lead to manipulation, and avoiding long-term commitments (divorce is easy and economic individualism is favoured). For the Sherpas there are two types of admirable people - the hermit (who is totally uninvolved) and the peacekeeper (who helps individuals return to autonomy if they wish, while respecting those who decide to be members of other types).

Cultural Theory and Environmental Controversy

Cultural theory has been applied to a wide range of environmental controversies, which include the impacts of deforestation in the Himalayas (Thompson and Warburton, 1985), the commercial development of a Site of Scientific Interest (Harrison and Burgess, 1994) and London's traffic problems (Adams, 1995). However, the environmental issue that appears to have received the most attention is that of global climate change (Thompson and Rayner, 1998a, 1998b; Thompson, Rayner and Ney, 1998; O'Riordan and Jordan, 1999; Adams, 1995).

Within Thompson and Rayner's (1998a; 1998b) study of climate change, a 'tri-polar policy space' is identified, within which three diagnoses of profligacy, pricing and property rights and population are contested. Each of these are said to represent one of cultural theory's ideal types. For instance, the profligacy diagnosis portrays the concerns of the egalitarian, by submitting that the current form of capitalism has created an impending environmental catastrophe. It asserts that humankind's wellbeing has been compromised by the profit motive, resulting in inequitable consumption levels that are intolerably unsustainable. For this diagnosis, humans have no special status above the rest of nature. However, neither have real human needs been met by the current modes of production and consumption either socially, culturally or environmentally. According to this view therefore, real reform, centring upon decentralisation and grassroots democracy must take place if climate change is to be stopped, embracing the requirements of the 'precautionary principle'. For this to happen, both policy-makers and individuals must take action, focusing upon their value systems, and relinquishing capitalism in its current form.

According to the pricing and property rights diagnosis (the individualists) however, the problems of climate change are essentially technical. Of key concern are the distorted resource prices, which have not reflected the full social costs of natural resources ('social', because nature only has value when it is required by humans). For this diagnosis, capitalism is seen to be structurally flexible, allowing economic growth to work in favour of the environment just as easily as it can work against it. This means the current problem is that humans do not know the true value of the environment; for if they did, they would not degrade it so much. The solution therefore lies in getting the prices right, either with carbon tax and tradable emission rights, or through pricing mechanisms which ensure all users pay the full costs of their activities.

For the hierarchists' population diagnosis, it is the rate of population growth that is intensifying human pressures on the environment. What is more, humans have a moral duty to look after the Earth, stewarding economic activities to ensure that they do not become too excessive. Economic activities therefore, are not undesired. Indeed, they are believed to be necessary for environmental protection. For example, in the less developed countries they can prevent poverty, and thus the consequential effects of over-population and environmental decline. However, the excesses of economic growth need to be addressed, ensuring that humans are living on the Earth's income, rather than eroding its capital. For climate change, attention is particularly focused upon taking action in less developed countries, since their increasing populations will mitigate any benefits that accrue as a result of action in the developed world. Measures such as literacy programmes, reduction in infant mortality and increased availability of birth measures are therefore advocated.

Within the climate change controversy, Thompson and Rayner (1998a) describe how each voice can be heard with its own distinctive discursive style. Thus, the profligacy diagnosis utilises passionate and moralising sermons, the pricing diagnosis adopts a language of algebra and value-free equations (moralising that those who put the most in, should get the most out), while the population diagnosis offers wise guidance and the moral imperative for those with expertise to act. Each diagnosis and its distinctive style is said to be heard competing with the others, discrediting them in the vain hope that the public and policy makers will adopt their manifesto. Attending to *how* these voices interact, Thompson, Rayner and Ney (1998) find that it is totally unpredictable, and yet ordered. That is, each voice discredits and assimilates the others' arguments, while feeding in new scientific findings, so that the argument lurches between the positions.

Adams (1995) has also equated various voices from the climate change debate with cultural theory's ideal types. For instance, in his analysis he describes how the possibility of a 'runaway greenhouse effect' is enough for egalitarians to invoke the precautionary principle, which demands urgent action in the face of uncertainty. He thus describes how Greenpeace developed a 10-point agenda setting out actions for the 'concerned citizen', within which people are advised to use energy-efficient light bulbs and appliances, install draft-proofing, reduce their dependence on the car, recycle waste and eat an organic vegetarian diet (1995: 168). The individualist meanwhile, is thought to believe that the climate over the past 100 years can be accounted for by 'natural variability'. According to this rationality, to act in a precautionary manner would hinder human ingenuity unnecessarily, and prevent the ability of humans to continue to see off 'the Malthusian prophets of doom' as they have done for the past 200 years (1995: 169). To balance these extremes, Adams describes how the hierarchists use scientific and management procedures and favour a 'constrained version of the precautionary principle' (1995: 170). He therefore considers that they devise further research projects to understand the problem, the most ambitious of which he believes is that of the economists, who attempt to construct a cost-benefit analysis of global warming.

In a third analysis of the climate change problem, O'Riordan and Jordan (1999) report on a slightly different approach. Here they describe a detailed survey of Norwich residents, who were selected as being representative of the UK population as a whole. Their analysis is thus of the discourse used by individuals, rather than the discourse of public statements, as the previous two studies had been. During the first phase of their research, a questionnaire was sent with a checklist of responses intended to elicit an individual's cultural solidarity, and another to determine understandings of fairness in hypothetical circumstances. Having ascertained which individuals strongly matched cultural theory's types, focus groups were organised to observe each different outlook more closely. For example, to understand attitudes towards key aspects of climate change two statements were used. The first was, 'It is not fair that some people benefit from climate change while other people suffer the consequences without any gain for themselves.' While the second was, 'A risk is less acceptable if it affects future generations' (O'Riordan and Jordan, 1999: 88). The tables on the next page show the response of each type to these statements.

According to O'Riordan and Jordan (1999: 88) what struck the researchers as remarkable in this study was the 'unanimity of view *within* the groups and the huge divergence *between* the groups'. The voices of the groups were thus reported to be both considered and agreed in relation to their interpretations of global and irreversible risk. Describing each of the types in detail, they describe how fatalists accepted the deceit of risk-makers and

<p>FATALISTS</p> <p>Companies and governments avoid their liabilities by never owning up to their mistakes</p> <p>People who are knowingly in danger should get paid more</p> <p>Regulatory agencies do not apportion blame or responsibility</p>	<p>HIERARCHISTS</p> <p>People are both individualistic consumers and social citizens, so it is inevitable that some will lose and some will gain</p> <p>Losers should inform themselves of their position and take appropriate action</p>
<p>INDIVIDUALISTS</p> <p>Parents have a duty to inform their children of risks</p> <p>The responsibility of being more self aware lies with the individual, not the specialist</p> <p>It is not fair to expose people to dangers they cannot reasonably be made aware of</p>	<p>EGALITARIANS</p> <p>There are too many cases of the wealthy gaining and the poor losing: these are not confined to risks</p> <p>The consumer in all of us has to be willing to pay the price in the form of abuse of corporate power</p>

Table 3.3. Responses to ‘It is not fair if some people gain the benefits while other people suffer the consequences without any gain for themselves’ (O’Riordan and Jordan, 1999).

<p>FATALISTS</p> <p>We all have a moral responsibility for each generation so we should not knowingly pass on harm</p> <p>Future generations have, in the past, been better off, so we should weigh gains against losses</p>	<p>HIERARCHISTS</p> <p>It is wrong to harm the future but this is the lesson of history</p> <p>We cannot foresee all dangers, so some future dangers are inevitable</p> <p>Best quality information is the key to wise judgement</p>
<p>INDIVIDUALISTS</p> <p>There is always some ignorance, but where reasonable, the precautionary principle should be applied</p> <p>Individuals have their own duty of care to be thoughtful and informed about future generations</p>	<p>EGALITARIANS</p> <p>It is irresponsible to harm the future</p> <p>It is equally irresponsible to harm present generations</p> <p>There is less excuse to harm the future because we know more nowadays, but we still do so because present patterns of power lead inevitably to injustice</p>

Table 3.4. Responses to ‘A risk is less acceptable if it will affect future generations’ (O’Riordan and Jordan, 1999).

regulatory bodies, and so placed their concern in whether people know that they are at risk. The egalitarians blamed consumption, corporate abuse and capitalism, which was perceived to cause the maldistribution of both risks and benefits; the individualists found it reasonable to expect people to inform themselves, but considered that risks should not be placed on those who cannot be expected to learn about their dangers; while the hierarchists accepted that there will always be losers, but that those losers will find out what risks they face and act accordingly.

Seeking Wisdom from Plurality

A key focus of cultural theorists has been to understand policy debates in which people 'are clearly arguing from different premises [...] showing no tendency to converge towards consensus as the debate progresses' (Thompson, Grenstadt and Selle, 1997: 3). They therefore enter the fray when there is still no agreement as to what the facts are, and when no amount of information or money seems to solve the dispute (Schwarz and Thompson, 1990). Describing how Sidney Smith observed that two women shouting at each other across an Edinburgh street were arguing from different premises, Schwarz and Thompson (1990) declare that it is these different premises or contradictory certainties 'that are the key to understanding the cloud itself' (Schwarz and Thompson, 1990: 26).

In order to understand controversial matters, cultural theorists assert that their aim is not to decide which voice is the more rational, but to ensure that all the rationalities are heard. As Thompson, Rayner and Ney (1998: 333) state, 'If you are having to ask who is right (worse still, if you already *know* who is right) you are wrong'. Correspondingly, Douglas (1992) concedes that sociologists should defend cultural ideals such as denouncing injustice and speaking for the oppressed, but questions this approach when considering potential environmental problems. Cultural theorists therefore promote a reflexive approach, which practices the 'ruling-in, rather than out, of framings that happen not to be the framing that is self-evidently true and sensible to the policy analyst' (Thompson, Rayner and Ney, 1998: 333). In this way, Douglas believes that it is possible to 'dispel the fog of expressive propaganda' (1992: 269) and to maintain a distance from personal commitments.

As a result of this thinking, Adams (1995) proposes that researchers should attempt to attain the hermit's detached state of mind. So too do Ney and Thompson (1997: 218) who state that it is 'a surprisingly useful vantage-point from which to view the policy fray.' However, Adams (1995) also contends that the attainment of this position may be impossible, having

considered how his own personal involvement in the seat belt debate may have introduced bias to his analysis. Furthermore, he considers the work of Beck and Wildavsky, and suggests that Beck's (1992) 'The Risk Society' is written from an egalitarian perspective, while Wildavsky's work is written from an individualist perspective. For Adams (1995), the irony is that both these theorists support their ideas with physical scientific evidence, calling for better science in the future, while asking for science to be removed from the control of hierarchists. Likewise, both accept that risk is culturally constructed, but somehow 'this insight doesn't liberate them from culture's grip' (Adams, 1995: 181).

Despite questioning the ability of researchers to attain the mind-set of autonomy, Adams does suggest that they can detach themselves from the 'fray' by rising above and viewing the partiality of those below (1995: 201). Douglas (1986: 129) too suggests that academics should let go of what they know, by temporarily treating their own view of nature as science fiction. Meanwhile, Milton (1996) describes how cultural theory is anthropology's tool for applying 'systematic doubt' to both the views of others, and oneself. As a consequence, Milton finds it possible to describe herself as an anthropologist on the one hand, and an ardent environmentalist on the other, demonstrating that analysts can 'at the same time, be full, committed participants in society and detached observers of it (1996: 2).

To illustrate this idea of detachment, Adams has constructed a third vertical dimension called 'insight', which he places above the grid-group quadrant. At the bottom of the insight axis he places the 'engaged ways of life': those who argue with each other from different premises, and who 'often reserve a special contempt for the philosophers who merely interpret' (1995: 210). Meanwhile, those moving towards the top of the axis are said to be the aspiring cultural theorists. These people, despite their views, equally wish to understand those of others. Thus, according to Adams, 'the more committed one is to changing the world, the more difficult it becomes to take a detached and tolerant view of the thoughts and deeds of those not in agreement with your objectives' (1995: 210). Where a researcher sits upon this axis, appears to be a necessary consideration when analysing controversies, especially if that researcher has a fixed position.

Why cultural theorists avoid favouring one type over the others, is that they believe each possesses valuable knowledge about some aspect of reality. Although perceptions of nature are labelled 'myths', cultural theorists assert that each is based upon some essence of experience and wisdom (Thompson, 1986: 453). By ruling-in the contradictory certainties of each type therefore, cultural theorists are not only trying to encourage a 'truly democratic' or 'plural' society, they are also trying to encourage fully informed decision-making.

To illustrate how decision-making processes can become more democratic, and can lead to more successful outcomes, cultural theorists present a number of illustrations. Schwarz and Thompson (1990) for example, describe how the involvement of egalitarians in the development of the Frish toilet-rim block lead to a product that was not only better for the environment, but also cheaper to produce. Similarly, Ney and Thompson (1997) describe how Munich's more responsive planning authorities produced an exceptional road system, while Birmingham's authorities decided to reject all criticism and hence created Birmingham's infamous Bull Ring. Indeed, even a controversy such as the Brent Spar is considered to have been successful, since its original inclusion of just the British government and Shell was expanded as soon as other groups expressed their concerns. However, according to Schwarz and Thompson (1990: 137-138) the 'most advanced instance of practice that has come to attention' is the 'sociale kaart' (social map), which was designed to manage the many divergent and contradictory views held within the Dutch population. In this way, the Dutch political process allows all the various perceptions of an issue to be represented right through to policy level, where they become a major input into the decision-making process. Such inclusive forums are considered to be the exception rather than the rule however (Schwarz and Thompson, 1990).

Although cultural theorists assert that all the ideal types should be able to access decision-making processes, their attention is usually directed towards the individualists, egalitarians and hierarchists, as demonstrated with their analyses of the climate change debate described above. According to cultural theorists, only these types actively engage in controversial matters because the hermit is unwilling to participate, and the fatalist is unable to do so. When considering a particular controversial matter therefore, cultural theorists aim to determine how each active type participates in the policy process, and how institutional arrangements might make this process more inclusive (Ney and Thompson, 1997).

The Discourse of Individuals

While various empirical studies have found cultural theory to be useful for examining environmental controversies, there has been some controversy about why individuals seem to combine the discourses of the ideal types. Often it is proposed that individuals utilise the discourse of more than one type because they swap types depending upon their circumstances, as O'Riordan and Jordan (1999: 91) state, 'where you stand depends upon where you sit'. For Douglas, this idea initially undermined the theory that she had first conceived. However, she has since decided to support the notion that cultural theory should be utilised only within a

specific context (1982). To illustrate, Adams (1995) considers how his own biases change according to the context, as he states:

‘[...] *depending on circumstances*, I am capable of assuming all of the earthly personas of cultural theory. Sometimes I can see a role for government (hierarchist action); I believe that it would be desirable to curb the depredations of the motor car. Sometimes, when confronted with extremes of power and vulnerability, I respond with an egalitarian’s sense of injustice. Sometimes I am an individualist, resentful of the interference in my life of an overwhelming State bureaucracy. Sometimes, when contemplating the inevitability of my own mortality, I am a fatalist.’

(Adams, 1995: 134)

Adams (1995) then takes the example of James Lovelock, the author of *Gaia* (1991), and demonstrates that Lovelock’s type also shifts depending upon his circumstance. For example, viewing nature within its geological timeframe, Lovelock observes that the Earth is remarkably stable and able to cope with many fluctuations. However, since such changes are not always hospitable to human life, Lovelock could take on a view of fatalism with regard to the long-term survival of human beings. Lovelock has also lent his support to environmentalists, backing egalitarian campaigns to save whales and other endangered species; while at other times he has publicly rebuked campaigners for their exaggerated claims and economically harmful delay tactics, so taking on the role of a hierarchist. As a scientist meanwhile, Adams contends that Lovelock has taken a very individualistic approach.

Even within a context-specific case however, researchers have found that individuals do not speak with the discourse of just one type. Selecting the development controversy at Rainham Marshes (a Site of Special Scientific Interest: SSSI), Harrison and Burgess (1994) focus upon the various conceptualisations of nature that developers, nature conservationists and local residents promoted within their discourse. Following the debate publicly, and interviewing the participants privately, Harrison and Burgess describe a complex entanglement of ‘environmental meanings, social structures and political actions’ (1994: 307). Showing how fragments of several rationalities underpinned the rhetoric used by both the developers and the conservationists, they describe how the developers communicated to the public using three separate rhetorics. The first of these identified themselves as experienced managers of nature, supported by the fact that they had won awards for their involvement with Yosemite National Park since the 1930s (failing to mention that this was for the provision of visitor services!). The second demonstrated that they were credible scientists, for which they employed ecological consultants to advocate ‘technocratic solutions’. While the third explained that

nature could be 'engineered and created by skilled technocrats' (1994: 301). As a result, they acknowledged nature's vulnerability and robustness (equating with nature perverse/tolerant) while also demonstrating an affinity with nature benign.

The conservationists meanwhile, found that the rhetoric of extinction could provide them with their own moral authority. But as this failed, they turned to the legal characteristics of the SSSI as a way of countering the developer's scientific credentials. This enabled them to express their belief that there is a critical boundary within nature perverse/tolerant, so upholding their preference for a hierarchical way of life. However, as the developers questioned the science upon which the SSSI was designated, the conservationists were forced to retort that all parts of the SSSI were vulnerable to damage, so shifting to the egalitarian's myth of nature ephemeral. At the same time, and in sharp contradiction, members of the Conservation Consortium initiated their own development plan, demonstrating that perhaps nature was not as vulnerable as they had first communicated.

By stepping behind the façade of public rhetoric, Harrison and Burgess were able to show just how 'forged and fudged' the rhetorics about nature were (1994: 303). In private, some NGO members acknowledged that certain habitats were more vulnerable than others, despite their public claims otherwise. Meanwhile, some of the development team admitted that they 'regarded environmental concerns as expendable' (1994: 302), despite the rhetoric that indicated that they were concerned about environmental conservation. Nevertheless, the environmental consultants made it clear that they wished to be accepted as working for the benefit of nature. Indeed, Harrison and Burgess submit that it was perhaps because of their involvement, and because of social and political pressures, that the developers had had to adapt their own rhetoric. In this way, the developers were seen to be adjusting their rhetoric partly as a tactic to respond to the claims of opponents, and partly because the values and actions of those within their group were being continually shaped by their social context.

Despite the shifting discourse of the Rainham Marshes dispute, most groups do appear to have conformed to one particular type. The company was essentially concerned about a weak economy and increasing costs (particularly for environmental mitigation); the conservationists wished to enforce the SSSI status, but launched a more sympathetic development proposal when this appeared to be unachievable; while the campaigners demonstrated how certain species would become extinct if any development was undertaken. Where the discourse did not correspond with the type appears to have been when it was necessary for the individualists to convince others of their environmental credentials, or when the hierarchists realised that it would be better to compromise than to lose completely.

Such findings, rather than contradicting the assumptions of cultural theory, clearly match Schwarz and Thompson's (1990) concept of 'stolen rhetoric'. According to these theorists, stolen rhetoric is detected when the discourse of a particular group or individual does not correspond with its social relations. As an example, they describe Ed Teller, a leading pro-nuclear and pro-market adherent, who nonetheless appeared to have converted to environmentalism when he tried to encourage people to convert from coal by proclaiming, 'come over to clean fuel!' (Schwarz and Thompson, 1990: 73). Rather than discrediting cultural theory, Schwarz and Thompson believe that this phenomenon is necessary if the myths 'are not to become historically entrained' (1990: 74). By taking up the rhetoric of other groups, they state that old commitments have to give way to new and up-dated ones, so keeping pace with time, place, science and technology. Stolen rhetoric thus indicates the changes that policy actors feel they have to embrace if they are to stay within the popular arena.

In a similar vein, Schwarz and Thompson (1990) describe a further method of incorporating change, by co-opting those who are threatening a group's membership. They illustrate this with the case of the troublesome critic, whose uncompromising activism appears to be damaging another group's social-standing. Rather than defy change, they describe how the threatened group creates a niche for the critics, where it is possible for them to speak within the forums they had previously criticised. By appeasing its members in this way, the co-opting group is thought less likely to lose members. Indeed, it may even acquire them, as Schwarz and Thompson describe of the co-opted egalitarians who, having spent so much time 'hobnobbing with the hierarchists in the corridors of power', and so little with those for whom they speak, find that they have crossed 'the hidden line' (Schwarz and Thompson, 1990: 60). The fine balancing act between the egalitarians and the hierarchists is thus described to have failed these egalitarians, as they find that they have more in common with those who have given them a prestigious place within their institution. For the remaining egalitarians, it is proposed that this abandonment is likely to be unforgivable since, according to Schwarz and Thompson (1990), once trust has been lost, it is difficult to regain.

Other alliances are also thought to occur, such as those between two weaker groups who wish to overthrow the third. When acting alone, Schwarz and Thompson (1990) maintain that a group is more liable to be surprised because it can only see in one direction. As it rejects the insights and visions of competing biases therefore, it fails to deliver the promises that it makes. By forming an advantageous alliance however, groups increase their chances of foreseeing surprises by compensating for each other's deficiencies. However, despite the strength that they gain from each other, these alliances are said to eventually fall apart, since

they still miss the valuable insights of the third active group. What is more, even in the highly unlikely scenario of an alliance between the three active groups (which would probably only occur during a war-like crisis), cultural theorists believe that the alliance is unlikely to last. The idea that there will one day be a cultural convergence that will lead to the end of history is regarded as a highly unlikely event (Schwarz and Thompson, 1990).

One further reason for individuals to combine discourses, is thought to be because they themselves are in the process of changing. For Holling (1986), it is possible for people to change their myth of nature, and usually because they have experienced a surprise. Taking a historical perspective, he describes how nature in the past has generally been perceived as stable. Such qualities of control and stability are asserted to have been underpinned by the physical theories of Newton and Laplace, which denied intrinsic unpredictability and removed God as a causal factor. However, because of the prevalence of this perception, Holling (1986) proposes that nature has become over-exploited and thus more fragile and unstable. For instance, he describes how the introduction of cattle lead to a predominance of more vulnerable grass species, while the control of forest fires lead to the build-up of fuel and thus more destructive fires. Such 'surprises', Holling (1986) explains, made individuals experience alarm, denial or adaptation, so informing their future perceptions of nature.

Thompson (1982a) has also introduced the idea of change to cultural theory, this time not only due to the surprises that the natural world holds, but also due to those that occur within the social world. According to Thompson (1982a) when individuals are firmly affiliated to one type their situation is stable. This is because the way that they have learnt to understand allows them to see what they believe is there, and by seeing what they believe is there, they can further rationalise the way that they understand it. The 'stable condition', according to Thompson, 'is really a huge confidence trick', with the individual supporting the whole and the whole supporting the individual (1982a: 58). However, since each way of life is believed to be not entirely impervious to the real world, individuals are able to detect discrepancies between what they expect to see, and what they actually see (Thompson, Ellis and Wildavsky, 1990). In the event of a single surprise, it is thought that individuals might pass it as a simple anomaly. However, upon the occurrence of successive surprises, individuals could choose to search for a more reliable way of understanding the world. The example that Schwarz and Thompson (1990) give is that of local objectors. Describing how local objectors become threatened by an unexpected risk, they submit that such people suddenly need to network with egalitarians, with whom they previously had little social contact. As the battle against the new risk ensues, they assert that these individuals become increasingly involved in egalitarian activities, which can lead to them becoming egalitarians themselves.

Each type is thus said to encounter situations that it did not expect, while others will have identified the same surprise as a likely event. The groups that accurately made their predictions therefore become bolstered, by attaining status and attracting the disillusioned members of other groups. To change from one type to another however, is thought to take considerable effort. For one, the original worldview is considerably difficult to unlock oneself from, since it has created a way of seeing that precludes any other. Furthermore, even if the need to develop a new worldview is perceived, the individual will know that it will be a difficult transition to make, particularly considering all the time and energy that has been put into securing the current way of understanding the world. Change, therefore, will not occur unless it has to, either because the individual decides that the effort is necessary, or because a large jolt from outside forces that change (Thompson, 1982a: 49). However, once a new cosmology has been adopted, other risks will be perceived in a way that will support the new type further.

Thompson (1982a) adapts Douglas's grid-group typology to incorporate these dynamics of change. As individuals undergo the transition from one type to another, Thompson describes how they often inhabit the hermit's zone, either because they are no longer committed to their original worldview, or because other members have rejected them. By redrawing the model, Thompson (1982a) shows how individuals can occupy one of the five stable types, or anywhere else in between them. Beyond the stable states however, he describes how views are likely to be individualised, less stable and liable to change; mixed types are therefore only temporary. To represent this, Thompson (1982a) joins the stable states with an undulating surface, where the lower plane represents those living by survival strategies and the upper plane represents those utilising manipulative strategies. The areas in between subsequently become the steep slopes upon which individuals who are between types can adapt their worldview. The centre however, remains the domain of the autonomous individual or hermit, where those passing through it are said to perhaps encounter 'an intense and perhaps alarming experience'. As Thompson explains: 'in a blinding flash (blinding because, for a moment, he has no way of seeing) the whole world is altered, but of course the world is the same: it is his view of it that has altered' (1982a: 50). Nevertheless, change can also occur without moving through the centre, for example by climbing slowly from fatalism to individualism, or by suddenly falling from individualism to egalitarianism.

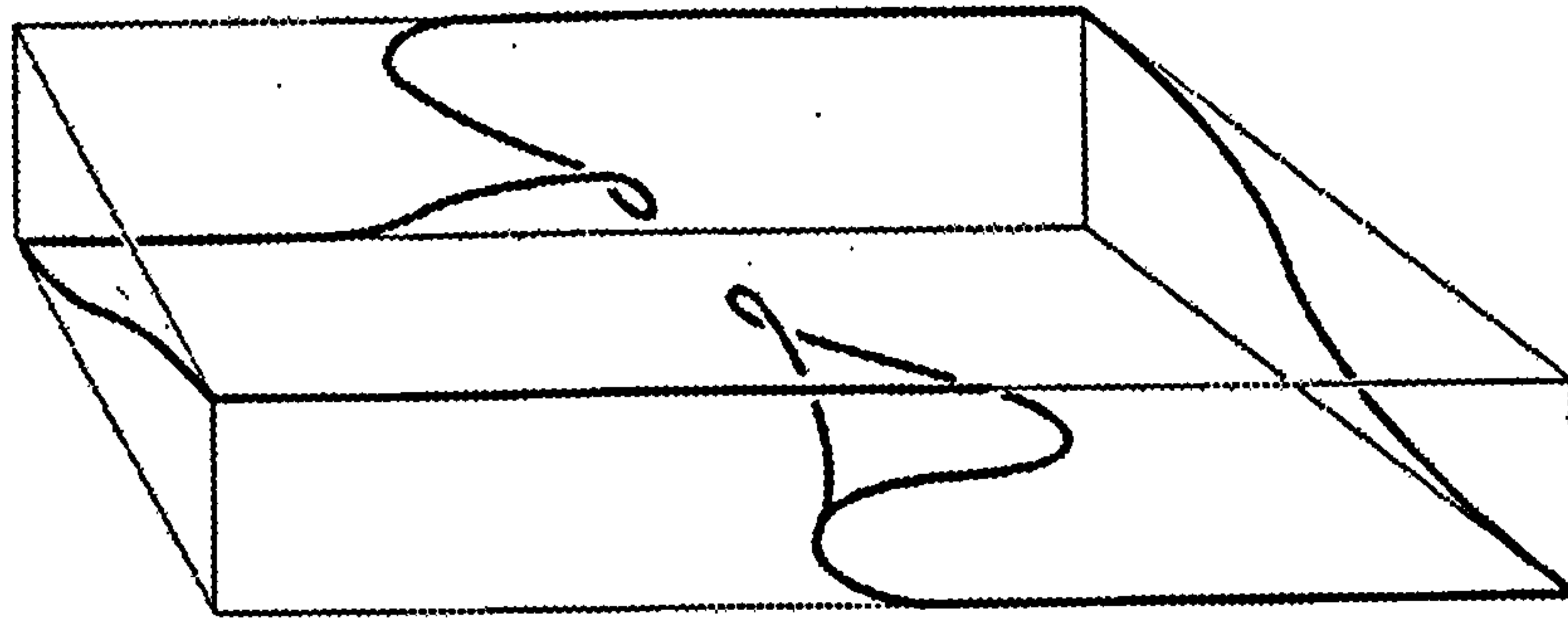


Figure 3.3. Thompson's (1982a) three-dimensional model, with the survival strategy on the bottom plane, the autonomous strategy in the middle, and the manipulative strategy at the top.

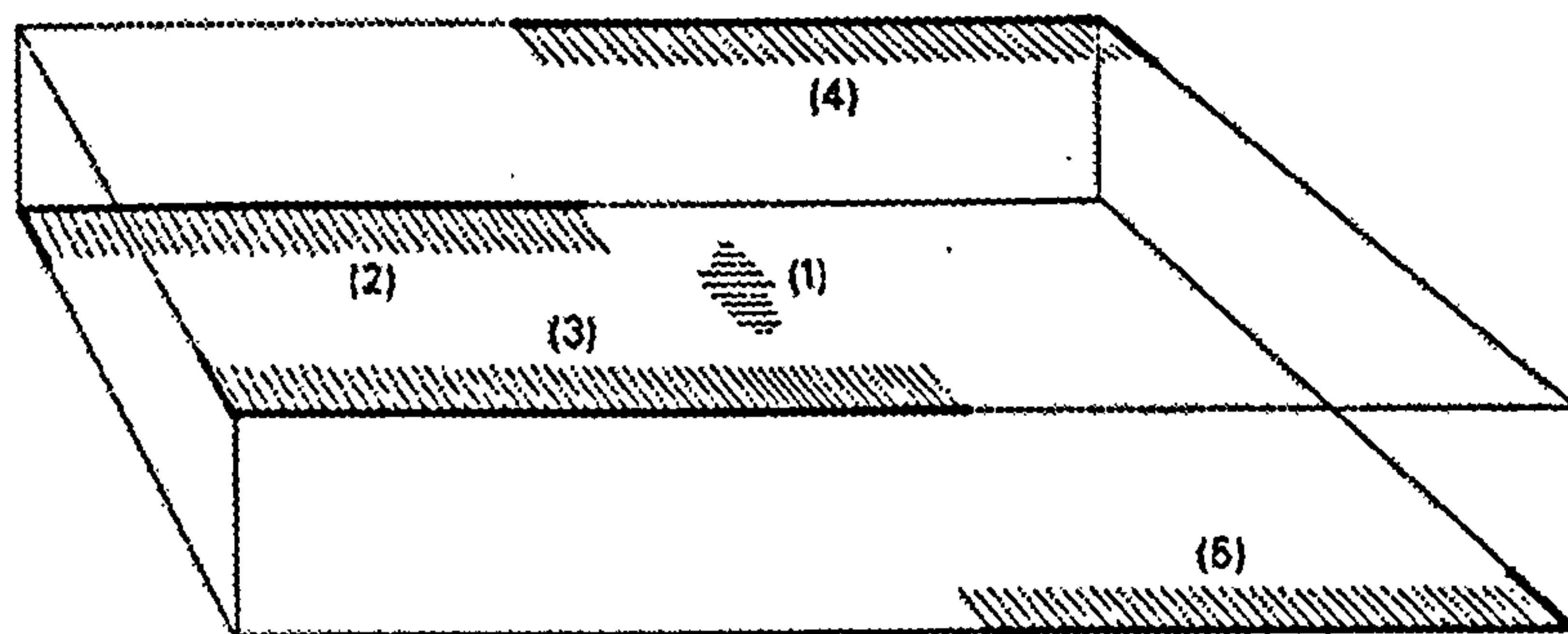


Figure 3.4. Thompson's (1982a) three-dimensional model, where 1 is the hermit, 2 is the fatalist, 3 is the individualist, 4 is the hierarchist and 5 is the egalitarian.

Adams (1995) has also produced an alternative model, which shows 16 possible types, as demonstrated in table 3.5 below. Although Adams (1995) states that the ideal types are the most stable and frequently encountered, he also contends that some individuals understand nature in one way and society in another. For example, he describes how a bankrupt venture capitalist, who once had an individualistic approach to life, would suddenly experience a hostile environment, while a lottery winner, who once lived in an unpredictable world, could now choose to hold egalitarian beliefs. Of course, it is possible that these individuals are mixing discourse because they are still in the process of change. However, Adams submits that although new perspectives on life may develop, some aspects of the old ways of life and perceptions of risk will be retained. Subsequently, he explains that the beliefs that are not consistent with one another are held by the one individual because, in a globalised world, 'our cultural filters must cope with a cacophony of competing and conflicting messages' (1995: 202). For Adams therefore, perceptions of nature and society do not necessarily correspond as neatly as cultural theorists attest, and mixed types can be a stable state.

	Egalitarian	Fatalist	Hierarchist	Individualist
Ephemeral	Communard Lovelock, Soros	Hell's Angel	bankrupt Lloyds "Name"	bankrupt venture capitalist
Capricious	Ned Ludd, lottery winner	Somalian refugee	BBC weather forecaster	Gambler & lady luck, Lovelock
Perverse/ tolerant	Friend of Earth government advisor	Rebel without a cause - James Dean	Ambitious civil servant, Lovelock	Venture capitalist in bear market
Benign	Utopian socialist on Kibbutz	Calvinist, Lovelock, religious martyr	Contented civil servant	Venture capitalist, Soros

Table 3.5. Adams's elaboration of cultural theory (1995: 203).

While Adams (1995) suggests that an individual can hold beliefs that are not consistent with the assumptions of cultural theory, empirical work by Ellis and Thompson (1997) demonstrates otherwise. Investigating the cultural sources of environmental attitudes and beliefs in the Pacific Northwest, Ellis and Thompson³ (1997) discovered that there was a strong correlation between environmentalism and egalitarianism, and that individualists rarely supported environmentalism. Their work therefore suggests that within a specific context, individuals do understand nature and society in a way that corresponds with cultural theory. However, they also found that it might be more appropriate to present the discourse of cultural theory's types along a continuum, rather than on the grid-group model.

Aiming to discern what lay beneath environmental attitudes, Ellis and Thompson (1997) conducted a postal survey with four environmental groups and a random sample of rural residents. Their results indicate that the difference in environmental attitudes lay in the intensity of what individuals believe, rather than in what they believe. Thus, while the residents were found to have a strong faith in the promise of science and technology to solve human problems, the Audubon Society and Sierra Club were seen to largely share this faith, while the Earth Islanders and Earth First! did not. In addition, they demonstrate that there is a strong inverse relationship between support for market individualism and support for environmentalism, which they suggest indicates that they exist at opposite ends of a scale. This they also support with evidence from Marris, Langford and O'Riordan (1996), who contend that nature benign and nature ephemeral are mirror images of each other.

³ Note that this is Fred Thompson and not Michael Thompson who has published the majority of papers on cultural theory.

With nature ephemeral and nature benign on opposite ends of a continuum, Ellis and Thompson (1997) place nature perverse/tolerant in the centre. Interestingly, Thompson, Ellis and Wildavsky (1990: 26-27) also contend that nature perverse/tolerant might exist as a middle-ground between the two extremes. Furthermore, Ellis and Thompson (1997: 892) state that there is a 'theoretical muddle about how hierarchical attitudes towards environmental issues are supposed to differ from individualistic attitudes', referring in particular to work by Dake and Wildavsky (1991: 17). From their own research, Ellis and Thompson discovered that the environmental debate was primarily between the egalitarians and the individualists, which they liken to Cotgrove's Cornucopians and Catastrophists (1982). However, they also propose that the hierarchical perception of nature is distinct from the two extremes, although 'it is hard to say positively what *is* the hierarchical conception of the environment' (1997: 892). As a result, they propose that there is a hierarchical perception of nature, but it remains between nature benign and nature ephemeral. However, Thompson and Rayner state that although nature perverse/tolerant 'might appear to suggest that it is a hybrid of the two myths [...] it is very different' (1998a: 285).

One reason why the the discourse of individuals remains contested, is that cultural theory is often applied at the level of voice. As Johnson (1987: 151) states, Douglas intended grid-group analysis to be focused upon public actions or public statements defending their actions (public is suggested to be three or more group members). As such, conventional classifications such as the state, government, pressure groups or the individual have been avoided. However, as Adams (1995: 41) expresses, very often such approaches can lead to the development of caricatures, rather than accurate depictions of what individuals actually perceive. It thus appears that an environmental controversy needs to be analysed at the level of the individual, so that it will be possible to develop a better understanding of how and why individuals combine the discourses of cultural theory's ideal types.

Cultural Theory and the GM Crop Debate

The key aim of this research has been to consider whether new modes of public participation would make the insitutional arrangements for GM crops more inclusive. Since it is claimed that the ideal types represent all the possible ways of perceiving the world (see page 36), cultural theory provides an ideal tool with which to understand the true diversity of opinion communicated within this debate. It enables consideration of whether the discourses of all three active types can be heard, whether they are all acknowledged by the government, and whether new modes of public participation could allow a greater diversity of opinion to be

voiced. Furthermore, and as cultural theorists assert, by actively 'ruling in' each ideal type, cultural theory appears to encourage the researcher to distance him or herself from personal prejudice (see pages 50-1). This last point was deemed particularly important with regard to this research, because I had previously worked as a campaigner against the introduction of GM crops and wanted to ensure that my viewpoint was not obstructing those of others (this issue is discussed in greater detail in chapter 4).

In order to consider whether new modes of public participation would make the institutional framework more inclusive, it was first deemed necessary to understand how cultural theory's ideal types were represented by those already engaged in the GM crop debate. This not only required an examination of the disembodied 'voices' heard within the media and the literature of participating organisations, as Douglas first intended (see page 60), but also of the more private discourse of individuals within one-to-one interviews. As Harrison and Burgess (1994) discovered (see page 54), individuals can adapt their discourse for the public arena in order to win favour, while hiding their true motives and beliefs. If there is no attempt to understand private concerns therefore, powerful motives could remain concealed and minority views unspoken.

While considering the discourse of individuals in order to ascertain the true diversity of opinion held by those within the debate, it was also possible to consider whether and why individuals combined the discourse of cultural theory's ideal types. As described on pages 52-60 above, a number of theories have been devised to explain why mixed discourse is used, which include the existence of alliances and stolen rhetoric, the effects of surprise or gradual change, and the possibility that the discourse of ideal types exists along a continuum. By attending to the discourse of individuals therefore, not only was it considered possible to determine the full diversity of opinion within the debate, but also to develop a better understanding of how individuals utilised the discourses of cultural theory's ideal types.

Once a full understanding of the discourses utilised by individuals in both public and private domains was determined, the public attitudes communicated in earlier social science studies could be examined to consider whether these views were already widely communicated, whether they were already privately held by individuals engaged in the debate, or whether they were entirely new. It was therefore deemed possible to ascertain how new modes of public participation would contribute to policy decision-making, and whether there was an alternative that could provide a simpler and perhaps better result.

Summary

This chapter described how cultural theorists believe that there are only five ways in which the world can be understood. Each of these has been assigned an ideal type, named the individualist, egalitarian, hierarchist, fatalist and hermit, and each has a corresponding view of nature and society. Cultural theory's ideal types were devised by Douglas using grid-group analysis, which states that individuals perceive the world according to the groups that they belong to and the pressure that is put upon them to conform. In order to develop each type's perception of nature further, Thompson, Holling and Timmerman adapted the myths of nature so that a myth could be allocated to each ideal type. Although the views of each type contradict one another, cultural theorists believe each is required if decision-making is to be both democratic and fully informed.

While cultural theory is believed to be useful for examining environmental controversies, there is some disagreement about how and why individuals utilise the discourse of more than one type. Individuals are thought to change their discourse according to the issue being discussed, which has led some to call for case specific analyses. However, individuals are also thought to steal the rhetoric of other types, or to use a combination of discourses when they switch from one ideal type to another, as Thompson (1982a) has modelled. Meanwhile Adams (1995) asserts that individuals combine discourses far more than others have acknowledged, which he has illustrated with a model showing 16 cells. However, empirical work by Ellis and Thompson (1997) demonstrates that individuals do use consistent discourses within a case specific context. Ellis and Thompson (1997) also suggest that the discourse of the ideal types might be better presented along a continuum, although they state that this still requires a greater understanding of nature perverse/tolerant. This research uses the categories and concepts of cultural theory as tools to determine whether new modes of public participation will improve the inclusiveness of institutional arrangements, and while doing so, reflects upon the relative merits of cultural theory's various models.

The questions that this research has been designed to answer are outlined on the following page, and the methods that were developed to answer them are presented in chapter 4.

Research Questions

This research was devised to answer the following questions:

- 1. By utilising cultural theory to analyse the GM crop debate, do new modes of public participation still appear to be the best way to make institutional arrangements more inclusive?**
- 2. How do individuals engaged in the GM crop debate utilise the discourse of cultural theory's ideal types, and does this have implications for making decisions inclusive?**

These questions were answered by satisfying the objectives listed below:

- To outline how each of cultural theory's ideal types frame the GM crop debate;**
- To determine how individuals utilise the discourse of cultural theory's ideal types;**
- To consider how the discourse of individuals is best modelled;**
- To establish how the ideal types are represented within the wider public debate;**
- To establish the extent to which government actions reflect the concerns of each type;**

Methodology

Introduction

In this chapter the methods that were employed to answer the research questions listed on the previous page are presented. First, the information sources that were used to develop a better understanding of the GM crop debate, and to understand how the ideal types were represented in public, are described. This is followed by a description of how a semi-structured interview schedule was developed, how potential interviewees were identified and contacted, and how the interviews were conducted. Due to my previous involvement in the GM crop debate, and due to the fact that some interviewees discovered this, the impact of the researcher upon the research process is also discussed. The chapter concludes with a description of how the data was analysed.

Sourcing Secondary Data on the GM Crop Debate

Throughout the duration of this research, a wide range of secondary data sources were accessed and utilised. This enabled a thorough understanding of the issues at stake, which ensured that they could be discussed with competence during interviews. Furthermore, it provided a wealth of information that enabled a full analysis of the ways in which the ideal types were represented within the public debate.

As an environmental campaigner, a number of meetings and conferences on GM crops had already been attended, where both sides of the debate had presented their views. A reasonable understanding of the debate from both the opponents' and proponents' perspectives had already been developed therefore. Moreover, through a subscription to the Genetic Engineering Network's (GEN) electronic mailing list since its inception in the spring of 1997, a good understanding of the controversy's evolution had also been acquired. Indeed, it could be said that the main concern of this research was to restrict the accumulation of information, rather than to maximise it, since it would have been an impossible task to exhaust all the material that existed on GM crops, especially on the internet.

Despite the reams of information that existed on the internet, this proved to be one of the most powerful tools for understanding the issues that surrounded the release of GM crops to the UK environment.⁴ Through subscriptions to GEN, GM-Action, Friends of the Earth (FOE), the Natural Law Party (NLP Wessex) and the Institute for Science in Society (ISIS), it was possible to gain a good insight into the issues that concern most campaigners, and to see how they reacted to the beliefs and actions of others, as O'Dochartaigh (2002) also found:

'The internet has provided activists [...] with an opportunity to spread their message more widely. As a result researchers have the sort of access to those types of materials which they could only have dreamed of up to a few years ago.'

(O'Dochartaigh, 2002: 17)

The internet also made it possible to keep abreast of most media articles and press releases relating to the introduction of GM crops to the UK environment, both through the electronic mailing lists described above, and through a GM news archive (www.gmfoodnews.com), which was particularly good from January 1999. In addition, the websites of various news providers such as the Guardian, the Telegraph and BBC Online, enabled the identification of further news items.

Despite the convenience of the internet however, it was not relied upon entirely. This is because when a group compiles an archive, it could omit some items either because they appear to be irrelevant, or because they contradict certain assumptions and beliefs. Of course, this is interesting with regard to the discourse that organisations chose to present, but it would not be possible to determine this without first having a broader perspective of the debate. For this reason, the national news providers, both on the television, in the media (tabloid and broadsheet) and in specialist magazines such as the New Scientist, Farmers Weekly and the Economist were also followed. Again, these sources were not searched exhaustively, since the sheer mass of information that was generated on GM crops since the late 1990s made this impractical. Nevertheless, using the combination of information sources described above, it was possible to gain a thorough knowledge of events pertaining to the introduction of GM crops from 1997 to 2002, and a good insight into those that went beforehand.

⁴ Many of the electronic mailing lists and websites that were used are listed in appendix 2.

By following the media, it was also possible to determine which organisations were engaged in the GM crop controversy. With this information, various internet search engines were used to determine which organisations had websites, and whether these websites had information describing their position on GM crops. Furthermore, through links on some of these websites, it was possible to identify other key organisations. As a result, a list of those groups engaged in the GM crop controversy was compiled, and a collection of articles and position statements originating from each was accumulated. This process was particularly useful for understanding the beliefs of those campaigning against the cultivation of GM crops, such as Greenpeace, Friends of the Earth and more radical groups such as GenetiX Snowball. But it was also possible to follow the policies and positions of those involved in the trialing of GM crops, such as government agencies, advisory bodies and the scientific steering committee for the FSEs.

While it was relatively easy to identify information emanating from campaigning groups and government departments, it was more difficult to identify that originating from biotechnology companies and the agricultural community. This appeared to be because such organisations were quoted less frequently in the national media, and rarely publicised their convictions on the internet. To a certain extent the situation changed towards the end of this research project. However, even in 2000 there were a number of exceptions, which included the daily electronic mailing list AgBioWorld, and Monsanto's website, which provided a weekly update of news items and hosted discussion forums on various aspects of the debate.

Of great value to understanding of the proponents' viewpoint, was a visit that I made to the United States of America in November 1998. At the time the focus of this research was being formulated, and I was concerned that my background as a GM campaigner might bias the research. I therefore decided to immerse myself in the culture of GM crop proponents for two weeks, spending time at the headquarters of Monsanto in St. Louis, visiting producers and seed retailers in Iowa and meeting various representatives and officials in Washington D.C. As a result, it was possible to gain a valuable insight into the assumptions and beliefs of those developing and promoting GM crops, and to view how differently American citizens had reacted to their introduction. It was also possible to start challenging my personal beliefs about the potential impacts of GM crops, although I did not abandon my environmentalist viewpoint. When asked to write a piece for the local Friends of the Earth newsletter about my experience therefore (circulation under 100), I saw an opportunity to practice a different style of writing, rather than a potential obstacle for my research. However, this article was discovered by interviewees eighteen months later, and created both opportunities and obstacles, as discussed below.

Within the UK, a number of public meetings and conferences were attended, and proceedings and tape recordings of others were also obtained. These forums again made it possible to witness the various accounts that individuals put forward to support their perception of GM crops. Furthermore, by obtaining the proceedings of conferences lead by industry and scientific establishments, it was possible to observe how proponents of GM crops presented their case when opponents were no longer present. The meetings and conferences that were attended, and those from which proceedings were acquired, are presented in table 4.1 below.

March 1997	<i>Advancing Biotechnology – Prospects for the Agricultural and Food Industry.</i> Royal Agricultural College, Cirencester (proceedings)
March 1997	<i>Edinburgh Science Festival</i> (attended)
September 1998	<i>Genetics Beyond 2000</i> , The British Association’s Annual Festival of Science, Cardiff University (attended)
October 1998	<i>Public meeting on GM crops</i> , Exeter University, Devon (attended)
October 1998	<i>Public meeting on GM crops</i> , Midsomer Norton, Somerset (attended)
February 1999	<i>Genetic Modification – Path to profit or road to ruin?</i> Farmers Weekly Conference, NEC, Birmingham (attended)
April 1999	<i>Gene Flow and Agriculture – relevance for transgenic crops.</i> University of Keele, Staffordshire (proceedings)
April 2000	<i>DETR Public Meeting</i> , Banbury, Oxfordshire (attended and transcribed).
January 2000	<i>Biotechnology, the Science, the Impact.</i> US Embassy Conference (proceedings)
April 2000	<i>The State of the Countryside in a Biotechnological Britain.</i> Landuse and Research Co-ordination Committee Meeting, Fitzwilliam College, Cambridge (attended)
May 2000	<i>Public meeting</i> , Alderminster (attended and transcribed)
Summer 2000	<i>DETR public meeting</i> , Cambridge (tape recording)
Summer 2000	<i>DETR public meeting</i> , York (tape recording)
May 2001	<i>Seeds of Opportunity – the role of biotechnology in agriculture.</i> London (proceedings)

Table 4.1. Meetings and conferences that were attended and from which proceedings were acquired.

In addition to sourcing data from the internet, newspapers and meetings, many books were published on GM crops, which were written from both from a proponent’s and opponent’s perspective (for example, Kneen, 1999; Anderson, 1999; McHughen, 2000; and Purdue,

2000). As a result, it was possible to 'rule in' the various framings of the GM crop debate, and to discern how each was represented. However, in order to determine how individuals utilised the discourse of each of cultural theory's ideal types, it was necessary to design questions that could elicit this information from a broad-spectrum of individuals engaged in the GM crop debate.

Question Design

Having sourced a great deal of information about the GM crop debate, it was clear that a wide range of issues had been embraced, including bioethics, patents, food safety, world hunger, the environment, and capitalism. To discuss each of these issues in sufficient depth would have been impossible within the confines of single interviews. Furthermore, it would have been difficult to analyse interviews if individuals were encouraged to discuss those issues that were most important to them. For example, one interviewee might have chosen to discuss the ethics of genetic engineering, while another might have discussed technical issues. It was for these reasons that one specific area was focused upon.

It was decided that the most interesting and beneficial area to consider would be how individuals perceived nature and the environmental impact of GMHT crops. Initially this area was chosen because I had become interested in my own understanding of nature, which I had started to question as a result of being engaged in the GM crop debate. Since its outset, this debate had been rich in discourse about naturalness and environmental impact, and it therefore seemed likely that most individuals engaged in this debate would have a considered position about the human relationship with the environment. By focusing specifically upon GMHT crops meanwhile, the intention was that the interviews would again be more comparable.

It was also apparent that cultural theory would benefit most from an empirical enquiry into people's conceptualisations of nature. Since Holling (1986), Timmerman (1986) and Thompson (for example, 1987) adapted the ecologists' myths of nature to fit the grid-group quadrant, it is clear that there have been some difficulties, as described in chapter 3. In particular, the myth of nature perverse/tolerant has been described differently by each of these theorists (see pages 41-43), and has presented problems for practitioners such as Ellis and Thompson (1997), who have been unable to identify the myth of nature perverse/tolerant within their empirical work (see page 60). It thus seemed sensible to focus upon this aspect in some detail, so that each conceptualisation of nature could be properly understood, and so that it would be clear which discourses individuals were using.

Although conceptualisations of nature were chosen as a focus, it was decided that it would also be important for interviewees to mention other issues if they wished to do so. This was because an individual's principal interest might not be in the physical impacts of GM crops, but rather in another issue such as the control of multinational companies. To strictly limit discussions to the physical aspects of the debate therefore, would have been similar to the current risk assessment process, which has been criticised for its narrow focus of enquiry (ESRC, 1999; see page 32). Furthermore, although cultural theory states that perceptions of nature are indicative of other concerns (as outlined on page 37), Adams (1995) suggests that individuals actually use inconsistent discourses (as described on pages 58-59). It therefore seemed necessary to consider whether an individual's discourse about nature matched the societal concerns that they chose to disclose; and if not, which issues most appeared to influence their position on GM crops.

With the intention of examining one particular aspect of the GM crop debate, while being open to the possibility that other aspects might be considered more relevant, it was decided that semi-structured interviews would be undertaken, which are known for their flexibility and depth of enquiry (Patton, 1990; Sarantakos, 1998). By doing so, it was not only possible to consider other issues, but also to explore the possibility that there were other conceptualisations of nature that cultural theorists had not yet considered. For example, if a more structured approach had been taken, different framings of the GM crop debate might have been taken from the secondary sources described above, and allocated to each of cultural theory's ideal types (as others had done with the climate change debate, described on pages 46-50). To consider the perceptions of individuals, a questionnaire could then have been constructed with answers that reflected the discourse of each myth, so that respondents could select the answer that best reflected their outlook, for example:

Selecting your answer from the following statements, to what extent do you think we can understand the environmental effects of GMHT crops?

- a) we already know that GMHT crops are safe for the environment, and we have already conducted far more tests than are necessary;
- b) we will never understand the effects of GMHT crops on the environment, because there are so many complex interactions to consider; or,
- c) once the farm-scale evaluations are complete, we will have a good understanding of the possible impacts of GMHT crops.

By enquiring in this way, it would not have been possible to know whether there were other responses to the question, or why certain answers were chosen. For example, it would have been impossible to tell whether answers reflected a physical understanding of the environment, whether they represented social concerns, whether there were other myths of nature yet to be identified, or whether individuals occupied a position somewhere in-between two myths. A semi-structured approach on the other hand, would enable interviewees to utilise their own discourse to a far greater extent, and without the imposition of my own assumptions or those of cultural theory. For example, when asking how the environmental impacts of GMHT crops can be understood, without the three answers outlined above, interviewees could now offer a range of answers, which might include:

- It is not possible to understand all the impacts of GM crops, but we must introduce them because the world desperately needs more food; or
- We can understand the impacts of GM crops, but we can not trust the scientists to be honest about them.

Furthermore, it would allow questions to be rephrased and further explanations to be requested if this was deemed necessary. These last aspects were particularly important because the intention was to interview a broad-spectrum of individuals, whose knowledge and discourse was likely to vary considerably.

Having decided to focus upon how individuals conceptualise nature, questions were constructed that represented various aspects of environmental beliefs. As sources of inspiration, descriptions of the myths of nature were drawn upon, such as Schwarz and Thompson (1990), and key texts on environmentalism and nature, such as Pepper (1996), Coates (1998) and Macnaghten and Urry (1998). The questions that were devised as a result of consulting these sources generally reflected nature's stability, attitudes to trial-and-error, preferred futures and the philosophical concerns of environmentalists such as Naess (1988) and McKibben (1990). However, questions were also composed from information acquired from the public debate on GM crops, which seemed to indicate that organisations were primarily concerned about the intricacies of testing procedures.

To encourage interviewees to reveal their true concerns, they were urged to discuss technical aspects of the testing procedures at some length. Such an approach might sound contradictory, but as a result interviewees either faltered and exposed their lack of understanding in this area, disclosed that their opinion was based upon trust rather than knowledge, or demonstrated their boredom with the issue and their wish to discuss something

different. While noting these desires to change the topic, the technical enquiry was often pursued further so that it could be determined whether these issues were considered important enough to be mentioned again (Oppenheim, 1992). In addition, more ambiguous questions were devised that could be interpreted according to the interviewee's value system. For example, when asked about the importance of cross-pollination, an interviewee could answer scientifically or philosophically, while a question about 'future agriculture' encouraged answers pertaining to either agronomy, the environment, the economy or society. Subject matter could thus be diverse, according to the interests of the interviewee. However, when an issue was mentioned frequently, it was often incorporated at the end of those interviews within which it had not been discussed. It was therefore possible to see whether these respondents had failed to mention an issue because it was not relevant to them, or merely because they did not take the opportunity to do so earlier.

Probably the best time to gauge the motivations of each individual however, was at the beginning of the interview, when interviewees were asked general questions about their background and involvement in the GM crop debate. Such questions were not only intended to identify their motivational drive, but also to develop a good rapport. Furthermore, they offered the opportunity to determine how interviewees might best communicate. For example, would they need encouragement or 'reigning-in', and would they prefer a formal or informal approach? Most importantly however, they provided the opportunity for the respondents to ease into the interview, and to develop the habit of offering text-rich answers (Oppenheim, 1992).

To touch upon an individual's personal philosophy about nature, a summary of the following passage was narrated, with the intention to incite an emotional response:

'When I was out walking a few weeks ago, I almost kicked the biggest rabbit I had ever seen. She had nearly finished turning white for the winter, and we stood there watching each other for a pleasant while, two creatures linked by curiosity. What will it mean to come across a rabbit in the woods after genetically engineered 'rabbits' are widespread? Why would we have any more reverence, or even affection, for such a rabbit than a Coke bottle?'

McKibben (1990: 194-5)

This passage conforms to Oppenheim's advice on attitudinal statements (1992: 174), since it generally captured the respondents' interest and provoked passionate responses from both extremes. However, because some respondents reacted with great agitation or suspicion when

emotional considerations were touched upon, this statement was only introduced once technical topics had been discussed, and sometimes it was omitted altogether. By managing sensitive issues in this way, a good rapport was maintained with interviewees, whose respect and co-operation might have been lost if too many 'irrational' lines of enquiry were pursued (Moser and Kalton, 1985). Indeed, this was also a tactic that was used with interviewees who found other forms of questioning boring, irrelevant or difficult. However, in most cases the order of questioning was maintained, as presented in table 4.2, following a logical and seemingly conversational order, and finishing with an inquiry about the respondent's ideal future and the offer of a 'magic wand'. This last question offered a final opportunity to disclose those issues most pertinent to them, even if this was only once the interview was 'over' and the tape recorder was switched off.

The interview schedule was piloted on six individuals who either worked with GM crops or campaigned against them. During this phase it was discovered that more questions had been devised than necessary, so those that elicited the best responses were selected. As intended, most questions enabled text-rich answers, which required the interviews to be tape recorded and transcribed verbatim (Bryman, 2001: 321). In order to do this however, it was first necessary to gain the trust of individuals who were participating in such a politically sensitive arena.

The Interviewees

Individuals engaged in the GM crop debate were first identified by collecting the names of people quoted in the media, speakers at meetings and conferences, contacts on websites, farmers involved in the farm-scale trials, and prominent individuals on electronic mailing lists. However, additional names were also gathered through the process of 'snowballing', when interviewees recommended contacts of their own (Coleman, 1958). Estimating that between forty and fifty interviews would need to be undertaken before a good understanding of the perceptions of individuals was acquired, the names of one hundred people who were either highly involved in the debate, or who took a unique or extreme stance were selected. Since the interviews were intended to determine how individuals utilised the discourse of cultural theory's ideal types, those who could enable the diversity of opinion to be understood, rather than the balance of opinion, were selected.

An enquiry about the individual's background and involvement in the GM crop debate.

What do you think about the view that it is not 'natural' to genetically modify a plant?

How does GM crop technology compare with conventional plant-breeding techniques?

- How different is it to traditional cross-breeding/induced mutagenesis?
- Does this difference matter? Some say it does/doesn't because (offer opposing views)
- To what extent do you think GMHT crops need to be tested more rigorously? Why?

Can we ever fully understand the environmental impacts of GMHT crops?

- Does this matter?
- Do we know enough about GMHT crops to be releasing them into the environment?
- How could tests to assess the environmental impact of GMHT crops be improved?
- What do you think of the farm-scale evaluations? (choice of organisms, buffers etc)
- How useful do you think the results of the farm-scale evaluations will be? Why?

To what extent does it matter if another plant cross-pollinates with a GMHT crop?

- What about philosophically?

Someone came up with the concept of 'raw nature' (McKibben's rabbit quote, p.71). Do you think it would matter if 'raw nature' no longer existed?

- Why? (Offer opposing views if not too sensitive)

How do you think agriculture has impacted upon the environment in the past?

- Do you think agriculture always has to have a negative impact on the environment?

In an ideal world, how would you like to see UK agriculture develop in the future?

- What sort of crops? Why?
- What role would GM crops have? Could GMHT crops have a role to play?
- Where would nature be in your ideal landscape? (on farms or in reserves)

If I gave you a magic wand to use in the GM crop debate, what would you do?

Table 4.2. Key questions devised for the semi-structured interviews.

Having contacted the majority of people during April 2000, a total of 49 interviews were conducted over the next 6 months. Of these, 23 were opponents, 23 proponents, and three were uncertain. In almost all circumstances, interviews were conducted on a one-to-one basis for approximately one hour, and usually in the respondent's own office or home. However, on one occasion three campaigners (Emily etc.) were only available as a group, while on another an industry representative was visiting a farmer who suggested that he contributed to the discussion. Data from these interviews was therefore treated more carefully during analysis, since it was possible that respondents were influenced by the presence of others. Nevertheless, since the pilot interviews were data-rich, it was decided that these would be included in the final sample, ensuring that there was a total of 55 interviews with which to examine how interviewees utilised the discourse of cultural theory's ideal types.

In table 4.3 below, a brief outline of each interviewee is provided, which can act as a guide when reading the results. The pages where interviewees are quoted in the text are also listed, so that it is possible to gain a fuller picture of each individual in isolation. Although the names reflect a persons gender, the real names of interviewees are not given, despite the fact that some wished their identity to be known. This is because of my own experiences of the politically sensitive nature of this debate (outlined below), and my desire to treat interviewees equally. Similarly, where interviewees might easily be identified, text and information that might enable this has been retained.

Name	Description	Page numbers
Alice	<i>Campaigner. No membership to environmental organisations.</i>	118, 135, 139, 189, 191, 192
Alma	<i>Plant scientist.</i>	87, 88, 89, 98, 108, 112, 203
Anthony	<i>Campaigner and human biologist.</i>	117, 119, 126, 136-7, 137, 140
Ben	<i>Ecologist involved in the farm-scale evaluations.</i>	150, 153, 158, 163, 165
Bryn	<i>Employee of an organisation that supports the Five Year Freeze campaign.</i>	124, 129, 132, 136, 146
Cathy	<i>Campaigner. Active member of environmental organisations.</i>	118, 131, 134, 137, 181, 182
Chris	<i>Farmer participating in the farm-scale evaluations.</i>	93, 94, 100-101, 107, 204
Clive	<i>Campaigner. Active member of the Natural Law Party.</i>	121, 123, 128, 129, 136, 138

Table 4.3. The interviewees and where they are quoted in the text.

Name	Description	Page numbers
Colin	<i>Agronomist involved in the farm-scale evaluations.</i>	89, 92, 96, 97-8, 104, 105, 111, 113, 161, 165, 178
Daniel	<i>Ecologist involved in the farm-scale evaluations.</i>	141, 143, 191
David	<i>Farmer participating in the farm-scale evaluations.</i>	92, 94, 96, 97-8, 98, 99, 105, 113
Dean	<i>Employee of an organisation that supports the Five Year Freeze campaign.</i>	155, 182, 185
Dominic	<i>Ecologist involved in the farm-scale evaluations.</i>	94, 95, 96
Douglas	<i>Farmer participating in the farm-scale evaluations.</i>	156, 166, 168, 173, 176, 177, 193, 194
Edward	<i>Ecologist involved in the farm-scale evaluations.</i>	157, 162, 164 170-71
Emily etc	<i>Members of a group campaigning against GM crops.</i>	119, 120, 124, 146, 191
Fred	<i>Farmer participating in the farm-scale evaluations.</i>	100, 108, 109, 204
Gail	<i>Employee of an organisation that supports the Five Year Freeze campaign.</i>	122-23, 132, 140-41, 145, 181, 183
Gordon	<i>Ecologist and government advisor.</i>	153, 156, 176, 195
Hazel	<i>Campaigner and active member of environmental organisations.</i>	116, 117, 120, 121, 128
Henry	<i>Plant scientist.</i>	166, 174, 177, 199, 200
Ian	<i>Scientist involved in the trialing of GMHT crops.</i>	156, 162-63, 163, 169, 177, 192, 208
Isobel	<i>Employee of an organisation that supports the Five Year Freeze campaign.</i>	138, 181
Jake	<i>Employee of an organisation that supports the Five Year Freeze campaign.</i>	150
James	<i>Employee of an organisation that supports the Five Year Freeze campaign.</i>	124, 126, 130, 136, 145, 182
Jim	<i>Plant scientist.</i>	160, 177, 194
Joe	<i>Scientist involved in the trialing of GMHT crops.</i>	94-5, 168, 171, 178
John	<i>Ecologist and government advisor.</i>	151, 175

Table 4.3. continued. The interviewees and where they are quoted in the text.

Name	Description	Page numbers
Joshua	<i>Campaigner.</i>	117, 130, 133, 146, 147, 183
Julia	<i>Campaigner and plant scientist.</i>	131, 184, 187
Kate	<i>Campaigner. Active against a number of environmental issues.</i>	118, 120, 125, 127, 129, 132, 133, 134, 138, 142, 144, 188
Louise	<i>Campaigner. No membership to environmental organisations.</i>	128, 136, 192
Martin	<i>Industry representative.</i>	89, 90, 92, 93, 95, 98, 100, 102, 103, 104, 105, 114
Matt	<i>Plant scientist. Member of a conservation organisation.</i>	142, 167, 172, 175, 176, 199
Megan	<i>Employee of an organisation that supports the Five Year Freeze campaign.</i>	142, 185, 187
Morris	<i>Industry representative.</i>	93, 98, 99, 103, 107, 109, 110, 111, 204
Natalie	<i>Employee of an organisation that supports the Five Year Freeze campaign.</i>	127, 134
Nathan	<i>Employee of an organisation that supports the Five Year Freeze campaign.</i>	151, 152, 166
Neil	<i>Plant scientist/ecologist involved in the farm-scale evaluations.</i>	150, 152, 155, 159, 161, 167, 171-72, 197, 198, 206
Nick	<i>Campaigner and member of the Green Party.</i>	117, 121, 122, 134, 138, 139
Nigel	<i>Employee of an organisation that supports the Five Year Freeze campaign.</i>	119, 128, 136, 143, 185-6, 186-7
Paul	<i>Student studying plant science (placement working with GMHT crops).</i>	91, 104, 105, 109, 114, 202
Pete	<i>Ecologist involved in the farm-scale evaluations. Member of conservation organisations.</i>	156, 162, 199-200, 206
Philip	<i>Agronomist and government advisor.</i>	91, 104, 111, 112, 114, 158, 159-60, 161, 175
Rachel	<i>Campaigner and long-standing member of an environmental organisation.</i>	127, 130, 189, 190
Richard	<i>Ecologist involved in the farm-scale evaluations.</i>	153, 159, 162, 165, 166, 169, 170, 172, 174

Table 4.3 continued. The interviewees and where they are quoted in the text.

Name	Description	Page numbers
Rupert	<i>Campaigner and ecologist.</i>	125, 131, 136
Ryan	<i>Campaigner and plant scientist.</i>	125, 186
Sandra	<i>Campaigner. Recent member of an environmental organisation.</i>	122, 188, 190
Sarah	<i>Representative of the Church of England.</i>	195, 196, 196-7, 197
Simon	<i>Plant scientist. Member of conservation organisations.</i>	150
Stephen	<i>Scientist studying the dynamics of plant communities.</i>	87
Terry	<i>Ecologist and government advisor.</i>	85, 95, 149, 153, 157, 160, 162, 167, 173, 201
Tim	<i>Campaigner. Long-standing member of environmental organisations.</i>	123, 131, 191-2

Table 4.3 continued. The interviewees and where they are quoted in the text.

Communicating a Neutral Position

Due to the sensitive nature of this issue, and the possibility that I could have been identified as someone who had been an environmental campaigner, letters to potential interviewees were written on headed paper, and accompanied with a note of authorisation from my supervisor. Although this is an uncommon practice, it was decided that it would be better to take a precautionous approach, since there was a limited source of potential interviewees. In both letters, the fact that an objective approach was being taken, and that the research was funded by the Economic and Social Research Council was highlighted, as my own letter stated:

‘Due to the sensitivity and highly topical nature of these trials, I think it is important for me to emphasise that this will be a highly objective piece of work. It is not intended to support the aims of any organisation or group, and full anonymity will be offered as required. It may also be of interest for you to know that, although my own personal opinion should in no way influence the results that I produce, I remain open-minded on the issue of GM technology. My intention is essentially to provide a thorough, fair, and unemotive investigation into the attitudes of those engaged in the GM crop debate.’

(Extract from my letter to interviewees, March-June 2000)

And as my supervisor states in his own letter of support:

‘I do not routinely write in this way on behalf of PhD students undertaking interviews, but I am keenly aware of the sensitivities surrounding this particular topic. Consequently I felt it would be helpful to add my own reassurances to those given by Liz in her own letter to you. I am entirely happy that Liz is adopting an objective and neutral attitude to this subject and that she will fully observe the rules of confidentiality that should apply to all social and attitudinal research.’

(Extract from Professor M. Winter’s letter of support, March 2000)

Rather than mentioning that I had campaigned against GM crops previously therefore, I presented myself to potential interviewees as an objective observer. This, I felt, was an accurate portrayal of myself at the time, partly because I believed that I could leave my own personal opinions aside, and partly because I had also started to question my own assumptions and beliefs. Indeed, it could be said that I was beginning to acquire the autonomous individual’s viewpoint (as propounded by Adams and Douglas, see pages 50-2) and so felt that it would be foolish to start worrying people unnecessarily.

Since it is well documented that an interviewer’s appearance and behaviour will usually influence data collection (for example, Lecompte *et al*, 1999; Sarantakos, 1998), I also tried to present an image of neutrality during each interview. In order to do this, I ensured that my dress and discourse were as unobtrusive and neutral as possible, and when asked for an opinion on GM crops, I confirmed that I had not formed a definite opinion, and was glad not to have done so yet. By describing my position in this way, I invited interviewees to convince me that they were correct, and showed that I was listening attentively so that they knew their arguments were of interest. As a result, at least two interviewees stated that they had said far more than they had expected to, and that they had disclosed rationales that they would usually keep to themselves.

At times however, I felt that my neutrality worked against me, since I knew that I could imitate the dress code and discourse of an environmentalist, and could thus develop a better rapport with them. For example, when it appeared that two of the more extreme opponents were holding back, I took advantage of my background towards the end of the interview, and mentioned another environmental issue that I had once been involved with. As a result, both interviewees relaxed and became more open. In fact, one of these interviewees then disclosed that my letters had been received with scepticism in the campaigning world, and had caused

individuals to e-mail each other in order to decide what to do. Their decision had been that they would allow this first interviewee to 'suss me out', and if I gained her seal of approval, I would be given access to other campaigners. It is quite possible therefore, that by 'letting it slip' that I had once campaigned on another environmental issue, I had gained access to individuals who might otherwise have ignored the request for an interview.

Other than in these two exceptional cases however, I decided that it was essential for my appearance and discourse to remain consistently neutral. This was partly because I was attending meetings where opponents and proponents gathered, and partly because I did not want interviewees on either side of the controversy to detect that I had once campaigned against GM crops. If they did, I was concerned that opponents would be given the false impression that I was fighting their cause, while proponents would refuse to participate.

Upon being identified as a 'Friend of the Earth'

Despite efforts both to be and appear objective however, some individuals on either side of the controversy discovered that I had once campaigned against GM crops. During the period between my visit to the United States in November 1998, and summer 2000 when the interviews were conducted, the article that I had written for the local Friends of the Earth group had been put on the internet⁵. The internet had thus transformed from a powerful tool with which to begin to understand participants in the GM crop debate, to one that potential interviewees could learn (partially) about the interviewer.

Unfortunately, I did not realise just how accessible my article had become until after my letters requesting interviews had been posted. Most individuals responded positively, and continued to do so throughout the summer, but a number of scientists involved in the farm-scale evaluations responded in a very guarded manner. Initially I believed that this response was because I had not followed the proper protocol, as I was told that I should have approached the scientists through the Department of Transport and Regions (DETR), rather than directly. However, as I tried to gain access through the DETR, I found that my correspondences were rarely answered, and never clearly. Meanwhile, one scientist wrote to me explaining that he would be happy to be interviewed, but that the 'consortium is going to take a corporate view on whether the several colleagues you have approached will or will not co-operate in your investigation'. He therefore felt unable to respond individually. According

⁵ This FOE article, and the position statement that I wrote in August 2000, are presented in appendix 3.

to another scientist, the reason for their reluctance to be interviewed was because they believed that this research was interested in their attitudes, as he stated in a letter:

‘We are, as individuals, at liberty to talk to the Press (and do so), but your study is clearly a bit different, as it touches on our attitudes (and presumably belief-systems) rather than on the facts of what we are doing and our reasons for experimenting in the way that we are.’ [Identity withheld]

It was not until one month after sending letters to individuals involved in the farm-scale evaluations, that an official response was received from the DETR, which read:

‘The researchers tell me that they are under a great deal of pressure as rain is delaying research. They do not feel that they can help in your survey. Please do not approach the researchers, but contact [an individual in the DETR] as he may be further help to you.’ [Identity withheld]

Interestingly, I was already in contact with this particular individual in the DETR, since he had been sending me tape recordings of the DETR town meetings and had promised to send me more in the future. However, once I had received an official response from the DETR, this individual also became less easy to contact and I received no further tape recordings, despite requesting them on a number of occasions. The reason for this hostility seemed unclear to me, until I received an e-mail from a campaigner on the other side of the country who seemed happy to be interviewed because she had read my article on the internet.

Fortunately, by this stage a large number of interviews had already been carried out with other scientists involved in the farm-scale evaluations, and others had been secured that would provide a good understanding of proponents’ viewpoints. Within these remaining interviews, I decided to mention my prior membership to Friends of the Earth towards the end of the interview, and to state quite clearly that I was no longer certain about my own position in this debate. By approaching the subject in this way, I intended to appear open enough to discuss my article with those who knew about it, while not arousing the suspicions of others.

By adopting this approach, I still found no evidence to support the possibility that proponents had seen my letter. However, in July I was mid-way through an interview with a farmer, when he took a phone call from a scientist involved in the farm-scale evaluations and stated that a PhD student was interviewing him. Having finished the call, we continued with the interview, only to be interrupted by the same scientist again. This time, the scientist

apparently told the farmer that there was a member of Greenpeace posing as a PhD student, and that he should be careful. The farmer consequently asked for the tape recorder to be turned off as he described the situation, and fortunately stated that he would continue to be interviewed regardless of whether or not I was that particular individual. With the interview complete, I disclosed that I had been a member of Friends of the Earth, but that I was undertaking an objective piece of research within which he could check any references to our conversation.

Realising that I was now racing against the grapevine, I then met another scientist from the consortium, who was leaving the company of my next interviewee. Upon hearing my name, the scientist asked if he could have a private word with this individual prior to our interview, and gave me a knowing look! I had thus been forewarned, and was able to answer openly and honestly when asked if I had ever been a member of Friends of the Earth. However, only days later, I travelled for some hours to interview another farmer involved in the farm-scale evaluations, only to be met by a less pleasant response. Upon my arrival, I went towards the office door and was greeted by an employee who tried to keep me outside by chatting nervously about the weather and the fact that his employer was on the telephone. The farmer then arrived and took me into his office, whereupon he closed the door and told me that I had lied about my objectivity and that people like me should be ‘incarcerated’. Having then been threatened with libel suits, I was offered two minutes of his time without a tape recorder, which I accepted.

The scientists’ rumours had thus threatened my safety, but, since this interview was my last with a proponent of GM crops, they did not greatly affect my data collection. In response to these events, I wrote a document outlining my evolving position on GM crops (see appendix 3), and offered it to those interviewees who might have been in contact with the scientists. As a result, I discovered that the rumours had only reached one other individual (after the interview), and that neither of the individuals whose interviews had been disrupted felt concerned about this research, as they state:

‘I was well aware of the rumours regarding your objectivity but was delighted to meet you. There is too much mistrust regarding genetic modification. This has been created by the “megaphone diplomacy” style of debate.’ [Colin]

‘With regard to the rumours that you mentioned, I am not at all concerned about your objectivity [...] you mentioned your previous membership of Greenpeace and I was entirely happy to discuss the subject of GM crops with you.’ [Fred]

Meanwhile, I have been told that it was not the Internet that enabled my 'identity' to be discovered, but rather that a scientist in East Anglia had parents in Bath who received one of the 100 hard copies of the article! It seems therefore, that even the smallest events can impact upon research in a field as politically sensitive as this. It also identifies the need for scientists from different disciplines to communicate with each other, rather than spreading half-truths. Most importantly however, it identified the need for me to reflect more seriously about my own framing of the GM crop debate, and to consider how my background had impacted upon the research process. In doing so, I realised that the scientists' rumours had not created a problem, but had actually enabled me to see how my own involvement in the GM debate had lead to a unique data source and insights that might otherwise have been ignored.

The Researcher as Subject

Although interviewees were informed that I was open-minded on the issue of GM crops and intended my work to be 'highly objective', I perhaps should have stated that I wished to 'rule-in' each framing of the debate, regardless of my own position. Whether or not this would have been met with the same degree of hostility is impossible to say, but it would have reflected my later realisation that I could not represent real world events without incorporating my own personal experiences. Although some academics still believe that personal experiences are merely subjective feelings that do not reflect 'how things are', many others now assert that autobiographical accounts make a valuable contribution to the research process, and as such they should not be omitted. Indeed, it is often considered impossible for any scholar to remain outside their work, as Steier (1991) states:

'This attempt to keep oneself, even as an objective observer, out of one's constructions, and to hold onto the vestiges of objectivism, I refer to as *naïve*.'

Steier (1991: 4)

Rather than seeing the researcher as someone who simply observes from a position of detachment, those who argue against objectivism suggest that any statement about human behaviour 'refers as much to the social scientist as anyone else' (Woolgar and Ashmore (1988:1). Since the researcher is necessarily the medium through which the research is constructed, it is asserted that this process must influence the presentation and analysis of the data, as Steier (1991) states:

'[...] we come to "know" that which we claim to know, as a model (or modelling process) that comes to us through other similarly constructed models, and refers not to an independent world "out there", but to our own constructing processes.'

Steier, (1991: 2)

These processes, Steier (1991) explains, may come from a person's own experiences or from the shared conventions of a particular academic community. Whatever their origin however, it is asserted that they are impossible to remove, and thus their concealment is said to obscure the research processes and findings (Roseneil, 1993). Indeed, it is proposed that the inclusion of autobiographical accounts can greatly improve the quality of research (Cooper, 2001). By challenging ones own assumptions and experiences, Steier (1991) states that it possible to see how values enter into the research process and become imposed upon the data, and thus how this impact can be reduced. Meanwhile, it is possible to come to know the self better, and, in so doing, to know others better through the self, as Cohen states (1992):

'It is commonplace of fieldwork experience that we learn a good deal about ourselves while struggling to understand others.'

'[...] In studying others I do not regard myself as merely studying my self; but rather, as using myself to study others.'

Cohen (1992: 223-4)

The process thus becomes reciprocal, while also enabling a more transparent relationship with readers who can now determine which are the opinions of the researcher, since they are no longer disguised by impersonal objective language. The meaning of the written study thus becomes clear, presented as 'an unfolding story where the writer makes sense of the data and the total experience of which it is an artefact' (Holliday, 2002). For Roseneil (1993) this process was particularly valuable, and relevant to my own study of the GM crop debate, since she researched a social-political movement of which she was once a part. By using her own account as primary data, she suggests that she brought valuable insights to her research, which demonstrated that she knew her subject, unlike others who merely knew about it. She also states that it was possible 'to integrate 'the personal' with the 'sociological' within the confines of a doctoral thesis', and appealed for others to 'look to their own unique life-histories and experiences for inspiration in their research' (Roseneil, 1993: 205).

Following the traditions now set by these researchers, I have tried to incorporate my own experiences overtly, rather than treating them as a hindrance that should be concealed. With regard to the practices of cultural theorists, such an approach seems to be highly appropriate, since both Douglas and Adams advise the practice of reflexivity (see pages 50-53). Nevertheless, it is important to point out that this approach will not suddenly reveal 'how it really is', but instead will make clear my own construction of the GM crop debate, which has emerged as a result of the methods I employed and my personal experiences.

Analysis and Presentation of Results

When analysing the data, the first task was to consider how each of cultural theory's ideal types framed the GM crop debate, and whether there were any additional framings. Since the interview transcripts were so text-rich, it was possible to construct detailed descriptions of each framing of the debate almost entirely from primary data, as presented in chapters 5-7. The discourse presented in each of these descriptions is to be viewed as the 'disembodied' voices that cultural theorists refer to (see page 60), rather than the typical discourse of individuals. How individuals utilised the discourse of each ideal type was not considered until a later stage, as Thompson, Rayner and Ney (1998) recommend:

'Placing the discursive styles in the foreground, and then tracing their dynamics through into all scale levels, we are arguing, is a more useful, and more valid, way of setting the policy scene [...]

Thompson, Rayner and Ney (1998: 335-6)

In order to make the descriptions coherent both within and between types, five areas of enquiry were focused upon, as listed below:

- 1. Perceptions of the human relationship with the environment**
- 2. The similarities that GMHT crops were thought to share with nature, conventional plant breeding and other human interventions**
- 3. The experimental procedures that were deemed necessary prior to releasing GMHT crops into the environment**
- 4. The risks and benefits that GMHT crops were believed to present**
- 5. Perceptions of other groups within the debate and social concerns**

Having outlined how each type framed the GM crop debate in response to the interview questions, how individuals utilised the various discourses was then considered. To do this a chart was created that comprised the above sections on one axis, and the ideal types on another, as demonstrated in table 4.4 below. A phrase that best described a particular type's position was then chosen and assigned to the relevant cell. It was then possible to consider which discourses a particular individual utilised, and to shade the cell accordingly. In the case of an individual using the discourse of more than one type, it was considered whether one was used more frequently than the other. Whether some issues appeared to be more important to individuals than others was also considered. The patterns of discourse that individuals utilised are presented in chapter 8.

	Nature	Similarities	Understanding	Consequences	Other Groups
Individualist					
Egalitarian					
Hierarchist					

Table 4.4. The chart that was used to determine which of cultural theory's discourses individuals utilised during their interviews.

Each of cultural theory's models were then examined to determine the best way to illustrate these patterns of discourse. My own involvement in the GM crop debate was also considered, to determine whether the perceptions of an individual over time could also be represented in this way. Whether the different representations of cultural theory could influence the way that good decision-making is sought was then explored.

The secondary data sources described at the beginning of this chapter were then drawn upon to consider how each type was represented within the public debate. Upon considering the tactics that each type used, and their reasons for doing so, interviewees' public statements were compared with their more private discourse whenever possible. The ways in which Government discourse and action represented the different types was then examined. As a result of these processes, it was possible to consider the ways in which the policy process could be made more inclusive, if indeed this was required.

Summary

In this chapter it was explained that secondary data was acquired from a wide range of sources including conferences and public meetings, electronic mailing lists, books, websites and the national media. Furthermore, a visit to the United States in 1998 enabled a good understanding of the proponents' framing of the debate to be developed. A questionnaire was designed to help determine how individuals utilised the discourse of each of cultural theory's ideal types. Since the debate embraced a wide range of issues, it was necessary to focus upon one specific area. Perceptions of nature and the environmental impact of GMHT crops was chosen because the debate was rich in discourse about naturalness and the environment, and because researchers have found it difficult to identify cultural theory's myth of nature perverse/tolerant empirically. It was therefore possible to access the diversity of opinion and to develop a better understanding of cultural theory's discourses. However, since interviewees might have considered other issues to be more important, the interview schedule was semi-structured and incorporated some open questions. Between March and September 2000, 55 individuals were interviewed, including industry representatives, regulators, scientists and campaigners. Although a number of potential interviewees discovered an article that I had written for a local Friends of the Earth newsletter that made it clear that I had been against the technology, it was concluded that this had probably created more insights than obstacles. The interview transcripts were then analysed to determine how each of cultural theory's types framed the GM crop debate, and how individuals utilised the discourse of each framing. This enabled cultural theory's different models to be explored to consider which best illustrated the discourse of individuals. Information from secondary sources was then used to determine how each of cultural theory's ideal types were represented in the wider debate, and within the policy arena. How institutional arrangements might be made more inclusive was then considered.

In the following four chapters the discourse of interviewees is presented. The first three chapters are dedicated to the ways in which cultural theory's three active types framed the GM crop debate, while the fourth considers how individuals utilised these discourses.

The Individualist's Framing of the GM Crop Debate

Introduction

This chapter presents discourse that most closely resembles cultural theory's individualists.⁶ This was extracted from interviews conducted with individuals engaged in the GM crop debate, as described in chapter 4. How individualists perceived the human relationship with the environment, and the approach that they recommended for the future is described. This is followed by a description of the similarities that GMHT crops were perceived to share with nature, conventional plant breeding and other human interventions. The experimental procedures that individualists deemed necessary prior to the release of GMHT crops, and the risks and benefits that these crops were said to present are then outlined. The chapter finishes with a description of the ways in which other groups within the debate were perceived.

Dangerous Planet

According to individualists, humans have had to battle against the forces of nature just to survive, as Alma explained:

'It goes way back to the start when the plates are all shifting about, the land's forming, you've got your volcanoes erupting, you've got your hurricanes, and then you've got your Ice Age. It's so dynamic and it's so unsafe. I think that really puts it into perspective. And when humans then start worrying about GMs or whether or not to get their children vaccinated against something, that's when you put it into perspective of an extremely dynamic earth. [...] Humans have really had to struggle and develop to just SURVIVE in this environment.' [Alma]

⁶ When this chapter refers to *individualists*, it is to one of cultural theory's ideal types, and not to any particular interviewees. When named individuals are mentioned, it is because they used discourse illustrative of this ideal type. It should not be assumed that these individuals were stereotypical individualists. How individuals used the discourse of each type is presented in Chapter 8.

In such a hostile environment, human life was perceived to be exceptionally fragile, as Alma further illustrated by describing how people die from a variety of medical conditions:

'Cystic fibrosis is natural. My cousin died of cystic fibrosis a couple of years ago. [...] It's natural not to be immunised. I probably would have died in childbirth if there hadn't been any drugs or any assistance [...].' [Alma]

By describing the world as an erratic and dangerous place, individualists seemed to perceive nature capricious, rather than nature benign as cultural theory predicts. Indeed, members of the biotechnology community have declared, quite categorically, that nature is not benign. For example, Wilson (2001: 1) states that 'famines and epidemics continue; Mother Nature is most certainly NOT benign' (original emphasis), while Pickard (2002) states:

'Nature is not benign [...]. We are in the midst of a battle for survival. There is no flying hence nor tarrying here, in Macbeth's terms; we have to deal with our problems now. New threats and disasters await us. [...] Those who would leave the fruits of science to wither on the vine would leave us naked in a hostile universe.'

(Pickard, 2002: 1)

As this quote demonstrates, although individualists appeared to perceive nature capricious, they were not like cultural theory's hapless fatalists, who are said to be so overwhelmed by nature capricious that they are unable to act. Indeed, these interviewees seemed determined to modify nature in order to improve the chances of human survival, as Terry described of agricultural interventions in the past:

'Nature is something which is not in any sense kind. It is red in tooth and claw. If we hadn't been doing genetic engineering by breeding since Neolithic times, the reality is that we would mostly live nasty brutish and short lives which would be disease-ridden, and hunger-filled, which it is I'm afraid for 800 million people in the world.' [Terry]

Similarly, Martin described how people's lives were far shorter in Queen Victoria's reign, when people ate organic food, drank untreated water and had no antibiotics. Indeed, individualists seemed to suggest that nothing should stand in the way of prolonging human life. As Martin stated, he was appalled at the idea of having to lead a more 'natural' life, because this would prevent him from reaching the age of one hundred, which was his 'life

plan’:

‘I don’t know about you, but I’m going to live to be a hundred, that’s my life plan.’

[Martin]

To provide enough food for people, individualists described how agriculturalists have had to modify crops in order to produce higher and better yields. They also described how it has been necessary, in more recent years, to develop chemicals with which to win the battle against pests and disease. Indeed, without human assistance, individualists believed that agricultural crops would also struggle to survive, as Colin outlined:

‘These wheat plants would not survive in nature [...]. If you planted those in a field here and left that field alone, in two or three years they’d be gone, they wouldn’t survive, they have to be nurtured.’ [Colin]

According to individualists, the chemicals that enabled crops to survive sometimes had negative effects upon human health and the environment. Nevertheless, they asserted that such adversities were better than the ‘natural’ alternative, which included starving people and unpredictable farm incomes. Indeed, it seemed that individualists usually favoured human welfare over that of the environment, and perhaps even in the case of a chemical linked with ozone depletion, as Alma expressed:

‘[Soft fruit growers are] struggling along with the chemicals that they do have approved. There’s a soil sterilant that they all use, methyl bromide, which is attributed to ozone depletion, so that’s being banned from next year. I mean it’s the only soil sterilant that they have, so they will have to set up plantations obviously on clean land. When that goes I don’t know how they’re going to manage.’ [Alma]

Concern for the environment thus appeared to be of secondary importance when compared with the day to day survival of people, and this was perhaps because people were perceived to be capable of only making small and reversible impacts upon the environment. For example, Paul stated that ‘species do incredibly well despite whatever we chuck at them’, while Fred described how he had seen wild flowers return to land that had been sprayed with herbicides for sixty years, and had witnessed the germination of seeds that had lain dormant for even

longer:

'In the next door village there were some cottages which have probably been up for 200 years, and they were cleared for a new housing development. The spoil from underneath them was put into one of my pits, and the following summer I had these old-fashioned poppies growing about the height of, well, that you and I are, with tremendous blooms on top of them [...]. They'd obviously been dormant in that soil since before those cottages were built. But I mean they've taken seeds out of the tombs in Egypt haven't they and got them to grow!' [Fred]

Even when irreversible impacts were perceived however, these interviewees still seemed to dismiss them. For example, Stephen questioned whether conserving biodiversity really was as important as people declared:

'Is [biodiversity] a good thing? Who knows. Who cares! Does it really matter if we've got lots of biodiversity or we've only got very little biodiversity? The world could probably exist forever if we just had grass, cows and people. Or even just grass and people if we come down to the... a vegetarian could.' [Stephen]

Similarly, Martin suggested that it was perhaps sufficient to maintain bird biomass, rather than biodiversity, since he was unable to decide whether one species was more valuable than another:

'If you look at pigeons, starlings and various other birds, they've either stayed the same or they've increased. I ask BTO, and I ask RSPB, has anyone ever plotted bird biomass against time? Because I would submit that bird biomass would remain more or less stable. I think you'd have ups and downs, and those ups and downs would probably reflect the climate. If it's a bloody cold winter and it goes on forever, that could have an effect. My view is that, in fact, what they're measuring is differences in species, and not differences in the total number of birds [...] you end up with an argument is the pigeon a better bird than a blue tit?' [Martin]

It is possible that individualists perceived biodiversity in this way because they believed that extinction was part of the natural process of life. As a number of interviewees stated, nature makes far bigger extinctions, as can be seen with the extinction of the dinosaurs. Furthermore, extinctions were perceived to be relatively benign when compared with the ferocity of nature, as Paul expressed with regard to woolly mammoths:

'I just see it as being an impact. It's neither good nor bad. You can't say, "oh, woolly mammoths were quite cute weren't they, what a shame we killed those off"!' [Paul]

Indeed, many individualists maintained that 'so-called' impacts upon the environment had been vastly exaggerated. For example, both Morris and Chris believed that BSE was probably a naturally occurring disease that had previously gone undetected. While, David and Fred proudly described how the RSPB had found a high number of skylarks on their farms, which were 'supposedly' endangered:

'For 3 years they had trials on various farms all over the country, attempting to determine what was happening to the skylark population. No doubt you have read about the SUPPOSED reduction in skylarks over the country.' [Fred]

It was thus perceived that nature had continued to thrive, while humans had continued to struggle to survive. With regard to agriculture, individualists had become increasingly concerned about the capacity of existing technologies to produce enough food for the future. According to these interviewees, this was because yield gains from conventional plant breeding programmes were beginning to plateau, while the human population was continuing to increase, as Philip described:

'[There are] 6 billion people in the world, of whom 2 billion go to bed each night seriously undernourished. If you look at even the lowest estimates of population increase, it's probably fair to say that within the next 20 years we'll be 8 billion, and that could be 10 billion. I accept a lot of the evidence that suggests that we have to increase food production by about 40% if everybody in the world is going to enjoy at least a reasonable standard of nutrition. Where's that going to come from?' [Philip]

The potential for greater starvation in the world was thus a great concern. Indeed, some declared that their desire to feed the world provided them with a great motivation to do their work:

'I thought another way of helping people was to improve the way we grow crops, to improve yields of crops, or reduce diseases in crops and so on which have a world-wide impact. I thought that was the way I would contribute to society and help people.' [Paul]

Martin meanwhile, explained how his concern for those in less fortunate circumstances had encouraged him to join various charities:

'[...] my social conscience has meant I've supported all sorts of charities [...]. I used to be a member of a thing called Action Aid, and we paid to support a little girl in Peru, but when Action Aid decided that they were going to have an anti-GM stance, I cancelled my subscription. I now support World Vision and we support a kiddie somewhere else in the world, in India now [...]. I try and give away a proportion of my money to worthy causes. So despite the popular image that us industrialists are mean and miserable wotsits, many of us do have a social conscience.' [Martin]

By trying to improve the circumstances of those less fortunate than themselves, individualists hoped that everyone would begin to enjoy the same opportunities and standards of living as those in the West. However, this did not mean that they wished to hinder progress in the developed world, and neither did they wish to see a redistribution of food or wealth. For example, Colin stated that he would like the whole world to be fed, but that it would first be necessary to feed those who could most afford it:

'People always say, well, what about Africa? [you haven't fed them]. But, to be callous, I think Africa's only 13% of the world population, and the hunger is going to be not only Africa, but in Asia, where they will be able to afford the food. Of course I do hope we can feed Africa as well, but they don't seem to help themselves half the time, but that's another matter.' [Colin]

Colin therefore indicated that his primary concern was to secure the survival of his own country, and then to encourage others 'to stand on their own two feet'. Indeed, individualists stated that the most important challenge for the future was actually to improve agricultural profitability. For some, this could be attained by removing bureaucratic 'red tape', but many more stated that higher yields and added value had to be achieved. While showing a strong dislike for hierarchical bureaucracy and a strong desire to market goods freely, such comments also demonstrate that individualists believed in fighting for survival in the social world, just as they did in the natural. As Morris stated, people should not get complacent about food sufficiency, because war can strike at any time, and anywhere:

'We have to decide as a nation how much of our own food resource we want to maintain as a security against being held to ransom. Now you could argue that we're going into, or we're getting tied into a European block, which is a fair size, so

in theory one would expect food not to be a problem. But you've only got to look at how many bits of Europe suddenly fall out for various reasons and you suddenly get a small area that is at risk.' [Morris]

In such a hostile and erratic world, individualists described how important it is to embrace the inherent forces of change. Thus, even if the products of new technologies were not needed, their development was still required. As Martin explained, nourishing the human spirit of innovation is essential for long-term survival:

'[...] man's intellectual curiosity, his spirit of innovation will not stop. What was the downfall of communist Russia? Man has an intellectual desire and need to understand and do things differently, not to be closed in a box, in a time warp that was 1915 or whatever the number is. My career has been based on change, and man has to change, and you change as people, you grow up and you change. You're a different person now than what you were 5 years ago and what you will be in 5 years time. I feel that that's imperative that you do that. We DO need new crops, we DO need new technologies, and man will always continue to do that. Otherwise you and I wouldn't be having this conversation. You'd be in a cave somewhere, and I'd be dead, because the life expectancy of the Neanderthals was about 39 or something like that!' [Martin]

Crop Biotechnology is not New

Within the dynamic world of the individualist, the genetic structure of organisms was also perceived to be constantly changing. As Paul said, organisms are forever being bombarded with UV light and smoke, which both cause genes to mutate. Furthermore, genes are moving within and between species by means of horizontal gene transfer, leading individualists to conclude that genetic engineering already occurs in nature. Indeed, if genetic engineering did not occur in nature, it was claimed that organisms would not have evolved from 'primordial ooze'. To concern oneself with crossing the species barrier (itself a human construct), or to question nature's ability to cope with the movement of genes, thus seemed incomprehensible:

'[...] we all came from these bacteria and things that developed in volcanoes and fumeroles. And then from that life evolved, plants evolved, and then from that animals and so on. That's why 50% of the genes in you are the same as in a plant [...] so what's the big deal if we stick an animal gene into a plant? It probably

happened in evolutionary terms millions of years ago anyway. And they're saying, 'Oh, I don't think you should do that'. It's probably occurred! It probably occurred millions of times millions of years ago. And now we're saying, 'No, we can't do it!' [Laughing] That's what I find very strange. [...] We're denying the fact that evolution is running. We want to try and stop the clock and say we're going to fix everything as it is now. Crazy!' [Joe]

When describing these processes, individualists often claimed that crop biotechnology was 'working with nature'. This statement seems to contradict their earlier assertion that it is necessary to impact upon nature in order to save human lives. Why, for example, would someone wish to 'work with nature', when nature was perceived to be causing numerous catastrophes? It is possible that the reason lies in the fact individualists wished to rebuke their opponents' claim that genetic engineering is 'unnatural'. Thus, by describing the chaotic qualities of nature, and by 'stealing the rhetoric' of their opponents, these interviewees felt able to dispute the egalitarians' moral high ground.

As part of the natural processes of change, individualists also explained that for the last 10-12,000 years, humans too have altered the genetic structure of plants, as Dominic described:

'[Genetic engineering is] simply a way of creating further genetic variation. If you look at how we've done it in the past, the Abyssinian farmers of 10,000 years ago went out into the field and looked for natural mutations, they found grass that was a bit taller, had more seeds or bigger seeds, and they selected that.' [Dominic]

By crossing plants, individualists described how humans have moved thousands of genes in ways that have become more and more unpredictable over time. For many, Golden Promise barley provided a potent example of how humans had altered the genetic make-up of plants. This, they stated, was created by induced mutagenesis in the nuclear reactor at Aldermaston in the 1960s, and was thus described as a 'gamma ray mutant of an existing variety'. Having described such techniques, individualists declared that crop biotechnology was logically only a step on from an already highly manipulative process:

'People always feel that traditional plant breeding is gentlemen with beards and sandals and corduroys, shaking pollen with a rabbit's foot or a paintbrush across a plant. It isn't. If you actually look at plant breeding, it's a highly technologically sophisticated process in which you make plants exchange genes that they wouldn't normally do. [...] it's a bit like seducing the plant [...] you can actually make plants

do things. And if you then look at the plant genome, back on what you mean by natural. Here we are, biscuits. Of a wheat genome, something like 40% comes from maize, 15% comes in from rye. [...] So crudely 45% of wheat is not wheat. Should we worry? We've been eating it for hundreds of years.' [Martin]

The idea that transgenes were 'foreign', was also a strange concept to individualists. As a number of interviewees pointed out, food is already made out of genes, and the genes used in GMHT crops already occur in nature. Individualists therefore stated that people should not be afraid of eating these genes, since they are likely to be part of the diet already. Indeed, even if they were not part of the human diet, individualists asserted that crop plants could acquire these genes from nature anyway:

'The herbicide genes are natural anyway, they're found in nature, they're in the soil, they're in soil bacteria. So plants, if there was this ability to do it, plants would have done these sorts of things before. So I can't, you know, in theory...' [Martin]

Similarly, concerns about plant virus genes were dismissed, since these too were considered to be a component of nature, as David explained:

'Where are these viruses coming from in the first place? Fly on any aeroplane from America, you come off there with more viruses than you'd find on these sugar beet. Viruses happen in nature with or without genetic modification. I don't think we're adding any more, any dangerous viruses to anything really.' [David]

Indeed, many of these interviewees explained that cabbages were already infected with the cauliflower mosaic virus, which meant that far more of this virus could be eaten conventionally than was likely through the consumption of GM crops. As Alma stated, 'it is probably one of the most widely spread viruses in nature'. However, even if the genes were foreign to the UK environment, individualists did not consider this to be new, since most UK crops originated from overseas:

'The Victorians were wonderful plant collectors, they brought plants back from all over the world. So they were introducing, in inverted commas, 'foreign' material into this country, and that caused changes. Even if you look at what are our predominant crops now – wheat, barley and potatoes – not one of these is a native crop in the UK. So the idea of foreign genes is not one that people should have any great hang-ups about' [Dominic]

As a result of this outlook, individualists rarely understood the quote that was read about Bill McKibben's feelings towards a GM rabbit in a woodland. As Alma replied, while laughing, 'I can't even understand where he's coming from with that!' Furthermore, just as they could not see why McKibben perceived a GM rabbit so differently, neither could they see why so much fuss had been made about the herbicide tolerant quality of these crops. As David described, 'sugar beet is already resistant to 27 herbicides', while others described how frustrated they became when people talked about 'super-weeds':

'There was a picture in the Sunday Times, about three years ago, of people in masks with great machetes chopping down super-weeds which are taller than them. That kind of thing just gets my teeth on edge really, because it's just not possible. Super-weeds are just the same as any other things that are herbicide tolerant.' [Colin]

In fact, even the herbicides used on GMHT crops were not considered to be new, since both glyphosate and glufosinate ammonium had been widely used in conservation and agriculture for over 20 years. For these interviewees therefore, neither the mechanism to create GMHT crops, the release of modified plants to the environment, nor the chemicals used alongside them were perceived to be new. Indeed, even GMHT crops were not considered to be new anymore, since they had been grown and eaten for many years throughout the world:

'These crops have been growing for 20 odd years and eaten with no ill effect. I mean everyone eats GM crops in this country. They don't know it!' [Chris]

A Safe and Precise Technology

As people had been eating GM food for so many years and on so many continents, individualists felt confident that there would be no harmful side-effects. As Terry said, 'as far as I'm aware, there's not a spot, there's not a pimple or anything else that you could associate with them'. For individualists this was to be expected, since crop biotechnology was considered to be far more precise than conventional breeding, as Dominic described:

'It is very precise; I mean it. I make the comparison between the old-fashioned naval surgeon out there with his saw, removing bits and pieces that have been infected, damaged by canon balls, whatever, and the modern surgeon with his laser scalpel.'
[Dominic]

Unlike past breeding techniques, and breeding in the wild, individualists asserted that plant geneticists were now only moving one known gene, rather than mixing many thousands. Genetic modification was thus considered to be far more reliable than conventional techniques, and especially when compared with human-induced mutagenesis, which was said to result in all sorts of strange deformities. These interviewees were also confident that the herbicides used in conjunction with GMHT crops were extremely safe, as Chris and David described:

'Glyphosate is about the most friendly weed killer. You can almost drink the stuff!'

[Chris]

'You can get it on your hands and not worry too much about what it's going to do to you.' *[David]*

Since crop biotechnology was perceived to be similar to nature and conventional plant breeding, and indeed more precise, individualists found the rejection of GM food frustrating. This was all the more so, since regulators were alleged to have made GM food 'the most tested food in the world'. In fact, the extent to which GM crops had been tested was believed to be overly precautionous by individualists. As David stated, as far as he was concerned 'GM crops are 100% safe'. The FSEs were thus considered to be unnecessary from the point of view of safety. Indeed, they were also thought to be unnecessary from the point of view of biodiversity, since, as Martin declared, 'biodiversity does not belong in the centre of the field'. Moreover, biodiversity was not perceived to be more important than the farmers' opportunity to use safer chemicals.

Perhaps because individualists did not see the technical need for the FSEs, they knew very little about the scientific protocol. For example, both Colin and Fred appeared to be disinterested in the ecological parameters that were being tested on their farms. Nevertheless, individualists believed that it was beneficial to comply with the voluntary moratorium, and to undertake the FSEs. One reason for this was that the European Deliberate Release Directive could require such data in the future. But perhaps more importantly, individualists believed that these trials would show that something was being done, and would encourage people to accept the cultivation of GMHT crops in the UK environment, as Colin and Alma declared:

'I think yes [the FSEs are necessary], I... [pause] I don't know about that. [pause] I think... Initially I thought probably no, but now I think yes. I think yes. Yes I do.'

Yes they are necessary. I mean there's, there is this element of... you know, to make sure that people are, are happy to have seen, have seen something done.' [Colin]

'I think they should be thoroughly tested, if it's only to put the general public's minds at rest [...]. I think if people, IF people become more confident, and if GM becomes more accepted, I think it [the level of testing] will ease off.' [Alma]

Since GMHT crops were perceived to be safe, the controversy over separation distances often bewildered individualists. According to these interviewees, it did not matter whether other plants obtained transgenes or not, since the genes were considered to be entirely safe and nothing new. Certainly they could not see why anyone would be concerned about eating or breathing GM pollen, as Martin illustrated:

'Have you heard the argument that you actually are breathing part of Christ's body? If he was average size, and his lungs were average size, and he lived for 30 years, you can calculate how much carbon dioxide he would have respired in his life [...] you find that each of us that are respiring something that Christ respired. It doesn't have to be Christ, it could be Hitler or whoever. And that's the same argument. I don't want to breathe the air that Hitler breathed. Tough luck, you're going to! It's of no significance, consequence or importance to you.' [Martin]

Indeed, individualists asserted that people were already consuming pollen from far more dangerous sources than GMHT crops, as Terry and Morris described:

'If you were to say that we must destroy honey because there are pieces of DNA in it [...]. It's the equivalent of saying, well hang on a second, also in honey there will be bits of DNA that [...] would produce toxins that would kill you immediately. Bees go to deadly nightshade [...]. So here we are eating genes that if they were in plants they would kill us.' [Terry]

'One could argue that it's a brave farmer that grows HEAR rape, because HEAR rape is poisonous to humans [...] Many do that without thinking twice.' [Morris]

Individualists were most confused about people's objections to trials of GMHT sugar beet however. As David and Fred explained, 'bolters' (sugar beet plants that start to flower in the first year, rather than the second) are pulled every 10 days to prevent the production of pollen. Furthermore, the GMHT sugar beet seed was coloured to differentiate it from the conventional

seed, and the conventional beet was only harvested once the GMHT beet had been carefully removed and disposed in landfill. For individualists, these seemed extreme measures for what were essentially safe plants. Indeed, even if GMHT crops were not safe, individualists claimed that it would not take long to eradicate them. As they described, there are many chemicals that could kill GM crops if required, and anyway, crops do not survive for long without human assistance, even in the case of oilseed rape:

'When rape first came out, and we all remember it very well, they bunged it in the back of lorries and just never thought what little holes bits of rape could bounce out of, and how motorways and roads were all covered with little strips all down the edge. Well why aren't they there today? Well, one of the reasons is obviously we've learnt to block lorries up. But then if rape was supposed to be so aggressive, if it was there in the first place, why isn't it there today? The answer is it doesn't survive.' [Morris]

Since GMHT crops were perceived to be intrinsically safe, individualists found it extremely difficult to envisage potential problems. When they tried therefore, their remarks were generally sarcastic and fanciful, as David's comment illustrates:

'I've had all sorts of weird and wonderful things put to me: "What if a deer walks over and picks a sugar beet up and runs off with it?" "Well", I said, "Well, okay, but deer don't normally pick up sugar beet and run off with them, they normally eat them where they are if they're going to eat them." And then they said, "Well how's that going to affect the deer?" Well, how's it going to affect the deer? I mean, there's not a simple way of putting this [...] there's 27 chemicals you can spray on sugar beet and it's resistant to them, and deer and rabbits and hares are eating that now, and they're not going around with three ears or five legs or anything like that. There's no way you can transfer a gene that's resistant to a chemical herbicide into an animal, it just won't happen. Its like trying to grow cabbages on a sheep's back or something. It just... it can't happen!' [David]

Indeed the only problems that these interviewees seemed to envisage were agronomic in nature. For example, individualists stated that weeds could eventually become resistant to the herbicides, and that it might be more difficult to plan rotations if a number of GMHT crops were used. Nevertheless, the intrinsic qualities of crop biotechnology were still perceived to be benign.

Saving Human Lives and the Environment

According to individualists, one of the key benefits of GMHT crops was the superior safety of glyphosate and glufosinate ammonium. This was particularly important to farmers, who stated that they had been concerned about the toxicity of conventionally used chemicals. For example, maize growers stated that they had to use a 'very nasty' and 'persistent' chemical called atrazine to produce conventional maize, while sugar beet growers described how they had to use many different chemicals to protect their crop. As David stated, 'you can stand the sugar beet up on its head with the chemicals we use', which inevitably had a deleterious effect on the sugar beet, as Fred explained:

'Growing GM beet on a plot size this year has really brought home to me how much damage is done to the sugar beet. At the time that the comparable conventional trial was being sprayed, and the GM crop was being sprayed with glyphosate, there was no effect at all on the genetically modified beet. You could see how much damage was being done to the conventional crop, it was extremely striking how much.'
[Fred]

While reducing exposure to toxic chemicals, individualists also believed that farm management would become easier with the less persistent qualities of glyphosate and glufosinate ammonium:

'[... glyphosate] will only kill what's there that day, if something pops up tomorrow and starts growing away it will just keep growing because there is no residual effect.' [Martin]

Thus, rather than waiting seven months or even a year before growing another crop (as atrazine requires), farmers could cultivate fields immediately if they so wished. Furthermore, individualists asserted that there would be a 'bigger window' (longer time period) within which glyphosate and glufosinate ammonium could be sprayed, so enabling farmers to let weeds grow bigger, knowing that they could still be killed. This was perceived to be a great advantage to farmers, who had struggled with the smaller window that other chemicals offered, as David explained:

'The biggest nightmare for anybody growing sugar beet is the pressure to spray before the weeds get too big [... If they do] you have to put something really hot on, that will cut the sugar beet a little bit as well. You've got to get on, the pressure's

there. People get up at four o'clock in the morning. You have to go spraying while it's still, before the wind gets up. Then you look out of the window and think "ah, it's not too bad, not too windy". It's probably not the ideal spraying conditions, but you go ahead and do it. You have to because you can't let the weeds get away from you. So your spraying conditions aren't ideal, so you've got drift problems then with these hot mixes.' [David]

With GMHT sugar beet however, David found that he no longer had to worry about rushing:

'You can sit back and wait and wait and wait, and think "nah". This is what we did with the Roundup. We decided we were going to spray it on the Monday, and I think it was eight days later that we sprayed it, because the weather wasn't right.' [David]

According to Morris, this aspect of the technology would have saved his oilseed rape fields from being smothered by weeds, in some places by up to 95%. Furthermore, individualists claimed that farmers would spend less money on herbicides if they could use GMHT crops. For example, Colin found that the herbicides for GMHT sugar beet cost £7.50 instead of £50, while Chris calculated that he had spent £16 a hectare on herbicides for his GMHT maize, instead of the £120 that he usually spends. Colin also explained that farmers would experience lower machinery and labour costs with GMHT crops, since they would not have to apply herbicides as frequently. With such savings, David maintained that he would use the technology even if it produced lower yields:

'People say, "why are you doing it?" or, "what's the need for it?" Well, the need is three litres of Roundup that cost me £16 a hectare. Add all that up [the chemicals used previously] and you're looking at £120 a hectare [...]. If somebody said to me, "GM beet, you're going to lose 5% of your yield", no problem, no problem whatsoever, I'm quite happy, I'd sacrifice 5% of yield. It just means I've got to grow a little bit more, another 3 acres more to do away with all that lot, all the hassle that lot causes me, and the effect it has on the environment.' [David]

Individualists thus contended that the health of farm workers and the economic efficiency of agriculture would be improved with the commercial introduction of GMHT crops, which again illustrated the extent to which these interviewees prioritised the needs of people. Nevertheless, individualists also advanced that GMHT crops would bring considerable environmental benefits. For example, since glyphosate and glufosinate ammonium were

considered to be less toxic and less persistent than their conventional counterparts, these interviewees submitted that wildlife would experience fewer negative impacts with the introduction of GMHT crops. Furthermore, since GMHT crops provided a bigger window within which to apply herbicides, they asserted that this would encourage farmers to control weeds later in the year, which would provide insects, birds and mammals with more food and shelter, as Martin explained:

'If you take sugar beet, you can leave the weeds in the ground until such time as you want to control them. [...]. If they were sown in March, you could actually leave it until mid-May before you take the weeds out, and in that period you've got shade protection and you've got weed seeds going on for birds in that environment. You actually also do other indirect effects in that aphids go and settle on the weed and not on the plant, so you don't have virus transmission by aphids. So you get a package that all adds up to give you quite a dramatic impact on the environment.'
[Martin]

When the crops are eventually sprayed, David proposed that these weeds would also protect the wildlife beneath:

'You imagine a shrew or something that lives in that field getting blasted every few days by all that lot. Now when we go in, there's quite a canopy of weeds [...]. You could not see a piece of earth through that canopy, it's a job to see the sugar beet let alone anything else, a huge canopy of green material. So that shrew's underneath that, so at least he's got an umbrella [because] the spray will go on to the green... Alright, I'm not saying... Some of the animals are going to get sprayed [... But] at least there's a chance of not being sprayed, whether its partridge chicks, curlew chicks, or shrews or slugs or whatever.' [David]

Indeed, even once dead, the weeds were expected to bring benefits:

'I'm sure [...] earthworms will benefit as well, because there'll be more organic matter going into those soils.' [Martin]

To illustrate just how well GMHT crops benefited wildlife, farmers described their own observations in the field. For example, Chris explained that glufosinate ammonium had not killed all the nettle weeds in his maize field, and that he had noticed populations of aphids on these nettles that were being eaten by ladybirds, and possibly birds. Similarly, David

described how some weeds had been shaded when he sprayed, 'so we haven't obliterated everything, we haven't massacred the whole plant population'. Indeed, when I visited his field of GMHT sugar beet, he pointed out the skylarks that were visiting it, which Morris said he had also noticed in his own fields of GMHT oilseed rape:

'From what I've seen there's enough skylarks and god knows what bouncing around in that field where those two trials are, I don't have any worry at all.' [Morris]

For Martin, evidence of environmental benefits came from a meeting with an American farmer, who had witnessed the return of raptors after the introduction of GMHT crops:

'[...] he said he was a passionate bird man, and he said his father had said that when his dad was a youngster, I suppose you're talking about the 1920s, 1930s, there were a lot of hawks and birds of prey in the area. He said as farming intensified, so the number of raptors has decreased. He said since they've been growing GM crops on their farm, there has been an increase in these particular hawks in Alabama, and so he says the evidence there is bingo!' [Martin]

By pronouncing the environmental benefits of GMHT crops, individualists demonstrated their belief that nature would not collapse as a result of a new intervention. However, the extent to which they promoted these environmental benefits seemed out of character with the typical discourse of an individualist. While these interviewees justified the fact that GMHT crops had been developed to satisfy the economic needs of biotechnology companies and farmers, they appeared to spend far more time explaining how wildlife would benefit. Of course, this was partly in response to my interest in their perception of nature. However, such arguments have also appeared in the national press, at conferences and on the internet, suggesting that individualists have spent some time considering how this technology might benefit nature.

Despite the advancement of environmental benefits by individualists however, it was apparent that they might still prioritise economic considerations. For instance, when farmers were told that some people believed they would still apply herbicides earlier in the year, they stated that they would not because of the increased cost:

'I don't know why people have this funny idea that farmers don't know what they're doing! I think they think we're all a load of nitwits! And they don't put sprays on willy nilly either! Because they cost a lot of money! And time! It's ridiculous [...]. They've got no idea some of these people. They really haven't. I can assure you that

we don't splash weedkillers about willy nilly, because they are very expensive, and things are pretty tight at the moment.' [Chris]

Indeed, they rarely stated that their decision would be based upon environmental criteria. Moreover, when I asked interviewees to describe their ideal future agriculture, those with individualistic tendencies often stated that their first consideration had to be its economic competitiveness:

'Well, I don't know, I mean you have to look at it within the economic framework.'
[Colin]

'Make potatoes cheaper! I don't know.' [Paul]

'Well, agriculture has to be competitive, and farming will not survive if it's not economically viable.' [Philip]

However, they also described how agricultural intensification could benefit the environment. By increasing yields, they asserted that it would be possible to introduce wildlife margins and headlands around fields, and to expand nature reserves elsewhere. They therefore advanced their green credentials once more, although it was clear that yield was still the key priority, as Martin illustrated:

'[If] you have a hedgerow and you can't spray it, you then have a strip where the first metre is not treated, the next metre or so is mown or sprayed with some friendly-type herbicide, you get beetle banks, you get butterflies, you've got birds... You give them the habitat in which they can survive and you don't need that habitat in the middle of the field. You go into Sainsbury's and say, "goodness gracious, that's a very rare mould on the ceiling there, shall we call it a nature reserve and give it protective status?" You don't, the manager of Sainsbury's will come along with a bottle of, I don't know, some hydrochloride and wipe it and paint it. His argument is valid for agriculture: the farm is a factory, the edge of the farm is not a factory, so manage the outside of Sainsbury's and do nice things there to attract wildlife, and don't do it in the middle of your field.' [Martin]

By stating that it was not desirable to maintain wildlife in the centre of the field, interviewees seemed to contradict their earlier arguments about the value of GMHT crops. As Martin stated, English Nature should have been concerned about the management of margins around

GMHT crops, rather than their in-field impacts. The arguments that individualists used to advocate GMHT crops thus appeared to have been constructed in response to the criticisms that GMHT crops had received. This does not necessarily mean that the environmental benefits did not exist, but rather that they were not a key concern for individualists. Indeed, it is possible to see how these interviewees used arguments that were clearly not their own. For example, Colin stated that he did not share the environmental ideals of his children, and yet used environmental arguments to defend GMHT crops:

'Here we're interested in doing stripped tillage [...] and that will retain over-wintered stubble, which is fairly good for farmland birds, so people tell me, I'm not a great expert, so people tell me. [...] There is another advantage, possibly, if we do delay weed control just a bit longer, because of herbicide tolerance, [you get] increased biodiversity. I'm not an expert on that, but so I've been told it increases biodiversity. So, I must admit, I can only see advantages.' [Colin]

By discussing the future of agriculture however, it was possible to glimpse what could be a more accurate portrayal of individualistic discourse. For example, Dominic stated that nature reserves should be expanded and protected because they act as a genetic resource for the future, while Paul maintained that nature could not be incorporated into agriculture because it does not make money:

'You can't pay continually to have land doing nothing, which is what nature is, it's not bringing in any money. The only way I can see it going is where you just have protected areas where nature is and people go to look at it and say, "ooh nature", and then you have areas where there's farming [...]. In this country farmers are producing food to make money. You can't make money if you've got deers bouncing all over your corn can you, so there won't be deer hopping around anymore.' [Paul]

Although individualists believed the farm should be seen as a factory, they also wished to minimise the human impact in areas of recreational value. For example, Martin opposed the preservation of wildlife in the centre of fields, but was a keen member of bird conservation charities and a frequent hiker in the countryside, as he described:

'I'm actually a mad walker anyway [...]. When I go for a walk I take a poly bag with me and I pick up cans and detritus and stuff and put that in there [...]. One of the beauties of sitting on the top of hills in the Lake District is looking around and not seeing very much of man's impact there at all.' [Martin]

When mentioning the potential benefits of biotechnology in the future, individualists again appeared to be most concerned about more homocentric issues. For example, many stated that ‘golden rice’, designed to contain higher levels of vitamin A, could save millions of children from blindness, while foods containing high levels of anti-oxidants could improve diets throughout the world. Furthermore, they argued that foods could be produced to resist pests and diseases, which would enable farmers in poorer countries to protect their crops, while specialist crops could be developed to give countries like Britain a market advantage. Again however, many of these interviewees stated that some of the biggest bonuses of biotechnology would be the environmental benefits that could arise. For instance, some stated that pest-resistant crops would lessen the need for agrochemicals, while others claimed that new varieties of oilseed rape would provide different quality oils that could then reduce the pressure on dwindling fossil fuel reserves and fish stocks. Such crops, these interviewees claimed, were being specifically designed to produce environmental benefits; unlike, perhaps, their herbicide-tolerant counterparts.

Naïve and Dishonest Environmentalists

Individualists often tried to avoid criticising campaigners during their interviews. When the names of prominent activists were mentioned, these interviewees generally avoided talking about them, and only occasionally reacted with a look of exasperation, or by uttering a few words such as “Oh yes! I’ve seen her!” or, “Oh yes, the mad dentist [...], the mad hatter at the...!” On the whole, they appeared to be tolerant and non-confrontational. Indeed, only the farmers openly slandered environmentalists. One refused to be interviewed and stated that all activists should be incarcerated (as described on page 81), while others provided letters from local campaigners, which they believed would show just how little knowledge these people had. For example, Chris gave me a copy of the following letter:

Dear [Chris]

I am writing direct to you to ask that you take into account my deep concern about GM maize crops that I understand are to be grown on your farm.

As a local resident who has not been consulted on this very important issue that affects us all, humans and wildlife and farm animals that we consume, I feel that your trial crop is too near houses, gardens, wildlife/nature reserves, [...] woods etc.

Please can you kindly reconsider this planting; trials should not be held in such open spaces without proper advance consultation and agreement with us all locally.

Yours sincerely [...]

[Letter sent to Chris during May 2000]

Although most individualists refrained from openly criticising campaigners, they were still keen to point out that their arguments were full of inconsistencies. For example, when it was declared that GM technology was inherently dangerous, it seemed strange and perhaps selfish to individualists that campaigners were then willing to accept GM medicines. Furthermore, they could not understand why the use of glyphosate and glufosinate ammonium had been accepted prior to the introduction of GMHT crops, but was now deemed harmful:

'Why is nobody worried about birds on set-aside land, that we've had now for six or seven years? [...] With all these acres and acres of set-aside being sprayed with Roundup, why is nobody up in arms about that?' [David]

For reasons such as these, individualists concluded that the campaigners' demands for bigger separation distances and further scientific research were likely to be based upon devious tactics, rather than a well-founded scientific critique, as Morris alleged:

['They say it takes at least five years to count birds'] 'Well yeah, this is, "How can we get another five year moratorium?", and on and on and on. It's sick. "And once we get to year four, and nearly got an answer, let's find another excuse". But if they were told, "you've got sudden cancer and we've just discovered maybe a new cure, do you want to try it?" [they'd reply] "Yes please!" So what's the difference?' [Morris]

Indeed, Scott suggested that campaigners had requested a six-mile separation distance between GMHT crops and organic crops because they knew that a six-mile radius around each organic farm would leave very little land for GM crops. This, he suggested, could have been inspired by the success of campaigners in North America, who prevented deforestation by discovering that the spotted owl had a territorial radius that, when drawn on a map for each owl, could cover most of the forest. Other individualists meanwhile, stated that many of the Soil Association's concerns appeared to be unfounded, since neither organic oilseed rape nor

sugar beet had been grown in the UK, and certainly not on the organic farms whose certification had been threatened, as David explained:

'It's been levelled at us that we're trying to force [an organic farmer] out of business, you know, to get her licence revoked so she'll have to give up organic farming [...]. The Soil Association threatened to take away her licence because of the proximity of this trial. They said, "Well, what if she wants to grow beet?" [...] But she hasn't got any sugar beet quota [...] so she can't grow sugar beet.' [David]

In fact, according to individualists, people do not campaign against GM crops because they think that there is something wrong with them, but rather because they are owned by 'big businesses' that are 'preventing' campaigners from creating a 'better' world. As Fred stated, the biggest concerns appeared to focus upon how farmers and companies benefited financially:

'But the main query at the end of the talk was what I was being paid to do it. [...] There was apparently a rumour going around this village that I was being paid £100,000 for conducting the trials! [...] Then of course, having got that out of the way, the venom was directed towards Monsanto [...] "The only people that are going to be benefiting", so they said, "were Monsanto". And some of the letters that I have subsequently received, objecting to it, have majored on this, their concern that Monsanto and other chemical companies like them are merely doing it to enhance their own profits.' [Fred]

Meanwhile, the inspiration for this 'better world' was thought to have originated from a poor understanding of nature, and an unrealistic perception of life in developing countries:

'I find it really difficult when people talk about natural and we should turn to the developing world to see how they do it and it's all sustainable. You think, yes that's all very well, but I'd rather my children go to school and didn't have to go travelling 20 miles for water every day. I find it really strange the way people romanticise things.' [Alma]

'I think the Eurocentric view of nature is getting to be a bit plastic, it's not real [...] if you ask any African farmer as to whether his interfered crop is better or worse than the crop that his dad made, what are they going to say? What are his kids going to say? Which is going to feed them the most. Which is going to pay for my

kids' education. Bollocks! It's a lot of people thrusting their well-paid ideals onto nature that aren't there.' [Paul]

To think that nature would be kind to humans as a result of 'treading lightly on the Earth' seemed incredibly foolish to individualists. Indeed, these interviewees believed that human suffering would increase dramatically if the world converted to organic agriculture, because organic systems were believed to produce half as much as conventional ones, and perhaps less on very poor soil. Furthermore, it was deemed unlikely that this situation could be improved by increasing research and development, as Morris explained:

'Why have we got to where we've got? [...] Scientists have been looking, and they've gone down the route where they've shown the greatest increase. [...] I'm sorry, what do they mean? Are they meaning that we then look for some more magic? After all, what are we talking about? It's still chemistry, whatever you're looking for, you're looking for something chemical that will make the crop grow better. And therefore... Is it the fact that you're adding manure? We know what manure does to the soil, we've always known it.' [Morris]

It was also asserted that widespread organic agriculture would be an economic disaster, as Fred explained:

'If you grow organic crops, you are going to produce less per acre, and on light land, which is the land around here, light poor land, you are only going to produce a fraction of what one would produce by using fertiliser and spray. The people who do grow organic crops at the moment are only successful if they're on fertile land, and they aren't making a lot of money. And if a lot of people enter the organic market, the price will go down to the same as conventional crops, and one will go broke. [...] The only reason organic farmers can make any money at the moment is because their produce commands greater prices. Well if that goes, and you see on poor soil...' [Fred]

Indeed, according to individualists, most people would not pay the high prices that organic produce commands, and certainly not when they saw its inferior quality. To illustrate, Chris described how a local farmer could not sell the organic food that he thought people demanded, while Morris described how British farmers could not sell pig meat because they had adapted

their welfare standards to suit the wishes of campaigners:

'There's a farm shop up the road here and some people are saying, "Why don't you sell organic stuff?" So they got some in, and they said, "Oh, don't like the look of that!" An absolute wasted effort. They don't do it anymore. Very few people visiting the farm shop wanted organic food. If it's done properly it's got holes in it and it's misshapen and bugs of all sorts.' [Chris]

'[...] the public are generally saying, "Well, we actually don't like this, we want something which is an ideal rather than a practical way of going forward". Whether it's the way we keep our animals or whatever, we've been asked to do changes, most of which we've been happy to do. But then we find that the public will only cheerfully go and buy our competitor's product, because it's cheaper, because it still happens to be made with techniques that we've been told we can't do. It doesn't add up, whether its keeping pigs in stalls or tethered, or... It's those sorts of arguments that it's difficult to crack.' [Morris]

Campaigners who favoured organic production were thus perceived to be a small minority who did not represent the real wishes of the British public. Rather than acting democratically, they were believed to have used their power and influence to manipulate the media into publishing frightening propaganda about 'Frankenstein Foods', and into promoting unreasonable demands with regard to buffer zones and GM-free food. Rather than being honest about their motives, individualists believed that campaigners had challenged the introduction of GM crops by pretending to be interested in science and democracy. On this last point individualists were particularly bewildered, since it was campaigners who had forced their opinions upon others and who had uprooted legitimate scientific trials. Indeed, individualists stated that they were even represented by a large multinational organisation with an annual turnover of almost \$100 million; it just so happened that this organisation was called Greenpeace!

By stating that their critics were undemocratic members of a multinational organisation, individualists again seemed to be stealing the discourse of their critics in an effort to win favour. However, their main concern was still the fact that the seemingly selfish, or perhaps naïve, demands of Western consumers would lead to a great deal of suffering elsewhere, as

the following quotes demonstrate:

'There's two or three modifications that are sitting there ready to roll that [people in the Third World] daren't use because of the Western World's antipathy to GM constructs. They're frightened of actually preventing the sales of any other crops that they might grow [... All] because of this current Greenpeace, Friends of the Earth argument that we must stop genetic technology. I think it's immoral, quite seriously.' [Morris]

'I think that it's a very arrogant view to believe that we, who happen to be relatively prosperous at this moment in time, in the north west of Europe, can continue to exploit the rest of the world to supply our food needs [...]. I think that you would take a very different view of food if you were in the Third World. So I don't accept that we do not need to examine these technologies. Mankind does.' [Philip]

'We might think there's plenty out there to buy, [and that] we can turn our own countryside into some garden of Eden where people can walk around and everything looks pretty with butterflies and flowers and all the rest of it, and the actual production bit that we want to feed ourselves on is tucked away in some little corner, which we needn't really bother with. I'm sorry, it's a bit naïve in the long-run.' [Morris]

'I have read scientific papers, or not scientific papers, but papers prepared by the organic movement, and they accept that the only way that organic agriculture will feed the world is if it had less people in it. The Chinese are not very successful with rather brutal methods at restricting their population growth, and the only other way of restricting population growth is to starve people. I don't think that's a reassuring element as well.' [Colin]

Indeed, individualists claimed that organic agriculture was not even a better proposition for the environment. The human population was thus perceived to be suffering for no reason. For example, Martin asserted that organic farmers do not produce environmental benefits because of the way that they grow crops, but rather because they manage strips of habitat between their fields. Such a management technique could thus be applied to any form of agriculture, whether organic or not. More importantly however, individualists asserted that widespread organic agriculture would actually necessitate the destruction of the habitats that

environmentalists valued, as Philip and Martin expressed:

'This is a question I've asked some of the environmental groups, and never got a satisfactory answer. If you accept that if you move to less intensive agriculture, you're going to have a reduction in yield, where is the additional food going to come from? It's only going to come by extending agriculture into the non-cultivated parts of the world. And that is going to have, in my mind, a much greater impact on the environment [...]. If you go for less intensive agriculture, and more people, then you have a greater area of the world involved in cropping, or you have a greater level of starvation. I fail to see how you can do otherwise.' [Philip]

Furthermore, farm animals were expected to suffer more, which again seemed to contradict the values of campaigners:

'My grandfather used to keep chickens in an orchard, which was virtually organic because he never used any chemicals, so I grew up on it if you like. It certainly wasn't a world I'd like to go back to. The chickens used to suffer like mad. They ran around outside and they dropped dead from this that and the other. This is the reality of it.' [Morris]

Indeed, even the standard of organic produce was considered to be inferior when compared to conventional agriculture. In many cases, individualists pointed out that there were a number of different organic certification standards that consumers could not differentiate between in the supermarket. Furthermore, these standards changed over time. For example, at one time organic animals could be fed 20% non-organic food, and non-organic seeds could be used to produce organic crops. However, the Soil Association since stated that all seed and animal feed should be organic. It thus seemed strange that food could be organic one year, but not the next. For other interviewees however, the organic standards were not considered to be inconsistent, so much as downright dangerous. For example, a number of interviewees stated that they would not eat organic potatoes because of copper residues, while others stated that they were concerned about the risks of *e.coli* and so-called 'natural' substances:

'The organic soft fruit growers use things like rotinon, which is 'natural', extremely nasty. [...] They actually use it in fish farms to control fish populations it's so toxic, so I mean...! But again the organic bandwagon, I don't know if its about to burst with the e-coli and stuff like that, I really don't know.' [Alma]

'I wouldn't let my kids eat organic potatoes because of the copper they put on for blight.' [Colin]

By arguing that organic agriculture is disastrous for human health, the environment and farm animals, individualists again appeared to be using the discourse of an egalitarian. Indeed, some of interviewees stated that the organic lobby only campaigned against GM crops because they could see that they would soon be superior in quality to organic foods, and so saw a need to protect their market. They therefore seemed to be arguing that financial greed, rather than a concern for human welfare and the environment, motivated egalitarians.

Possibly one of the biggest irritations for individualists however, was the fact that they had undertaken more than enough studies to fulfil their regulatory obligations. Indeed, they stated that they had even adhered to a voluntary moratorium and had informed local communities of the locations of GMHT maize trials, even though this was not legally required. These interviewees did not seem to be angry with the regulators however, but rather with the campaigners, who had slandered their products despite many years of testing. In fact, individualists rarely criticised the activities of hierarchists. This was perhaps because many of these interviewees had scientific backgrounds, but it could also be because they believed that hierarchists supported their agenda. Nevertheless, there were occasional comments about Prince Charles's involvement in the GM debate that suggested individualists were not fully supportive of hierarchy, and others that suggested that they did not like being told what to do, and certainly not by those without respected authority:

'I just think [the royal family] are a burden on our society! I think we should pay the queen, and all the rest should earn their living. The trouble with Prince Charles is, as with a lot of people, he's got too much time on his hands. If he had to work for a living he'd probably be less of a nuisance.' David

'I don't tell the village what to do in their gardens and I don't expect them to tell us what to do in our fields, on the basis that I consider it to be 100% safe.' [David]

Even without the regulations of hierarchists however, individualists maintained that they would still ensure the safety of their products. This, they claimed, was because they had no intention of hurting their customers, who they knew would abandon a company if it was discovered that a product did not work or did harm in some way. Furthermore, they

declared that companies were not as powerful as their critics seemed to believe, as Martin described:

'[A company] is only big because it sells good products. Monsanto are only a reasonable size because they sell good products. Novartis only sell good products. If you sell crappy products, you hurt and damage people. [...] Look at Marks and Spencers, they grew big, they grew arrogant, they didn't produce products that people want, and they're sunken now.' [Martin]

Nevertheless, it was proposed that it was better if companies were big, since these organisations would be able to afford far more rigorous research:

'The only people who are going to produce decent work are the companies that can afford to. [...] There's an awful lot of absolutely awful science being done by small groups, simply because they don't have the resources to throw at a subject.' [Paul]

Indeed, it was said that the campaigners themselves were encouraging the companies to amalgamate because of the extra research that they demanded, as Philip explained:

'I think it's probably inevitable that there will be a concentration in the number of companies at the stage of bringing it through from there to the market, because of, in many ways, the safety requirements that society demand.' [Philip]

Furthermore, individualists claimed that these companies could afford to do research for developing countries that would otherwise not be undertaken. These interviewees therefore hoped that the regulators would not listen to campaigners, since they believed that crop biotechnology was possibly more valuable than other inventions such as the car or steam engine, which could equally have been abandoned if regulators had listened to 'the purveyors of doom'. Indeed, in the case of DDT, Paul asserted that the activities of campaigners had already cost the lives of many:

'DDT was a really valuable weapon [...] but] there was the enormous panic and it was banned. Now people are dying of malaria in the US. They're dying of malaria where they wouldn't have done if DDT was still in use.' [Paul]

Summary

From their account of the human relationship with the environment, it is clear that individualists considered the Earth to be an unpredictable and hostile place, where humans had to struggle to survive. For individualists, it was the impact of technology that was considered to be benign, rather than the qualities of nature. Instead of worrying about the environmental impact of human interventions, individualists focused upon more homocentric issues such as providing health, wealth and abundant food. Individualists did not consider GMHT crops to be new because genetic engineering already existed in nature, previous plant breeding techniques were already highly technical, alien species had already been introduced, and glyphosate and glufosinate ammonium were already frequently used. Indeed, individualists stated that crop biotechnology was so much more precise than both nature and past interventions that it might not require so much testing in the future. Furthermore, individualists believed that GMHT crops would benefit both the economy and the environment, and that this had already been witnessed in the United States and at trial sites in the UK. Their ideal agriculture comprised a highly productive system, which would ideally be separated from the conservation of nature. Individualists tried to refrain from slandering other groups engaged in the debate, but they usually targeted the 'naïvety' and 'dishonesty' of egalitarians when they did. According to these interviewees, campaigners were more concerned about the power of multinational companies than they were about GM technology. Their tactics were perceived to be irresponsibly preventing the environment from being protected and the starving from being fed.

The egalitarians' framing of the GMHT crop debate is presented in the following chapter.

The Egalitarian's Framing of the GM Crop Debate

Introduction

This chapter presents discourse that most closely resembles cultural theory's egalitarians.⁷ This was extracted from interviews conducted with individuals engaged in the GM crop debate, as described in chapter 4. How egalitarians perceived the human relationship with the environment, and the approach that they recommended for the future is described. This is followed by a description of the similarities that GMHT crops were perceived to share with nature, conventional plant breeding and other human interventions. The experimental procedures that egalitarians deemed necessary prior to the release of GMHT crops, and the risks and benefits that these crops were said to present are then outlined. The chapter finishes with a description of the ways in which other groups within the debate were perceived.

On the Brink of Catastrophe

Egalitarians were usually long-term members of organisations such as Greenpeace, Friends of the Earth, the Soil Association, the Campaign for Nuclear Disarmament and animal rights groups, as Hazel described of her own membership:

'The first thing that I was involved in actively was when I was 15 years old, and that was the new CND. I was a member of Amnesty International, so it was mostly peace groups, and social welfare groups, humanitarian groups. Then I got more interested in conservation-type groups, so I joined the wildlife trusts, the WorldWide Fund, the National Trust, RSPB, those sorts of mainstream ones. But then [...] in 1985 or 1986 I joined Greenpeace, Friends of the Earth, Women's Environmental Network, and a whole load of more environmental-based organisations.' [Hazel]

⁷ When this chapter refers to *egalitarians*, it is to one of cultural theory's ideal types, and not to any particular interviewees. When named individuals are mentioned, it is because they used discourse illustrative of this ideal type. It should not be assumed that these individuals were stereotypical egalitarians. How individuals used the discourse of each type is presented in Chapter 8.

When considering how human interventions had impacted upon the Earth, these interviewees often stated that the consequences had been catastrophic. Nature was therefore described as ‘out of balance’, ‘on the brink of destruction’ and ‘hanging on’, as the following quotes demonstrate:

‘We’re having a HUGE impact on the world. We’re destroying species, losing 30,000 species a year at the moment, of life on this planet, largely as a direct result of human behaviour. The South East Asian rainforest has got a 10-year life expectancy etc, etc...’ [Joshua]

‘[...] I mean what we’ve done, global warming and famines and overpopulation... I mean species are being wiped-out every day all over the world, the rainforests are disappearing... It’s terrible what we’re doing to the Earth.’ [Nick]

The egalitarian perception of nature ephemeral was thus applied to a wide variety of cases, and with regard to farming, it was declared that the British countryside was now in a ‘terrible, terrible state’, where ‘too many things have been destroyed’. Such damage was perceived to have been particularly bad over the past fifty years, when hedges were ‘ripped out’, dangerous chemicals such as DDT were sprayed, organic matter was not returned to the soil, rotations were abandoned and a small variety of crops were grown. As a result, it was stated that there had been a catastrophic decline in flora and fauna, and most particularly birds:

‘[Agriculture] has done catastrophic damage over a period of fifty years. It’s reduced skylark numbers by whatever it is, I think it’s 70%, tree sparrows by a greater percentage, we’ve wiped out the English partridge, well wiped it out over much of the country, the grey partridge. And those are just some of the examples. Industrial agriculture has caused 80 or 90% loss of chalkland, loss of this and that and the other, and all these species, and butterflies, and left the soil lifeless. The scale of the damage is unbelievable.’ [Anthony]

Indeed, many of these interviewees believed that there was more wildlife in the average garden than there could be on farmland:

‘There’s more wildlife in my garden of half an acre than there is in [...] say five square miles, because it has been so intensely cultivated. In Norfolk they actually had to import bees to pollinate their crops, because they had so much destroyed the natural habitat of bees!’ [Hazel]

Because of the destruction that humans had apparently created, egalitarians believed that the Earth would be far better off without them, as Cathy described:

'I don't mind humans, but I do ask myself why we're here really, because I don't see that we add anything to the planet. I think we've made a mess of doing things so often. [...] I can't see that if we disappeared, and the rest of nature, or the ecosystem was left without us, I don't think it would suffer at all. Quite the opposite. [...] I think really we're not able to be here without inflicting a lot of damage, both to ourselves and on the rest of nature.' [Cathy]

Furthermore, and as this quote demonstrates, they believed that humans were harming themselves as well as nature. For example, many stated that they had been highly affected by the bovine spongiform encephalopathy (BSE) outbreak, which had influenced Ryan in his decision to become vegetarian and had left Louise and Rachel worried about what to feed their children. Others meanwhile, were concerned about *E. coli*, antibiotics, additives and chemical contamination, leading them to always check labels when purchasing goods:

'Well you want to read 'Our Stolen Future' by Theo Colborn [...] it's terrifying, and what plastics and everything else, and all these chemicals [...]. I've got some Boots bath stuff and it's got all sorts of chemical names in it. I don't know whether any of them are harmful or not, but I now only really want to source things that are definitely proved unharmed.' [Alice]

Kate's concern meanwhile, stemmed from the fact that she had been diagnosed as severely intolerant to environmental pollutants. As she described, she is often unable to leave the house because of the pollution outside, and is unable to eat anything other than unprocessed, organic wholefood, which she claimed is quite common:

'[...] back in 1981 I got ill with some mysterious illness and nobody knew what it was [...] I just became allergic to everything, all foods, water, even water out of a bottle. I just started reacting to everything [...]. I was treated at a clinic in America, which has hundreds and hundreds of adults and children coming through every month [...]. Pesticides, bleaches, gases given off by waste tips, gases given off by waste incinerators, all these things really really are affecting people badly, to the extent that in America they think that 25% of the American population is environmentally ill to some extent.' [Kate]

According to these interviewees, the cause of such environmental and health problems lay in the fact that humans had dominated and suppressed nature for material gain. Moreover, they believed that many of these detrimental impacts had yet to be discovered, simply because the complexities of nature were not yet understood, as Anthony described:

'If I go to my farm and dig up a bit of soil, 98% of it is a blank sheet of paper, I've no idea what's there. Now, if I've got no idea of what's there, I've certainly no idea of what's going on, what the relationships are between the living organisms. [...] you can film a mole eating worms, and we know that modern agriculture has eradicated moles from most cereal fields [...] so we've done something fairly fundamental [...] but what else is going on in that ecosystem? What else have we taken out? What else is wrong? We know more about the surface of the moon, I sometimes think, than we do about the soil under our feet.' [Anthony]

With such a lack of knowledge, and such an adverse effect upon the environment in the past, egalitarians claimed that it was necessary to start working with nature, as Nigel stated:

'We have a system that works, it's called nature, and you should work with it rather than against it.' [Nigel]

To achieve this end, egalitarians supported the uptake of organic and more traditional forms of agriculture, which, according to James, have 'always been a partnership with nature' or even 'a dance with nature'. Others suggested that it would be wise to learn from the practices of less industrialised nations. For example, Isobel described how the inhabitants of Ladakh had created fertile pockets of land within a stone desert, which had enabled crop production to be sustained for thousands of years. Bryn and Ryan meanwhile, asserted that much could be learned from permaculture, which would encourage inter-cropping, and would utilise the skills of other species, such as chickens and ducks for the control of weeds. More frequently however, initiatives such as community supported agriculture and farmers' markets were mentioned, which enabled interviewees to understand and influence food production, as a member of Emily's group described of a farmers' market that she had just visited:

'I bought this lovely cauliflower, it was 70p and it was huge, and it was perfect, absolutely perfect, and I said, "Now, how did you manage that? What do you do?" and he said, "planting other things near it, and using the Bt spray" [an insecticide used by organic producers].' [Emily etc]

By encouraging such practices, these interviewees admitted that food might become more expensive and less prolific. However, since famine-stricken countries had exported food to over-fed industrialised nations, egalitarians asserted that the root of the problem lay not in food shortage, but in corruption and distribution:

'We already have enough food to feed the world's population one and a half times. Shortage of food is really not a problem. All the major countries that have been having big famines in the last ten years have all been net exporters of food during their famines [...]. The reason why they were doing that is because we have embroiled them in a debt situation and the only way that they can get out of this is by growing cash crops for export, rather than – which they were doing several generations ago, perfectly happily – feeding their own population with subsistence agriculture.' [Kate]

With greed identified as the primary cause of other people's starvation, egalitarians stated that it was important to ensure that food production was not subjected to 'the vagaries of the market'. Thus, even if organic farming became unprofitable, it was asserted that this form of agriculture should still be pursued. Moreover, in the event of there not being enough food, egalitarians pronounced that it is first necessary to consider what humans really need. As a number of interviewees stated, humans are not the most important species on the planet, both because other species have their own intrinsic value, and because humans need other species in order to survive:

'Why is mankind so important? I don't subscribe to this. I believe that we don't have a right to existence. I don't believe in God. I don't feel superior to any other creature on the planet. We have the brain capacity to do incredible things. But I don't think that mankind has the right to exploit nature in the way it has, completely for its own benefit, and to completely upset the whole ecosystem.' [Hazel]

Indeed, according to some interviewees, it is always necessary to set aside some land or a proportion of food production for other species, and to show them respect:

'You've got to think that 10% of it has got to go to waste, to the bugs, or to anybody. I think it's at Findhorn they actually told the insects and things which was their 10% [...] I think we've just lost faith, because I can get rid of ants, out of my house [...]. You just ask them to go, as simple as that. You have to ask them nicely, and address the King of the Ants' [Emily etc]

Although an extreme example, this quote clearly demonstrates the extent to which egalitarians believed that humans should not acquire a greater proportion of the world's resources than they absolutely needed. Instead, they asserted that efforts should be made to reduce the human population, and to encourage the more affluent to control their obesity by eating less meat:

'I'd probably, wish that nobody would have more than one child. Yes, that would be the best way of fixing up the world.' [Nick]

'I'd rather have a low yielding crop and insects and butterflies and bees. And I'd be happy to encourage people to eat less meat and consume the crops themselves [...]. It's very inefficient feeding crops to animals for humans to then eat. A bit of vegetarianism goes a long way!' [Hazel]

Only once humans had tried to fulfil their needs by working with nature and reducing their demands, did these interviewees believe that new interventions should be introduced. As Anthony stated, to introduce technologies just because they have been invented is 'a sign of a very uncivilised society'. Egalitarians thus believed that it was best not to intervene in nature unless absolutely necessary, because the consequences of doing so could be catastrophic.

Working against Nature AGAIN

Like the technologies that had gone before, crop biotechnology was perceived to be yet another attempt to control and manipulate nature in order to satisfy human greed. Many interviewees drew parallels with existing 'dangerous' technologies, such as pesticides, incinerators and nuclear power. Furthermore, they stated that the same promises had been made about these technologies, as Clive explained:

'Nuclear power is the obvious parallel [...]. The whole idea was that nuclear energy was going to be very beneficial for the world, it would help irrigate vast areas of desert so nobody would go hungry anymore, it would provide electricity that was going to be so cheap that it wouldn't be worth metering [...]. Radioactivity itself was considered good and healthy. They thought it could cure all sorts of diseases, and cancers particularly, and so on and so on. And then, as the decades advanced, the story broadened a bit, until the point where everyone's closing down the nuclear power stations now, and it's regarded more as a problem than a solution.' [Clive]

Indeed, egalitarians asserted that crop biotechnology showed even less respect and understanding. For example, Rupert described how genetic engineers ‘steal’ genes from other species, and how his ‘whole life [would] feel completely irrelevant and meaningless’ if, as Joshua expressed, nature became ‘the creation of the human mind’. Similarly, Hazel described how crop biotechnology was yet ‘another step towards a plastic consumerist society’, where ‘everything would then be man-made commoditised’. Nick meanwhile, likened transgenic crops to ‘a fake Picasso’:

‘It’s like with art. If you had a Picasso that was worth a million pounds, you’d hang it in your front room and you’d be thrilled with it. But if someone came round, an expert, and said it’s a fake, it wouldn’t be worth anything, even though it would look the same. [...] I think it would alter our whole relationship and the way we look at things, knowing whether they’re natural or artificial, fake if you like.’ [Nick]

Many of these comments were offered in response to a description of McKibben’s GM rabbit in a woodland (see page 71), which was usually responded to very quickly. For example, Sandra had been nervous and hesitant during her interview, but when asked to comment on this quote, she suddenly became far more certain of her reply:

‘I understand that perfectly. It’s a different reality. I can relate to something because I know it, in nature. I can relate to something because I know it’s there in and of itself, before I was there, and it has as much place to be there, if not more than I have. [...] It’s a fantasy. It’s not a reality, and you may as well not have it there. Yes, I couldn’t agree more [...]. Something that’s been created in a test tube and shovelled into the Earth is... has no place to be there!’ [Sandra]

Unlike individualists therefore, egalitarians identified with McKibben’s quote extremely well, and never sought clarification, as the following quote again illustrates:

‘[...] because it’s not an amazing product of nature if you like. Yeah, I can relate to that kind of outlook. I don’t know if you’ve ever read ‘Do Androids Dream of Electric Sheep?’ [...] It deals with these kinds of issues. It’s futuristic, set in a world where we’ve destroyed our environment and species [...]. So this bloke had an electric sheep, that he tends to on the roof of his apartment block. And everyone has these kind of substitutes for things that used to exist, and that was them relating to their environment. It’s all about the hollowness and the emptiness that it leaves

inside you [...] and those instinctive needs that humans have to be connected and things like that. Just that whole grieving for the loss of that stuff.' [Gail]

While being perceived as unnatural in a philosophical sense, GMHT crops were also deemed unnatural in a functional sense. As Kate declared, 'GM crops are about as far from nature as we are from Mount Everest!' Perhaps the most significant reason for believing that GM crops were unnatural, was the fact that biotechnology required the species barrier to be crossed. This, according to some interviewees, never occurred in nature:

'You could leave a tomato in a jar with a jellyfish for a million years and they wouldn't crossbreed. There are species boundaries which are being broken with genetic engineering in a very bizarre way. That's never happened before.' [Clive]

Egalitarians also submitted that conventional plant breeders had never crossed the species boundary, leading them to conclude that crop biotechnology was 'a quantum leap'. Indeed, even proponents of GMHT crops were seen to describe the technology as 'revolutionary', since they had deemed them novel enough to warrant patenting. Unlike biotechnology therefore, traditional plant breeding was perceived to be merely 'helping nature along the old path-line', which Rupert likened to an arranged marriage:

'[With conventional plant breeding] you're only actually aiding plants which would normally mate anyway to produce off-spring. It's like an arranged marriage, you're putting things together that might have got together anyway.' [Rupert]

Often egalitarians were unaware of species such as triticale, which had been produced as a result of crossing species. However, those that were, believed that this was not as dangerous as crop biotechnology, because the species involved were close relatives. Similarly, many egalitarians had not heard of induced mutagenesis,⁷ but upon being told about it, they usually thought that it sounded 'horrible', as this quote from Tim's interview demonstrates:

'What's all that? What's all that then? Golden Promise what? In a nuclear weapons place? Well, I must say that's the first I've heard of that. I mean the word mutation... I mean again I'd have to know what we're talking about. It's the first I've heard of it.' [Tim]

⁷ Induced mutagenesis was first referred to by individualists, as described on page 94.

Other interviewees meanwhile, had heard about induced mutagenesis from proponents, but did not always believe that the technique had been used:

'[They say] "What about Golden Promise barley, one of the most successful malting barleys created at Aldermaston in a nuclear reactor in the 1950s? And here you are complaining about this! Ha, ha, ha, ha." [...] But it isn't true. One man who has worked in plant breeding said the only food that was created that way was one tomato and it was abandoned. It didn't work.' [Emily etc.]

Of those egalitarians who were aware of the prevalence of induced mutagenesis, it was advised that the technique should not be allowed, and certainly not in organic agriculture. Indeed, James described how he had stopped growing varieties created in this way, because he had read research that showed it compromised food quality:

'There's some research work that's been done very recently, which shows that F1 hybrids are not as vital a food as traditional open-pollinated varieties of vegetables [...]. I switched my entire crop back to open-pollinated, even though it's giving me marketing problems, because I believe that it should be the farmer's responsibility to grow healthy vital food. [...] I suspect that many of these grey plant-breeding techniques may have undesirable consequences, and I think what we need to do for the future of plant breeding, is rethink the criteria for what is acceptable and what isn't. It may be that mutagenesis and some of these sort of grey area techniques that have been used and maybe even are still being used, are, dodgy, in which case we shouldn't use them any more.' [James]

Despite the undesirability of induced mutagenesis however, egalitarians submitted that this technique was still not as bad as crop biotechnology. This was because mutations occur within the plant itself, and because they also occur naturally. Similarly, alien introductions were perceived to be more natural, because they are not created by humans and because species move naturally between continents. The comparisons that individualists drew between alien plants, induced mutagenesis and GM crops were thus perceived to be irrelevant, other than the fact that they could all lead to disasters:

'Why should you, because you've already made some horrendous mistakes in the past, carry on doing it in the future? For goodness sake! I mean that's just not an argument is it!' [Bryn]

Although most egalitarians stated that nature did not cross the species barrier, others conceded that this did happen, but in a very different way. According to these interviewees, when genetic material invades foreign organisms, it is usually rejected or silenced. Thus, only in perhaps hundreds, thousands or even millions of years, did they believe that unrelated species exchanged genetic material successfully. Furthermore, even when closely related species reproduced, such as the horse and the donkey, egalitarians stated that the off-spring were usually sterile or too weak to survive. Thus, despite the incidence of gene exchange between species, these interviewees concluded that nature preferred not to cross the species boundary. Indeed, the only way that genetic engineers had been able to overcome nature's desire to prevent horizontal gene transfer was through violence, as Kate described:

'[The construct is] built to overcome the plant's natural tendency to try and shove it out as an invader. So it's really as if it's a specifically constructed weapon that is designed to penetrate a castle wall. [...] Cells of plants are like concrete bunkers, you can't get anything into them, you try and you try and it's just fortified against the invader. [...] Genetic engineering has had to evolve around the idea of how do I get this invader into this cell, and how do I make it express in every cell of the offspring. It is an incredibly violent process.' [Kate]

When genes did naturally transfer between species, egalitarians asserted that it was highly unlikely that genetic material from a variety of organisms would transfer at the same time. Furthermore, it was believed that they would probably incorporate themselves discreetly and safely, while those inserted artificially would be quite disruptive. This was because genes were thought to work in 'families', rather than as single distinct entities, as Ryan explained:

'In a particular circumstance this particular bit of DNA from somewhere to the left, somewhere to the right, codes for one particular thing, but half of that towards the right might just go a bit further and code for something different. Also, genes aren't discrete sequences, you'll get a bit of gene here, another bit here and so on.' [Ryan]

By randomly inserting a genetic construct, egalitarians explained that a family of genes could become fragmented. Furthermore, they claimed that an inserted gene could require other fragments of DNA in order to function properly, or could confer more than one characteristic. For example, Kate suggested that the gene for blonde hair could also confer resistance to leukaemia. Egalitarians also submitted that the environment within which the gene is placed affects the traits that it expresses. Thus, a gene could cause quite a different trait in the host organism compared with its parent, and could express itself differently depending upon

environmental conditions. For example, it was proposed that a gene could behave differently when exposed to temperatures over 40° Celsius, while another ‘could make you prone to Parkinson’s disease, but only if you’re exposed to organophosphates at some point in your life’. To assume that randomly firing segments of DNA into a plant’s genome would result in just one desired change was thus considered incredibly naïve:

‘As the BUPA add says, ‘We’re amazing!’ We are! We’re like a symphony of genes all playing in harmony with each other. You cannot simply regard it as being a sort of cut-and-paste job of genes, which are stuck onto a stick. It isn’t like that. I’m not like that anyway! Genetic engineers may be! [...] It horrifies me that anybody could have that attitude towards the miracle of life, whatever that means. That we should presume to be so arrogant as to be able to think that we could rearrange the building blocks of life in that profound a way. [...] I think is completely horrifying. I think it’s one of the most scary things that I have ever come across in my life.’ [James]

That organisms have genes in common with one another was also not a justification for genetic engineering. As many egalitarians stated, it is the dissimilar genes that are being transferred, not the similar ones. Indeed, the fact that humans had perhaps 60% of their genes in common with a banana, or 98% with a chimpanzee, proved to these interviewees just how important a few genes were. For Anthony therefore, it was impossible to believe that individualists could justify genetic engineering by describing genetic similarities:

‘Yes, well, some of these farmers may behave as if they were 60% cabbage, but most of us don’t... It’s infantile. I mean are you a cabbage? Are you more than half a cabbage? Of course not. It’s a completely... It’s not an argument [...]. Even people who are pissed as newts wouldn’t contemplate... It’s a stupid argument. [...] I’ve never met a serious scientist that’s propounded anything so silly. That’s all I can say about it. It’s not worth spending time on quite frankly.’ [Anthony]

One of the key concerns however, was the fact that DNA from the cauliflower mosaic virus was used. According to egalitarians, genes naturally switch themselves on and off when they are needed. For example, a plant might only express a toxin when a pest is attacking it. However, by using DNA from the cauliflower mosaic virus, genetic engineers were perceived to be forcing the genetic construct to express itself all the time. This, egalitarians claimed, depleted the GM plant’s limited supply of energy, and prevented it from gaining control of that gene. Furthermore, it was claimed that the cauliflower mosaic virus could switch other

genes on and off within the plant, while also increasing the chances of horizontal gene transfer, as Kate described:

'We do ingest the cauliflower mosaic virus, but it's in a very different form from the form that we find in GM plants, and in those plants it's present in a very unstable, aggressive and promiscuous form. It's really the difference between the kind of world where most people practice safe sex with condoms and just having one partner most of the time, and a totally promiscuous world where everybody just goes around doing it with everyone else [... catching] all kinds of strange viruses.' [Kate]

Egalitarians therefore expected transgenes to insert themselves into other organisms frequently and irreversibly, making 'genetic pollution' far more worrying than any existing pollutants:

'With everything else, even nuclear fuels, you can say, "well, we'll stop it now. Fifty years on we found that it's not a good thing, it's destroyed the planet, it's doing this, it's doing that, we'll stop." But with this they can't actually do that. Once it's growing, once it's in the soil, once it's transferred to other plants, you can't stop it. I think that's the scary thing.' [Rachel]

'It's a bit like Antarctica, I find it really depressing that there's those persistent organic pollutants in Antarctica [...]. I find it really upsetting that there is nowhere that our society and culture will not touch in terms of leaving things pristine, and they... and I just think, oh God, you know, it's the final sort of barrier almost, between species, and we're going to fracture that. I think it's just deeply sad actually. Just where...? Will we ever...? Will we stop? What are we going to hand on to our children?' [Natalie]

GMHT crops were thus perceived to be highly unnatural, and far more manipulative than the technologies that had gone before. Indeed, even the herbicides that were being used were considered to be different, since they had only been used in rotations before, and had certainly never been sprayed onto food crops.

An Unpredictable Technology

Since genetic engineering was perceived to be very different when compared with other interventions and natural phenomena, egalitarians believed that it was not yet possible to know how GMHT crops would react. As these interviewees pointed out, 'unforeseen' and 'unknown' consequences had resulted from the introduction of far less manipulative interventions, and often these did not manifest themselves until it was too late, as Louise described of BSE:

'I don't want it to be the same as BSE that unfolds in ten years time that I shouldn't have been eating it. That worries me greatly.' [Louise]

Predicting the effects of GMHT crops was thought to be especially difficult because there was perceived to be very little knowledge about fundamental genetics. For example, Ryan described how the genes of a simple plant called *arabidopsis* were not yet understood, while Clive described how only 3% of all DNA had been identified:

'People don't really know, for example, what 97% of the DNA actually does. Until recently they've just called it junk DNA. Now they realise that if they remove that part of the DNA, there is a difference between an organism that's got that junk DNA and the one that hasn't. They don't exactly know what that means, how significant that is, but it's obviously there for some purpose [...]. So here's a system that we only know what 3% of it is for, we don't know how that 3% actually interacts with itself, and we don't know how it works.' [Clive]

Against this backdrop of perceived ignorance, egalitarians described how random gene insertion had made the technology extremely crude and haphazard, rendering the prediction of effects even more difficult, as Nigel and Hazel described:

'They're really just blundering around in the dark, trying to give the impression that it's all very high-tech and we know what we're doing, but actually it's a very crude technology.' [Nigel]

'They just haven't got a clue what one extra gene or two extra genes that aren't natural to a species are going to do to that species, particularly the way they have to introduce it. It's randomly introduced, they can't be precise.' [Hazel]

Indeed, according to some interviewees, the unpredictable nature of GM crops resulted in each plant being different, even when they came from the same transformation:

'Pusztai, I believe, said that every single one of the potatoes he was measuring was different. They'd come from the same genetic modification, but every single potato was different from every other. He said to test the safety effectively of a crop, you'd have to test every single plant to find out if anything had happened.' [Clive]

To expect the unexpected thus seemed eminently sensible to egalitarians, but it also made testing very difficult, if not impossible:

'The actual thing that goes wrong is something which nobody has even thought of, just like we had with thalidomide, just like we had with 101 things that go wrong with technology [...]. I read the United Nations' draft Biosafety Protocol [...]. It basically itemised 12 scenarios of things that could go wrong, and I pointed out that actually these were just things that environmental groups had thought of [...]. It could be something totally different which goes wrong in the end.' [Rupert]

'It's going to be the thing that we don't test that's going to be the thing that comes and bites us in the end, presumably.' [Bryn]

The fact that problems had not yet been found did not demonstrate to these interviewees that GMHT crops were safe therefore, but rather that too few tests had been undertaken. For example, many believed that GM food only appeared to be safe because no one had conducted proper feeding trials, and because no one knew whether or not they had eaten it. As Hazel described, it is highly unlikely that an allergic reaction, tumour or illness will be linked to GM food, when that food has not been labelled. Similarly, Clive stated that no one would notice the effects, 'unless there are a lot of people dropping dead', while Emily's group were highly amused that anyone could call the American public 'healthy!' To say that GM crops were safe therefore, was considered farcical by many:

'It doesn't matter how many times the government comes out with these assurances, "GM food is safe, it's quite safe, there's nothing wrong with it." It's based on nothing. It's equivalent to me saying, "There's a pink elephant in that garden." "Well, where's your proof?" "Well, it just is, it's out there. There are pink elephants." That's all it is. That is the basis on which they are contaminating our food supply. There is no better science than that.' [Kate]

With such intrinsic problems, egalitarians asserted that it was far too soon to be conducting field trials, which were considered extremely dangerous. Of particular concern was the fact that transgenic material would escape. For example, many interviewees described how GMHT oilseed rape in Canada had cross-pollinated with conventional oilseed rape 800 metres away, while others described how Friends of the Earth had found GM pollen 4.5km from a farm-scale trial. Some egalitarians also stated that they had personal experience of how easily oilseed rape spreads. For example, Nick mentioned that he knew people who had allergic reactions to crops grown some miles away, while Hazel described how oilseed rape grew along roadsides, even where none could be seen in nearby fields. Other interviewees meanwhile, described how pollen had travelled many hundreds of kilometres, as Joshua explained:

'Of course, pollen can travel huge distances. Pollen was found in a Rajasthan desert for example, [...] 650km away from the closest place that the pollen could have travelled.' [Joshua]

With the aid of the wind, bees, birds and animals, egalitarians believed that few places would escape the influx of GM pollen. As Nick described, even if you floated a trial somewhere in the Atlantic, pollen would still escape. The distances that separated GM crops from their conventional counterparts were thus rendered ridiculous. As many egalitarians described, if GM pollen can escape, it is likely that it can also pollinate related plants, and so spread potentially dangerous genes. Indeed, some interviewees were so concerned about pollen flow, that they were also unhappy about it landing on unrelated crops. As Rachel stated, no one knows whether or not GM pollen affects human health. Furthermore, it was suggested that GM crop residues could enable dangerous genes to transfer from the soil to bacteria and plants, even when the trials are over:

'Maize is a big tall plant, and to have ploughed all that in... you don't know what's left in the soil, and how that's going to affect the soil, and whether that will affect the next plant that's grown there. Whatever your buffer distance is, that's going to be the case isn't it?' [Rachel]

'The DNA [of sugar beet] was still present in the ground after three years. And there's evidence of horizontal transfer into soil bacteria. So [...] we shouldn't be risking open-air release.' [James]

Even with the greatest separation distances possible therefore, egalitarians believed that transgenic DNA could escape and could then incorporate itself into other organisms. This, it was perceived, was permanent damage to the environment, leading some to assert that it was better if the FSEs were destroyed altogether:

'My basic sort of approach to field trials is that I think people should go out, dig them up and burn them!' [Julia]

'I'd like to just tear it all up!' [Tim]

In their place, many suggested that GMHT crops might be returned to the laboratory, while others believed that biosphere domes could be built. Within such containment, it was proposed that GMHT crops could undergo the same degree of rigorous testing as new drugs, while others suggested that genetic stability and gene flow might also be assessed. In order to do this, interviewees recommended a period of perhaps 20 to 50 years. However, others thought that even this was too soon:

'And thirty, forty, fifty years of course is nothing you have to remember. I think our time-scales have got very distorted. We should think more in geological time. To realise that we discovered this twenty, thirty years ago, and therefore we know all about it, is a very, very frightening attitude to take.' [Cathy]

By designing laboratory experiments that could determine whether or not GMHT crops were harmful, these interviewees also seemed to be portraying themselves as particularly fastidious hierarchists. However, the extent to which these interviewees wanted GM crops to be tested was often impractical. For example, Alice wanted 'absolute proof' that GM crops were safe, Rupert proposed that testing should continue until there are no contentious issues left, while Kate stated that potential toxins should be looked for, although 'you'd be here 'til kingdom come' because there are 'millions' of these'.

Rather than asking for more tests to fill the 'missing gaps', many egalitarians appeared to request tests in order to delay the introduction of crop biotechnology. For example, Hazel made much of the need to conduct feeding trials on animals, but when these trials were announced some months after her interview, she campaigned to stop them. Bryn meanwhile, demonstrated how trials could be criticised if they did not provide the evidence that he

required to support his case:

'We should feed rats with the vegetable that contains the gene to see if it has any effect. They say there is a problem with that, because the gene is expressing an enzyme or a protein in such small quantities that you have to feed a rat tonnes of potatoes a day for it to get enough of the protein to actually get a noticeable effect. The other way is to take a protein out of the potato, produce it synthetically, and then feed that to the rat to see if that has an effect. But then you then run into the problem that it's not in the food itself, and are you getting a true result, just by taking it out. By synthesising it artificially you might have subtly changed some characteristic you don't know about. So there are problems with it.' [Bryn]

The fact that Gail was calling for a five-year moratorium also appeared to be a poor reflection of her true position, since she told me that she would never be satisfied until GM crops were banned. Indeed, when asked which tests had not been undertaken and which she would require during a moratorium, she was unable to specify:

'Well at the end of the day. I mean, I think that... I'm a lay person, I'm not a scientist. Okay, I'm fairly well read and things. But why is it my responsibility to actually tell them what to do? [...] Who knows what the scientists will come up with. It's for them to go and do their experiments, they're the experts, they know what kind of different things... lines they can go down [...]. I'm just saying it has to go back. I can't really dictate to them what... or come up with ideas about what they might do. But I'm sure that there is stuff that they can do.' [Gail]

That Gail worked as a GM campaigner for one of the leading organisations, suggested that the scientific rhetoric of at least some members of her organisation was 'stolen' in order to gain credibility. Of course, this does not mean that all scientific arguments used by egalitarians were spurious, but rather that they seem to have been conceived, or at least adopted, because they supported the belief that GM crops were dangerous. As Kate stated, science is useful because people listen to it, and because, if it is done properly, it shows that environmentalists are right on every issue:

'And [science] is really effective. People listen to it, they respect science. I respect science. And when the science is done, my god, it shows that we're right! You know, us activists. It shows that we're right. As long as the science is done right.' [Kate]

Kate's comment suggests that her primary motivation is to prove that environmentalists are right, rather than to gain a scientific understanding of risks and benefits. Nonetheless, later in her interview, she again asserted that she is only motivated by science:

'We're coming in for some incredible stick from the pro-GM scientists, who think that we're totally ill informed and emotional. But from what I can see, the opposite is the case. I have looked and looked and looked for science to support GM food safety, because I would like nothing better than to have a quiet life, forget about GM, know that it's safe, and get on with life.' [Kate]

This quote, and the fact that a few opponents were highly qualified scientists, suggests that some were perhaps more hierarchical in their approach to risk assessment than egalitarian. However, many more egalitarians were adamant that emotions and feelings should be used during the assessment of a new technology. For example, James stated that intuition was a valid tool for evaluation, and suggested that if people had listened to their instincts, BSE would not have occurred. Similarly, Joshua stated that people should be emotional:

'People are told they are emotional. Bloody right, people are emotional! Absolutely! They should be! And that's not something to be ashamed of.' [Joshua]

Nevertheless, some of these interviewees stated that it was important to appear 'rational' (scientific) in public, even if the technology had been rejected for 'irrational' reasons; which could explain why Kate was so quick to defend her 'scientific approach'. For example, Emily's group agreed that their position was intuitively formed, but that leading opponent Mae Wan Ho should avoid public speaking because she was 'too on the emotional side'. Similarly, Alice stated that she felt 'emotional and hysterical' 'most of the time', but preferred opponents to present their information 'unemotionally' at public meetings. Joshua meanwhile, seemed to have become uncomfortable about having disclosed his more intuitive feelings, since, as Natalie agreed, this could be used to undermine his credibility:

'Perhaps the mind isn't necessarily able to articulate in words quite what you're feeling. But the fact is it's a feeling shared by quite a lot of people, whatever that feeling is. Maybe it's a different feeling for different people. I'm sure that it is. But I think there's just a... [pause]. I mean someone listening to what I'm saying now would find it a great reason to ridicule arguments against genetic engineering, as if it was just some vague sensation that people have that things aren't quite okay. But, I think... [pause] sometimes, you know, feelings can be wise.' [Joshua]

'It's very, very difficult in our society to articulate and for your articulations to be given legitimacy. Things go round: unnaturalness, moral, ethical concerns. They're just not given any weight. You're just seen as dippy dippy or something.' [Natalie]

Whether their rationale was scientific, intuitive, or a combination of both, egalitarians seemed certain that GM crops could never be understood. As Clive said, 'they could test for a hundred, a thousand years, and never find a way of predicting'. These interviewees therefore believed that testing was senseless and expensive:

'It's quite possible that we're living in a sort of 'multiverse', where we can't predict anything. [...] When you reach a certain number of interacting phenomena, they start to oscillate in such a pattern, in such a periodicity, which really would make it unpredictable. Even when you run the equations through time and time again they give completely different outcomes each time. Basically we are dealing with chaotic systems.' [Rupert]

'No amount of testing can reassure us [...]. It's a very futile exercise really, to try and tinker with the tests. It's not going to prove anything.' [Nick]

Even contained experiments were deemed unnecessary by egalitarians therefore, and potentially dangerous:

'I suppose [a biosphere's] a possibility, so long as we don't let any of the soil out. But how do you drain a biosphere?! And what happens afterwards?' [Cathy]

'[...] scientists working in these laboratories don't contain, they just flush everything down the sink at the end of the day! It goes into the sewage works. They have to find a way of doing these safely, so that they are contained.' [Kate]

Despite believing that GMHT crops were intrinsically risky, and that there should not be field trials, egalitarians had still constructed detailed critiques of the FSE methodology. For example, many stated that the range of organisms being monitored was limited, because earthworms and soil microorganisms had not been included, and that the methodology was inadequate for those organisms that were being assessed. Others meanwhile, stated that extreme weather conditions, geographical factors and baseline data should have been taken into account, and that the split field approach was inappropriate because no two sides of a field were similar enough to be compared.

When making these criticisms, many interviewees made inaccurate statements, suggesting that they were either unfamiliar with the details of the FSEs, or did not understand the nature of scientific monitoring. For example, Cathy stated that only ‘some kind of beetle’ was being observed, while Emily’s group believed that they were monitoring an ‘aphid-like creature’ and a ‘shield beetle’. An opinion leader meanwhile, stated that if the trials were to have any credibility, the hypothesis and parameters under observation should be published (which they were), and that ‘English Nature fear these trials because they’re almost designed not to find anything’ (despite the fact that English Nature were involved in their design).⁸

Whether or not egalitarians had a full grasp of the methodology, it seems strange that they had constructed a detailed critique of trials that they essentially disagreed with. For some however, this appeared to be a tactic with which to undermine the feasibility of the trials, and so to remove GM contamination from the environment, while for others it acted as an illustration of how scientifically incompetent proponents were perceived to be. Thus, those leading the campaign against GM crops could use these arguments to support their case, while those new to the campaign could believe that the ‘scientific flaws in the trials’ were representative of the hierarchists’ general approach to risk assessment.

Nevertheless, other interviewees could not be bothered to discuss the details of the FSEs. For them, the trials were irrelevant because GM crops were inherently risky and the ecological world was far too complex for any sensible impact assessment to be negotiated. These interviewees, it seemed, were more stereotypically, and perhaps more honest, egalitarians.

Catastrophic Consequences

Since GMHT crops were perceived to have unknown, and perhaps unknowable qualities, egalitarians were often unable to state what the consequences of growing and eating these crops would be. For example, James declared that they were ‘beyond our imagination’, while Louise described how she no longer knew what was growing on her doorstep. By being ‘unknown’ however, these interviewees were extremely nervous about the introduction of this technology, since they believed that it could ultimately lead to catastrophic consequences:

‘Who knows what’s going to happen. A virus inside something, another thing, more and more hosts... It can produce all sorts of things. It is terrifying.’ [Alice]

⁸ An English Nature employee confirmed that they were satisfied with the method during an interview.

'In about fifty years time you might suddenly find that the environment is suddenly collapsing about your ears and sort of, "Ooh! What's going wrong?" Too late, you see.' [Bryn]

To illustrate just how frightening the implications of GMHT crops could be, Alice described how she felt more terrified now than she had as a child caught-up in the Battle of Dunkirk, while others stated that it was like being in a science-fiction novel:

'[...] what's creeping in, you know, creeping, mutating and viral and bacterial up-take is a worry too. Everyone thinks that sounds a bit sci-fi but...' [Louise]

'It's unbelievable really. It's almost like we're in some sort of science-fiction novel, and you can't believe that a sane society has allowed this to happen.' [Clive]

What made these consequences most worrying, was the perception that they would be far-reaching and irreversible. As outlined above, egalitarians believed that transgenes would be able to travel over great distances, transfer between species, live in the stomachs of animals and dwell within the soil. Indeed, since the same transgenes were being used right across the globe, the spread of catastrophic consequences was perceived to be particularly fast:

'I realised that nobody could be immune from changes on that scale, it would just take over the world.' [James]

'What's happened is that we've now got the tools to have a global effect on what we do, and this is true of this industry like nothing ever before. What they do is done on a world-wide basis. If there is a disaster, it would be a world-wide disaster. I don't have too much hope actually.' [Nigel]

The devastating consequences of GMHT crops were thus expected to affect most people throughout the world, including those in the distant future. As James stated, 'it's not even like nuclear power, it's forever'. However, when these consequences were likely to begin was more difficult to say. For example, some egalitarians submitted that they might have occurred already, although they had not yet been detected:

'The protagonists of the technology say there hasn't been a catastrophe. [...] That's quite true. It's quite interesting that there's been this degree of rejection of the technology without the equivalent of a Chernobyl or a Three Mile Island. In the

early nineties we really thought that we couldn't win the campaign until there would be... There WOULD be a disaster, we were sure about that, in a way, and when there was, then we'd win the campaign. Rather like the anti-nuclear power campaign [...]. There's a good chance of winning this campaign, before there's a disaster. Assuming a disaster hasn't happened, we just don't know about it yet.' [Anthony]

Others meanwhile, believed that benefits would probably be experienced for the first few years, but after that problems would occur. For example, Sandra believed that transgenes could be safe in the first plant, but could cause problems in the offspring of those that it cross-pollinated with. Similarly, Nigel described how a temporary benefit might be experienced for a while, but that there would eventually be a downside. Whether or not the consequences would be felt now or in the distant future however, egalitarians felt certain that problems would be experienced at some point. As Clive stated, 'I find it difficult to imagine you could do something which is so fundamentally unnatural as this, and have no adverse side-effects'.

Although egalitarians felt that the consequences of GMHT crops were generally unknowable, many suggested ways in which they might manifest themselves. Often it was asserted that new allergens, toxins and diseases could occur, either because scientists did not know the full effects of the transgenes, or because dormant genes could be switched on. For example, a number of interviewees stated that the vitamin A content of rice could be increased, but at the expense of introducing new and deadly toxins. Others meanwhile, described how cancer could become more prevalent, although it was not possible to say when:

'These are very complex, very complex things. We've no idea... If it gives people cancer in thirty years time, it won't be detectable for thirty years. And even then, against the background of increasing incidence of cancer, would it be detectable? Very difficult to know, isn't it.' [Anthony]

Nevertheless, some egalitarians were not concerned about the implications for human health, as Cathy and Isobel stated:

'I'm not really bothered about eating the food myself really. It might have effects; of course it might [...]. But I wouldn't look at a genetically modified tomato and think "yuck!" But I would look at it and start thinking of the whole politics and the philosophy around it, and then I would soon start going yuck. I'd probably eat it all the same, rather than waste it! Unless I was spreading the seeds around'. [Cathy]

'I mean I don't buy anything that maybe has GMO crops in it, for example soya. For me it's not so much that I'm worried about my health, but I do not want to support it. It's like, for me, on a personal level, my protest.' [Isobel]

Thus, rather than being motivated by health concerns, these interviewees appeared to be motivated by political considerations (which are discussed in the next section), or by the possibility of catastrophic environmental consequences, as Nick and Clive described:

'It would weaken the natural world, it would cause instabilities and the plants or the animals that were getting the foreign genes are likely to be compromised, and it's likely to be a threat to their ability to survive [...]. The natural world is unstable enough and facing enough dangers without adding to that.' [Nick]

'If you do do this, then there's this potential for destabilising every plant in the world.' [Clive]

Indeed, some egalitarians stated that intrinsic problems with the technology had already been detected. For example, Kate described how 'horrific' side effects had occurred in laboratories, and how viruses such as AIDS and Ebola had perhaps emerged as a result of genetic engineering:

'In the development of GM animals and plants there are so many horrific things that happen that the public never gets to see. Like with the GM salmon. They had a whole race of them turn green, and they were born with lumps all over their heads.' [Kate]

'Since genetic engineering was first pursued in the 1970s, and since it was done relatively in the open, as opposed to just in the laboratory, there have been numerous cases of viruses and bacteria crossing species barriers that they didn't before. Now in history this has happened on occasion [...] but it's happening more and more and more. [... There's] quite a lot of evidence suggesting that both AIDS and Ebola were created by genetic engineering in the laboratory, either deliberately or by accident, and released into populations.' [Kate]

Similarly, Emily's group were able to list many examples of unexpected effects. For instance, they described how a gene had been inserted into a petunia to make its flowers red, but in the process the plant had grown taller and had developed more leaves. They also believed that the

stems of a GMHT maize crop in Africa had split unexpectedly, while the bolls of a cotton crop in North America had dropped off when the weather became hot. Furthermore, they believed that the effects of GM crops had been felt in the UK, because they had heard that the incidence of allergic reactions to soya had risen by 30-40% over 3-4 years. Nick meanwhile, considered that he had already witnessed how GMHT crops fail in the UK:

'GM crops do fail. The winter crop up the road failed, they don't know why [...]. Around the edge of the field it's grown reasonably, but the whole of the central area of the field has only got to about an inch or two high and then it sort of died [...]. What happens if half the planet is depending on this wonderful new crop [...] and then one year it doesn't come up?' [Nick]

To risk such problems seemed incredible to egalitarians, and especially when the technology was perceived to offer very few benefits. For example, egalitarians asserted that it was almost certain that GMHT crops would not encourage fewer or later applications of herbicides. In fact, they believed that more herbicides would be used, because farmers would think that the chemicals were safer and cheaper to use. Individualists were thus seen to be encouraging the widespread use of just two herbicides that had never been used on food crops before, and which would almost certainly affect worms and soil microorganisms, and possibly other creatures too:

'Glufosinate [...] has both oral and dermal toxicity, with dogs particularly sensitive to the former. Otters, which have been brought back from the verge of extinction, due to current farming methods, will be wiped out.' [Alice]

By encouraging the widespread use of unknown chemicals, egalitarians could not see how GM crop technology could possibly help create a chemical-free future. And even if GMHT crops did encourage the use of less toxic herbicides, it was clear that farmers would still continue to use fungicides, insecticides and molluscicides. Furthermore, egalitarians believed that weeds would soon develop resistance to glyphosate and glufosinate ammonium, which would then force farmers to use more potent chemicals, as had happened in America:

'In America they've now got triple-decker, I mean they really have got Frankenstein... The farmer said to Monsanto, "What am I going to do?" and they said "Well, you'll just have to use, I think it's 2-4D". He doesn't want to use that, it's really nasty [...]. It's one of the constituents of Agent Orange [...] I think they're absolutely... It's just a time bomb.' [Alice]

Rather than describing the technology as innovative therefore, egalitarians considered that it was just one more step towards a more industrialised form of agriculture. As Cathy described, crop biotechnology was ‘a bigger and worse form of agriculture’, which Gail asserted was just a ‘quick-fix’. Others described how it was part of the ‘old mind-set’, or as James described, ‘part of the old suppression idea’. Indeed, according to Anthony, organic farming was synonymous with computer technology, while GM crops were more like the pieces of an old-fashioned board game:

‘Say kids stopped wanting to play Monopoly, and wanted to play computer games instead, and you were the maker of Monopoly. There are two things you can do. You can just go out of business and say, “Right, my Monopoly days are up”, or you could go into computer games, which kids want to play. The one thing you wouldn’t do, is say, “Look I’ve got all these little plastic green and red houses from Monopoly sets, how can we use them in computer games?”’ [Anthony]

The individualists’ vision of the future was thus perceived to be part of a highly outdated and defective mind-set, and especially with regard to the management of nature. For example, Cathy stated that it is not necessary to kill every weed within a field, while Rupert described how confining nature to reserves is like the ‘ghettoisation of nature’. Furthermore, these interviewees asserted that GMHT crops would not even reduce starvation. As Daniel stated, if biotechnologists really wanted to feed the world, they would not develop GMHT forage maize, which is used to produce unnecessary meat products for people who are already well-fed. Indeed, even future GM crops were not thought to offer anything more than existing varieties, and certainly not without producing more risks. With regard to vitamin A rice, egalitarians stated that people deficient in this vitamin could be helped far more safely by redistributing land and food, introducing varieties of rice that are ‘naturally’ high in vitamin A, and by encouraging them to eat green leafy vegetables. And as for the crops that were being promised for the developed world, these were considered particularly unnecessary:

‘There’s been all these reports in the paper recently about producing GM foods that have got much reduced carcinogen content in them, and that this is going to be great. So wiping out cancer or whatever. Now, on the surface I think most people think “Wow, that’s a really good idea. Brilliant!” But [...] they’re only looking at one thing. They’re looking at the carcinogen content of one food, or three foods. They’re not looking at a person’s lifestyle, whether they’ve got a nuclear reactor down the road from them, what their other dietary inputs are, how much exercise they take, how much stress they’re under because they live in a really like fast-paced

world. [...] There have got to be better ways. What about sorting out the lining in tin cans that is carcinogenic? That person is probably eating that at the same time as eating an anti-carcinogenic food! [...] It's just ridiculous to me, it really is.' [Gail]

Egalitarians thus struggled to see why it was worth risking the safety of human health and the environment for any GM crop. Throughout their interviews most returned to the same point, 'Why do we need these?' Nonetheless, they saw the need for GM medicines and believed that these should be endorsed, especially since they were contained and could be taken at the individual's own volition. Furthermore, Julia and Megan condoned the use of GM vegetarian rennet, because again this was contained, and reduced suffering. Rupert meanwhile, thought that GM technology might finally demonstrate to humans that the world was not predictable and controllable, and so might change their behaviour. But for most egalitarians, the benefits of GM crops could not outweigh their potentially devastating consequences, and as a result they wanted them banned, and usually forever.

Money is their Only Motivation

Egalitarians could see one only 'benefit' arising from the introduction of GMHT crops, and that was the financial benefit that biotechnology companies were expected to gain. According to these interviewees, large multinational companies had lobbied for the introduction of patents that would make biotechnology profitable, and had subsequently rushed through the development of GMHT crops in order to make a quick return. They were thus perceived to be motivated only by money, which made them impossible to trust. This was especially the case when they appeared to be 'loveable', 'compelling' and 'persuasive', or painted 'nice rosy pictures' of GMHT crops saving the world:

'When any multinational company claims this will improve the environment, this will feed the Third World, it won't. You couldn't expect, in this day and age, for people to swallow that lie and that spin, wholesale. I'm not convinced by it to be honest. Let's face it, there's money to be made by these companies.' [Daniel]

If individualists had wanted to feed the world and save the environment, egalitarians claimed that they would have developed crops other than those resistant to herbicides. For these interviewees, GMHT crops had no other purpose than to make crop production easier and cheaper in countries that already had too much food. Furthermore, they believed that it was

no coincidence that glyphosate-tolerant crops were introduced just a few years before the patent on glyphosate expired, as Matt explained:

'Glyphosate's a very interesting story though. The reason it's been pushed so hard, as a herbicide-resistant crop, is that the company's patent on it runs out in two years time, or may have even run out, and so they were desperate to get some money back on what they could.' [Matt]

Indeed, some egalitarians stated that individualists were so obsessed with money that they were keen to introduce GMHT crops when they knew that they were dangerous. For example, Megan believed that biotechnology companies prevented farmers from saving seeds, not only to protect their investment, but also to prevent anyone from finding out how dangerous these crops became after one generation:

'That's why Monsanto always keeps custody of its seed. It won't let anybody breed a second generation from its plants, because it knows that – it's just common sense, really – it's going to break into something nasty.' [Megan]

That the companies involved were the same ones that had introduced other perceived hazards, also made egalitarians sceptical. Many of these interviewees mentioned an issue of the Ecologist, published in September 1998, which detailed how Monsanto had threatened the survival of sea mammals with PCBs, poisoned Vietnam with Agent Orange and had hidden damaging information from the public. Just as they were thought to have done in the past therefore, these companies were seen to be fulfilling regulatory obligations as cheaply as possible, and hiding any documentation that could hinder this. Indeed, egalitarians declared that they already had evidence of this. For example, they believed that antibiotic-resistance genes would never have been used if safety was a prime concern, and more research would have been peer-reviewed and published if it had been conducted properly. As Kate stated, only one substandard piece of research had been published on food safety:

'And poor old Professor Pusztai [...]. His was the first, except one, scientific study to measure food safety of GM. Before that study there was only one that Pusztai knew of, that had been peer-reviewed and published, and that study was done by a Monsanto scientist. Pusztai said, "If this person who had written this study was a PhD student and I was supervising them, I would just laugh them out of the room, because this study is not real science!"' [Kate]

Since industry representatives were considered to be notorious for their obsession with money, egalitarians expected little more from them than incompetence and corruption. However, when the government was also seen to be solely motivated by money, these interviewees appeared to be far more outraged. According to egalitarians, the government's desire to run a rich country had encouraged it to abandon less lucrative, but safer forms of agriculture, in order to support biotechnology. As a result, the government was perceived to be dwelling within 'the pockets of the biotechnology industry', which made it impossible to introduce sufficiently rigorous regulatory hurdles. Industry representatives, regulators and government scientists were thus perceived to share the same outlook, so ensuring that there could be no such thing as independent scientific assessment:

'One of the things that is most astounding about the whole thing, is that virtually everyone working in the field is tied in with industry. There are very few free spirits, and when they are there's this sort of vilification. They won't accept anybody who steps outside this dogma.' [Nigel]

When scientists such as Arpad Pusztai and Dr. Mae Wan Ho questioned the perceptions and conclusions of established science therefore, egalitarians believed that their ideas were dismissed on political grounds, rather than scientific. Indeed, Rupert stated that as a biology undergraduate, visiting lecturers often talked more about the financial rewards of biotechnology than scientific issues, which made him suspect that scientists were no longer motivated by a desire to develop a better understanding of the world.

Within this context, the FSEs were perceived to be a 'veil of scientific respectability' for the biotechnology industry. By giving the appearance of answering key scientific questions, egalitarians believed that the trials were 'tricking' the public into thinking that the government was finally taking people's concerns seriously. However, according to these interviewees, the government's real intention was to 'let GMHT crops through the back door', since, after four years, GM pollen would become a permanent feature of the countryside. The trials were thus described as a 'fraud', a 'conjuring trick', a 'con' and a 'Trojan horse':

'Businesses like Aventis and Monsanto will be able to pull on a veil of scientific respectability, and that will open the floodgates to a new form of agriculture [...]. It's like a Trojan horse, which is going to lead to this sort of expansion in genetic modification.' [Daniel]

According to egalitarians, the FSEs were not only asking an irrelevant question, they were also answering it in a way that would bias the results. As outlined above, earthworms and soil microorganisms were not being monitored, despite the fact that egalitarians believed these would be most sensitive to glyphosate and glufosinate ammonium. Furthermore, some interviewees submitted that non-GM crops were being intentionally sprayed more than the GM crops, and that the trials were being visited when the GM crop was at its best, and the conventional crop at its worst. The government and industry were thus perceived to be paying for results that were subjective, and that could only be published in journals if the referees were biased also:

'I've been told by several scientists that the design of the trials isn't scientific enough to pass peer review, they say it's not strict enough. I suppose as long as they send it to the Royal Society they'll be fine. Or the John Innes Centre. Both are so pro-biotech that they'd just rubber-stamp it.' [Kate]

Egalitarians also thought that the government had protected the biotechnology industry when contaminated oilseed rape was introduced to the UK in May 2000. Rather than releasing the information to the public immediately, interviewees claimed that the government had deliberately delayed making an announcement until after the seed had been sown. As a result, one trial consisted of GMHT oilseed rape on one side, and conventional oilseed rape contaminated with GM seed on the other, which seemed ridiculous to many egalitarians. Furthermore, the government was thought to have ignored its own regulations governing the control of rhizomania, so that trials could be undertaken on farms contaminated with this disease. Indeed, the government was perceived to be so protective of the biotechnology industry, that when trial conditions were breached, little action was taken, and further investigations were not carried out.

In the unlikely event that the FSEs did show that GMHT crops were more detrimental for biodiversity, egalitarians believed that the government's alliance with the biotechnology industry would still lead to the crops' commercialisation. As supporting evidence, a number of interviewees pointed out that GMHT maize had already been considered for the national seed list years before the FSEs were due for completion, which indicated that the government was not taking the trials seriously. Moreover, it was asserted that if SCIMAC could not find enough farmers willing to participate in the trials, commercialisation would probably commence anyway.

Possibly of greater concern however, was the fact that the government had not consulted its constituents prior to introducing GM crop technology to the UK. For example, when GM foods were first imported, Rupert and Cathy described how they were horrified to find that the public was totally unaware of this. Rachel meanwhile, described how she could hardly believe that a trial was happening so close to her home without any notification, which Tim described as ‘an absolute imposition’. Worse than not being consulted therefore, egalitarians felt that they had not even been told about this technology. As James described, it seemed that just because they had invented something, they thought that they could take over the whole world’s food supply:

‘What really turned me, was when I heard a woman from Monsanto speaking at a conference [...]. She got up on a public platform and said, “There are about five or six biotech companies, and within five years we believe that 90% of all the world’s staple food crops could be genetically engineered, if we get our way”. She said, “That’s our programme. That’s our agenda”. And I was sitting at the back of this hall and I thought, Christ! This is unbelievable! This woman is standing up in front of this audience and she’s saying, “we’re going to convert the entire world’s staple food crops to genetic engineering.” [...] It just shocked me profoundly.’ [James]

Similarly, other interviewees described how ‘unelected committees’ had force-fed people with GM food, and had allowed other plants to be contaminated by transgenes:

‘The thing that I object to there is the way it’s being ram-roded into the UK over everything else. Choice doesn’t come into it, and respect, and other farming systems. It’s like, “we’re going to put this in the countryside, you’re going to accept it, you’re not going to be able to maintain your organic status, or your non-GM status, and further down the line you’re going to have to have to eat it. Stuff your rights!” There’s a violation of rights going on around choice.’ [Gail]

Rather than perceiving the FSEs as a breathing space within which people’s concerns could be seriously considered, egalitarians believed that the trials represented just how little the government is willing to listen. Many described how their meetings had filled local halls and how neighbours had supported their campaign and signed petitions, but nevertheless, the government had spent public money on experiments that had little to do with their concerns. They subsequently felt that they had little control over the spread of ‘genetic pollution’, or over the way in which the government spent their money. Indeed, many believed that people

were no longer in control of their lives:

'It's unsettled people, because we're losing control of our lives. Food is a very important part of our life, so we would like to feel that we have control of it. Through GM technology we're handing over control to some man in a white coat. Is that really what we want to do? [...] We don't know whether these people are good at what they're doing. We're asking the questions, and, really, they're not giving us the answers yet. They just keep on saying, "Oh, everything's alright." Well, if I went to a doctor and he said that, I'd say, "That's not right, I'm going somewhere else, thanks very much! I'll get a second opinion." But we don't have anywhere to go for this at the moment.' [Bryn]

As this quote demonstrates, egalitarians felt that they had no one to ask for advice, and when they did ask for information, they believed that it was often inaccurate. Many interviewees believed that this was because the government and biotechnology industry were highly secretive. For instance, Alice described how an employee of Aventis was 'the most secretive person in the world', because he would not tell her which field GMHT maize stalks had been ploughed into, which made her think that they had been fed to the farmer's cattle. Similarly, Kate believed that even though the farming industry said that glyphosate was safe, they really knew that it was dangerous, but could not afford to tell people. And Cathy explained that people had to be really determined to ascertain which tests had been carried out, and even then it was not possible to discover what the results had been, as Emily's group also found:

'I actually wrote to Aventis [...]. I said, "Please give me results of any of these tests", and I just didn't get a reply to the letter at all. I'd phoned them and they said the person to write to. So it makes you just not trust them at all [...]. You think if they'd done some proper feeding tests they would be only too happy to tell people about them, if the results were positive, showing that there was no harm.' [Emily]

Others however, suggested that members of the government were secretive because they actually had a poor grasp of the facts, as Joshua described:

'You only have to look at the past three years to see how many things the government has said wouldn't happen or were totally secure or absolutely fine, and then just two years later saying, "Well... Oh, well, yes of course! Of course pollen travels over much larger distances than the separation distances! Of course it does!" Two years ago they weren't saying that.' [Joshua]

Whether it was due to incompetence or secrecy however, egalitarians felt that their concerns were being dismissed. As Joshua stated, ‘they’re not really interested in these annoying little flies that they’d much rather swot out of the way’. Indeed, they often felt that they were being intentionally lied to, which certainly proved to be the case for one interviewee:

[The farmer said] on BBC Look East, that he wasn’t going to run a trial this year. I got a message on my answer phone for him from the biotech people [...], “Hello, it’s [...] from Aventis, I’m bringing over the draft contract!” [...] I contacted the BBC and said, “You said he said he wasn’t... Can you check your tapes to see?” They checked it and said, “No he definitely said that”. But I couldn’t get any journalists to touch it. The fact that he had lied, I thought, was a big deal.’ [Name withheld]

Because of this mistrust, egalitarians spent vast amounts of time telephoning and writing to people who might be able to help them understand issues further. For example, Alice stated that she spent most of her time writing letters, while Emily’s group listed numerous organisations and individuals with whom they had contact. Tim also spent a lot of time contacting people, and occasionally e-mailed me to see whether I could discover how a certain organisation was involved in the trials, or whether I knew of the ‘Farm Research Unit’. With regard to this latter case, Tim discovered that the ‘Farm Research Unit’ was actually part of a company employed by Monsanto, which diminished his trust even further, since he had been lead to believe that the company had conducted independent research.

Egalitarians thus called for far more openness, and requested new mechanisms that could enable a greater degree of public participation. To participate, these interviewees did not believe that it was necessary to have a great understanding of science. Indeed, it was often claimed that the scientific mind was the wrong mind with which to judge biotechnology, since scientists usually ‘get carried away with their inventions’, and are ‘unable to see the bigger picture’. Indeed, for many, the debate was not even about genetic engineering, as Joshua explained:

‘Genetic engineering is derailing the debate from the real questions that need to be asked, which is how to provide real food security. And those are political questions that need to be answered. The suggestion by governments and industry that some kind of biotechnological panacea is going to provide all the answers, just allows them to distance themselves from their constituency and social and political inequalities that do derive from hunger.’ [Joshua]

It was therefore declared that a public debate was required, within which people would consider how they would like agriculture to develop. Furthermore, it was stated that politicians needed to start looking beyond the next election, and that the public should elect, as Nigel described, 'knowledgeable pessimists' rather than 'ignorant optimists'. As for the future of the biotechnology industry, many egalitarians stated that they would be quite happy if such companies folded. Just as cultural theory predicts therefore, egalitarians wished to diminish the power of both the individualists and hierarchists.

Summary

Egalitarians believed that humans had created catastrophic impacts for both human health and the environment. They explained that this was because humans had tried to control and manipulate nature for material gain. In order to prevent such impacts in the future, egalitarians thought that it was essential to work with nature, and to prove that an intervention was absolutely essential prior to its introduction. Since egalitarians believed that GMHT crops were a further attempt to control and manipulate nature, they thought that these crops would also result in catastrophic consequences, which would almost certainly be irreversible. With regard to the testing procedures required, opinion seemed to be divided. Some seemed to think that it would never be possible for science to determine the impacts of GMHT crops, and that it would be far better to listen to people's intuition; others stated that it could be possible to determine the impacts, but then made impossible demands of science; while yet others requested what appeared to be more realistic testing procedures. Egalitarians did not trust the other groups engaged in the GM crop debate because they were perceived to be primarily motivated by money. This encouraged egalitarians to call for more transparency and for a greater level of public participation.

The hierarchists' framing of the GMHT crop debate is presented in the following chapter.

The Hierarchist's Framing of the GM Crop Debate

Introduction

This chapter presents discourse that most closely resembles cultural theory's hierarchists.⁸ This was extracted from interviews conducted with individuals engaged in the GM crop debate, as described in chapter 4. How hierarchists perceived the human relationship with the environment, and the approach that they recommended for the future is described. This is followed by a description of the similarities that GMHT crops were perceived to share with nature, conventional plant breeding and other human interventions. The experimental procedures that hierarchists deemed necessary prior to the release of GMHT crops, and the risks and benefits that these crops were said to present are then outlined. The chapter finishes with a description of the ways in which other groups within the debate were perceived.

Stewarding the Earth

Hierarchists generally had a strong interest in the natural environment, which often stemmed from their childhood, as Terry described:

'I've always been extremely interested in evolution. Probably the defining moment was when I was eight or nine or something, I'm not sure. I remember being shown a Venus flytrap plant by an uncle, who showed me its pollination methods and how they trap the little flies and pollinate. I was thinking, "My goodness, that's amazing! I really must understand how that evolved, how it works".' [Terry]

This interest lead such interviewees to pursue careers in science, where they felt able to develop their understanding of the environment further. It also encouraged them to join

⁹ When this chapter refers to *hierarchists*, it is to one of cultural theory's ideal types, and not to any particular interviewees. When named individuals are mentioned, it is because they used discourse illustrative of this ideal type. It should not be assumed that these individuals were stereotypical hierarchists. How individuals used the discourse of each type is presented in Chapter 8.

societies within their chosen field. For example, Terry was a member of the Botanical Society of the British Isles and the British Ecological Society, while others belonged to societies that specialised in plant breeding or microbiology. Some also belonged to organisations that were directly involved in conservation work, such as the British Trust for Ornithology and the Scottish Wildlife Trust. However, none were members of environmental lobby groups such as Friends of the Earth or Greenpeace, since these organisations were perceived to be too extreme, as Ben described:

'I've never been a member of Greenpeace or Friends of the Earth, they've always struck me as being too radical. I didn't like their methods ever since they bombed the French ship in New Zealand. I thought that was just not on.' [Ben]

Despite disagreeing with the egalitarian approach however, these interviewees did believe that humans had impacted upon the environment. Indeed, most described how the environment was an artificial creation, and how early settlers had cleared the 'wildwood', as the following quotes demonstrate:

'The whole of nature is completely constructed, there isn't any natural nature in Britain, it's all made up.' [Jake]

'There's only one natural woodland that I know in the whole of the U.K. [...]. We're pretty sure that it's as natural as you can get. It hasn't been managed by people. Almost all woodlands are not natural at all. In fact, some of the species that were common in our natural oak woodlands have virtually VANISHED because they were rooted out and used by Neolithic people.' [Neil]

The environmental impact of agriculture was thus said to have commenced many thousands of years ago, after which time change had become a constant element of the British landscape. As examples, many interviewees described how alien crop species had been introduced, hedges had been planted and then removed, agrochemicals had been utilised and sowing regimes had shifted from the spring to autumn. In many instances these changes were deemed to have had a detrimental impact upon the environment. However, they were also considered to have been necessary, as Simon stated:

'We've already had a massive impact on our environment and we can't help that, it's necessary for our survival.' [Simon]

Without impacting upon the environment, hierarchists asserted that the human population would not be able to survive. As Neil described, a rainforest probably has the highest carrying capacity of all natural ecosystems, but even this could not feed today's population. Indeed, such impacts were not always considered to be bad for the environment either, since, although some species declined, others usually benefited, as John described of oilseed rape:

'Introducing oilseed rape into the countryside has undoubtedly had an effect on wildlife, some impacts may be positive, some are positive, some may be negative.'

[John]

It was thus difficult for hierarchists to say whether an impact was entirely detrimental or not, since they believed that change had shifted the agricultural landscape from one human creation to another. Consequently, when assessing impacts, they believed that human values played a substantial role, as Nathan described:

'There will always be some negative and there will always be some positive elements of agriculture's relationship with the environment. [...] It changes all the time, so people's sets of values change all the time. [...] We shouldn't be ploughing up pristine chalk grassland in order to plant linseed to get a subsidy because that goes against our set of values. But that chalk grassland may originally be created because we felled pristine primeval woodland a thousand years ago. But I don't think there are any absolutes, or there are very few absolutes. Soil erosion and chemical pollution perhaps are absolute, but in the overall management of the countryside there are few absolutes.' *[Nathan]*

However, as Nathan's quote also demonstrates, some impacts were considered to be environmentally significant, and thus in need of being prevented, or at least minimised. For example, a number of hierarchists expressed concern about global warming and deforestation, asserting that these problems needed to be tackled immediately. They thus seemed to categorise impacts into those that could affect the survival of humans, and those that could wait because they were either reversible or linked to human values. In so doing, hierarchists appeared to acknowledge the individualists' belief that the Earth should be adapted to enable humans to survive, while also agreeing with egalitarians that some adaptations could disrupt the ecological systems upon which humans depend. For these interviewees therefore, the key was to determine how the environment could be adapted for human survival, without

disrupting those systems that made it habitable in the first place, as Neil described:

'What we do, probably uniquely for a primate species, is modify our habitat for our own purposes. But in doing that, we've now, over the last twenty years, become increasingly aware that we do so at our peril, because the planet needs a robust ecological system in order to function as a fairly stable system. We know that now. [...] What has always fascinated me, is the huge dilemma that we have on this planet, that we need to modify our habitat, but we don't really know how to do so in what we call a sustainable way. So the search for sustainability is a search for survival.'
[Neil]

Essentially therefore, hierarchists sought to achieve a balance between the individualist and egalitarian approaches to land management and, like Neil, many believed that this had not yet been attained. For example, some stated that markets had been far too influential in the past, since few agricultural changes had been subjected to the rigours of thorough testing and cost-benefit-analysis, while others described how the government had condoned practices before the full facts were known, which in the case of BSE was seen to have undermined the credibility of scientists:

'I can use the BSE fiasco as an example of that, where politicians were desperate, DESPERATE to demonstrate to the public that there was not any harm. They simply disregarded what the scientists were saying. The scientists were saying, "Look, there's a real risk here. We don't have enough science to tell us how big that risk is, but there is a real risk that this can be transmitted to human beings [...]. We should be very very cautious, and maybe we should think about slaughtering the entire national herd, and certainly slaughtering whole herds". The politicians wouldn't have anything of it.' [Neil]

Like egalitarians therefore, many of these interviewees were unhappy with the power that individualists had had over the state of the environment. However, unlike egalitarians, they seemed certain that lessons had now been learned, and that a great deal of information had been acquired with which to make decisions in the future. Indeed, Neil asserted that this knowledge made it possible for humans to become their own prophets:

'We really do have a greater capacity for foresight now, because we have such a vast corpus of knowledge [...] I think we're gradually increasing our capacity of being our own prophets, and not necessary prophets of doom.' [Neil]

Hierarchists also believed that it was essential to use this knowledge in order to establish a balance between human and environmental needs. This, they asserted, required a great deal of management, since humans had disrupted the ‘natural balance’ long ago, as Ben described:

‘We are at the top of the pyramid, and we are in control, and therefore we are responsible for taking the place of animals that perform perhaps what we could morally consider rather unsavoury jobs, but we have to assume because we have got rid of those animals. [... There are] all sorts of areas where we’re ducking the issue by saying, “oh, let nature take its course, let the natural balance establish itself”. It doesn’t work because there is no natural balance anymore. We’ve got rid of that, we’ve destroyed it, so we have to wade in and do the necessary.’ [Ben]

Thus, although hierarchists seemed to agree with egalitarians, that individualists had created many of the ecological problems that now exist, they did not believe that nature would be better off without humans. Indeed, Ben went to great lengths to describe how elephants would die from starvation if ‘left to nature’, while others described how valued features of the British landscape would disappear without human intervention:

‘People probably have a very mistaken view of what [nature] would be like without humans [...]. There is a bust and boom cycle linked to elephant numbers. Elephants increase to the point that they completely destroy their habitat, completely change the ecosystem, and die, because there’s no food for them. Do people consider that a mass death of elephants through starvation is a good thing?’ [Ben]

‘All the skylarks and butterflies and pasture plants and flowers that we get would virtually disappear wouldn’t they? That’s what nature would do.’ [Gordon]

Consequently, hierarchists found ‘sentimentality about Mother Nature frustrating’, and distanced themselves from organisations that took anything other than a practical approach to land management, as Richard described:

‘I’ve been a member of the RSPB, I’ve been a member of the wildlife trusts, been a member of the National Trust. But I’m not a member of any of them now. I’ve resigned, because I find their bunny-hugging attitude annoying. I believe in managing the countryside and I believe in facing the truth, and I don’t think any of those organisations do that, they put on a front. If they don’t acknowledge and grasp the problems I don’t really want to support them.’ [Richard]

With regard to agriculture, hierarchists asserted that it was probably best to combine the idealisms of individualists and egalitarians. For example, many stated that organic agriculture had a lot to offer biodiversity, but that it could not feed the world's growing population. As a result, they suggested that organic practices could take place on perhaps 30% of the UK's arable land, while other areas could produce the 'vast swathes' of crops that were needed to feed the human population. For the conservation of valuable habitats and species meanwhile, hierarchists suggested that reserves linked with wildlife corridors could be introduced to intensive agricultural zones, while less intensive farming could be established in other areas. Furthermore, it was proposed that people could reduce their demands upon the environment by eating less meat, but that they should not be encouraged to become vegetarian, since many valued environments needed to be grazed by livestock. In essence therefore, hierarchists appeared to see the value of most of the approaches that individualists and egalitarians advocated, but submitted that perhaps the best approach would be to incorporate the wisdom of each, as Terry suggested:

“The farmer and the cow-girl should be friends” is a good motto, because life is about diversity and differences. I see a role for the industrial grain farmer of East Anglia, he feeds the world, he's the breadbasket, he produces cheap food. We've got full bellies and we can afford to go to a supermarket and pay more money for something labelled organic. [...] I think there's room for a good deal of tolerance of each other's viewpoints, and that will produce a diverse countryside I'm sure.'
[Terry]

Indeed, by scientifically assessing various forms of agriculture, hierarchists asserted that it was possible to derive benefits from almost any technology, and to legislate against those practices that did stand up to scrutiny. By taking this approach, hierarchists stated that they were neither restricting humankind's 'inherent curiosity' because of a perceived lack of need, nor endorsing the introduction of new technologies simply because they were marketable. Instead, they declared that they were supporting the 'establishment of facts', which would enable them to advise how both human and environmental needs could be met in the future. To encourage farmers to then adopt these practices, hierarchists suggested that the government introduce more agri-environment grants, or perhaps set 'wildlife targets', which farmers could then meet in a variety of ways.

Just Another Change

Since hierarchists believed that the British countryside was unnatural, they also believed that it did not matter whether GM crops were natural or not. Indeed, Neil asserted that it was dangerous to argue that any farming system was natural, as he explained:

'If you argue that [a farming system] is natural, philosophically you're moving away from the realisation that because it is dependent on what we do, we need to be stewards of it and custodians of it. We need to look after it and cherish it, and learn more about how we can maintain the natural world in our artificial world. That's why I think that argument's dangerous. I think it's very very dangerous, because we can't go back to the natural world.' [Neil]

Unlike individualists and egalitarians therefore, these interviewees did not try to support their argument by claiming the 'natural' moral high ground. As Terry stated, 'I don't subscribe to naturalness', while Simon declared that naturalness was not a sensible argument to make, and was certainly not a sensible basis from which to judge the future of a new technology. Indeed, many unnatural interventions were perceived to have made great contributions to the world, as Dean illustrated with his response to McKibben's quote:

'No I wouldn't buy into that. No. What if he saw a rabbit that had been operated on by a vet and had a metal plate added to its bones? That would still be humanly modified. [...] So what if he saw an animal that had come into contact with that aspect of human science? I'd still consider it to be a rabbit. [...] I don't believe that there really is a harsh line, and all of a sudden it's a product of industry and no longer a plant. They still behave like plants and they're still within the natural world.' [Dean]

Nevertheless, some hierarchists did attempt to compare the naturalness of GM crops with that of other interventions. For example, Pete suggested that crops treated with pesticides were unnatural, but were perhaps less unnatural than GM crops, while Neil suggested that GM crops were more natural than those grown with pesticides, but less natural than those grown organically. When making such comparisons however, these interviewees were not arguing that GM crops were essentially good or bad, and neither were they claiming that they were radically more natural or unnatural than anything else. Rather, they seemed to be reasserting that there are already many unnatural practices being undertaken in the agricultural landscape.

To reject GM crops upon the basis of ‘unnaturalness’ was considered to be an emotional response that was not based in reality. Indeed, upon hearing McKibben’s quote, many hierarchists pointed out that rabbits were not a natural component of the environment, while others stated that they understood how people sympathised with McKibben’s view, but nonetheless they felt unable to relate to it personally, as Gordon described:

‘The fact that the rabbits were brought in by the Romans was something wasn’t it! [Laughing] Sorry, I just find that sort of thing... I can understand how people can have that fear, but I can’t handle it! I couldn’t possibly make... give anybody any advice on how to cope with that.’ [Gordon]

Rather than worrying about whether a gene had come from another organism or not, these interviewees were more concerned about whether the ‘behaviour, biology and ecology of the rabbit’ had been affected. They therefore stated that they were unable to think in a way other than as a scientist, as Pete and Douglas described:

‘I can’t divorce me from my scientific self, I think, really, I’m afraid.’ [Pete]

‘I know that the question is based in some sort of cultural value about the sanctity of the genome and stuff like this. Well, if you’re essentially a molecular biologist and you’re a person who has a career reading DNA sequences and things like that, it doesn’t cut a lot of ice.’ [Douglas]

Furthermore, hierarchists declared that GM crops should not be compared with any other human intervention or natural phenomenon, since each had its own specific qualities that needed to be understood separately. Indeed, hierarchists even found it difficult comparing biotechnology with conventional plant breeding, as the following quotes demonstrate:

‘It’s not comparable. You can’t make a direct comparison because you’re doing two different things. I don’t think it’s really altogether that different from what’s been going on for last few hundred years. We’ve always been mucking about with different species and breeding characteristics for all sorts of different reasons and from all sorts of different sources. I mean it is obviously different, because the technology of actually getting what you want at the end of the day is different. But the principles are the same [...]. It’s just a different way of going about it really.’ [Ian]

'It's literally the same as what's happened in plant breeding in the past. But in some fundamental way it's different, because it enables the biotechnologists to put in genes from other parts of the plant and animal kingdom which would not normally be found in the plant they're engineered with. That's why we recognise that it should be regulated' [Terry]

By arguing that GM crops are 'the same, but different', hierarchists again seemed to be stating that there is a middle ground between the egalitarian and individualist viewpoints. Indeed, it was clear that Edward thought this, as the following quote demonstrates:

'It is a bigger jump than the geneticists would admit to, but not as great as many people who are against the technology would suggest.' [Edward]

Hierarchists thus seemed to believe that the technology was similar in its approach, but different in that it had access to a wider pool of genes. In fact, Neil believed that it was this difference that made the technology so exciting:

'Oh it is fundamentally different. People who argue that it's just no different than conventional breeding are talking absolute nonsense, because you're shifting genes from one species, or you can do that, from one species into another. Now those genes could not be made during conventional mutational events, they're genes that do not exist in any way shape or form within the gene pool of the recipient organism. So you cannot reach those ends using conventional breeding. It is quite different. That's what makes it exciting.' [Neil]

Unlike egalitarians therefore, these interviewees did not see the novel qualities of GM crops as a threat, but merely as a new parameter that needed to be scientifically assessed. Subsequently, they asserted that there was no reason to believe that the impacts of GM crops should be different to any other intervention, so long as the assessments were undertaken sensibly, as Terry expressed:

'Providing we work within our understanding, it's fundamentally no different.'
[Terry]

With regard to GMHT crops therefore, hierarchists asserted that all novel traits should be assessed, and this included the ecological effects of broad-spectrum herbicides, since these had not been used over crops before.

Rational Scientific Procedures

Hierarchists asserted that it was essential to scientifically assess the impacts of GMHT crops prior to deciding whether or not they should be commercially released. They therefore neither agreed with individualists that enough testing had been done, nor agreed with egalitarians that 'unknown consequences' should prevent the introduction of this technology. As Gordon stated, 'we cross the road by looking, we don't not cross the road'. Only by keeping an open mind, and considering scientific evidence, did these interviewees believe that one could make a sensible decision could be made, as Philip stated:

'It is absolutely critical that we have objective information because without that objective information there is no basis for rational discussion, or indeed any sort of rational decision by society at the end. I am very strongly committed to getting objective data.' [Philip]

Thus, neither anecdotal evidence nor emotion were considered appropriate decision-making tools, since wrong conclusions could easily be drawn, as Ben described with reference to the introduction of new oilseed rape varieties:

'When [new varieties of oilseed rape] were introduced, it coincided with reports of large numbers of brown hares dying in Europe, and in this country, and also of reports of roe deer being found dead. People thought that it was something terrible linked to the release of this new variety of oilseed rape, because the oilseed rape was found in their stomachs. Subsequently there were laboratory trials and field studies on the animals to see to what extent feeding on this new variety actually affected them. It didn't, and people to this day aren't sure why the roe deer were affected. But as far as the hares go, they reckon that the new crops coincided with an outbreak of brown hare syndrome disease.' [Ben]

To ensure that proper scientific evaluations were undertaken, hierarchists asserted that robust regulations were required that would penalise those who tried to disregard them. This was considered to be particularly important following Britain's experience with BSE, which was seen to have emphasised the need for proper risk assessment, and to have undermined the public's confidence in science. Those involved in the design of GM regulations stated that they had made the procedures extremely precautionous, and believed that individuals had 'followed them to the letter'. Indeed, scientists working with GM crops stated that they would not even contemplate breaching regulations. As Henry stated, 'obviously one must abide by

the legislation, otherwise you're breaking the law'. Consequently, Neil felt able to pronounce that the regulations surrounding GMHT crops were 'seriously robust':

'What's important in this is that the regulatory system is seriously robust. I mean it's populated by a lot of people, like myself, who are highly sceptical about what seed companies and biotechnology companies say, and we go through their applications with a fine toothed comb. Where either their data isn't good enough or we don't believe them, we send them back and say do it again. And where necessary we'll ask for an independent assessment. I think it's important that the regulatory system is kept that sharp.' [Neil]

One essential criterion for those working with GM crops, was that they were able to maintain their independence, and thus credibility. For example, Philip explained that his organisation had no commercial interest in GM crops, which enabled him to develop his own viewpoint. Indeed, Richard was particularly protective of his organisation's independence, as he described:

'I'd take anybody's money, just so long as the job's done, and I don't have my hands tied behind my back. What is fundamentally important in all this is that you realise that we are totally independent. So if we take money from Zeneca, Zeneca will have to know that if we find bad things about Zeneca's products, we'll say them [...]. We have a published or be damned philosophy here. Everything we do gets published. I guard our independence very jealously, because without that our credibility's gone' [Richard]

As Richard's quote indicates, these interviewees also felt that it was important to make their findings public, and to release any information that was used during decision-making. With regard to GM crops, they believed that this had been achieved. For example, some described how ACRE published minutes of their meetings on the internet, while others explained that there was a great deal of information available about the FSEs, which included details about the methodology and the precise grid references of the trials. Indeed, Philip believed that 95% of each dossier submitted to ACRE was available for public viewing:

'The UK is set out to be as open as possible [...]. Well over 95% of each dossier is there for people to look at. The only things that are actually in commercial confidence are not technical points, but are issues such as who the companies are

working with, which are commercially sensitive to them. None of the technical issues are actually excluded under confidentiality, and in fact ACRE would send them back and say why is this technical point commercially confident?' [Philip]

When assessing the risks of GM crops, hierarchists asserted that it was essential to consider each case separately. They therefore contended that it was nonsensical to state that GM crops were generally either good or bad, as Terry expressed.

'The whole GM debate has been devalued by being at that sort of generic level, by people asking is GM a good thing or a bad thing, will GM do this or do that? It's a debate that Plato would have recognised, this sort of generalisation of ideas, that really should be Aristotelian, it should be synthetic. Each crop with its construct carries a specific set of risks which can be assessed. Each example of genetic engineering should be assessed very much on a case by case basis.' [Terry]

Indeed, when Terry made this point for the second time, he thumped his fist hard on the table as he spoke each word:

'You. Cannot. Make. Generic. Risk. Assessments.' [Terry]

When assessing the risks of each application, hierarchists described how they looked for the occurrence of toxins and allergens using well-established procedures. To prove that these procedures worked, they often cited the case of a soya bean, which was found to be allergenic following the insertion of a gene from the brazil nut. Jim meanwhile, described how his institute had looked for indirect 'unknown' effects and had found none, as he described:

'We tried to see what indirect effects there might be from gene insertion. We looked at a whole range of genetically modified potatoes, modified all sorts of different genes, affected all sorts of different things. We then looked at the potatoes to see whether other things had changed. We looked at things like vitamin C level, we looked at glycoalkaloid levels, we looked at starch content and what have you. And true enough, we found differences between the GM variants and the non-GMs from which they came. But they didn't fall outside the range that we found between ordinary potatoes, which had been derived by conventional means.' [Jim]

These interviewees therefore felt confident that GM crops had been thoroughly tested and that there were no intrinsic problems with them. Much of this confidence stemmed from the fact that they believed that they had acquired a great deal of information about the biochemistry of plants. For example, with the fruition of genome sequencing projects, Neil described how scientists not only knew about how plants function, but also about which genes produce which enzymes to drive these functions. Furthermore, hierarchists explained how colleagues had spent years in laboratories looking for 'weirdo proteins', and how any plants with rogue proteins were ditched, even before it was known whether or not those proteins were dangerous.

Following these laboratory tests, hierarchists described how they assessed whether or not the new genes would affect a plant's 'fitness'. For example, would a crop become more invasive, and so take the place of other plants in that area? And could those genes then transfer to other plants, which could also become more invasive? Hierarchists also described how impacts upon wildlife were considered, and how no crop would be released if it was thought that it could have a toxic effect. These interviewees thus stated that they felt satisfied with the level of testing, and trusted colleagues to judge the scientific rigour of applications when they were unable to do so themselves, as Philip described:

'This is an area well outside my experience, but I sat and listened to discussions by those who were expert in toxicology. They talked about homology and groups of protein, and looked to see whether these were similar to groups of proteins which are known to cause allergic or toxic reactions [...]. I was quite satisfied, as a non-expert in that area, that the proper elements had been thoroughly considered and therefore researched and that this was perfectly safe.' [Philip]

Much of the hierarchists' trust in colleagues derived from the fact that these interviewees believed that they had conducted rigorous assessments within their own areas of expertise, and thus expected others to have done the same. Indeed, when anything other than a scientist's particular area of expertise was enquired about, they were either unaware of the scientific issues involved, or felt unwilling to discuss them because there were other people better qualified to do so, as the following quotes demonstrate:

'No, I'm not fully aware of [the concerns about the cauliflower mosaic virus]. I can't comment on that. I mean I'm not an expert, and I know that a lot of people who claim to be experts on GM don't know what they're talking about, so I'm not going to talk about that, so there you are.' [Colin]

'I don't know enough about that to say. Finding pollen moving doesn't mean it's a problem, but, there are better people, better qualified than me, to make a final judgement on that.' [Richard]

'I don't know much about the pollen issue. That could be quite important, but I'm not expert enough to answer that.' [Pete]

Either as a result of their own investigations, or those of their colleagues therefore, these interviewees believed that GMHT crops had been thoroughly tested. Indeed, the only question that they felt had not been answered, was whether spraying broad-spectrum herbicides over GMHT crops altered the abundance of wildlife. It was this question that the FSEs were designed to consider therefore, and not anything to do with the fact that the crops had been genetically modified:

'As I understand it, the trials which some of the biotech companies have done on the crops prior to these farm-scale type releases have been quite extensive, [but] they certainly haven't looked at the impacts on wildlife in any sensible way.' [Edward]

'All competent authorities around the world have said that those constructs are safe. What is unknown about them is that you have to use herbicides with them. So if you've got glyphosate or glufosinate tolerant plants, you use those herbicides. Since they're broad-spectrum herbicides, they'll clearly give the farmer the possibility of having cleaner fields, destroying all the weeds, so that's got an implication for biodiversity. But it's not a safety issue.' [Terry]

Since GMHT crops were deemed safe and non-invasive, hierarchists concluded that if pollen escaped from the FSEs, it really would not matter. Indeed, they saw no scientific need for separation distances at all, and believed that they would only dilute GM pollen anyway, as Ian described:

'It's like, how long is a bit of string? You just don't stop pollen by growing a buffer zone around a crop, it just doesn't happen. Oilseed rape pollen will go for miles at the end of the day. [...] A buffer zone actually has the effect of diluting pollen [...]. If you've got a barrier of non-GM rape around a GM trial, the pollen will be mixed and it will be dispersed in that way, so it will have the effect of diluting it, and it will probably have the effect of restricting pollinating insects [...]. But you won't ever... you just can't... it would be impractical to suggest the size of the isolation distance

that you would actually need to stop pollen going X hundred metres. [...] But it's what it does when it gets there that's important. If it gets dispersed 4 miles and then lands on somebody's front lawn, who cares! [...]. It's probably more of a political issue than a scientific one [...]. Scientifically I don't really think a barrier's going to do a great deal of good. I mean it will dilute pollen, but it won't actually stop it. There's no absolute kind of... Short of putting a glass dome over a field!' [Ian]

Although Ian stated that a glass dome would prevent pollen flow, he also advised that this would not be a sensible way to test GMHT crops. According to hierarchists, it was impossible to 'recreate the climatic conditions that a field would encounter', or to get plants and other organisms to behave indoors as they would outside. Indeed, Ian stated that when experiments were conducted in greenhouses, one of the first questions that his peers asked was, 'But are these results the same as those you'd achieve in a field?' In order to test the impact of broad-spectrum herbicides on wildlife therefore, Ian concluded:

'You've got to look at it in as real a fashion as you possibly can. That's part of the principle of some of the trials that are being done just now. They're quite big, they're quite widely dispersed over the countryside, and they have to be to get a handle on what's going to happen. You have to be able to get a result that's going to reflect the farmer's situation. Not just something that's done in plots the size of this room, in a glasshouse. It has to be kept real.' [Ian]

According to hierarchists therefore, the only way to test the impact on biodiversity was to test organisms *in situ*. However, due to the sheer number of species present in any one field, these interviewees stated that even this task was difficult, as Ben described:

'If you look at the species of weed that you get on an average British field, 200 odd species maybe. Then you've got some 60 bird species that regularly use arable fields. In terms of invertebrates, a couple of thousand. Then you'd move on to the bacteria...' [Ben]

Rather than finding it necessary to test all the organisms in a field, these interviewees asserted that it was only necessary to monitor a small number of species. To determine which species to monitor, hierarchists described how they selected those that were known to fluctuate widely, and which were thought to be sensitive to the herbicides. They also had to consider which would provide the greatest value for money, and which would require the least disruption. For example, Richard described how the steering committee had decided not to

monitor earthworms because their numbers could fluctuate widely as a result of weather conditions, and because their testing would require a lot of digging:

'You can sieve out a lot of earthworms and it tells you very little. [...] You can be in one field on one day and find a lot and be in the same field the next day and find none, so it's a very hit and miss sampling methodology. [...] And again, in terms of value for money and in terms of the best return on effort from all this research work, it was decided that earthworms wasn't a productive way to go. You could expend a lot of time and energy and come up with no answer, or come up with an equivocal answer, which would be worse, because the pro people would say, "We went and looked and found no difference", and the antis would say, "Well, they were using the wrong methodology in the wrong way".' [Richard]

These interviewees also described how they were looking at species that people valued, such as butterflies, birds and mammals. Sometimes however, this did not make scientific sense to them. For example, although birds were considered to be a good indicator of problems lower down the food chain, some interviewees believed that it was not possible to extrapolate useful data from trials of this size because birds' territories stretch over a far greater area. Similarly, Pete believed that monitoring mammals was 'ridiculous', while Edward described it as 'a bit of a sop':

'Large mammals have been covered, but that's rather weak, it's not very strong, it's just counting hares and deer and foxes that happen to be seen during the bird watch. It's a bit of a sop really.' [Edward]

Nevertheless, these interviewees maintained that the trials were 'a smart piece of work', that were 'as good as it's practically going to be'. Certainly they believed that the procedures were 'standard scientific practices that could be found in any textbook', as Edward described of their decision to use split fields rather than baseline data. They also believed that it was important that the impacts of GMHT crops were being compared with those of intensive and less intensive conventional agriculture, since it was within conventional agriculture that these crops would be used. Indeed, they submitted that it would have been impossible to make a comparison between GMHT crops and organic agriculture, since the organic regulations would not allow this. Nevertheless, they proposed that the results could be looked at alongside research comparing conventional and organic agriculture, since this had been conducted in the past using a similar methodology.

Upon describing how well the FSEs had been designed, many asserted that they had made a special effort to ensure that the methodology was rigorous. For example, Ben stated that he had asked colleagues to design one aspect of the methodology ‘in a rather more rigorous fashion’, and asked specialists in other areas to explain their work so that he could judge it for himself. Edward, meanwhile, declared that if SCIMAC did not find enough trial sites to meet the statisticians’ requirements, then his organisation would pull out, while Colin insisted that there was no ‘cunning plan’, and that he had tried to make the trials as fair as possible:

‘I’ve been insistent in the meeting that it’s a very rigorous test, because there’s no point otherwise. [...] I know from past experience you can always affect field trial results by the treatments you put in, obviously, if you’ve got two comparisons. But I’ve insisted that it’s fair, as it is possible to be fair [...]. This is to say what the farmers do in this situation, given these instructions, in terms of the label. That’s the way it’s going to be done. So it’s not designed to say this is how to get the best out of GMs, because that’s a separate exercise as far as I’m concerned.’ [Colin]

Hierarchists thus declared that there had never been such a rigorous, multi-disciplinary and immense piece of work before, and that this would provide some of the best information in Europe. Indeed, Richard asserted that the FSEs were a major breakthrough, since they demonstrated that the government was now willing to take environmental impact assessment seriously:

‘The government’s spending MILLIONS on what they’re currently doing, and they’ve never spent millions on this kind of thing. This is an enormous leap forward. We’ve never had such a large-scale, multi-disciplinary, well co-ordinated piece of work, and I’d like to give it a chance.’ [Richard]

Nevertheless, a number of scientists pointed out that it would only be possible to know the full impacts of GMHT crops once they are grown commercially, as Ben described of the impacts upon birds:

‘I don’t really see how you could test for those impacts, because they are impacts that act at the national scale, and they would only be picked up by a trial at the national scale.’ [Ben]

This was not perceived to be a fault of the trials, but rather the reality of risk assessment. Indeed, most hierarchists stated that it was not the aim of science to understand everything, but rather 'to shine light on the dark recesses of ignorance'. In this way, it was asserted that science could be used to inform decisions, but never to provide definitive answers, as Nathan expressed:

'Trying to put in place systems of testing that will give you an absolutely definitive answer is a false premise. I just don't think you can do that, and I don't think you can do that for anything. You can not get a definitive answer when you're working with natural systems. But you can take your level of testing to a level where you've got confidence that it's unlikely to have an impact.' [Nathan]

Case Specific Consequences

Since hierarchists believed that science could never provide definitive answers, they maintained that it would be impossible to predict the exact consequences of introducing GMHT crops. Indeed, a number of scientists disclosed that there could well be a surprise in the future, but that this was no more likely than with any aspect of life. For example, Douglas pointed out that since a meteor could fall from the sky, he could never say never, while Henry explained that things could go wrong with GMHT crops, but so could they with any technology:

'All things are possible. There is a finite risk that a meteor will fall on your head in the next five minutes. It exists as a risk. Well, what are you going to do about that? The answer is precisely nothing, because the risk is tiny. ACRE don't come up with opinions, which say there is no risk from this release [...], they advise in the form of there is a very low risk. That's the advice that's given. So it's a question of balance of risk. I'm not going to say that this is inconceivable, the weirdest things can happen, but it's incredibly difficult to imagine.' [Douglas]

'Well I'm sure things probably will go wrong, just like oil tankers go aground, or cars pile up on the motorway. But the more information we have, the more we'll be able to minimise the possibility of that happening and deal with it if it does.' [Henry]

Although hierarchists asserted that anything was possible, most seemed confident that there would not be any intrinsic problems with crop biotechnology. Upon discussing issues that most concerned egalitarians, such as using the cauliflower mosaic virus as a promoter, most were certain that there would not be any negative repercussions. As Douglas stated, the fact that ‘the virus belongs to a family that has distant relationships with the family in which you find hepatitis B, and the family in which you find retroviruses’, leads to ‘no great excitement at all on my part’. Indeed, hierarchists could not see why there would be any detrimental implications for human health, and saw little reason to expect pleiotrophic effects, since they already had a good scientific understanding of these aspects, as Neil explained:

‘You can put the gene in and it can affect other parts of the plant. Yes, that’s true, it could happen. It’s very unlikely. If you look closely at the biochemistry of plants, and the metabolic pathways, it’s actually very unlikely that that would happen, because we KNOW so much about the way that plants function now.’ [Neil]

Indeed, even in the apparently unlikely event of negative impacts occurring, hierarchists asserted that it would be possible to solve or manage these problems. Essentially this was because they believed the technology had improved dramatically following the development of the first GM crops. For example, Matt described how far more sophisticated constructs had been produced, while Terry described how ‘proglers’ could now be made to seek out specific pieces of DNA:

‘A lot of the first products that were put out on the market were virtually Stone Age technology, because they did have these ENORMOUS gene constructs with promoters, antibiotic resistance genes, all sorts of junk DNA in them. [...] We do a lot of work on improving these systems. Things like tiny promoters, or plant-based natural promoters that switch genes on and off, no antibiotic resistance genes, no extraneous DNA... The technology is getting much, much better these days. Certainly a very bad example is the early transgenic corn. That didn’t have one, it had TWO antibiotic resistance genes in it, which is very, very bad science. But scientists can see these problems and are trying to solve them.’ [Matt]

‘You have to put this in the context of the rapidly improving technology that we have now. You can produce proglers which will look for DNA in all sorts of places, and therefore you can find a gene like kanomycin resistance in soil simply by probing for it. You could find the gene for herbicide tolerance...’ [Terry]

Other interviewees meanwhile, asserted that it would soon be possible to modify crops in a way that prevented them from producing GM pollen. This, they proposed, would make it possible to grow GM crops alongside their organic counterparts, and would render the technology reversible. Even without these new developments however, hierarchists were certain that, if there were any negative impacts from GM crops, they were likely to occur as a result of the application of the technology, and not as a result of using crop biotechnology, as Douglas declared:

'There is no sensible discussion on the issue of GM really. It's a question of cases. Individual cases have to be examined. So in other words, there are genetically modified organisms which, if released into the environment, would probably be a cause of at least concern. There are other genetically modified organisms where it is extremely difficult to see what sort of harm there could be from their release [...]. I get quite... almost cross at the sort of sound bite questions that... "Do you think GMs are harmful?" Well, some yes, some no. There are GMs which are saving lives right now. So it's absurd. [...] Some are correct, some are rather foolish. How's that?' [Douglas]

To many of these interviewees therefore, the GM component of herbicide-tolerant crops was considered to be 'practically irrelevant', since the gene sequences involved were believed to present few risks to either human health or the environment. For example, Neil stated that 'hand on heart' GMHT crops themselves posed no risk to biodiversity, while others claimed that even if GMHT transgenes did become incorporated into other plants, it would be highly unlikely that they would make any impact, as Joe explained:

'The impact of herbicide tolerance on the environment is through the herbicides, the genes really are irrelevant, because what are the genes going to do? If the genes get into wild plants they become herbicide tolerant. Big deal! Nobody's using herbicides on wild plants.' [Joe]

In the case of weeds developing herbicide resistance on agricultural land, hierarchists disclosed that there could be agronomic problems, in that farmers would not be able to control these weeds using glyphosate or glufosinate ammonium. But again, this was not perceived to be an environmental issue. Indeed, since maize had no wild relatives, sugar beet was prevented from flowering, and oilseed rape was 'very unwillingly' to hybridise with the few weeds that it was related to, hierarchists asserted that the transfer of genes from these GMHT

crops to wild plants was highly unlikely, as Ian described:

'In the UK there just aren't that many weeds closely enough related that will actually cross-pollinate with rape. There's only two or three, and they're not widely distributed in the UK. There's only brassica rapa, which is the most closely related species to rape, and you do get hybrids forming, but quite often the plants are weak and won't actually survive very well. Really that's the only one. If it was widely distributed I would be more concerned about it, but we only know of an area up in Humberside and one area down in the Thames [...]. There are a couple of others. There's runch, which is wild radish, from which you can get hybrids forming, but I think you have to force it.' [Ian]

The fact that genes could travel beyond the buffer zone did not concern these interviewees therefore. Indeed, Ben described how 99% of the world's organisms were likely to be exposed to GM pollen, and that it would undoubtedly be found in the Antarctic ice before long. But nonetheless, with regard to GMHT crops, he was not concerned.

What did concern hierarchists however, as outlined in the previous section, was the fact that broad-spectrum herbicides would be used in a way that they had never been used before. According to some hierarchists, it was this aspect of the technology that could lead to negative impacts. For example, Pete and Neil suggested that agriculture could become more intensive as a result of using GMHT crops, which could accelerate the decline in biodiversity. Nevertheless, others believed that GMHT crops lead to positive impacts. For example, Gordon stated that they could reduce the amount of ploughing necessary and eliminate the need for more toxic herbicides. Perhaps more typical of the hierarchical outlook however, were comments by those who wished to remain open-minded until after the trials. For example, upon being awarded 'a magic wand', Ben demonstrated how important the FSEs were to him, by stating that he only wished to know what the results of the trials would be. Similarly, Richard explained why he sat 'very firmly on the fence':

'I can see lots of very negative impacts from this kind of technology, but in the absence of any science I can't evaluate those negative impacts, and see whether they are real or not, whether my feelings are justified or not. This is why we need the science. On the other hand, I can see lots of ways in which this kind of technology will enhance the environment. So I'm going to cop out here and say I'm very firmly sitting on the fence, because I see good things and bad things about it.' [Richard]

For most hierarchists, the impacts of GMHT crops would very much depend upon their management. For example, Pete suggested that if farmers were instructed to set-aside land for wildlife, they could off-set any losses experienced as a result of growing these crops. Indeed, Richard believed that GMHT crops could actually encourage farmers to set-aside land, since they could be used to control the build-up of weeds afterwards:

'We're encouraging farmers to manage their set-aside to keep it weedy. But of course, real farmers don't want to do that because when it comes back into production, they don't want all those weeds [...]. But if you were encouraged to do that in the knowledge that somewhere in the rotation, say when the field went into rape or maize, you were able to plant a GM crop that would just clean it up, you'd be much more confident. So two years ago you did it in cereals, last year you did it in set-aside, and the place is now a complete bloody weedy mess, but you don't mind because next year it will go into oilseed rape and you will be able to clean it all up.'
[Richard]

Regardless of whether GMHT crops benefited agricultural biodiversity or not, hierarchists asserted that the impacts of these crops would be minimal when compared with many other human interventions. For example, many declared that they felt far safer eating GM food than food treated with numerous chemicals, and saw no reason why advocates of organic farming should reject this technology, since it could eliminate chemical use in the future. Similarly, Douglas stated that he would be much more upset about people removing hedgerows than spraying a different herbicide over a crop, while Dominic described how he thought the effects of hill-walkers were far more damaging. Indeed, many of these interviewees reiterated that detailed risk assessments had been undertaken, and that these had demonstrated just how small the risk was. As Matt stated, the risk factor of a 'Big Mac' was probably far greater than that of a GM crop. Nevertheless, hierarchists also stated that they would not be complacent about any application of crop biotechnology, since some crops could lead to extremely negative consequences, as Edward advised:

'I don't think I'd even support field-scale trials with insect resistant crops, because obviously the gene is acting continuously, producing a toxin which kills insects, and that really could confer an advantage on some species of native flora. [... There are] a lot of potential threats on the horizon, like GM trees, GM biomass and the possibility of planting GM crops in areas where crops have not been planted at all; on marginal uplands for example. You get into the uplands of the UK, above the agricultural line, but below the moorland, there's a bit of ground which has been

getting increasingly turned over to agriculture. There's a fine line between it, and that's a shame because the marginal uplands are actually very important for some bird species and other wildlife. There's a few crops in the uplands that could be enhanced by GM technology, and that's a long way away yet, a decade perhaps further away, but that could have quite wide-scale effects on the environment. It could change the look of the landscape remarkably. I mean some of the effects may even be beneficial, but it's bound to have negative effects as well.' [Edward]

Hierarchists thus maintained that the impacts of each crop should be assessed individually. Unlike egalitarians however, these interviewees did not believe that 'need' could be an acceptable component of the risk assessment process. This, they stated, was because if a particular crop was deemed safe, it was not for them to judge whether or not it was useful. As Pete stated, he did not see the need for GMHT crops, but it was clear that farmers did, and consequently it should be up to them whether or not they want to use them. Similarly, Joe explained that it was more important to focus upon developing an understanding of the technology, rather than trying to ascertain whether something was needed:

'Different people have different perceptions of benefit. One person's benefit may not be another person's benefit. And who benefits? [...] then that feeds into needs. If somebody needs something then they benefit by getting it, if they don't need it then they see no benefit. [...] Basically what we need, is all the time to be moving ahead in our understanding of what happens, particularly in biological systems, and in the physical universe.' [Joe]

Nevertheless, these interviewees also stated that they would prefer it if crop biotechnology was used to solve problems rather than to satisfy greed. For example, many expressed a desire to develop crops like 'golden rice', with its elevated vitamin A content, or crops that could be used to provide pharmaceutical products. Furthermore, they commonly described how they would like to see the technology used to reduce the impact on the environment, such as by reducing agrochemical and fertiliser use, or by enabling the production of spring-sown crops, as Neil explained:

'I know of at least a dozen new GM developments that are likely to prove incredibly useful for conserving wildlife on farmland. They're at very early stages, but the potential's phenomenal [...]. For example, by introducing dwarfing genes so that cereals, instead of growing three feet high before they produce the ear, the important part, they only grow a foot high. Now that might not seem terribly exciting but [...]

it means that we COULD, theoretically, put our fields back to spring sown crops, and that would be an ENORMOUS benefit to farmland wildlife. It would mean that we could have fallow fields over the winter, which would be of huge value to wintering birds. And it also means that the cereal fields would be better for nesting birds [...]. That's just one example, there are lots of others. There are lots of others that revolve around the ability to reduce pesticide inputs and things like that.' [Neil]

For hierarchists therefore, the impacts of GM crops were perceived to be extremely case-dependent, and could only be determined by undertaking rigorous risk assessments. With regard to GMHT crops however, they were certain that this particular application of the technology was safe for both human health and the environment, but that it was impossible to know how biodiversity would be affected until after the FSEs had been completed.

Other Groups have Political Agendas

As described above, hierarchists believed they would gain a better understanding of the impacts of GMHT crops by applying science, which would then enable them to determine the best way forward. This, they believed would probably lead to a conclusion situated somewhere between the individualistic and egalitarian positions, as Richard stated:

'In all these arguments you have this polarised view, that there are those that never want to see it again, and there are those that are saying 'trust me I know what's good for you'. Somewhere in the middle, SOMEWHERE is the middle ground that will hope... will be the way we go forward. What you have to do is pick out that extremism and find out what is going on, which is why I have been happy to back the science, to find out what's going on.' [Richard]

By allowing science to select a middle path, and by describing the other groups as extremists, hierarchists asserted that the other groups engaged in the debate were motivated by political agendas, and not by a desire to improve humankind's understanding of the world. Indeed, it was pronounced that individualists and egalitarians had largely based their arguments upon 'fibs', 'prejudice', 'hearsay' and 'anecdote', rather than a thorough scientific understanding of the issues involved, as Matt stated:

'I'm almost obsessed with the fact that too many of the arguments are not based on science.' [Matt]

Rather than using science to help establish the best way forward, hierarchists asserted that the other groups used science in an effort to further their agendas. For example, Henry described how ‘people search around for things that confirm their prejudices’, rather than ‘challenging their preconceptions’, while Terry explained that findings could not be released until after the trials, because each side would jump to an opportune conclusion:

‘Those involved are incredibly nervous about publishing early results. I know Mr. Meacher would like to do so, but it’s just not possible after one year to have done a valid scientific comparison. One can see... Let’s say, for example, that all the maize fields that are GM are absolutely full of weeds, lots of bugs and birds and creepy-crawlies. The pro-GMs would say, “Look how wonderful this is! We ought to grow GM mai... herbicide-tolerant maize. It has a wonderful effect on wildlife.” Well, you have to take into account the second year of use, and the next crop in the rotation, and you have to look at inter-annual variation. One can see the anti-GM... you know, the first dead robin found in a GM rape field will be upside down on the front of the Daily Mail, “GM killed Cock Robin!” [Terry]

Although both individualists and egalitarians were said to have distorted the truth to some extent, it was proposed that egalitarians had done this far more frequently. Indeed, the science that they used was often described as ‘generalised’, ‘dubious’ ‘junk’. For instance, Matt stated that the science that Dr. Mae Wan Ho propounded (which was often referred to by campaigners, see for example Ho, 1998), was ‘at the extreme end of science’, while Jim declared that ‘Ho applies a logic that I find difficult to get around’. Many hierarchists also stated that the Monarch butterfly research, which attracted a great deal of media attention between 1999 and 2001, was very poorly conducted and was ‘typical of the shock-horror stuff’. Indeed, many of the scientific arguments put forward by campaigners, such as the probability of horizontal gene transfer and the dangers of promoters were considered to be highly exaggerated, while their claims about animals rejecting GM crops were ‘on the same scale as UFO magazines’. Douglas therefore claimed that many of the concerns he heard were ‘complete nonsense’, which were often based upon a very poor understanding of the facts:

‘They’re coming out with complete nonsense. [...] I nearly fell off my chair the other day! Well it was funny in one way. It was some goofy old guy [on the television] talking about bees. What he’d got hold of was the idea that transgenic pollen was in some way going to mutate his bees into frightful beasts or something. It was just headline sound-bite stuff [...]. He was just a country sort of bloke and he was completely misled.’ [Douglas]

Although Douglas stated that this particular individual had been misled into believing that GMHT pollen was dangerous, many hierarchists asserted that campaigners were using science in a way that was far more devious. On many occasions these interviewees stated that egalitarians had a 'hidden agenda', and that they were driven by political and spiritual beliefs, rather than by science, as Henry explained:

'I think it's important to consider what people are against. Are they against the things that they say they are against? Or are they against something that's hidden beneath that? I think everybody... well, a lot of people are against genetic modification per se, even if there were no risks attached to it. When there are genuine benefits for all, they would still be against it.' [Henry]

According to these interviewees therefore, egalitarians were campaigners first and foremost, and not scientists. Indeed, their claims about the dangers of GMHT crops and the benefits of organic food were perceived to have been made without any proper scientific backing, and this infuriated those who maintained that they would lose their credibility if they behaved in a similar fashion, as Richard stated:

'[The Soil Association] are not so much scientists as sort of political advocates. They're a lobby group in the same way that Greenpeace and Friends of the Earth are. What I'd like to see is some objective science in all of this to say, "Well, what is going on?" So I have a problem with them. I have a problem with everybody who makes claims and can't substantiate them with any science. Anything I ever say is substantiated with science, because people fall me from a great height when I don't. So I think it should be the same for everybody.' [Richard]

Furthermore, campaigners were perceived to be either scientifically illiterate or dishonest when they stated that earthworms should be monitored within the FSEs, since hierarchists believed that anyone with enough knowledge to judge these trials would know that this was impossible. Indeed, Edward asserted that their criticism of the FSEs was very foolish, since the results could be used to prevent the commercial cultivation of GMHT crops, if it was shown that they had a detrimental impact upon wildlife. More importantly however, hierarchists asserted that the campaigners' efforts to destroy the FSEs were highly undemocratic. For example, Dominic claimed that he had spoken to many people at public lectures, and had found that most were not in favour of destroying the trials. Similarly, Henry stated that their actions had discouraged organisations from funding research into crop biotechnology, and that this had resulted in the termination of a number of overseas projects

which could have helped those most in need of the technology. Consequently, there was perceived to be a danger of 'throwing the baby out with the bath water', which irritated hierarchists, just as any undemocratic behaviour would, as Philip described:

'I would feel equally annoyed if one of the companies was pushing a technology down our throat or a pressure group was determined that we weren't going to have it. I think that is no way for a society to act, at either end of the scale.' [Philip]

Indeed, although hierarchists had been irritated by the egalitarians' undemocratic behaviour, it seems that they were far more concerned about the power that individualists had acquired. According to these interviewees, companies had rushed the introduction of GM crops in order to recover their investment, and had thus forced people to accept a technology that could have benefited from more research and development. It is important to note that this was not because they believed that the technology was unsafe, but rather that it could have been more sophisticated. For example, Philip had advised companies not to use antibiotic-resistance genes, because he suspected that the public would not accept them, while others asserted that it would have been better if they had first developed a system to prevent gene flow. Indeed, many stated that they did not agree with the way crop biotechnology had been applied and introduced, and wished that the companies had waited until they had developed something more useful, as the following quotes demonstrate:

'One thing you can't divorce in the world of GM, is that big business saw one opening, invested a lot of money, wanted their money back, and pushed products onto the market, in my opinion several years before they should. In doing so they have shot themselves badly in the foot, and possibly irreparably.' [Matt]

'The companies have done some silly things, like quite often when they're carrying out this research, they've used marker genes, antibiotic resistance or whatever [...] and they've allowed that gene to go through into the commercial crop, when they could have removed it. So there's been some sloppy technology. One of the worrying things I found from ACRE was how environmentally unaware, certainly in the 90's, many of the companies were. When you saw the preliminary risk assessments they basically hadn't a clue as to why people were concerned about [biodiversity impacts]. I think they've learnt a lot since those early days. They obviously made a big mistake in releasing the first crops that they did [...]. If they'd introduced crops that were a clear benefit for the public, there might have been a different reaction. Basically they screwed it up.' [John]

As a result of industry's 'cavalier attitude', Neil stated that the introduction of GM crops had 'revealed a serious question about the influence of multinational companies over the democratic system'. Indeed, John stated that he knew a number of scientists, including himself, who had a 'sneaking admiration' for those who destroyed the FSEs, 'because it's one in the eye for agribusiness'. Nevertheless, these interviewees did not necessarily blame the biotechnology industry, since it was seen to be behaving as any individualistic organisation would. Instead, they blamed the government, as the following quotes demonstrate:

'I very firmly blame the UK government and its abysmal science policy. They should have seen that GM plants were being produced [...]. There's been a lack of clear policy. They've changed their minds all the time. This farm-scale thing could be viewed from someone who's more cynical as a sop to the big companies to enable them to get a toe-hold into the GM.' [Matt]

'The one thing that I would have changed, and it really upset me, was that we had a situation where industry, part of government, and another part of government were all singing to different hymn sheets. There was no continuity. People were getting different messages all the time. [...] We advised government that this would happen, but they did nothing.' [Gordon]

'There are people who's job it is to see what people are concerned about, and to deal with problems that are going to come up. That's what politicians are for, and they've failed the country' [Douglas]

Since the government knew about the introduction of GM crops many years in advance, hierarchists asserted that they should have made every effort to prepare the unsuspecting public. Furthermore, they proposed that if the government really thought that gene flow and biodiversity impacts were important, they should have asked companies to assess these parameters prior to allowing the crops' environmental release. Indeed, rather than acting upon scientific facts, hierarchists asserted that the government had merely tried to appease whichever side was most forceful, and that this had caused it to abandon science on a number of occasions.

What most troubled hierarchists however, was the fact that science was frequently funded by the private sector. Again this was largely seen to be the fault of the government, since it had sold the plant breeding industry, and had consequently given more power to multinational companies. Furthermore, the government was accused of reducing public funding, and of

endorsing stringent intellectual property rights. Such circumstances were said to have made it difficult for scientists to undertake non-profit making research, and had lead these interviewees to question the objectivity of research funded by the private sector, as the following quotes demonstrate:

'I would prefer there to be much more public money going into crop breeding now. We ought to go back to what we were spending on it say 20 years ago. That would take the power out of these private companies, because they have too much power and their results are all secret, they're not publicly available. If it's funded by the government the results are publicly available.' [Henry]

'If I worked for Monsanto or something you could reasonably expect me to have difficulty giving you disinterested science. I would hope that I could rise above it, but you never know, I've not been tested.' [Douglas]

'There is a genuine fear that GM technology is subject to much more stringent intellectual property controls, than conventional plant breeding ever was, and it might give some of these big multinationals the opportunity to really control the whole seed industry [...]. I feel quite strongly that the whole issue of intellectual property rights and patent control of living things has got to be sorted out in the next five, ten years.' [Jim]

With the government's poor leadership skills and inability to provide sufficient public funding, hierarchists asserted that it was not surprising that the public no longer trusted scientists. To rectify the situation, many stated that the public should be given more time, and should have far greater access to information. Furthermore, it was suggested that GM crops should be produced 'for the public in a public place'. Nevertheless, hierarchists also asserted that these issues were of a political nature, and as such they should not be allowed to distort the risk assessment process, as the following quotes demonstrate:

'Like I say, the actual fundamental principles of the science and using the technology, I don't really see why anybody can have a problem with that [...]. The control of the technology by multinationals and all that sort of business is a bit worrying [...]. If there's world domination by some sort of multinational like Monsanto or whoever, I don't think that's necessarily a good thing [...]. But I would divorce the two. People don't actually think about those two things as being separate, but to me there are two issues there.' [Ian]

'I try to do the risk assessment purely as a biologist and look at it from the point of view of the ecological impact and that sort of thing. But the risk assessment is being completely distorted by the hype and all the anxiety and the politics and all these other things.' [Joe]

'My concern is that relatively few people are controlling the world's gene pool, and the implications of that. But that's a political issue, not a technical one, and it comes down to the will of government, perhaps the will of the companies as well, in what you do about that. I do worry about lack of options to farm in the future if this technology comes to dominate [...]. So I'm not sort of wet behind the ears on this, there are concerns, but...' [Colin]

Summary

According to hierarchists, the environment has been highly manipulated by humans, and this has led to both positive and negative consequences. Although such impacts were perceived to be a necessary part of human survival, hierarchists asserted that detrimental impacts should be minimised as far as possible. In order to do this, they stated that it was important to undertake thorough risk assessments before introducing new interventions. With regard to GM crops, these were perceived to be just another change that needed to be assessed. Hierarchists believed that these should not be compared with anything else, and that each application should be considered on a case-by-case basis. They also believed that GMHT crops were safe to release into the environment, although the impact of broad-spectrum herbicides upon biodiversity was not yet known. This, they asserted, would be better understood once the results of the FSEs have been analysed. Hierarchists had concerns about the control of crop biotechnology, but believed that political considerations should not distort the decision-making process. They differentiated themselves from other groups, who they believed were motivated by unscientific agendas.

How individuals utilised the discourse of the ideal types is presented in the following chapter.

Patterns of Discourse

Introduction

How individualists, egalitarians and hierarchists framed the GMHT crop debate was presented in chapters 5-7. Each chapter described the discourse of an ideal type, which was divided into five areas: their conceptualisation of nature, the perceived similarities and differences with nature and other interventions, accepted modes of understanding, predicted consequences and attitudes towards other groups. The discourse that each ideal type utilised within these areas has been summarised and presented in table 8.1 below.

	Nature	Similarities	Understanding	Consequences	Other Groups
Individualist	Hostile. Struggle to survive.	Like nature. Like other benign technologies.	There is an urgent need for the technology now.	There are benefits for everyone.	Hierarchists too thorough. Egalitarians naïve and dishonest.
Egalitarian	Vulnerable. Work <u>with</u> nature.	Unlike nature. Like other dangerous technologies.	Never 100% so consider needs, ethics and intuition.	Likely to be catastrophic for humans and the environment.	They are both money-oriented and therefore untrustworthy.
Hierarchist	Artificial. Maintain a balance with good management.	Similarities and differences are irrelevant.	Never 100% so select best parameters to test on a case by case basis.	Through good management benefits can be attained.	They are both too dogmatic and unscientific.

Table 8.1. The discourse of cultural theory's ideal types within the GMHT crop debate.

By using the table above, this chapter demonstrates how interviewees utilised the discourse of each of cultural theory's ideal types. It first considers how individuals conformed to the egalitarian stereotype, and examines whether there might be a number of sub-groups within this type, as suggested in chapter 5. Likewise, how interviewees conformed to the hierarchists' and individualists' stereotypes is considered, followed by an examination of the extent to which interviewees utilised the discourse of cultural theory's other two types, the fatalists and the hermits.

The Different Shades of Egalitarianism

When analysing the patterns of discourse that individuals utilised, it was clear that the majority of interviewees who opposed GMHT crops predominantly used the discourse of egalitarians. As suggested in chapter 6 however, differences could be detected amongst these egalitarians, and these enabled the identification of three sub-groups. In this section the three sub-groups of egalitarianism are presented, and the ways in which various interviewees appeared to conform to them are described.

The interviewees with perhaps the most stereotypical egalitarian views have been named *fundamentalist egalitarians*. Individuals conforming to this stereotype were concerned about environmental issues for a long time, and either worked for environmental organisations such as Greenpeace and Friends of the Earth, or organised local groups that campaigned against GM crops. For example, Hazel described how her parents had been 'very left-wing', which, she stated, had probably encouraged her to join the Campaign for Nuclear Disarmament (CND) at the age of fifteen, and a whole host of other organisations afterwards (see page 116). Similarly, Josh had been raised in a predominantly egalitarian community, which was frequently visited by speakers and activists from around the world. This, he believed, had influenced him greatly, since it had made him 'become more and more aware of how globalisation is affecting people, and the environment'. Others however, did not become interested in egalitarian activities until early adulthood. For example, both James and Anthony described how they had become interested in environmentalism during the late 1960s and early 1970s, when they were in their twenties, and how this had motivated them to become highly involved in egalitarian organisations.

Since fundamentalist egalitarians believed that nature was too complex for humans to understand, they seemed to rely upon intuition and ethics far more than they did science. Within their interviews, they rarely stated that further testing would reveal whether or not GMHT crops were risky, and generally avoided commenting upon the FSE methodology. For example, Clive doubted whether a thousand years would enable humans to understand the consequences of these crops, while James seemed to get frustrated when he was asked about the methods employed in the FSEs. Nevertheless, fundamentalist egalitarians did occasionally discuss how science supported their view, but usually this appeared to be a superficial rationale, or one based upon a poor understanding of scientific issues. For instance, Cathy, who had been highly instrumental in setting up an anti-GM crop initiative, became confused about the implications of gene flow on two occasions during her interview,

as the following quotes demonstrate:

'I do have trouble keeping these arguments in my head. But, if a thing escapes... Yeah, I'm not prepared to go into that one. It's amazing how you can lose threads, and I've been completely out of touch for two weeks.' [Cathy]

'[Oilseed rape] practically gets everywhere, including being a nuisance weed, which is the worry about the herbicide tolerance. You've got herbicide tolerant weeds, and when you start having to spray that herbicide in order to get rid of a different sort of problem... I'll have to go back on that one and sort it out, I lose some of these arguments. I don't see why I should be a complete expert anyway!' [Cathy]

Furthermore, and as discussed on page 132, Gail proclaimed that more testing was required, even though she was unable to state how this should be undertaken. Indeed, at the end of her interview, Gail stated that, with a magic wand:

'I'd rip it out the ground! Ha, ha! I'd tell all the biotech companies to disappear from the UK, and, basically I'd just... If it's a magic wand, I'd just... I'd make everyone realise that it was crap technology and reject it right across the whole world! And for all the biotech companies to go broke! Ha, ha! And to go bust! And to end up in shreds! Ha, ha! That would do me nicely! Ha, ha, ha!' [Gail]

Nevertheless, Gail's official position was somewhat different, as she stated:

'Our official position is basically that more research needs to be done, and that we need a moratorium, for a minimum of five years, which is open to negotiation at the end of that, when we review the results of research. So we have five years of research plugging the gaps and stuff, we send the technology back to the laboratory, and at the end of five years you review the outcome of that, and if still more research is needed then you do that. But it's not an outright ban position at all, that's just me.' [Gail]

From Gail's quote, it is possible to detect that fundamentalist egalitarians were also highly critical of capitalism, and abhorred the idea of multinational corporations controlling the food chain. Indeed, for some this appeared to be the most important issue. For example, both Cathy and Isobel stated that they were not bothered about eating GM food, as outlined on pages 137-8, and yet distributed leaflets at supermarkets warning about the dangers of eating

products containing GM material. Of course, these interviewees might have been trying to convey that they were far more concerned about the environment than they were about themselves. Indeed, Isobel stated that she did try to avoid GM food when she was pregnant. Nevertheless, both these interviewees seemed to be primarily motivated by political issues. For example, Cathy stated that it was the politics behind the food that made her think 'yuck', while Isobel stated that her decision not to buy GM food was 'like a personal protest' against the monopoly of corporations:

'I don't actually personally know all... or particularly worried about the effect of genetically modified organisms on human health, so I'm not so focused on human health, I don't think that's the point. The point is that it's totally unnecessary, and it's going to create a greater monopoly for the corporations.' [Isobel]

Indeed, both Isobel and Cathy frequently referred to the political aspects of the debate, which were perhaps so important to Cathy that she hoped catastrophic consequences would occur, because the campaign would then be won, as she stated:

'From our campaigning point of view, the best scenario would be massive crop failure.' [Cathy]

Nevertheless, some fundamentalist egalitarians only presented arguments that referred to the physical consequences of GMHT crops. For example, James described his perception of nature as Gaian, and believed that scientists could not be trusted to make sound judgements because they did not listen to their emotions and instincts:

'I suppose my perception of the planet is Gaian. That is, it's incredible, it's an entity which is somehow more than the sum of its parts. [...] Imagining that the world's agriculture will be converted to genetic engineering, implied to me a complete abandonment of any vestige of nature, because it implied creating biological life on the planet in our own image. I find that ethically, it just, it did something to me, I just thought, I can't, I can't even comprehend the awesomeness of this.' [James]

'Scientists are very anti-emotion, and almost scared of it, or they compartmentalise it until after five when they quote Wordsworth and listen to great music and things, which is all non-rational activity. But to allow your emotions to be touched by these issues is actually what the public have done. And good for them! I think they've got a much more balanced view about this than the scientists have.' [James]

These quotes are typical of the discourse that James used during his interview, and demonstrate that some fundamentalist egalitarians rarely mentioned the political aspects of the debate. It is possible that such interviewees discussed the GMHT crop debate in this way because of the interview's focus upon nature, or because they thought that their case would otherwise be weak. However, it seems more likely that this approach was taken because their perception of nature provided them with a greater motivation than their political concerns.

For most fundamentalist egalitarians however, both political and environmental issues seemed to be held equally, as the following quotes demonstrate:

'For me, the GM issue expresses that kind of link between environmental and development and human rights issues. It has put them all together in one bag. That has been what I have found so exciting about working on it.' [Gail]

'It is about big business. And it's about the environment. And it's about human health. And it's about the science. And it's about the politics. And it's about all of these things. And it's only a particular mind that feels that things have to be taken apart and dealt with in separate corners.' [Joshua]

The discourse that fundamentalist egalitarians utilised can therefore be described as that used by cultural theory's egalitarian ideal type, as presented in table 8.2 below.

	Nature	Similarities	Understanding	Consequences	Other Groups
Individualist	Hostile. Struggle to survive.	Like nature. Like other benign technologies.	There is an urgent need for the technology now.	There are benefits for everyone.	Hierarchists too thorough. Egalitarians naïve and dishonest.
Egalitarian	Vulnerable. Work <u>with</u> nature.	Unlike nature. Like other dangerous technologies.	Never 100% so consider needs, ethics and intuition.	Likely to be catastrophic for humans and the environment.	They are both money-oriented and therefore untrustworthy.
Hierarchist	Artificial. Maintain a balance with good management.	Similarities and differences are irrelevant.	Never 100% so select best parameters to test on a case by case basis.	Through good management benefits can be attained.	They are both too dogmatic and unscientific.

Table 8.2. The key areas of discourse utilised by fundamentalist egalitarians (shaded areas).

The second group of egalitarians that was identified consisted of those who opposed the introduction of GMHT crops, but who were also highly trained scientists. These have been named the *hierarchical egalitarians*, because they used the discourse of both egalitarians and hierarchists when presenting their case against GMHT crops, as shown in table 8.3 below.

	Nature	Similarities	Understanding	Consequences	Other Groups
Individualist	Hostile. Struggle to survive.	Like nature. Like other benign technologies.	There is an urgent need for the technology now.	There are benefits for everyone.	Hierarchists too thorough. Egalitarians naïve and dishonest.
Egalitarian	Vulnerable. Work <u>with</u> nature.	Unlike nature. Like other dangerous technologies.	Never 100% so consider needs, ethics and intuition.	Likely to be catastrophic for humans and the environment.	They are both money-oriented and therefore untrustworthy.
Hierarchist	Artificial. Maintain a balance with good management.	Similarities and differences are irrelevant.	Never 100% so select best parameters to test on a case by case basis.	Through good management benefits can be attained.	They are both too dogmatic and unscientific.

Table 8.3. The key areas of discourse utilised by hierarchical egalitarians (shaded areas).

As a result of their education, hierarchical egalitarians usually discussed complex scientific issues in some detail. For example, Megan was able to explain why she was concerned about the instability of GMHT crops, while Nigel described the intricacies of toxicity testing. Moreover, these interviewees often presented the arguments of Mae Wan Ho, as articulated in her book ‘Genetic Engineering: Dream or Nightmare?’ (1998), which other egalitarians either failed to mention or struggled to describe.

Unlike fundamentalist egalitarians, these interviewees also appeared to perceive nature perverse/tolerant. Indeed, many began their interviews as hierarchists, stating that they had chosen to study science because of a desire to understand the natural world. For example, Ryan described how he had enjoyed growing plants from a very early age, while Julia described how she had fallen ‘madly in love’ with DNA at school:

‘I just love genetics. I love the fact that there’s this code that could be so simple, and lead to such complexity. I just thought it was incredibly beautiful and fell madly in love with it.’ [Julia]

When describing nature, these interviewees usually took a less emotive stance than their fundamentalist friends. For example, Dean used the discourse of a hierarchist when he described how humans had cleared the natural forests of England and had created beautiful landscapes such as those in the Yorkshire Dales. Indeed, on a number of occasions during his interview, Dean stated that he could not relate to the more spiritual perceptions of nature, as he explained:

'I try not to get into that [the naturalness argument]. My environmental thinking is not trying to go back to some supposed natural state of things, which is often how the green movement is portrayed. I don't think that is what I want, and it is sometimes counter-productive. There are statements that other organisations make that tend towards the kind of semi-mystical kind of nature, that looks after us all without us doing anything sort of line. But I wouldn't follow that.' [Dean]

Thus, on a more philosophical level, hierarchical egalitarians proclaimed that it did not matter whether or not something was genetically modified:

'I don't believe that there really is a harsh line and all of a sudden it's a product of industry and no longer a plant. They still behave like plants and they're still within the natural world.' [Dean]

'The fact that a grass is GM or not, on principle, doesn't bug me [...]. You see, this is the problem, [McKibben] is getting to just hate the whole idea of GMO, he's thinking of them as monsters, full stop.' [Megan]

Although these interviewees utilised the discourse of hierarchists when describing nature, they used more egalitarian language when describing recent impacts upon the environment. For example, Nigel stated that many human interventions had resulted in catastrophic consequences, which lead him to believe that it would be sensible to expect the same with GMHT crops:

'The way you can look upon these things is that you get a free ride for a bit, but the system reacts and there's a down-side. Let's take a few examples. Nuclear energy; there were actually adverts which said that this energy's going to be so cheap that it won't be worth sending out individual bills, you just pay a flat rate. Now we know that it's the most expensive form of energy ever conceived because of the decommissioning. Then the guys came along with organochlorine pesticides, and

now, fifty years down the track, we all have chemical residues, and the background levels are at a level where a proportion of the population are actually having an adverse effect on their children by breastfeeding. The soil's dying, and the yields are now beginning to drop because for 35 years the soil has had no inputs of natural organic material, just chemicals. And now the soil is dying. With GM it's even more tenuous than that [...]. These guys are selling hype, and they're trying to make you think that they really understand what the hell they are doing. They don't. They've learnt quite a few clever tricks, but it doesn't seem to be the solution to our problems.' [Nigel]

According to hierarchical egalitarians, such problems have been experienced because individualists have gained too much power, forcing the introduction of technologies before they have been fully developed and assessed. With regard to GMHT crops, many stated that the presence of antibiotic resistance genes proved that corners had been cut, while others described more personal experiences. Megan, for instance, stated that funding was no longer available for the work that she did for her PhD in plant genetics, even though she felt that there was still a need for research in this area. Similarly, Ryan described how he was 'shocked' by the realities of plant breeding, which he discovered while studying for a PhD at an independent research institute, as the following quotes illustrate:

'I can't remember what the wording is, but there's some kind of clause [at the research institute] that you're not allowed to be controversial about GM, which in effect means you can't say anything against it.' [Ryan]

'The other thing that I suppose I should have realised is that it's a very, very, very competitive, cut-throat atmosphere. It doesn't really suit me. I'm not like that. I don't mind being firm with people, but I don't like stabbing people in the back just for the sake of a career advancement.' [Ryan]

Ryan also believed that scientists at the research institute were far too narrowly focused upon specialist subjects, which he believed resulted in the neglect of other important areas. This was a common complaint of hierarchical egalitarians, who asserted that scientific parameters had been omitted from the risk assessment process, as had many economic and social consequences:

'If you look at some of the risk assessments that Monsanto have put out [...], they just identify some hazards and say "risk: assessed at low to effectively zero" [...]

Search me [what it's based on]! There's nothing to tell you. It's somebody's opinion! Just somebody's opinion! There's no methodology given, no details. That's the sort of level... The trouble is that many decision-makers, because they've dressed it up in a load of gobbledegook, and it's quite a thick document when they put it on the table, they think: "WOW! They must have done a lot of testing here." They've probably done no testing, but it's all in a big pseudo-scientific document saying "risk assessment" [...]. They don't really want to know if it's negative, so they do lots of science around the edges, they don't ask the crunch questions, and they put it all down as tested.' [Nigel]

'I'm trying to emphasise the multi-disciplinary approach. There would be a problem if genetically modified crops were only tested by geneticists. A benefit of the farm-scale trials is that they are now being looked at by ecologists, but they also need to be looked at by nutritionists and social scientists. All sorts of people need to look at the effects of technology, because it's a wider thing than it might first appear and we can't be satisfied with results that are produced by the original specialist.' [Dean]

Unlike fundamentalist egalitarians therefore, these interviewees believed that it was possible to understand the impacts of crop biotechnology. However, in order to achieve this, they stated that scientists had to become more independent. For instance, when Megan and Ryan were asked whether the impacts of GMHT crops could ever be adequately understood, they both replied, "Yes, but who would fund it?" Indeed, the lack of independent funding for hierarchists and the growing power and greed of individualists appeared to be the main cause of concern for these interviewees, as the following quotes demonstrate:

'The root of the problem with GE, and actually with most things, is not so much the technology, it's our economic system, it's our capitalistic, exploitative, Judeo-Christian exploit and dominate culture and world-view that is the problem, so I'd change that.' [Julia]

'I wouldn't like to deny man the opportunity of doing it, it's just the rate that man is doing it [...] and the strength and power of these companies. [...] Money talks I'm afraid. They're just making big bucks, and that should be stopped, because greed is an awful thing, greed is dangerous, it closes the mind to everything else. Obsession with money is like obsession with anything, terrifying.' [Megan]

With independent testing however, these interviewees did see a future for GM technology. Indeed, Megan stated that it would be 'selfish and principled' of her to reject applications that would genuinely help people. It was this belief, and their description of nature as nature perverse/tolerant, that distinguished hierarchical egalitarians from their more fundamentalist colleagues with PhDs. For example, Rupert was very competent at discussing scientific issues, but it was clear that he was primarily motivated by an egalitarian perception of nature and a desire to ban crop biotechnology. Indeed, it seemed that he had acquired a PhD in order to gain more power within such debates, which suggests that some hierarchical egalitarians may have done the same. Julia, for instance, spoke of her involvement with egalitarian organisations from an early age, while Nigel mentioned that he was a long-term close friend of a prominent egalitarian. However, without interviewing these individuals further, it is impossible to determine whether they were concealing their true egalitarian fundamentalism, or whether they really were willing to accept the introduction of GMHT crops if further tests were undertaken.

The third distinguishable category of egalitarians were those who were relatively new to environmental campaigning. In general, these interviewees had not been members of egalitarian organisations in the past. For example, Alice had been a member of the National Trust and the Royal Academy of British Museum, while Louise had avoided joining organisations altogether, as she explained:

'I worked in Fleet Street long ago and there was this old hoary old hat saying to me, "Don't join anything because if you go for a job they check everything. Never join the Labour Party..."', well, I think I almost joined the Labour Party anonymously at the time, "Never join anything because someone will have a tab on it somewhere." And boy was I grateful! I was [at a court trial], and they said to me, "Have you ever been a member of Greenpeace? Have you ever been a member of anything else?" And hand on my heart I could say, "No"!' [Louise]

As a result of being involved in the GMHT crop debate however, some of these individuals became members of egalitarian organisations, as Sandra explained:

'I felt so incensed about what was going on that I felt I should do whatever I could. So [joining Friends of the Earth] was initially my first move.' [Sandra]

The reason why these interviewees had chosen to associate themselves with the egalitarian outlook was generally due to trust, or more typically, a lack of it. Throughout their interviews

they described how they had lost their faith in the government and multinational companies, and could therefore only trust those within the other egalitarian groups. This was often as a result of their experience with issues such as BSE, pesticide residues or nuclear power. However, another important reason for their involvement was the fact that GM food had been introduced without labelling, while the FSEs had been forced upon people without any consultation or warning. The following quotes are taken from the beginning of Rachel's interview and are typical of motives behind *trusting egalitarians*:

'The food scares that have gone on all over the years do start to affect you, and you do start looking at additives and chemicals used in things. I was very affected by the BSE thing, not only about the food aspect of it [... but also] the sort of cover-up. I found that quite frightening.' [Rachel]

'I was reading [the local paper] and there was an article about labelling [...] so you haven't got any choice. So I was interested in that. And then it said that there were going to be these farm-scale trials in the country, which was a big jump from what they had been doing. And they were going to do seven trials, one of which was near here. And I just sort of read this and went "WHAT! I can't believe it!"' [Rachel]

Having discovered that people were eating unlabelled GM food, and that trials of GMHT crops were close to their homes, trusting egalitarians often described how they then struggled to find independent information. In their quest for knowledge, Alice appeared to be the most active, since she spent much of her interview referring to the people she had contacted, when she contacted them, and when they replied to her, if they did at all. Amongst her respondents were regulators, employees of various companies and members of the church. However, she felt dissatisfied with most sources of information, until she discovered the Norfolk Genetic Information Network (NGIN), as she described:

'I decided to find out what I could without belonging to any of these groups. I felt absolutely desperate, and I got things like ACRE's report, and I began to start getting things, and when they first arrived I thought, "My God, I'm never going to want to read that". Now, of course, I can't wait for next one to arrive! I just gulp them down! And then, last Easter a year ago, I was told about Jonathan Matthews, the Genetic Information Network, and it was like a lighthouse because he's so well informed about everything [...] and he sent out information. It's fantastic. That was a turnaround.' [Alice]

Although other interviewees with hierarchical or individualistic tendencies suggested that people like Alice only sought information from other egalitarians, it is clear that she tried to obtain information without belonging to any groups. This is typical of trusting egalitarians, who often stated that they would prefer to find independent information because they knew that many groups had agendas. It was for this reason that Rachel tried to find out about GMHT crops without consulting egalitarians, as she explained:

'I'm quite aware that newspapers slant things, that campaigners' mail-outs aren't always... they're not lies, but obviously everybody has a point to make. So we actually started looking with the NFU document and the DETR document.' [Rachel]

However, because these interviewees believed that individualists and hierarchists gave them poor information, or perhaps ignored or lied to them (as described on pages 146-7), and because they were able to develop a good relationship with egalitarians, they soon learned to place their trust with this group. As Alice stated, she saw no reason why she should not trust Mae Wan Ho, while Sandra seemed more willing to trust a fellow campaigner with 'a degree in some science' than a scientist who was speaking at the local FSE meeting:

'To quote someone else at the meeting, who did have a degree in some science, I can't remember what, she was very, very angry and said, quote, "It was poor science, very poor science" [...]. In absence of distinct safety criteria, she felt that no, it wasn't a valid scientific experiment, and because I don't know any better, it sounds quite logical to me, that she said that, so I agree with that.' [Sandra]

Nevertheless, these interviewees occasionally doubted their faith in the egalitarian scientists. For example, when Tim started describing how imprecise crop biotechnology was, he suddenly stopped and questioned why he believed this, and suggested that it might only be because he could not trust either individualists or hierarchists:

'Mae Wan Ho [... says] that it can make it very unstable. And the combinations and the hot spots that you get around the DNA that joins up, does make it... it's not as precise or as controlled as the industry likes to make out... I mean its difficult isn't it, because am I just saying that because I want to believe it, or have I done sufficient research to say that with confidence? I don't know [...]. It's understanding how these companies work and how they have to get their product out to get their returns. It seems like a real stampede to do it fast [...]. Another angle is the whole thing about where science research is located now and how it's shifted from government

and nationally funded science research into actual companies, so it's very difficult to get an unbiased viewpoint.' [Tim]

Emily's group also doubted Mae Wan Ho's arguments, and stated that it was possible to use science in a biased way:

'He doesn't like her book, "Dream or Nightmare?" Have you read that one, by Mae Wan Ho? It is quite sort of exaggerated, it sounds it, and [a prominent campaigner who is trained in science] said, "Yes, she is a bit sort of exaggerated [...]." Just doing this objection (to Chardon LL) made me think how easy it was to just choose the statistics that support your argument. You're just... You're bound to.'

'Well, everyone does it in a way don't they.' [Emily etc.]

Indeed, when presenting their case against GMHT crops, these interviewees were keen to point out that they were not scientists, and that their opinions were based more upon trust than anything else. This, they asserted, was reason enough to object to the introduction of GMHT crops, and especially when so many people agreed with them. For example, most trusting egalitarians stated that local opinion polls revealed exactly how unpopular GMHT crops were, while others described village meetings, which had proved to be extremely popular:

'[The meeting] was absolutely fantastic, it was amazing, because it was a very hot summer's evening, a Saturday, and I'd spoken to a colleague who had organised village meetings [on other topics] once or twice beforehand, and I was worried that there weren't going to be many people. But people just started pouring in, and the chairs filled, and there were windows down the side and these were all open for the air, and people were crowding in at the windows, people on the floor...' [Alice]

For these interviewees therefore, perceptions of nature and need had little bearing upon their attitude towards GMHT crops. Certainly some were concerned about 'naturalness', while others questioned need, but many more believed that such issues were irrelevant, as the following quotes demonstrate:

'I don't think [naturalness] is really the way in which I would express my arguments [...]. I suppose I've got a natural opposition to people who say things are natural. It seems to be a bit of a cop out really. Maybe this comes about because I'm a sociologist, and anybody who uses the words "It's natural! It's natural!" raises my heckles a little bit.' [Daniel]

'I don't think [need] would be the thing that I would worry about. I don't... I mean I've never had to consider these things before. It's rather like a course in logic or something! I've always assumed that people would... I mean falsely, because of PBCs and... Is, is it PCB or PCT? PCB, and DDT, and, I mean, I can't really... And the Vietnam war and horrible... what it's done to all their own veterans and all sorts of ... like the Gulf War and... Full stop really.' [Alice]

Indeed, Kate, who was highly motivated by her lack of trust in multinational companies and the government made one of the most homocentric comments of all interviewees, which illustrates just how much her outlook differed from that of more stereotypical egalitarians:

'I would like to see the end of all herbicides because they're toxic to human beings. I wouldn't honestly care about the effect on the environment if it was divorcable from the effect in human beings. If somebody told me this herbicide is going to kill all the frogs in the world, but humans are fine from it, I'd be concerned, but I wouldn't be outraged. It's the human aspect of herbicide usage that outrages me.' [Kate]

Whether or not such issues were deemed important however, it was clear that trust and democracy were these interviewees' primary motivations. This is reflected in the key areas of discourse that trusting egalitarians used, as outlined in table 8.4 below.

	Nature	Similarities	Understanding	Consequences	Other Groups
Individualist	Hostile. Struggle to survive.	Like nature. Like other benign technologies.	There is an urgent need for the technology now.	There are benefits for everyone.	Hierarchists too thorough. Egalitarians naïve and dishonest.
Egalitarian	Vulnerable. Work <u>with</u> nature.	Unlike nature. Like other dangerous technologies.	Never 100% so consider needs, ethics and intuition.	Likely to be catastrophic for humans and the environment.	They are both money-oriented and therefore untrustworthy.
Hierarchist	Artificial. Maintain a balance with good management.	Similarities and differences are irrelevant.	Never 100% so select best parameters to test on a case by case basis.	Through good management benefits can be attained.	They are both too dogmatic and unscientific.

Table 8.4. The key areas of discourse utilised by trusting egalitarians (shaded areas).

Reintroducing Holling's 'Nature Engineered' and 'Nature Resilient'

Interviewees who supported the FSEs primarily utilised the discourse of hierarchists. However, they rarely used it exclusively. By analysing the discourse of individuals engaged in the GMHT crop debate it was possible to identify three main groups of hierarchists. Two of these compare favourably with Holling's original myths of nature engineered and nature resilient, while the other consists of individuals who appear to be stereotypical hierarchists. As with the egalitarians, this latter group have been named the *fundamentalist hierarchists*.

When discussing the introduction of GMHT crops, fundamentalist hierarchists generally focused upon the scientific and regulatory procedures that were employed. As outlined in Chapter 7 therefore, these interviewees emphasised the need to be rational during the risk assessment process, asserting that it was important not to be emotional. Indeed, when they were asked anything beyond the bounds of risk assessment, some interviewees became evasive. For example, when Douglas was asked to describe how he would respond to those who stated that GM crops were 'unnatural', he replied:

'By asking for a definition of terms.'

'And how would you define naturalness, with reference to GM crops?'

'I shouldn't fence! You'll appreciate that being a member of [a particular group] puts me in a position of needing to be guarded. Not that I'm wanting to obscure anything or in any way be dishonest, but I don't want to be drawn into saying something careless which will then appear in print and will call what I'm doing into question. Okay?' [Douglas]

Furthermore, when people suggested that the trials were designed for a purpose other than assessing biodiversity, Douglas became extremely irritated:

'I react a little bit negatively to the rather cynical statement that they are just doing these experiments to calm the public down, and when we've calmed them down we'll do what we like. Well that's not the way it works. They're regulations, and regulations are regulations. People have to do what they do. So, I think it's the height of nonsense that people antagonistic to... or rather people who are alarmed about the danger of procedure, all procedure, destroy experiments designed to find out if there is a harm or not. That procedure seems to be illogical to me. Basically that sort of activity seems to me irrational, rather than rational.' [Douglas]

Indeed, Douglas appeared to have such respect for the principles of science and the integrity of scientists, that he responded with indignation when it was stated that 'most campaigners quote the work of Dr. Mae Wan Ho, and say that it's more complicated than you can imagine':

'You mustn't lure me into criticising my colleagues; that's dreadful. However, of course what you say is correct, and that is why we have a regulatory system which examines the construct that is released, that demands molecular data of high precision.' [Douglas]

Other fundamentalist hierarchists however, were far less defensive than Douglas, and appeared to be comfortable discussing the more philosophical and political aspects of the debate. Usually their comments about the other groups were equally positive or negative. For example, Scott stated that there was a commercial angle that made the companies push the technology, while the Soil Association had a spiritual dimension that made them difficult to reason with; Joe stated that some of Greenpeace's publications were good, but these were not the arguments that they used in public, while some of the companies visions were good, but unfortunately they had arrogant marketing people; while Jim proposed that much of the problem was to do with the individualists' and egalitarians' inability to listen to each other, as he stated when presented with a 'magic wand':

'I'd like to see the protagonists and the antagonists stepping down from their positions a little bit and trying to see the other guy's point of view. I do get the impression that some people have taken up stances and said, "This is our position, and that isn't correct."' [Jim]

Fundamentalist hierarchists therefore seemed to try to balance the opinions of individualists and egalitarians. Furthermore, they tried to separate their own political opinions from their scientific work (see pages 177-8), and encouraged others to do the same by limiting discussions to scientific issues. For example, when Jim stated that he was organising a public event at a forthcoming conference, he explained that the discussion would be limited to plant breeding. Similarly, Joe described how he had brought a number of disparate groups together, but only to discuss the risk assessment process. Fundamentalist hierarchists thus focused upon their areas of expertise, and excluded those issues that they could not assess scientifically.

As described in Chapter 7, stereotypical hierarchists believed in taking a case-by-case approach to the risk assessment process. This, they asserted, showed that crop biotechnology promised both great opportunities and potential dangers, which made it difficult for them to state whether GM crops were inherently good or bad. Indeed, Ian stated that he found it impossible to have a fixed opinion about GM crops, while Gordon declared that he had no preference regarding their future:

'Because I'm working as a scientist, I find it difficult to have a formed opinion about whether the whole thing is good or bad in a simplistic way. It's... It's hard... difficult really, there are so many different sides to it that it's really hard to come up with a formed opinion about GM. [...] I don't really have a negative view of it. And I don't really have a positive view of it, as such. [Ian]

'I actually don't give a damn whether GM crops exist or not.' [Gordon]

These interviewees also had no fixed opinions about the future of agriculture. For example, Ian had 'no idea', and thought that organic farming was 'a good thing and a bad thing', while Joe described his ideal future agriculture with reference to both the individualistic and egalitarian outlooks. However, Joe also stated that this was difficult to achieve, because it was all 'too bound up in politics'.

For Sarah, politics and ethics were central to her analysis of GM crops. This was because she was trained as a social scientist, and was therefore trying to find a middle ground between the viewpoints of egalitarianism and individualism, without purely focusing upon scientific issues. Indeed, as Sarah discussed the issue of GMHT crops, it was striking how she utilised the discourse of each type. For example, by using hierarchical discourse, she described how 'naturalness' was not the key argument, and stated that the environment needs humans in order to manage it. Her ideal agriculture was therefore one that would encourage people to work intelligently with nature, as she explained:

'One of the things that I find absolutely fascinating and really inspiring is where you have a really good match of human intelligence and natural resources [...]. The most beautiful thing [is] human intelligence working with exquisite laws of nature, exquisitely intelligent laws of nature [...]. All these brilliant scientists can tell you about that and it's absolutely awe-inspiring what they can tell you.' [Sarah]

As a result of her hierarchical outlook, Sarah had a lot of respect for scientists and stated that she trusted their judgement and believed that they had a great deal of integrity. However, she also expressed herself using the discourse of an egalitarian. For example, in response to Bill McKibben's quote, Sarah stated that it was 'resonant of us bugging up the environment for our own benefit'. Furthermore, she believed that the introduction of GM crops bore a strong resemblance to the Green Revolution, and thus suspected that there could be unforeseen consequences. This, Sarah declared, was 'the doom-laden and unscientific answer', which, nonetheless, was 'historically right'.

Nevertheless, Sarah also used the discourse of an individualist, stating that GM crops were perhaps no different to other crops, and that they were likely to be safe because 'lots and lots of people have been eating GM food for a quite a long time in America.' Furthermore, she suggested that the precautionary principle hindered human curiosity and thus development:

'Perhaps if we'd all had the Precautionary Principle, we wouldn't have any buildings, we wouldn't have aeroplanes, we wouldn't have ships, or commerce, or IT, because we'd all have stayed at home and sown our own plot! Which is the extreme version of my nice ideal view of people just eating food that's grown locally. It's not as simple as that. People are curious and they will find ways of doing things.' [Sarah]

Although utilising the discourse of an individualist, this quote also demonstrates that Sarah still related to the egalitarian ideal. She thus jumped from each of the ideal types, which occasionally made her seem fatalistic. For example, when asked whether people could ever understand the implications of growing GMHT crops, Sarah first responded as a hierarchist, then as an egalitarian and then stated that perhaps she did not want to prevent the introduction of GM crops because there was 'something inevitable about it':

'I think there are going to be some things that we simply won't know for decades... All we can do is measure what we can measure, can't we? And in a way it's... Although, as I said, I have nervousness on the basis of history, that every time man has said 'ah, yes, this is the answer, now we won't have any more problems', our solution to the problem always brings it's own problems. So in 50 years time we probably will find, if GM is the way that farming goes, then there will be some serious consequences that you can't anticipate. And if that argument of mine isn't enough to stop it... And I don't even know if I'd want it to stop it, if you see what I mean. There's something inevitable about it, isn't there? I mean inevitable about

the way human beings deal with the world in which they live. So I'm one of those awful people who say, "Well, okay, go ahead, but for God's sake be careful!"
[Sarah]

However, because Sarah was engaged in the GM debate, it is not possible for her to be a fatalist. It is also unlikely that she was a hermit, since she was trying to find a way forward for those engaged in the debate, and was constructing a position for her own organisation. Indeed, when describing her conclusions, which involved encouraging 'ethical GM crops', Sarah stated that perhaps she had 'got the balance right' because she had managed to upset people on both sides of the debate:

'I've had a bit of feedback, and most people are disappointed! Either because they're very much in favour of GM and they think it's very restricted. Or if they're against they think that it's a fudge, because we haven't said categorically "no!"'

'So that's pretty much everybody then!'

'Yes! But that's standard. It means we might have got it right! Or got the balance right.' [Sarah]

'I think if you get too enthusiastic about either side you stop looking in sensible places for the solution.' [Sarah]

It therefore seems that Sarah was a hierarchist who was identifying the middle ground by discussing the issues with various groups. Indeed, such were Sarah's hierarchical tendencies, that she decided to trust plant scientists, rather than her own instincts, because she ultimately believed that these people were better qualified to judge safety than anyone else. Her loyalty therefore appeared to be with other hierarchists, regardless of their discipline.

Although Neil was trained in plant science and was involved in the regulation of GM crops, like Sarah he also took time to consider the more extreme outlooks, including their political views. Indeed, unlike other physical scientists, Neil stated that this was what he enjoyed about the issue:

'The powerful mix of science and politics is rather a key issue in the biotechnology debate. Everyone sees that it's placed between the way science makes discoveries, and the politics of how we use them. It's really quite fascinating!' [Neil]

By involving himself with both extremes of the debate, Neil hoped that he would be able to encourage the development of crops that would satisfy the aims of both egalitarians and individualists. As described on pages 171-2, he therefore described crops that would benefit the environment, but that would also enable companies to make a return on their investment. Indeed, as Neil described his outlook, he spoke positively about most groups engaged in the debate, stating that environmentalists had reason to be concerned, government ministries now had 'really good people' who made him feel 'really optimistic', and company employees were, to his 'surprise' 'human beings who also care about biodiversity'.

The fact that this 'surprised' Neil however, suggests that he was slightly more egalitarian than his fundamentalist colleagues. Indeed, unlike fundamentalist hierarchists, who reserved their judgement until after the results of the trials were announced, Neil appeared to be certain that GMHT crops would have a negative impact upon biodiversity. Furthermore, he felt that other aspects of GMHT crops had yet to be considered, and stated that this was particularly the case with regard to their socio-economic impacts. Rather than reject the technology however, Neil attempted to rectify these problems, partly by being involved in the FSEs, but also by encouraging companies to take a different approach to business, as he explained:

'Do we really want strategies and policies to be determined by commerce, or do we want them to be determined through the democratic system, of which commerce is a part, but only a part, it shouldn't be running the show. A lot of the companies don't have the expertise, they don't have the aims and objectives to be able to make the kind of decisions which they are pretending that they have the right to make. That is a serious issue. I've been involved in fairly heavyweight conferences that are trying to deal with the tension between the WTO and other conventions, and deal with the effects of global capitalism on poverty, which is another very, very serious issue [...]. The inability of politicians to solve those questions, the inability of world trade to solve those questions, is something that people are concerned about. Those are all legitimate concerns, we're very aware of them. [We] are operating in that whole context, and for us to be effective we have to know about all these things, and we try to keep up to date if we can, so that we can start thinking about the impact of decisions that are made.' [Neil]

Indeed, it seems that many hierarchical interviewees sympathised with Neil's outlook. For example, John, Pete, Edward, Richard, Ben and Matt all described potentially negative aspects of GMHT crops, either with regard to their impact upon biodiversity or Monsanto's patent on glyphosate. They also described how they would like to see more organic agriculture

(although not exclusively so), and stated that they would like agriculture to have a 'better harmonisation with the land'. Furthermore, some of these interviewees declared that they were vegetarians, while many others described how they considered themselves to be 'green'. At times these interviewees even appeared to have ethical concerns about genetic engineering. For example, Matt stated that although he had been one of the first to genetically engineer oilseed rape, he had rejected work that involved the use of animal genes in plants, because he felt that it was 'going too far'. In many ways therefore, these interviewees proved to have strong egalitarian tendencies, as the following quotes demonstrate:

'I think perhaps people should be more concerned about the coke bottles, or the concrete, or the motorways. I think the destruction of nature has been extensive through the century and GMOs have negligible impact on it, so far, they may have more in the future, they may not. But I think the problem is not the GMO, the problem is the human race, the biggest plague that's ever affected this planet.'

[Henry]

'Certainly one of the biggest, the biggest factor on the global ecosystem is the effect of man and his activities. But I put it to you, all these people that... If you want to know what's causing real damage to the environment, just nip down to any road and count the number of cars that go past. Now how many of those have only got one person in them? And how much of the world's resources were used to form those cars, to run those cars, to get rid of those cars? Or computers, redundant computers. Or, whatever you want.' [Matt]

Unlike egalitarians however, these interviewees were not worried about the science behind GM crops. Rather, they were worried about the fact that these crops had been engineered to resist broad-spectrum herbicides, and/or that they were controlled by individualists. Indeed, the politics behind GM crops had caused Pete considerable concern, but because of his work as an 'objective scientist', he had learned to leave these worries at home, as he described:

'You could end up basically with a couple of massive companies controlling the world's food supply. I mean they deny this, but that sort of thing does disturb me a bit, being a bit of a closet communist! Some of these arguments they come up with, about how it can really help the Third World, I don't really buy that. I mean what are these people in it for? Are they in it to be altruistic? Of course they're bloody not. They're in it to make money... I hadn't really thought about that in our discussion. Within our country, fair enough, but if you talk about Monsanto

controlling Africa's food supply for God's sake, that's pretty scary. [...] So yes, yes, the whole thing is a worry, and I don't... I suppose I've kind of put it to the back of my mind, just for my day to day work on this kind of project.' [Pete]

Like Pete, John also stated that businesses had 'a stranglehold' over the agricultural industry, and that scientists felt the need to separate this from their work. Indeed, Henry proclaimed that GM campaigners would do better to 'smash capitalism', since he believed that this was the real cause of the world's problems:

'One of the main problems, if you're looking at the developing world, or the West for that matter, it's capitalism. Capitalism is incredibly exploitative and destructive, and you can't really have a nice, friendly, loving, equitable society if you're going to have capitalism. I mean we'd need a sort of globalisation of neo liberalism. What we see now is probably led by the United States and everyone else goes along with it. It's just destroying a large section of the world. I think arguments about GM or not GM are pretty irrelevant when you're faced with those kind of challenges. I mean these activists should be going out trying to smash capitalism, rather than going for GM crops.' [Henry]

However, despite sharing egalitarian concerns, these interviewees were not always sympathetic towards egalitarian organisations. For example, despite Henry's obvious concern for the future of the environment, his hatred of capitalism, and his previous support of Greenpeace, he now felt unable to defend this organisation. This was because Henry believed that he had detected Greenpeace's 'lies' within the area of biotechnology, which made him question whether he had been sensible to believe them in the past:

'Unfortunately a lot of organisations like Greenpeace, for which I've always had a lot of respect in the past, have been using highly emotive language, and they've also been telling lies. It makes me think that I should have doubted them in the past, and ought to have been going out and killing whales. Actually no, I don't think that, but they have been very deceitful on occasions. [...] They had a tremendous publicity stunt saying a ship was coming from the United States to Columbia with GMO soya on it, and that this had been brought illegally into the country, and this went around the world. A couple of weeks later they were forced to publish a retraction of this in local papers, just one paragraph, saying that it was a completely made-up story, but they got their publicity.' [Henry]

	Nature	Similarities	Understanding	Consequences	Other Groups
Individualist	Hostile. Struggle to survive.	Like nature. Like other benign technologies.	There is an urgent need for the technology now.	There are benefits for everyone.	Hierarchists too thorough. Egalitarians naïve and dishonest.
Egalitarian	Vulnerable. Work <u>with</u> nature.	Unlike nature. Like other dangerous technologies.	Never 100% so consider needs, ethics and intuition.	Likely to be catastrophic for humans and the environment.	They are both money-oriented and therefore untrustworthy.
Hierarchist	Artificial. Maintain a balance with good management.	Similarities and differences are irrelevant.	Never 100% so select best parameters to test on a case by case basis.	Through good management benefits can be attained.	They are both too dogmatic and unscientific.

Table 8.5. The key areas of discourse utilised by egalitarian hierarchists (shaded areas).

Like Henry, Terry also stated that he had once been a ‘great supporter’ of Greenpeace, and that he was a ‘rainbow warrior in [his] own way’

‘They spend their lives pushing out rubbish. Most of this is garbage (holding up a Greenpeace booklet). This is Greenpeace’s thing they produced in defence of Peter Melchett, and I know all the people involved in this, and I know their motives. It’s not science, it’s not to do with risk [...] it’s to do with a worldview and getting members, and getting people to subscribe, and go to Seattle and demonstrate, and big business, Americans... Almost everything you can think of that any disaffected individual might take against is there at the beginning of the GM debate. [...] I think a lot of you people within the social sciences have been wrong. I’ve found it very difficult to take on the chin all this stuff about how the process has not been inclusive or transparent and stuff, because that’s just absolutely wrong. There simply were never smoke-filled rooms in which people made secret decisions [...]. What has been underplayed has been the power of the opinion-formers, the media, the Greenpeaces, the Friends of the Earths...’ [Terry]

As a result of the GM debate therefore, Terry appeared to have shifted his sympathies away from the egalitarian cause towards that of the individualists. Indeed, just as some hierarchists utilised egalitarian discourse, a similar proportion utilised that of the individualists. For example, when these interviewees discussed the regulations and science, which they

supported, they also stated that the approach had perhaps been over-cautious. Indeed, most of the discourse presented in Chapter 5 appears to belong to these more *individualistic hierarchists*, since no interviewee predominantly utilised the discourse of the individualist. Individualistic hierarchists thus appeared to be motivated by the individualistic ideal of bettering the chances of human survival, but nonetheless, much of their discourse was hierarchical, emphasising the need to follow rigorous scientific procedures, as illustrated in figure 8.6 below.

	Nature	Similarities	Understanding	Consequences	Other Groups
Individualist	Hostile. Struggle to survive.	Like nature. Like other benign technologies.	There is an urgent need for the technology now.	There are benefits for everyone.	Hierarchists too thorough. Egalitarians naïve and dishonest.
Egalitarian	Vulnerable. Work <u>with</u> nature.	Unlike nature. Like other dangerous technologies.	Never 100% so consider needs, ethics and intuition.	Likely to be catastrophic for humans and the environment.	They are both money-oriented and therefore untrustworthy.
Hierarchist	Artificial. Maintain a balance with good management.	Similarities and differences are irrelevant.	Never 100% so select best parameters to test on a case by case basis.	Through good management benefits can be attained.	They are both too dogmatic and unscientific.

Table 8.6. The key areas of discourse utilised by individualistic hierarchists (shaded areas).

Although individualistic hierarchists shared many of the individualists' ideals, when it came to science, they believed that testing should be undertaken independently. For example, although Paul stated that companies produced better science (see page 114), he explained that this was only because they had more money. Indeed, at another point during his interview, Paul stated that although companies had the funding, it would not be sensible to trust their results:

'You can pay scientists to do something and they'll do it, and they'll produce the result that you want, which is a very valid criticism of a lot of work. Monsanto are doing this sort of thing. A lot of the companies are doing this sort of thing. They want results, so scientists will work extremely hard to get them [...] which in a way is perhaps why government funding may be better, because it's a democratic thrust behind the human being.' [Paul]

In his search for a PhD studentship therefore, Paul wished to avoid being funded by private corporations. Likewise, Alma, who had described nature in an extremely individualistic way and had defended people's need to make money, nonetheless stated that she would prefer it if people took more time to develop the technology:

'It was so difficult working in GM, because it was almost as if people were running before they were walking. We were trying to do all the risk assessment to see what the possibilities were, what the risks were, but it was almost as if we were being left behind by people who wanted to just go into large-scale production now. It was quite frustrating. I think we shouldn't run before we can walk, I think we have to take our time because I think its such a superb technology that it would be a shame to get it wrong in the early days when it has so much to offer. I'd rather see people be more cautious and taking the public along with them, rather than saying this is better, you're having it.' [Alma]

Regardless of whether interviewees were stereotypical hierarchists, had egalitarian tendencies, or perhaps individualistic ones however, it is clear that they had been primarily motivated by science throughout their lives. For Pete therefore, a key motivation for being involved in the FSEs, despite his egalitarian concerns, was the fact that he would be able to publish in a good journal. Similarly, Jim, who had more individualistic tendencies, appeared to be most excited about the fact that he was working on a large multi-disciplinary project that would be highly scrutinised, while Matt interjected at the end of his interview, to say that what was most important to him was the fundamental science:

'I would like to say, if you don't mind, just before anything else, that scientists like myself, who do work in GM technology, we're not just working on producing GM crops. A lot of the GM work we do these days is based on trying to understand the fundamental processes in plants. And a lot of the GM plants that I produce will never get out of the vat because we're looking at what goes on in there. We can apply the principles that we learn to a whole range of other circumstances. So the GM debate is not about fields of oilseed rape, it's about a lot of fundamental science to which GM technology has offered a great vista for improving our knowledge. I just wanted to make that point at the end because it's where I stand on this.' [Matt]

A strong interest in science also appeared to be the primary reason for farmers being involved in the FSEs. For example, Chris explained that he was trained in science at university and felt that he should help the scientists undertake their work, while Morris stated that his interest in science had encouraged him to be involved in farm trials before:

'Well I'm a scientist, and I believe in experimentation. You can't get results without it. And that's basically it, I thought, well, you know, anything to help.' [Chris]

'I've helped do several trials up here in the past. It's one of the reasons why I'm more prepared to do a GM trial, because I've always been interested in research, being involved on the outskirts admittedly.' [Morris]

Fred was perhaps most loyal to the hierarchical outlook however, since he was extremely supportive of scientists and the government, as the following quotes illustrate:

'The scientists say, and I can't put it any more strongly than that, because I don't know anything about it, that the sugar beet pollen won't go that far. I wouldn't know whether that was true or not, that is what Brooms Barn are saying. And they are meant to be independent.' [Fred]

'The government as a whole are very keen that these experiments continue, because until they can find out by scientific experimentation whether GM crops are doing any harm or not, one cannot make a rational judgement as to whether or not they ought to be grown. Anyhow, between them and the scientists, who are supposedly independent, there is a group who are in control of the scientists, telling them what they ought to be testing for, and overseeing their results. [These] acknowledged experts in their own fields, are wanting these trials to take place. Who of the general public are competent to say they know better than the representatives of these bodies, who are so committed to researching their own particular subjects? [...] I think that is a valid reason for any farmer doing it.' [Fred]

As Fred explained, these interviewees did not have a strong understanding of the science behind GMHT crops. Nevertheless, they felt that they could support the trials because they trusted those who were conducting them. Again therefore, it seems that some individuals were engaged in the debate because they trusted a particular group, and in this instance it was the hierarchists.

With regard to the egalitarian hierarchists and the individualistic hierarchists, it is interesting that Holling's (1986) myths of nature actually consist of two versions of the hierarchist's myth (as described on pages 41-2). The first is nature engineered, which depicts a world within which individuals think that they have enough knowledge to intervene, and the second is nature resilient, where it is thought that humans have insufficient knowledge. It therefore seems sensible to conclude that Holling's nature engineered illustrates the outlook of egalitarian hierarchists, while nature resilient illustrates that of the individualistic hierarchists. Such subtle differences appear to have been lost in cultural theory's nature perverse/tolerant, which has caused some confusion in the past (as described on page 60).

Where are all the Individualists?

It is possible that even the most ardent supporters of GMHT crops used predominantly hierarchical discourse because they were all highly qualified scientists. For example, Martin, Alma, Philip and Jim all had PhDs in the plant sciences. This is perhaps typical of the biotechnology industry, which requires the majority of its employees to be scientifically literate. However, of all the interviewees, only Martin had spent the majority of his career working for a large corporation, and it was perhaps because of this that his discourse was the most individualistic. This suggests that if more company employees with fewer scientific credentials had been interviewed, more extreme individualistic discourse might have been witnessed. However, many industry representatives failed to reply to letters requesting interviews, while others were apparently too busy. Just as egalitarian interviewees explained, there appeared to be an unwillingness within industry to respond to public requests for information (as outlined on page 146).

It is also possible that very little individualistic discourse was encountered because the focus of this research was upon nature and the environmental impact of GM crops. To be interested in perceptions of nature, rather than the potential for feeding the world or boosting the economy, may have carried egalitarian undertones that encouraged individuals either to ignore the letter requesting an interview or to conceal their more individualistic tendencies. This would have been particularly the case if they had heard the rumours that I was an under-cover environmentalist. However, it appears that these rumours did not spread until some months after the letters had been sent, and apparently only Colin had heard about my 'true identity' prior to being interviewed. It is more likely therefore, that the more extreme individualists either evaded being interviewed as a matter of course, or wished to conceal their individualism because the research seemed to focus upon egalitarian concerns.

Even if more interviews had been secured with industry representatives however, it is not certain that these individuals would have used more individualistic discourse. Indeed, a number of interviewees suggested that the more extreme individualistic views were held in the US. For example, Henry stated that 'exploitative' and 'destructive' capitalism is 'probably led by the United States' (see page 200), Pete stated that North Americans are less concerned about biodiversity impacts, while Neil described how different American culture is, where risk is taken less seriously:

'I went to [a talk] at the American Embassy about six months ago; some chap from Ohio University [...]. It was just so biased [...]. They didn't seem to understand our concerns. Particularly Americans, because I don't really think they perceive farmland as an important habitat. They're alright because they've got plenty of wilderness, it's a write-off to them. It's like, who cares? Here, we don't have any wilderness [...]. They just didn't appreciate our standpoint at all.' [Pete]

'They have to realise, if they're American, that they're operating in a different culture, different geography, different country, and they've got to accept it. [...] The only thing we have in common is the language. The national mindset is very different. They must understand where we're coming from and not simply say that Europeans are Luddite and conservative people. We're not. We invented biotechnology after all. We embrace change as quickly if not more quickly than Americans in many areas. But there are some areas where we take the risks more seriously. So we're not prepared to go riding off into the sunset, not knowing quite what's over the horizon. We do have that element of caution.' [Neil]

That Americans might use more individualistic discourse is further supported by my visit to the US in 1998. Here a Monsanto employee explained that it was important to feed the Third World, 'because if we fail to do so, the starving masses will flood to America to claim a better life at the expense of the American taxpayer', while others asserted that if Britain continued to reject GM crops it would become 'the next Third World country' where the farming landscape would be 'like a museum'. Such comments were more extreme than any witnessed in the UK. Indeed, the most individualistic people interviewed for this research stated that their views were considered to be typically American. For example, Colin declared that 'people accuse me of being American in my view', while Martin asserted that Dennis Avery, Director of America's Center for Global Food Issues of the Hudson Institute (a right-wing think tank) and author of 'Saving the Planet with Pesticides and Plastics' (1995), 'shows the way forward.'

Even within the US however, Ellis and Thompson (1997) found it difficult to differentiate between individualistic and hierarchical attitudes (see page 60). This suggests that whether or not Americans utilised more individualistic discourse within the GM crop debate, they would also have used the discourse of hierarchists. Of course, this does not mean that fundamentalist individualists could not exist, but it does indicate that there has been a long-standing alliance between individualists and hierarchists. Certainly this appears to be the perception of more egalitarian interviewees, and of interviewees with hierarchical tendencies who wished to free themselves from the control of private corporations. Furthermore, it was striking how interviewees with more individualistic tendencies were careful not to criticise hierarchists. The absence of fundamentalist individualists therefore has a number of possible explanations, including the fact that this is a science-based industry, that the research questions might have appeared egalitarian, that the more extreme individualistic views are held in the US, and that the mix of hierarchical and individualistic discourse is indicative of a long-standing alliance.

Fatalistic Tendencies

Although cultural theory asserts that only the three active types participate in debates, it was also possible to detect discourse that bore a strong resemblance to that of the fatalist. Although the use of fatalistic discourse was rare, Ian, Matt and Ben each displayed fatalistic tendencies on at least one occasion during their interviews. For example, Ben, who was an ecologist involved in the FSEs, stated that it was perhaps not worth worrying about the intrinsic risks of GM crops because pollen flow was now unstoppable:

'Of course there are risks, but in a way, it's probably too late to worry about them, because the United States have been growing GM crops for many years now. 80% of maize I believe is GM in the States. That's an awful lot. So, any risks from growing stuff like that will occur if they are genuine, because, it's now unstoppable.' [Ben]

Matt's fatalism meanwhile, appeared to dwell within the fact that he felt unable to realise his egalitarian ideal:

'We live in a technological world where technological evolutions occur all the time. It would be nice to get out of that, I should imagine, but this is the way that we live. We are very much technology-driven. And, yes, lots of this technology I don't particularly approve of as well. But its very difficult to, be, a small voice against what else is going on isn't it?' [Matt]

But perhaps the most fatalistic interviewee was Ian, who worked as a plant scientist:

'The control of the technology by multinationals and all that sort of business is a bit worrying, and that's one of the things that I do find a bit... I think it's inevitable, everything seems to go that way.' [Ian]

'I think there will be inevitable errors long the line, but I do think that the whole thing has just been turned into a media circus. It's just complete nonsense half the time really, it just really is. It has gone beyond a joke, as far as I can tell. I mean I don't really care anymore.' [Ian]

'It was only by chance that this project came along and I thought, "That sounds like quite a laugh!" So three years down the line that's where I am at. I can see myself changing again and doing something different after this.' [Ian]

'I think it's great that people can't stand GM technology. I think, go for it! But at the end of the day they are wasting their energy and things, really [...] because by the looks of it, it's going to happen anyway. I mean they can delay things and what have you. But at the end of the day, sooner or later...' [Ian]

'I was at a meeting the other day and somebody said "Oh [it's terrible how campaigners destroy trials]", and I said, "If it wasn't for them we wouldn't be doing any of this work!" So I'm quite happy for them to keep destroying trials, and going, "Oh we need more information on this, and we need this and that", and for the government to go, "Oh yes, let's sponsor some more work on that." So it's all a good thing, really!' [Ian]

What is particularly interesting about Ian and Ben, is that their involvement in the GMHT crop debate was by chance, rather than by design. This, it seemed, was why they appeared to care less about the introduction of GMHT crops, and why they made fatalistic comments. On the whole however, interviewees rarely utilised fatalistic discourse, which supports cultural theory's assertion that fatalists do not actively participate in debates. Nevertheless, it is important to consider such discourse when deliberating how best to model the discourse of cultural theory's ideal types.

Summary

By attending to the discourse of individuals, this chapter has demonstrated that there appear to be a number of sub-groups within cultural theory's ideal types. These sub-groups generally consist of what have been termed 'fundamentalist' positions and positions that are situated somewhere between hierarchy and either individualism or egalitarianism. Within the egalitarian group fundamentalist egalitarians, hierarchical egalitarians, and individuals who had moved to egalitarianism due to trust were identified. Similarly, within the hierarchical group, fundamentalist hierarchists, egalitarian hierarchists, and some who combined the discourse of individualism and hierarchy were identified. Furthermore, some individuals appeared to support the hierarchists' position because of trust. While it was apparent that none of the interviewees utilised predominantly individualistic discourse, a small number showed fatalistic tendencies. When presenting the discourse of particular individuals, it was clear that grid-group discourse and myths of nature discourse did correspond as cultural theorists assert. However, in the case of some individuals, such as Megan and Pete, it seemed that one of these aspects was more important, and perhaps more extreme, than the other.

In the following chapter each of cultural theory's models are examined to determine the best way to illustrate these patterns of discourse.

Modelling the Discourse of Individuals

Introduction

This chapter considers the relative merits of each of cultural theory's models (outlined in chapter 3) for presenting the discourse of individuals. The key trends that were identified in the previous four chapters, and that would need to be illustrated by a model, are first considered. Each model is then discussed with reference to the discourse of particular interviewees. Whether the models might benefit from minor adaptations, or whether it would be better to develop an entirely new model is also considered. Having favoured a particular model, the chapter concludes by considering whether this has any implications for seeking greater inclusiveness in decision-making.

Key Trends

Having presented the discourse of egalitarians and individualists, it was clear that these two discourses were mirror images of each other, as Marris, Langford and O'Riordan (1996) and Ellis and Thompson (1997) also identified (see page 57). For individualists, nature was a dangerous place, where humans had to struggle to survive, and where new interventions were constantly required. But for egalitarians, nature was a fragile entity, threatened by the devastating effect of humans, and requiring proof that new interventions were both safe and necessary. With regard to GMHT crops, individualists were keen to introduce this technology so that both human health and the environment would benefit, while egalitarians were keen to delay their introduction so that it could be ascertained whether these crops really were safe and necessary. Their discourses were typical of the polarised nature of the GM crop debate, suggesting that a model would need to illustrate these ideal types as two extremes.

When the discourse of hierarchists was presented in chapter 6, it became clear that this lay between the two extremes of egalitarianism and individualism. For example, nature was perceived to be neither fragile nor threatening, but modified so that there were both positive and negative impacts. For hierarchists, the modifications that humans made to the environment were necessary for human survival, but hierarchists only condoned intervening

in nature once the risks and benefits had been adequately assessed. It was for this reason that scientific procedures and regulatory frameworks had been developed. Such procedures were not intended to guarantee the identification of every risk, but to identify the most likely risks within a period of time that would not forsake the perceived benefits. With regard to GMHT crops, hierarchists believed that their approval by various advisory committees showed that the risks to human health and the environment had been adequately assessed, and that the impacts upon biodiversity would be sufficiently understood once the FSE results had been fully analysed. Their position was clearly a midway point between egalitarianism and individualism, which again would have to be illustrated by the model.

When presenting the discourse of hierarchists, it was apparent that some interviewees believed that a few more tests might be beneficial, while others felt that the regulators had perhaps been overly cautious. Furthermore, some hierarchists tried to predict the results of the FSEs before they were complete, stating that GMHT crops would either have positive or negative impacts upon the environment. These differences were discussed in chapter 8, where it was proposed that there were shades of both egalitarianism and hierarchy. Describing how individuals use the discourse of the ideal types, it was stated that most interviewees mixed the discourse of hierarchy with either egalitarianism or individualism. For example, Dean used predominantly egalitarian discourse, but also that of the hierarchist, while Henry utilised hierarchical discourse, but occasionally that of the egalitarian. Indeed, all the interviewees who used individualistic discourse also used that of the hierarchist. When modelling the discourse of cultural theory's ideal types, it was therefore necessary to illustrate these midpoints between the ideal types. Furthermore, it was necessary to show how individuals like Sarah utilised the discourse of all three active types when deciding upon a position, and how individuals like Ian used hierarchical discourse, while still showing strong fatalistic tendencies.

In chapter 8 it was also stated that individuals generally perceived nature and society in a way that corresponded with one of cultural theory's ideal types. For example, if an individual was against GM crops, they usually believed that nature was fragile, that nature was too complex to be understood, and that large multinational corporations should not control the food chain. However, there were also a number of instances when individuals spoke about nature and society in a way that did not match. For example, Megan and Pete perceived the hierarchists' nature perverse/tolerant, but like egalitarians they believed that multinational corporations had too much power. For Megan this led to her rejection of GMHT crops, but Pete decided to support their introduction because of his perception of nature. Such differences are important when trying to understand why individuals reject a particular technology, and it is therefore

essential to distinguish between how individuals perceive nature, society and a particular technology when modelling their discourse.

It was also apparent that a number of interviewees had moved from one type to another. For example, some local campaigners seem to have moved from a more fatalistic position towards egalitarianism, while farmers involved in the FSEs had also moved towards a more active position. Furthermore, Henry and Gordon, who had once been sympathetic towards the aims of Greenpeace, now disassociated themselves from this group, and consequently moved further towards hierarchy. Such movements between groups must also be considered when modelling the discourse of cultural theory's ideal types, as Thompson (1982a) has already acknowledged and attempted to do (see pages 56-58).

The Grid-Group Model

Mary Douglas's original grid-group model shows cultural theory's four ideal types occupying separate corners of a square. The model allows for the fact that individuals can occupy a position between two ideal types, but the way that Douglas has positioned these types makes some combinations difficult and others quite unimaginable. For example, by placing hierarchists between the egalitarians and fatalists, Douglas makes it impossible to represent people who use a combination of hierarchical and individualistic discourse, without placing them within the autonomous zone. Furthermore, the model suggests that it is impossible for fatalists to become egalitarians without first becoming hierarchists, individualists or hermits. This seems to contradict the findings of this research, which show

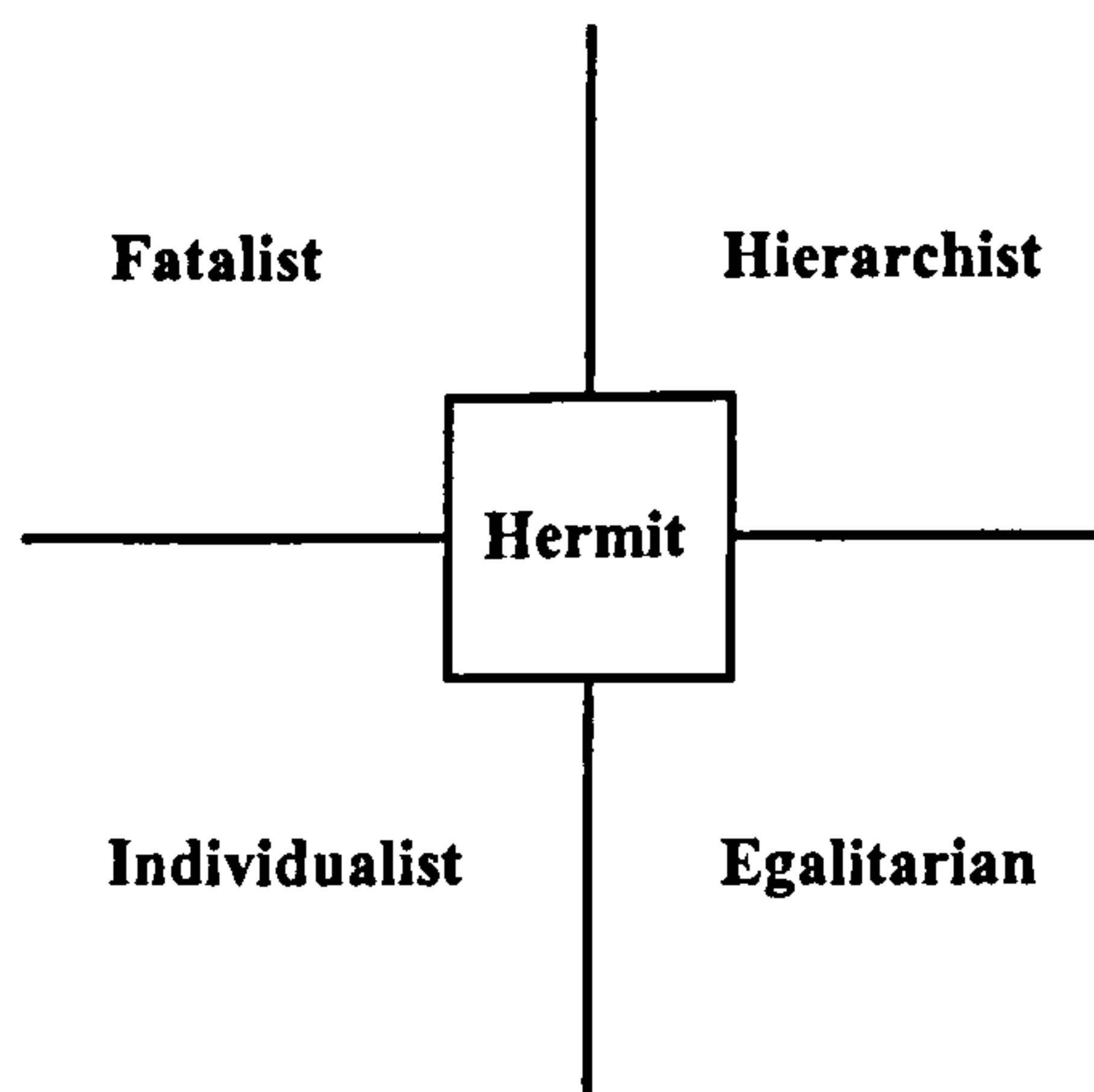


Figure 9.1. The ideal types as presented on the grid-group model.

that interviewees like Alice moved towards egalitarianism from a more fatalistic position. Perhaps the most surprising feature of this model however, is that it places the egalitarians next to the individualists, suggesting that individuals could mix the discourse of these two extreme types without being hierarchists. Within this study individuals only utilised the discourse of both individualists and egalitarians when trying to establish a 'more balanced' hierarchical position (see for example Sarah and Neil), which in itself was quite rare.

Although Douglas's grid-group model does not illustrate the ways in which individuals engaged in the GM crop debate utilised the discourse of the ideal types, this does not diminish the value of the grid-group scheme. As described in chapter 3 (pages 38-39), the grid-group model was devised to show how the variables of grid and group form and maintain different ways of organising. The position of the types within the model therefore shows how individuals belong to different ways of organising, rather than the way their discourses relate to one another. For some cultural theorists, the variables that determine these groups is still a key research interest. For example, Douglas has since reformulated the typology in ways that accent 'the attitude to power and authority' (1997), while Thompson (2002) has stated that he is opposed to the 'uncritical use of the term dimension for grid and group'. It is perhaps because this model is only suited to depicting the ways of organising, rather than individuals' patterns of discourse, that there is disagreement about whether or not individuals can occupy a position somewhere between two types (Thompson, 2002; Perri, 2002).

Thompson's Three-Dimensional Model

While Douglas's grid-group typology is intended to show how the ideal types organise themselves, Thompson's (1982a) three-dimensional model attempts to show how individuals move from one type to another. However, since Thompson has positioned the types in the same way as the grid-group typology, his model shares the same problems described above. Furthermore, Thompson works from the assumption that the ideal types exist on two separate planes of manipulation, with the fatalists and egalitarians on the lower plane, the hierarchists and individualists on the upper plane, and the hermits in the middle. However, the findings of this study indicate that hierarchists set limits to manipulation by balancing the individualists' desire to be highly manipulative against the egalitarians' desire to limit manipulation. A vertical continuum can thus be envisaged, with the individualists at the top, the egalitarians at the bottom and the hierarchists in-between. Furthermore, if one then considers each group's ability to be politically manipulative, all three active types appear to be equally manipulative, while the fatalists fail to manipulate anything or anyone, and the hermits avoid doing so.

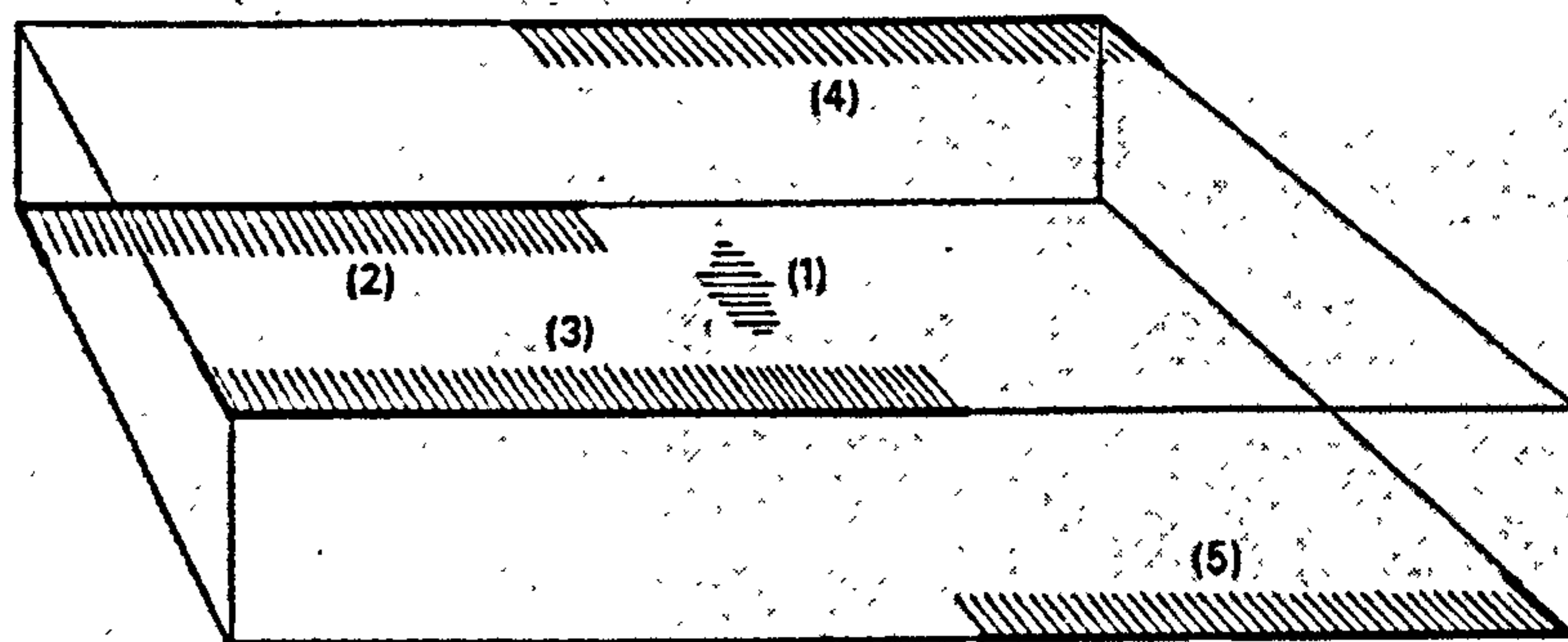


Figure 9.2. Thompson's three-dimensional model, where 1 is the hermit, 2 is the fatalist, 3 is the individualist, 4 is the hierarchist and 5 is the egalitarian.

By working from the assumption that the groups exist on these two planes of manipulation, Thompson (1982a) suggests that egalitarians are far more likely to exchange members with fatalists than they are with hierarchists. However, the results of this research suggest that egalitarians are just as likely to exchange members with hierarchists as they are with fatalists. Furthermore, it suggests that hierarchists are more likely to exchange members with individualists than egalitarians are. But again, the findings of this research indicate that either scenario is just as likely. Indeed, when contemplating the movements portrayed in this model, it appears that most have been represented poorly. Possibly the only exception is the relationship between individualism and the egalitarianism, since these are separated by a steep slope that makes exchanging members extremely difficult.

Adam's 16 Cell Adaptation

The rationale behind Adam's (1995) model is that the myths of nature and the grid-group types do not overlie each other as neatly as cultural theorists predict. Although the majority of interviewees in this research did discuss nature and society as cultural theory predicts, individuals like Megan and Pete used less compatible discourse, as discussed above. However, when considering how to present the discourse of these individuals on Adams's (1995) model, a number of difficulties arise. The first is that both Pete and Megan would be positioned in the same box, indicating that they perceived nature perverse/tolerant and had egalitarian concerns (in the illustration below, this box is occupied by the Friends of the Earth government advisor). By placing these individuals in the same box, it would not be possible to show how Megan had decided to reject the technology, while Pete had decided to accept it. Indeed, although Adams (1995) acknowledges that the myths of nature and grid-group types

may not always correspond, he appears to assume that perceptions of nature are synonymous with perceptions of technology. This is a common problem within cultural theory, where perceptions of nature and technology are so entangled that the individualists' myth is described as 'nature benign', even though it is clear that their perception of technology is benign, and not their myth of nature (see page 88).

	Egalitarian	Fatalist	Hierarchist	Individualist
Ephemeral	Communard Lovelock, Soros	Hell's Angel	bankrupt Lloyds "Name"	bankrupt venture capitalist
Capricious	Ned Ludd, lottery winner	Somalian refugee	BBC weather forecaster	Gambler & lady luck, Lovelock
Perverse/tolerant	Friend of Earth government advisor	Rebel without a cause - James Dean	Ambitious civil servant, Lovelock	Venture capitalist in bear market
Benign	Utopian socialist on Kibbutz	Calvinist, Lovelock, religious martyr	Contented civil servant	Venture capitalist, Soros

Table 9.1. Adams's 16 cell adaptation of the grid-group typology.

Unlike cultural theory's other models, Adams (1995) also does not allow for the fact that individuals often situate themselves between two ideal types. For example, if an individual used the discourse of nature perverse/tolerant and nature ephemeral, it would be necessary to tick two boxes, which would not show the extent to which they used one form of discourse over the other. Indeed, when considering which box to tick, it would be necessary to decide whether nature ephemeral is being utilised in conjunction with egalitarian, hierarchical or individualist discourse. However, this is often not possible. For example, if an individual described how nature had been destroyed, without talking about the social consequences, and then stated that GMHT crops could be introduced safely if science was more independent, which boxes should be ticked? And how informative would those boxes then be?

Ellis and Thompson's Continuum

With the discourse of egalitarianism and individualism as mirror images of each other, and with hierarchy in the centre, a continuum appears to be the most obvious way to portray the discourse of cultural theory's ideal types. This model also lends itself to illustrating the

different shades of each ideal type, as described in the previous chapter and illustrated in figure 9.3 below.

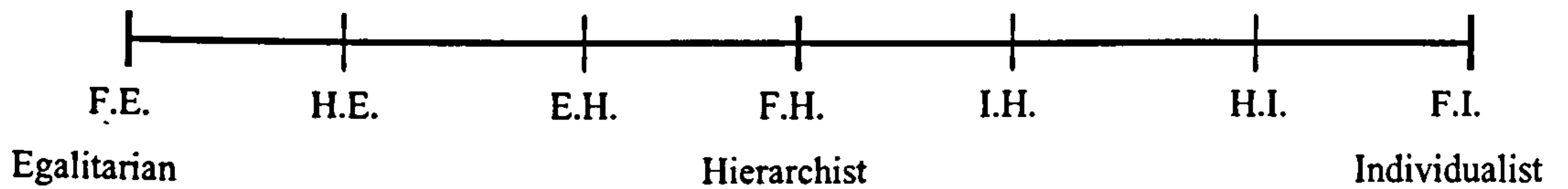
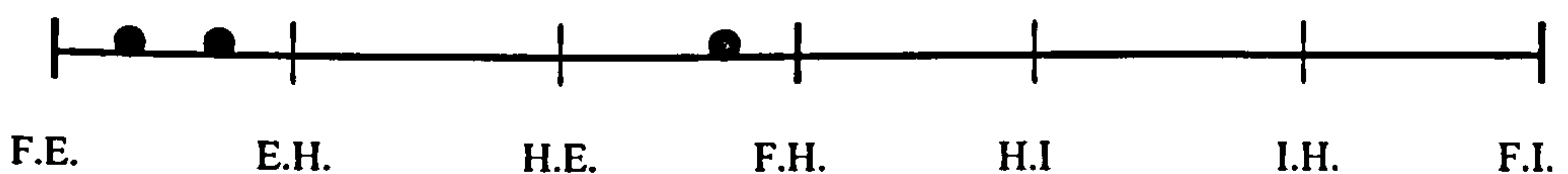


Figure 9.3. Cultural theory's ideal types and sub-groups presented along a continuum.

By presenting the sub-groups along a continuum, it is possible to show how views shift from fundamentalist egalitarianism on the far left, through hierarchical egalitarianism (where individuals use more egalitarian discourse than hierarchical), egalitarian hierarchy (where individuals use more hierarchical discourse than egalitarian), until finally reaching fundamentalist individualism on the far right. It is thus possible for an individual to occupy any position along the continuum, be it an ideal type, a sub-group or somewhere in-between. By using the continuum model, it is also possible to display an individual's perception of nature, society and technology separately. For example, in Figure 9.4 Megan and Pete's perceptions of nature have been illustrated with green circles, society with red circles, and GMHT crops with blue circles. It is thus possible to see whether it was their perception of nature or society that was most closely associated with their view of GMHT crops.

Megan:



Pete:



Figure 9.4. Megan and Pete's perceptions of nature (green), society (red) and GMHT crops (blue) presented along a continuum.

With regard to the discourse of the three active types, the continuum model appears to work well. However, unlike the other models, Ellis and Thompson (1997) do not illustrate where fatalism lies, and thus how individuals move from a more fatalistic position towards the political fray. Furthermore, there is no position for the hermit.

Adaptations and Alternatives

By extending the continuum at either side, it is possible to visualise how fatalists might have moved from either of the two extremes towards a more active position, as demonstrated in figure 9.5. Indeed, it seems that the fatalists' perception of nature as an erratic and changeable place is an extreme version of both the egalitarians' and individualists' perceptions of nature. For example, a venture capitalist might fail in his struggle to survive, so becoming a fatalist destined to cope with an unpredictable world, and a campaigner might tire from trying to save the world from collapse, so becoming a fatalist awaiting the impending doom.

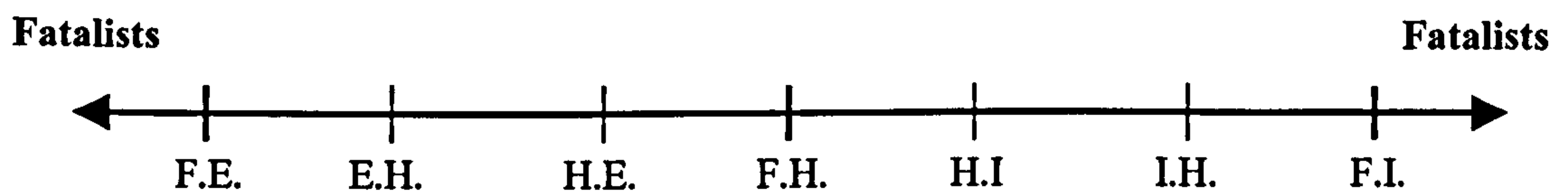


Figure 9.5. The extended continuum, showing how fatalists might join the political fray.

By noting how similar the extreme versions of nature 'benign' and nature ephemeral are to the fatalist's myth of nature capricious, it is possible to then join the two ends of the continuum so that a circle is formed, as demonstrated in figure 9.6 below. By doing so, a position is made for the hermit at the centre of the diagram, just as the grid-group model portrays. From my own experience interviewing individuals engaged in the GM crop debate, it felt very much as if I was surrounded by the debate, and that I was unable to favour any one particular framing of it. Through conscious effort therefore, I seemed to have acquired the mindset of the hermit, and as a result felt as if I was in the centre of a circle, about which the various discourses were placed. As my own life experiences were reflected upon, it seemed that they also fitted this model well. For example, my upbringing seemed to have been predominantly individualistic, and a number of 'surprises' had encouraged me to move towards the centre of the circle, and then to a position at the opposite extreme. The next six years were then spent shifting between egalitarianism and hierarchy, as I studied at university and worked as an environmental activist, although at this stage I was always predominantly egalitarian.

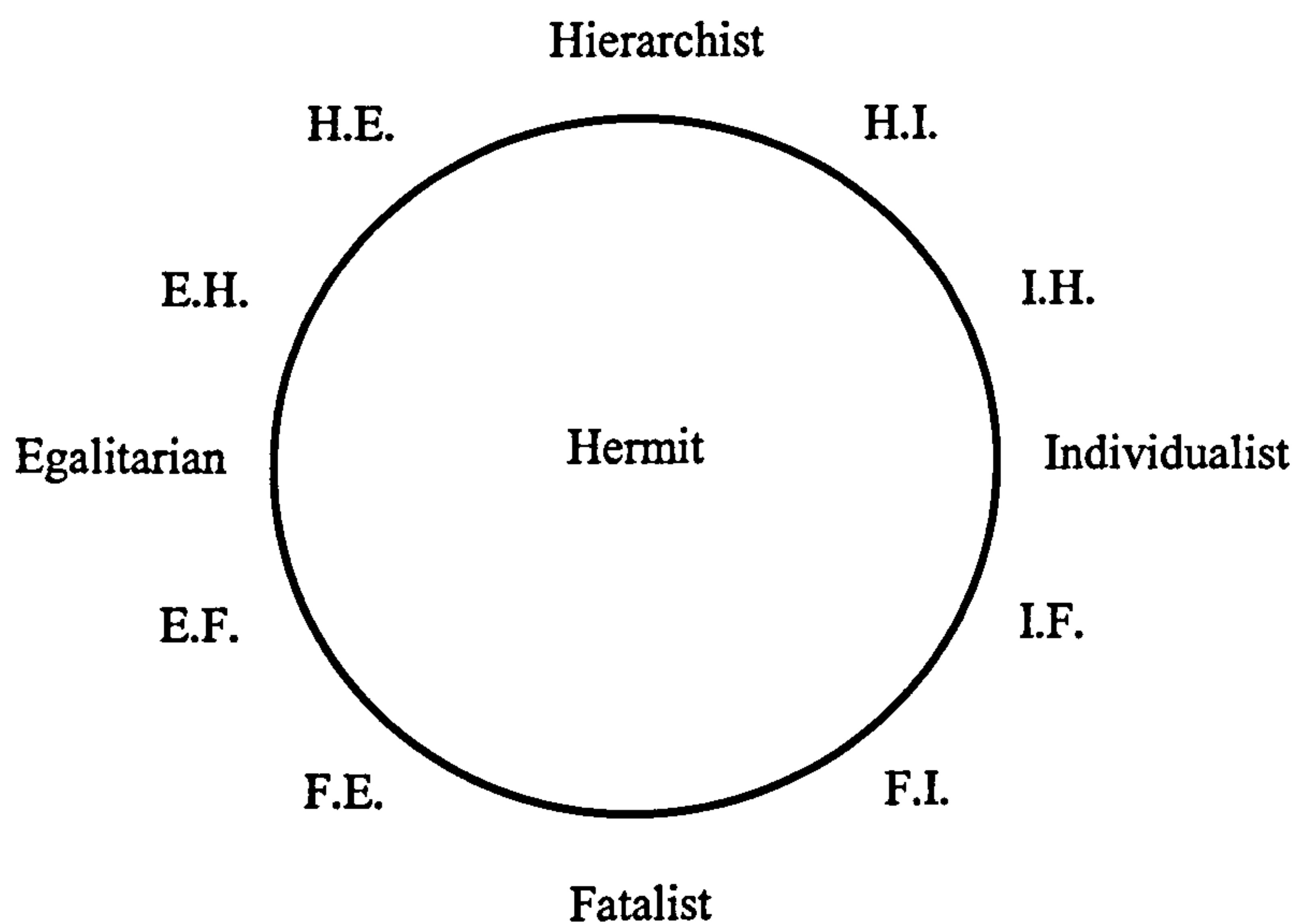


Figure 9.6. Cultural theory's types placed around a circle.

Reflecting upon my involvement in environmental activism after my bachelor's degree, I then remembered how highly committed individuals often became exhausted and withdrew from the campaigning world. For example, some high-profile road protesters went to live in a remote part of France, where they could create an egalitarian lifestyle without having to participate in environmental disputes, while others abandoned egalitarianism altogether so that they could live an easier and more fatalistic lifestyle. Through exhaustion or defeat therefore, individuals moved from egalitarianism towards a more hermitic or fatalistic position. However, others chose to acquire more power by going back to university, which ensured that they moved closer towards hierarchy, while still retaining their egalitarian objectives.

Although the model appears to work well with regard to my own experiences, it is entirely possible that it would not work for others. Indeed, if individuals ever moved between hierarchy and fatalism this model would not work because it would first require them to move through the autonomous zone. For example, Ian was a scientist working with GMHT crops, which encouraged him to use predominantly hierarchical discourse. However, he also showed fatalistic tendencies, which suggested that he either occupied a position between hierarchy and fatalism, or that he was a fatalist who just happened to work within a controversy. In other words, his job as a scientist might be nothing more than a fatalistic 'survival strategy'. Indeed, Ian stated that he took his job 'because it sounded like a laugh', and that he could see himself doing quite different jobs in the future. To know for certain however, would require far more in-depth interviewing.

Since this model does not allow hierarchists and fatalists to exchange members it also has potential limitations therefore. Indeed, after some reflection it seemed that my experience as a hermit in the centre of a circle was nothing more than the initial confusion that is felt when first exploring an issue. As Thompson and Wildavsky (1986: 275) describe, trying ‘to look at all data from all directions [is] like a swivel going around at the speed of light’. Abandoning this adaptation of the continuum, I decided to incorporate the other groups by placing one above the continuum and one below. With the hermits above, it is possible to see that they are floating above the political fray, as Adams (1995) describes, while placing the fatalists below shows that they are unwilling or unable to say or do anything. With enough power and/or motivation therefore, it is possible to see how individuals from either of these two groups could move to any position along the continuum, as illustrated in figure 9.7 below.

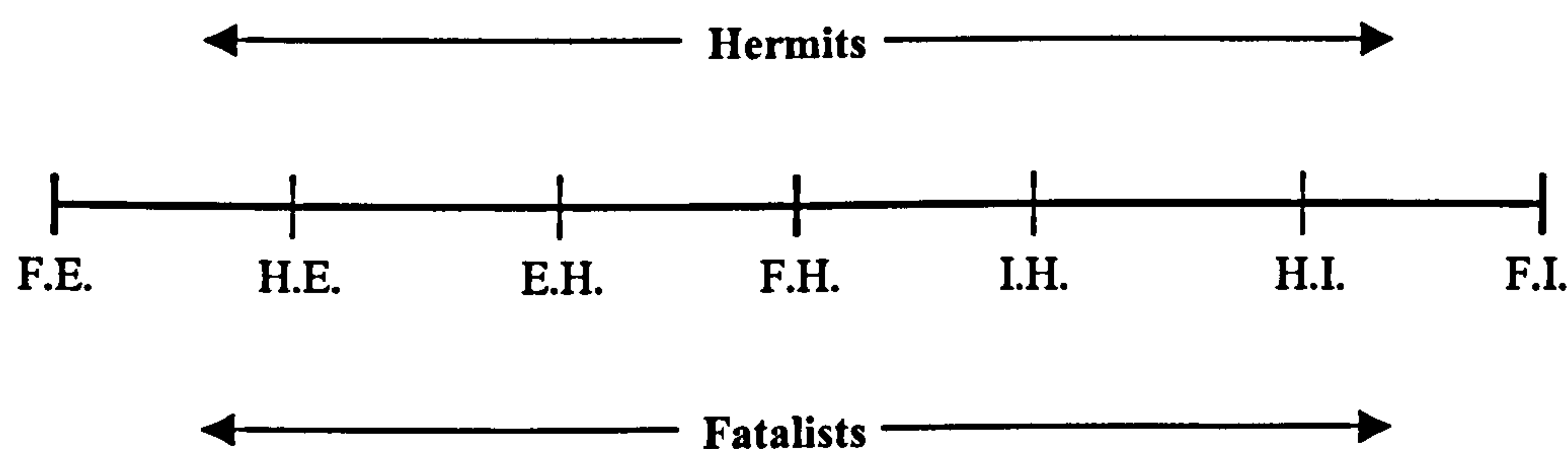


Figure 9.7. Cultural theory’s types presented along a continuum, with the hermits positioned above, and the fatalists positioned below.

By modelling cultural theory’s ideal types in this way, it is possible to see how individuals can occupy a position not only between the three active types, but also between any of the three active types and fatalism or autonomy. For example, it is now possible for an individual to be predominantly fatalistic, but to have a weak association with an ideal type, or for an individual to be strongly affiliated to an ideal type, but to have fatalistic tendencies. Similarly, it is possible for an individual to be predominantly autonomous, but to partially favour one of the ideal types, or to be strongly affiliated to one of the ideal types, but also to be able to rise above the political fray. The combination of types is thus greatly expanded.

Although this model is able to illustrate all the trends that were outlined at the beginning of this chapter, it does have one potential downfall: that it could favour the outlook of hierarchists. By placing the hierarchists at the centre of the model, it could be construed that this is where the answer lies. Indeed, while analysing interview transcripts, I found that my

own position started to reflect that of the hierarchists, although I could still sympathise with the views of others. It is perhaps no coincidence therefore, that I placed the ideal types around a circle when I perceived myself to be a hermit, and upon a continuum when I favoured the hierarchical point of view. When the types are placed in a circle, it is impossible to favour any one viewpoint; but when placed upon a continuum, it is difficult not to conclude that the hierarchist must be right. Whether my point of view has favoured my choice of model, or whether my results favoured the continuum, which then encouraged me to adopt the hierarchical point of view, is difficult to say. However, it is clear that this model risks concluding that their hierarchical viewpoint is the 'correct' viewpoint, which must be considered when deciding how to make institutional arrangements more inclusive.

Summary

The key trends that need to be illustrated on a model include showing egalitarianism and individualism as mirror images of each other, and hierarchy as a middle ground. Furthermore, it is necessary to show that individuals can occupy a position between hierarchy and an extreme type, can use mismatching discourse to talk about nature and society, and can move from one type to another. The strengths and weaknesses of the grid-group typology, Thompson's (1982a) three-dimensional model, Adam's (1995) 16 cell adaptation and Ellis and Thompson's (1997) continuum were described, and it was concluded that none of these models could illustrate all the trends required. It was then explained that the continuum could be extended with fatalism at either end, and that this could then be looped to form a circle. This alternative model seemed to illustrate the relationship between the discourses, but it did not enable hierarchists and fatalists to exchange members without moving through the autonomous zone. Another adaptation of the continuum was therefore favoured, which places the hermits above the three active types and the fatalists below. Although this model can illustrate all the trends listed above, it too has a potential weakness, because it suggests that the hierarchical viewpoint is the 'correct' viewpoint.

How the ideal types were represented in the wider debate, how their concerns were reflected in government discourse and action, and how the debate could be made more inclusive, are discussed in the following chapter.

The Public Debate

Introduction

In chapters 5, 6 and 7, discourse was presented to illustrate how cultural theory's individualist's, hierarchist's and egalitarian's framed the GMHT crop debate within one-to-one interviews. To consider how institutional arrangements might be made more inclusive, this chapter describes how the concerns of each of these types were represented within the wider public debate, and how they were reflected by government discourse and action. The chapter draws upon secondary data sources such as media coverage, conferences, public meetings, press releases, websites and electronic mailing lists, and compares the views presented in these sources with those presented in one-to-one interviews. It concludes by considering how the concerns of each ideal type might be more fully incorporated into the policy arena, and how the continuum model could influence such recommendations.

Representations of the Ideal Types in Public

In chapter 8 it was explained that very few interviewees utilised the discourse of individualists, and those who did also used the discourse of hierarchists. In discussing why this might be so, it was suggested that this research had failed to access the more individualistic participants in the debate. However, when looking at the wider public debate, the individualistic outlook was again a minority view. When individualistic discourse was utilised, it was usually to explain that there would be great benefits for people. For instance, many articles focused upon 'Golden Rice', which Zeneca announced would be delivered 'free-of-charge for humanitarian purposes in the developing world' (Zeneca, 2000). However, environmental benefits also appeared to be of key interest. For example, in 1999 The Express published an article by Richard North, which outlines how environmentalists had been wrong about many issues, and how plant biotechnology was likely to 'look after nature':

'[Biologists] are engaged in making huge benefits for mankind, but doing so in a way which is deliberately clever at looking after nature. More productive farmland means less need to convert wilderness. Insect resistant plants mean more, not fewer,

insects, and less chemical use to control them. (The plant repels but doesn't kill bugs). A good chunk of the tropical world's harvests gets wasted through rot: plants can be engineered to stay firmer longer. Mud-hut villagers visiting the market once a week will welcome produce which doesn't go off in a few hours.'

(North, 1999)

Like North, Des D'Souza from AgrEvo also outlined the environmental benefits of GM crops when he spoke at a public meeting in 1999. Furthermore, he stated that his company employs many conservationists:

'There are many conservationists employed by AgrEvo in the UK. I believe you don't have to be a member of Friends of the Earth or any other organisation to care for the environment, and I hope that everyone in this room cares for the environment.'

(D'Souza, quoted in NGIN, 1999)

Like more individualistic interviewees therefore (see pages 102-6), industry representatives engaged in the public debate outlined how their products would benefit the environment. It is possible that this was a result of the egalitarians' campaign against crop biotechnology. Certainly this appeared to be the case at the Greenpeace Business Conference in 1999, where Robert Shapiro from Monsanto spent some time presenting the benefits of GM crops (Greenpeace, 1999). However, even in September 1996, an advertisement by AgrEvo in 'Farm Chemicals International' described how this company was 'committed to green gene technology' and that they were developing 'products that will not harm the beneficial flora and Nature.' It thus seems that if individualists were 'stealing rhetoric' from egalitarians (described on page 55), they were doing so before the public debate on GM crops had emerged. Ever since Beck published 'Risk Society' in 1992, it has been widely acknowledged that society has become ever more risk averse, which is typical of the egalitarian position. Thus, rather than merely stealing rhetoric, it is likely that individualists had already adapted their viewpoint to incorporate the egalitarian ideals that were widely held in society (see pages 40 and 55). Certainly this was Colin's perception of what had happened within industry, as the following quote illustrates:

'The demand for food in the world is going to double in the next twenty or thirty years, so the idealism of the sixties might return. But of course the cynicisms of the eighties and nineties, and the concern about the environment has come in as well, so you have idealisms clashing within industry, which is an intriguing thing.' [Colin]

Indeed, when visiting Monsanto in St. Louis during 1998, there were a number of staff who had egalitarian interests. For example, one employee explained that she had spent much of her life working for environmental NGOs, but was now employed by Monsanto to criticise proposals that she thought could be environmentally or socially undesirable. In 1998 Monsanto also issued a report on 'Sustainable Development', which included an article entitled 'Feeding People, Protecting Habitat', and another describing how they had developed the world's first biodegradable credit card for Greenpeace. Similarly, during a visit to the Biotechnology Industry Organization in Washington, Val Giddings explained that environmentalist Rachel Carson, author of *Silent Spring* (1962), would have supported crop biotechnology because it was 'a biological solution'. Indeed, he provided the following quote to support this assertion:

"A truly extraordinary variety of alternatives to the chemical control of insects is available. Some are already in use and have achieved brilliant success. Others are in the stage of laboratory testing. Still others are little more than ideas in the minds of imaginative scientists, waiting for the opportunity to put them to the test. All have this in common: they are biological solutions, based on understanding of the living organisms they seek to control, and of the whole fabric of life to which these organisms belong. Specialists representing various areas of the vast field of biology are contributing - entomologists, pathologists, geneticists, physiologists, biochemists, ecologists - all pouring their knowledge and their creative inspirations into the formation of a new science of biotic controls."

(Carson, 1962, quoted by Giddings, 2002)

Within the wider public debate, proponents also tried to attract the support of environmentalists. For example, proponents frequently referred to Patrick Moore, who was one of the co-founders of Greenpeace International. On his own website, Moore states that if someone wants huge banners reading "Greenpeace is wrong about Biotechnology", "Millions of Children Condemned to Blindness by Greenpeace" and "Stop Greenpeace Lies", he 'would be happy to help organise such an event' (Moore, 2001). By aiming to satisfy both homocentric and ecocentric ideals, proponents formed alliances with individuals like Moore, who seemed to occupy a position somewhere between egalitarianism and hierarchy. Furthermore, industry representatives stated that they would like to work with environmental organisations. For example, when talking at the Greenpeace Business Conference, Shapiro described how he hoped for a dialogue that would 'search for common ground, for constructive solutions that work for a wide range of people' (Greenpeace, 1999). Likewise, AgrEvo's D'Souza said that he would love to work with Greenpeace (NGIN, 1999).

While much of the proponents' public discourse focused upon the benefits of GM crops, other individualistic arguments were also used. For example, early on in the debate, proponents presented biotechnology as a simple progression from existing techniques, comparing it with the production of cheese, bread and wine, and drawing parallels with induced mutagenesis. Furthermore, stories were released about the risks of organic agriculture, which they said produced low yields and contaminated food. These arguments were published in a book by the Institute of Economic Affairs entitled 'Fearing Food: Risk, Health and Environment' (Bate and Morris, 1999), although this did not seem to generate a great deal of interest.

It was also possible to hear arguments about the financial incentives behind biotechnology. For example, at the same public meeting mentioned above, D'Souza stated, 'We have eight thousand employees around the world, 900 in the UK, and we have a turnover of one billion pounds, and yes, we're in it for the money' (NGIN, 1999). Within the media too, there were stories about how biotechnology firms were leaving Britain because of the 'hostility' and 'red tape', which would mean that Britain would not reap the benefits of its investments (see for example, Henderson and Court, 2000). Furthermore, proponents tried to promote the idea that it was undemocratic to destroy crop trials and to refuse to eat food unless it was entirely free from GM 'contamination'. This latter argument was a key issue in 2002, when West African countries refused to accept food aid because the GM maize could be 'poisonous', and because it could be cultivated, which would then affect the marketability of West Africa's produce. When the government of Zambia granted permission to distribute the food, Mortished (2002) reported in the Times:

'The refugees are now to be given a chance to choose for themselves, free of political interference. They can decide whether to fill their empty bellies with funny food or spurn the invention of the wicked Americans and watch as their children die slowly and painfully as nature intended. Their decision should be obvious and a lesson to us all.'

(Mortished, 2002)

As stated above however, individualists received relatively little public support. Indeed, when Monsanto advertised the perceived benefits of biotechnology in 1998, they received a great deal of criticism. For example, having claimed that GM crops would help fight famine, Action Aid and representatives of African countries stated that poverty and hunger should not be used 'to push a technology that is neither safe, environmentally friendly, nor economically beneficial' (Shetty, 1998; Fidoun *et al*, 1998). In response to their other adverts, complaints were made to the Advertising Standards Authority (Gregoriadis, 1998).

It is perhaps because of industry's inability to generate public support, that their more individualistic arguments were generally found at conferences targeted at those who already supported crop biotechnology, and on websites and mailing lists organised by proponents. For example, at the 'Seeds of Opportunity' conference in London, Borlaug and Dowsell (2001) focused entirely upon the argument that biotechnology was needed to feed the world, stating that 'the battle to ensure food security for hundreds of millions of miserably poor people is far from won.' Likewise, Kishmore (1998), representing Monsanto, started his speech at an international conference on agriculture by explaining that biotechnology is extremely important because the human population is expanding at such a rate that, if yield increases are not attained, 15 million square miles more land will be needed. Concluding his speech, Kishmore then described the potential for plants to become 'factories' for vitamin A to combat the 'global epidemic' of this deficiency, and for nutrients that reduce cholesterol to reduce the massive cost of cardiovascular diseases.

Often speakers would describe how dangerous current practices are, and how citizens usually worry about non-existent risks. For example, at a conference entitled 'Interrogating the Precautionary Principle', Professor Norman Levitt (2000) from Rutgers University started his talk by naming a fruit or vegetable for every letter of the alphabet, which, he said, all contained toxins. Similarly, Ambassador David Aaron, from the U.S. Department of Commerce, began his speech at a conference on biotechnology with the following story:

'Hysteria over food is nothing new in Europe or the United States. Take the history of the tomato. It was once widely believed [...] that tomatoes were poisonous because of their relation to the nightshade family of plants. Tomatoes even had their own 'Franken Food' title – the 'Wolf's Peach'. In fact, the belief that tomatoes would bring sudden death was so strong that in 1820 the state of New York banned their consumption.'

(Aaron, 2000)

As stated in chapter 8 (page 206), it often seemed that the more individualistic arguments originated from the United States. One of the most prominent pro-GM websites in the UK was that of Monsanto. Not only was it an American company, but it also presented articles to support its point of view that often originated from American organisations and media. For example, in August 2000 references included Monsanto's own 'knowledge centre', the US National Corn Growers Association, a story in the Birmingham Post about how the head of the US Plant Sciences Institute believed that biotechnology would 'help save British farming', and an article by the President of the National Academy of Sciences in Washington. Another

high-profile site was AgBioWorld, which hosted a daily electronic mailing list. While this site was clearly international, it is interesting to note that it was organised by Professor Prakash, director of the Center for Plant Biotechnology Research at Tuskegee University in Alabama, and that the most individualistic contributions usually came from America. Indeed, there were a number of American websites on the internet that were highly individualistic in character. Those that clearly supported biotechnology, or criticised the activities of GM campaigners, included www.activistcash.com; www.undueinfluence.com, 'a project of the Center for the Defense of Free Enterprise'; www.green-watch.com, 'a project of the Capital Research Center'; and www.envirotruth.org, a project that promotes 'truth in environmental activism'. Often these websites were linked to right-wing think tanks.

Although these more individualistic contributions did originate from the US, there was also a British website entitled '*AntiEcohype: A Cure for Ecochondria*', which published articles challenging the idea that human interventions, and particularly biotechnology, cause catastrophic consequences. Whether British or American however, it is clear that these websites publicised a very different message to that communicated by individualistic interviewees and public figures in the UK. Rather than focusing upon the perceived benefits for the environment and the desire to work with organisations like Greenpeace, these organisations openly challenged the egalitarian viewpoint. Indeed, the American website ePublic Relations, which was promoted on the AgBioWorld listserv, outlined how the biotechnology industry must fight back and stop seeking compromise, because activists are only interested in being 'oppositional' and 'making enemies, not friends':

'The biotechnology industry ... must acknowledge that while it's pleasant to talk about win-win scenarios and building "relationships" with critics, activists are pursuing absolute victory.'

(ePublic Relations, 2002)

To win the battle against campaigners, ePublic Relations declared that it would be beneficial for the biotechnology industry to imitate the tactics of campaigners by 'looking beyond advertising brochures, an internet site and toll-free phone line.' Instead, it 'must understand, appreciate and accept the concepts of netwars and netwarriors. It must become a netwarrior' (ePublic Relations, 2000b), and 'embrace anarchy' (ePublic Relations, 2000a). Often the site quoted RAND, the US military think tank, stating that 'the network form is fast becoming a new source of power – as hierarchy has been for ages.' ePublic Relations thus called upon industry to 'caste aside your hierarchical, command-and-control attitude. Break out of your corporate isolationism' (ePublic Relations, 2000c).

Such statements suggest that industry commonly used a combination of individualistic and hierarchical tactics in order to gain power in the past, which perhaps explains why even the most individualistic interviewees also used hierarchical discourse, as described in chapter 8 (page 205). Furthermore, ePublic Relations contended that power had moved to the egalitarians, which required individualists to develop new tactics, as it stated, 'working with the "big boys" at provincial, state or national level is insufficient' now (ePublic Relations, 2002). Unlike the industry representatives and more individualistic interviewees described above, this site did not steal the discourse of egalitarians and seek compromise, but instead sought to steal the egalitarian's methods of organising. Furthermore, it advised that it was no longer possible to focus upon 'one node of conflict' (that of risk) because the debate had been successfully widened by egalitarians to include issues such as religion, democracy, multinational corporations, history of technology and economics (ePublic Relations, 2002). Rather than continuing to focus upon the hierarchists' domain of risk therefore, ePublic Relations recommended bringing other related issues into the discussion such as freedom, capitalism and property rights, and forming links between organisations that shared common goals. In other words, it recommended making the debate between fundamentalist egalitarians and fundamentalist individualists more overt, rather than hiding their respective ideologies behind the smokescreens of hierarchical discourse, as they had in the past.

Within the wider public debate however, both individualists and egalitarians did focus upon hierarchical concerns. In 2000 Aventis launched 'CropGen', which was intended to 'make the case for GM crops by helping to achieve a greater measure of realism and better balance in the UK public debate about biotechnology' (CropGen, 2000). While providing the funding for this initiative, Aventis stated that the scientists they funded to inform the debate were not industry representatives and operated independently. Similarly, in 2002 industry launched the Agricultural Biotechnology Council (abc), to represent 'a single and accountable voice for all crop biotechnology companies in the UK in response to the public demand for more open and accessible information on genetically modified crops' (abc, 2002a). In their report, 'GM Crops: Understanding the Issues', many chapters are written by independent scientists who focus upon hierarchical concerns such as the scientific issues surrounding GMHT crops, the UK regulatory process, and food safety (abc, 2002b). Indeed, even on the AgBioWorld electronic mailing list, the discourse of contributors appeared to be primarily hierarchical. For example, in 2002 a scientific critique was constructed of both Quist and Chapela's (2001) work on Mexican maize, and Xue's (2002) analysis of the impacts of *Bt* cotton in China, which he had conducted for Greenpeace.

One forum within which hierarchical discourse was particularly dominant however, was the FSE town meetings, which the DETR organised in 2000. At these meetings, representatives of key organisations were invited to present their viewpoint to the public. For example, at the Lincoln meeting Linda Smith (head of the DETR), Les Firbank (a member of the FSE research consortium), Pete Riley (a biotechnology campaigner for Friends of the Earth) and Steve Smith (a representative of SCIMAC), each presented their case. First, Linda Smith described how GMHT crops were developed and regulated, stating that ‘if the plants had not met the rigorous safety tests laid out in the legislation, and been approved by the advisory committee in small-scale tests, they wouldn’t be allowed to participate in the FSEs.’ Next, Les Firbank described what the FSEs aimed to do, why this was necessary and which procedures the scientists were going to undertake, concluding ‘we would argue strongly that the research should be supported because it is safe in itself, it is independent and open, but also it’s supported by a whole host of groups.’ Pete Riley then explained that pollen flow from the trials was likely to be dangerous because the crops had not been thoroughly tested, and that the trials themselves were not well designed. His argument was primarily scientific therefore, although he also mentioned a number of democratic issues such as pollen flow and the use of public money to fund the trials. Finally, Steve Smith described the role of SCIMAC and its code of practice, which he stated was developed ‘in consultation with over 50 individual groups’ ‘that represented both sides of the equation.’ In describing SCIMAC’s position, Smith emphasised what he perceived to be the democratic and independent nature of the FSEs, concluding that SCIMAC was committed to putting the technology ‘into an independent arena for independent assessment to produce good data based on sound scientific principles.’

At such meetings it was possible to hear the more hierarchical discourse of all three active groups. However, the discourse of fundamentalist hierarchists was usually confined to specialist conferences, scientific journals and government advisory committees. Of the individuals interviewed for this research, usually only those with more extreme views were quoted in the media, while those in the centre were rarely quoted at all. Furthermore, when hierarchical interviewees were quoted, they believed that their messages were often distorted to make them appear more dogmatically in favour of the technology and more critical of organic agriculture. It was perhaps for this reason that Douglas was so wary of discussing anything other than the regulatory procedures, as described on pages 194-4, and why two scientists involved in the FSEs decided not to be interviewed when asked if they would mind being tape-recorded. It may also be why another scientist stated that he would not be interviewed because he believed that this research would touch upon attitudes and belief-

systems, as described on page 80. Certainly, the experiences of one scientific advisor made him wary of being interviewed, as he explained:

'I get misrepresented all the time. [...] The media have a lot to answer for in this. I was telephoned one Friday afternoon, "Hello Professor, do you do the shopping?" I said, "Yes I do, I'm a bit of a weekend cook actually." "Well, what sort of things do you buy?" "Oh well, I don't know, all sorts." "Do you buy organic food?" [...] I said, "Well, it's not necessarily better." And she said, "Isn't it safer and more natural?" I said, "Oh gosh, no, no, no, there's nothing natural about growing the same plant in an area as big as a football pitch, it's just a question of how you share your food with all the pests and diseases that would have it instead of you. The things the organic farmer does, copper-based sprays and bacterial toxins like Bt, and sulphur against fungi and putting in lots and lots of manures that recycle e-coliform bacteria are actually not safer than conventional farming." [...] The next day we had this headline [...] 'Organic Food is Dangerous: Official says Government Expert' [...] I wrote to them and said, first of all I'm not an expert in organic farming, secondly some of the 'facts' you said, I didn't say [...]. They never published my letter. The thing I really objected to was 'government spokesman', I'm not. I have no axe to grind with this government, but I am an independent scientific advisor.'

[Identity withheld]

While interviewees on both sides of the debate felt able to utilise hierarchical discourse in order to promote their point of view therefore, the more hierarchical interviewees struggled to do so, believing that their messages were often distorted. Indeed, the views of scientists were rarely put across at all, and this was particularly the case with regard to the FSEs. Often the media were unclear about the fact that the FSEs were assessing the impact of broad-spectrum herbicides upon biodiversity, and instead took a more generic approach, which greatly agitated these interviewees (see page 160). Frequently it was stated that the FSEs were trying to determine whether or not GM crops posed a risk to human health or the environment, which gave the impression that their purpose was to assess the impacts of genetic modification. When Friends of the Earth announced that pollen from GMHT crops had been detected beyond the separation distance therefore, it was often assumed that this had serious implications for human health and the environment. The fact that scientists expected pollen flow over these distances and did not perceive it to be a significant risk was rarely mentioned. And on the occasions that the media did communicate the hierarchist's position, it was usually to quote government Ministers, as described below.

While individualists utilised hierarchical discourse to explain that GM crops had passed the various regulatory hurdles, and that independent ecologists were now assessing them, egalitarians utilised hierarchical discourse to challenge the rigour of the testing procedures. In their briefing 'Farm Scale Evaluations of Genetically Modified Crops: Comments by Friends of the Earth' (1999) for example, FOE questioned the regulation of the FSEs and asserted that their duration was not long enough, especially since 'the impact of organochlorine pesticides is still not fully understood after 50 years.' Furthermore, they stated that the research remit needed to be broadened to cover species at higher trophic levels, that baseline ecological monitoring was required, and that comparisons should be made with organic systems. In an appendix they then listed almost 50 topics for future research on GMOs in the agricultural environment. Likewise, Greenpeace (2001) listed a number of areas that the FSE research would not address. These included the unpredictable nature of GM technology, the safety of GM crops for farm animals, the impacts on soil ecology and bees, and the incremental effects of growing GM crops over time. Similar concerns also featured on the information sheets provided by local campaigners, such as those presented in table 10.1, which were outlined as the concerns of Tim's local group, of which he was a key member.

1. Cross-pollination with neighbouring non-GM crops;
2. The viral promoter gene – 'independent experts have raised concerns that these genes have the potential to reactivate dormant viruses or create new viruses';
3. The herbicide 'has been shown to have adverse health effects in animals, is likely to leach to drinking water sources, could increase nitrate leaching, and is toxic to beneficial soil micro-organisms';
4. 'There are serious doubts about the scientific evaluation involved in the trials. Micro-organisms in the soil, for example, are not being monitored despite the government's own Scientific Steering Committee considering them important for understanding effects on biodiversity.'

Table 10.1 The four main objections to the FSEs that Tim's local group listed on a leaflet.

When presenting such information, references were often made to scientific publications such as *Nature*, the *Journal of Applied Ecology*, and *Agriculture Ecosystems and Environment* (FOE, 1999a). Moreover, organisations such as Friends of the Earth and Greenpeace funded scientists to investigate certain areas of concern. For example, Xue's (2002) analysis of the environmental impacts of *Bt* cotton in China (mentioned on page 227 above) was undertaken for Greenpeace and concluded that laboratory experiments and field research on *Bt* cotton demonstrated an adverse impact on the environment. Similarly, Friends of the Earth

employed Kestin and Knowles (2000) to analyse a study on the effect of glufosinate resistant corn on the growth of male broilers, who then detected 'serious flaws' in the study, which 'should act as a spur to further investigation'. This study was used by FOE at the Chardon LL hearing in November 2000, where FOE stated there were 'concerns over the failure to test the GM maize on cows, and "suspicious" higher death rates among chickens eating the GM maize during trials' (FOE, 2000c).

By challenging the hierarchists' procedures, egalitarians of all shades presented the same scientific arguments to promote their position, even though, as discussed in chapters 6 and 8, a far wider range of issues generally motivated these individuals. While some egalitarians believed that further testing could determine whether or not GM crops were safe, others were fundamentally opposed to the technology. For these egalitarians, perceived gaps in the testing procedures did not represent their actual concerns and objections, but were a tool with which to acquire their preferred future, as Gail's comments on pages 132 and 181 demonstrate. If all the gaps were filled, just as the campaigners requested, it is almost certain that other concerns would have been found, and that some of the tests would have been deemed too dangerous, just as Hazel declared with regard to the animal feeding trials that she had called for (see page 131). Meanwhile, interviewees who had joined the debate because they no longer trusted those in authority promoted scientific concerns despite the fact that they could not always establish whether or not these were well founded. For example, although the leaflet that Tim distributed cited the four main concerns listed in table 10.1, he revealed that his views were actually based upon trust, as described on pages 190-1.

Just as many egalitarian interviewees stated that they distrusted those in authority, the issue of trust was also well represented within the wider public debate. In the first report produced by Greenpeace (1997a) for example, parallels were drawn between BSE and GMOs, which Greenpeace illustrated with the following quotes by John Gummer, the Minister of Agriculture, Fisheries and Food:

'There is no reason to believe BSE will be any different from scrapie.'

John Gummer, 1990.

'There is no reason to believe that the genetic modification of the maize will give rise to any adverse effects on human health from its use in food.'

John Gummer, 1996.

(quoted in Greenpeace, 1997a)

Within the national media numerous stories were also published to illustrate why the government and its scientific advisors could not be trusted. For example, in March 2000 it was reported that Friends of the Earth had called for Dr. Lutman to be dismissed from the FSE research consortium because he was also employed by CropGen 'to make the case for biotechnology' (FOE, 2000a). In April 2000, the Observer reported that 'minutes from the Ministry of Agriculture, obtained by this newspaper, show that an employee of a Suffolk-based firm, Grainseed, manipulated scientific data to make certain seeds in trials appear to perform better than they really did' (Barnett, 2000). In October 2000, it was then reported that trials of GMHT maize were secretly grown in five British counties, and that 'even Michael Meacher, the Environment Minister in charge of GM crops, has been kept in the dark' (Lean, 2000a). And in December Lean (2000b) reported that 'similar tests have been conducted, in secrecy, since 1995, and that more are planned for next year.' The perceived problems with links between the government, science and industry meanwhile, were reflected in stories about Science Minister Lord Sainsbury. For example, in May 2002 it was reported that he had been 'promoting GM research to further his business interests and encouraging Tony Blair to attack GM luddites in last week's speech on science.' Furthermore, it was stated that he had given £9 million to Labour over the previous five years (White, 2002).

While the issue of trust was prominent in the media, it was even more prominent within the publications of smaller organisations. For example, in the document that 'Stroud Campaign for Safe Food' produced to object to the commercialisation of Chardon LL, one of the first issues raised is that 'a court case is now in progress against the FDA for blatantly misleading the public on the safety of GM foods and systematically covering up the concerns of their own scientists' (Brighouse, 2000: 2). The report then explains that 'ever since Margaret Thatcher introduced the "Rothschild principles" limiting government funding for independent research, and [...] removed government funding for "near-market research" unless it was used in "strategic alliance" with business, science has progressively lost its independent vision because scientists have been forced to depend increasingly on industry (Brighouse, 2000: 3). It then describes how 'breathtakingly' quickly Pusztai was removed from his job, stating that this sort of treatment is what one would associate with Russia under Stalin or China under Mao Tse Tung. A survey by the Daily Telegraph is then quoted showing that 'one in three scientists working for government quangos or newly privatised laboratories says he has been asked to adjust his conclusions to suit his sponsor'. The report therefore concludes that 'when the government is significantly influenced by corporate interests then government is not in control of where those interests lead, and there is no independent entity to guide the course of progress with wisdom and foresight' (Brighouse, 2000: 4).

Likewise, on the Norfolk Genetic Information Network (NGIN) website, there were many assertions that those in control were highly untrustworthy. For example, in the NGIN (2000) publication 'GM spin: take a closer look', there were numerous quotes that demonstrated how committed the British government was to biotechnology, how the government was 'not in the driving seat', and how independent scientists were frequently linked to biotechnology companies. In fact, on NGIN's homepage, the three main features all related to issues of trust. The first was entitled 'Monsanto's web of deceit', the second was 'Professor Bullsh*t: bogus research, false reports and other GM spin', and the third was the 'Pants on Fire Award', which was 'offered for scientists' services to lying and deception'. In the magazine 'GM-Free' meanwhile, there were references to 'government cover-ups', 'regulatory shambles', 'bad science and big business' (April 1999) and to how a 'biotech company tries to stifle free speech' (June/July 1999). And in the *Ecologist* there were constant reminders of how those in favour of biotechnology could not be trusted. For example, a special edition in 1998 focused upon the 'checkered history' of Monsanto and the 'revolving doors [between] Monsanto and the Regulators', while the magazine 'Science in Society' (edited by Mae-Wan Ho) had the subtitle 'Against the corporate takeover of science', which was advertised saying 'Never need you trust the experts again.'

As the discourse of campaigners became more private, their concern about multinational companies became ever more prominent, and references to organisations such as Corporate Watch (with the slogan 'the earth is not dying, it is being killed, and those who are killing it have names and addresses') began to feature. Reflecting these concerns, the website 'Primal Seeds' was developed as 'a response to industrial biopiracy: control of the global seed supply and our food', which outlined how 'corporations are extending their empires' and described the 'facets of resistance.' One of the most extreme publications however, which actively promoted the destruction of GM crop trials, was 'Do or Die – Voices from the Ecological Resistance'. In 1999 an article entitled 'We Will Destroy Genetic Engineering: The New Luddite War', the author states that 'the technologies foisted upon the poor by the elite are aimed at accruing profit and power. As one Indian scientist put it: "Monocultures spread not because they produce more, but because they control more."' Arguing that 'the elite's new technologies change the seed from a key to freedom to a key to further slavery', the author states that the 'elite' should be 'disarmed' and that 'we must make the territory hostile again' (Do or Die, 1999).

While concern about multinational companies was apparent during many interviews and on the campaigners' less prominent websites, within the public arena it was mentioned far less frequently. When the issue did arise however, it was clear that this concern was shared by

many. For example, at a public meeting in 1998, a member of the audience tried to explain that part of her reason for being concerned about crop biotechnology was that it was controlled by only a few multinational companies. In response, a representative from Monsanto exclaimed that businesses were consolidating in every sector of the economy, and that if this concerned the audience, then they must also be concerned about other sectors too. The reaction of the audience was a resounding 'Yes!' followed by looks of both bemusement and relief at having finally been understood. The representative from Monsanto on the other hand looked astonished, and wished the audience 'good luck!'

Within the media meanwhile, there were occasionally references to a more egalitarian perception of nature. The most frequently quoted examples are comments made by Prince Charles (1998), who stated that he had 'always believed that agriculture should proceed in harmony with nature, recognising that there are natural limits to our ambitions.' Furthermore, he questioned whether 'we have the right to experiment with, and commercialise, the building blocks of life?' And in 1999 he asked 'Are we going to allow the industrialisation of Life itself, redesigning the natural world for the sake of convenience and embarking on an Orwellian future?' [...] Or should we be adopting a gentler, more considered approach, seeking always to work with the grain of Nature [...]?' Just as Prince Charles's comments were claimed to be in line with public opinion, Peter Melchett, then Director of Greenpeace, stated that the 'world-wide rejection of GM food shows people acting in line with civilised values and feelings about our relationship with nature' (Greenpeace, 1999).

Within the public arena therefore, the concerns of egalitarians were far better represented than they were for individualists and hierarchists. Within the national media individualistic concerns were infrequently communicated, and when they were, articles focused upon the perceived benefits for humans and the environment, and the belief that GM foods had been rigorously tested. It was not until discourse became more private that it also became more individualistic, and only on the ePublic Relations website was a more extreme individualistic viewpoint communicated. The hierarchical perception of wider issues meanwhile, was not communicated within any public forum, and within the media, scientists felt unable to present their viewpoint without it being distorted. Nevertheless, within press releases, publications and public meetings, both extremes utilised hierarchical discourse to promote their position. This ensured that the egalitarians' scientific concerns were most frequently communicated, even though it was clear that some egalitarian interviewees were motivated by a more fundamentalist ideology or by a lack of trust in those who controlled biotechnology.

Reflections in Government Action

Just as Douglas (1997) identified within her essay 'The depoliticisation of risk', the reason for the individualists' and egalitarians' focus upon the risk assessment process was that the government had again limited discussions to 'rational' concerns. With the government's own position apparently based upon the scientific advice of advisory committees, Ministers consistently stated that others must also do the same. Indeed, when the issue of GM foods first became controversial, the public was deemed 'emotional and 'hysterical', while the government declared that it was basing its views only upon sound scientific advice, as the following quotes demonstrate:

"We are certainly not prepared to be blown around hither and thither by shock horror or alarmist reports that are not substantiated or underpinned by good science."

(Cunningham, Minister for Food Safety, May 1999)

"This committee will ensure that the managed development of GM crops is underpinned by sound science and not science fiction."

(Meacher, Minister for the Environment, June 1999)

With the focus upon scientific issues, ministerial statements and press releases frequently stated that the government's first priority was to protect human health and the environment. Thus, when GM pollen was found beyond the separation distances, and when unauthorised GM seed was found in conventional seed stocks, the government usually communicated the implications for safety. For example, when in March 1999 the Soil Association announced that pollen could travel beyond 200m, Environment Minister Michael Meacher stated that there could be a contamination risk of 1% at 200m under moderate wind speed conditions, but this did not constitute damage to either the environment or human health (BBC News, 1999a). Similarly, when it was discovered that rapeseed sold by Advanta could contain GM seed, the Agriculture Minister Nick Brown stated that 'there was no threat to public health or the environment' (MAFF, 2000). Through government statements therefore, the hierarchical perception of risk was communicated.

Although the government communicated the hierarchical perception of risk, it did not always adhere to hierarchical rules and regulations. With regard to the Advanta case for example, Nick Brown was aware that conventional seed could be contaminated a month before making his announcement, which ensured that unsuspecting farmers planted unauthorised seed, which later had to be destroyed. During the first phase of the FSEs meanwhile, in August 1999, it

was discovered that the Department for Environment had amended old licenses to quadruple the amount of land covered by trials, and to enable winter-sown oilseed rape to be planted instead of spring-sown (Brown, 1999). In response to Friends of the Earth's threat of High Court action, the government suspended the trials, but stated that the issue was a technical one, and was not to do with safety (BBC News, 1999c).

As a result of such instances, the government was often perceived to be in collusion with the biotechnology industry. Indeed, even the language of government representatives at the beginning of the debate was associated with industry interests. For example, when Prime Minister Tony Blair made his first comments about biotechnology, it was suggested that he might be more interested in the benefits than in the risks, as the following quote has been used to demonstrate:

“If we ban products that our independent scientific advisors tell us are safe, we would send a negative message to the biotech industry [...]. And we would stop British expertise in farming and science leading the way.”

(Blair, 1999a)

Likewise, a letter accompanying a dossier on GM foods and crops, which was provided to Labour MPs in February 1999 stated:

‘Throughout history, new scientific advances have raised new fears. Some of these have proved irrational, others have proved well-judged. The government's first priorities are to protect people and the environment. But we must do so in ways that do not deny to our people the healthcare, environmental, economic and other benefits that flow from technological advances.’

(Cabinet Office, 1999a)

Furthermore, when the Nuffield Council on Bioethics announced in May 1999 that there was a ‘compelling moral imperative’ to make crops readily available to developing countries, the discourse of those in authority was again perceived to be echoing that of the biotechnology industry. Over time however, the government tried to distance itself from such criticism. For example, when the media first announced that Science Minister Lord Sainsbury had vested interests in biotechnology, the Department of Trade and Industry issued a press statement which explained that the patent Sainsbury owned had been put into a blind trust which, as a ‘Ministerial Code makes clear [...] is an acceptable way of avoiding conflicts of interest’ (DTI, 1999). Likewise, when campaigners announced that the government held 104 meetings

with industry representatives, which suggested that there was a 'cosy relationship' between them, Agriculture Minister Jeff Rooker explained that he had met campaign groups far more frequently. Furthermore, he stated that, since the Labour government had not approved GM food or GM planting since coming into power, 'the companies are not getting much in return if we are in their pocket' (BBC News, 1999b). When in August 1999 Friends of the Earth discovered that the DETR had amended old applications rather than insisting upon new ones, Meacher similarly declared that 'we are not in collusion with AgrEvo' (Morrison, 1999). Indeed, when ACRE published its fifth annual report in March 1999, the DETR made much of comments by Professor John Beringer, who was retiring from the position of chairman:

"I should like to take this opportunity to respond to those critics of ACRE and the government who imply that decisions have been biased in favour of industry and rapid development of biotechnology. They are wrong. [...] We might have given advice that is not liked, or is thought to be wrong by some people, but never has our advice been other than the best available at the time. In reply to this respect it has been a constant source of surprise to me that as chairman I have been subject to no special pleading by industry, and lobbying by them has been minute in both quantity and passion compared with that of pressure groups."

(Beringer, quoted by the DETR, March 1999)

Although there were a number of occasions when the government stated that advisory committees would remain independent and that it was not in collusion with the biotechnology industry, there were others when it was clear that the government did support industry interests. For example, when Mo Mowlam, Minister for the Cabinet Office, spoke at the Bioindustry Association Gala Dinner in 2000, she concluded by underlining the government's continued commitment to the biotechnology industry:

"Rest assured the government is ready to support and enhance the competitiveness of the biotechnology industry. We believe you are a real success story for the UK, which is why we are committed to maintaining and building on our competitive edge. We want the UK to remain a leader in this field. At a time when we face growing competition from overseas, we want the UK to be the first choice to do bioscience research and, crucially, to turn ideas into products.

"We will continue to work in partnership with industry. And to encourage greater dialogue between industry and interested groups on issues like GMOs. If we can work with you in industry, in science, with consumers and with interest groups, we

can help ensure the sector fulfils its potential to improve the quality of life here in the UK.”

(Mowlam, January 2000)

While Mowlam stated that the government would ‘continue to work in partnership with industry’, she also stated that it would work with science, consumers and interest groups. By mentioning each group on this way, she indicated that the government would take a balanced approach with regard to this technology. This was the message that many Ministers attempted to communicate following what was perceived to be Blair’s ‘gung-ho’ approach at the beginning of the controversy. Indeed, Blair was particularly careful to state that he was open-minded on the issue of GM technology, as the following quotes demonstrate:

“We’re in the position, as the government, where it is almost as if people say you’re the greatest advocates of GM food. I’m not the advocate of anything other than keeping an open mind.”

(Blair, 1999b)

“I’m not on either side of the debate [...]. We’ve got absolutely no interest at all except that we’re trying to do the right thing.”

(Blair, 1999c)

Similarly, when the Cabinet Office set up a GM Communications Unit in July 1999, a spokesman stated:

“We are not doing PR for the industry. We are doing PR for the government. We want to see the government’s interests represented. We are open-minded about the results of the research. We are not going to act as a lobby for the industry or for the green factions. We want to act as an umpire.”

(GM Communications Unit, July 1999)

As the debate progressed, the government also appeared to be more open, notifying locals about trial sites and publishing information on the internet. Furthermore, in May 1999 it announced the formation of the AEBC, whose members were drawn from a number of interest groups to examine the broader issues and to take account of a wider range of viewpoints (Cabinet Office, 1999b). Within an article in the Independent on Sunday, Blair reflected these efforts by stating that he understood the cause for ‘legitimate public concern’ (Blair, 2000).

While the government attempted to become more open and inclusive, it also seemed to take on more egalitarian concerns. This appeared to be the case with the FSEs, which focused upon biodiversity impacts in a way that no other regulatory procedures had done in the past. According to more hierarchical interviewees, comparable impacts could be experienced with any change in land management, whether it was a new crop, a new herbicide or a new sowing regime. The expenditure of £5 million was thus perceived to be extraordinary. However, the trials were not devised to satisfy the concerns of more egalitarian hierarchists, but rather to provide the government with a scientific rationale for delaying the introduction of GMHT crops. As the controversy continued, it was clear that the public would not accept these crops, and yet the government could not introduce a moratorium without first identifying a reason why human health or the environment might be adversely affected. By investigating the impact upon biodiversity, the government was able to find a legitimate way to delay commercialisation, while also demonstrating to the public that the cultivation of GM crops would not lead to any catastrophic impacts.

While the FSEs were testing the impact of broad-spectrum herbicides upon biodiversity, the government often claimed that they were achieving far more. For example, Meacher stated that the programme of trials was essential, and that it would help inform the public debate on the basis of sound science. However, the public debate was not about the biodiversity impacts of broad-spectrum herbicides, but rather the wider concerns of genetic engineering. Furthermore, Meacher stated that the FSEs could provide evidence to stop GM. But hierarchical interviewees stated that if negative biodiversity impacts did result, management regimes could be imposed to compensate for these losses, such as by restricting spraying to certain dates or by insisting upon the production of wildlife margins.

The government also appeared to become more egalitarian with regard to the separation distances between crops. Early in the debate Meacher explained that these distances were based upon seed purity guidelines, which had been established for over 50 years, and which would permit cross-pollination at a rate of 1% with adjacent crops. However, when Friends of the Earth announced the results of their research, which showed that pollen could travel 4.5km, Meacher stated that the separation distances would to be reviewed as a result of a number of studies on gene flow. Furthermore, rather than just consulting with specialists, MAFF held a public consultation, while Meacher indicated that he was taking into account the concerns of the organic sector, who had requested separation distances of 6km (BBC News, 1999d).

In 2001 it was agreed that the separation distance for maize would be increased from 50 to 80 metres, and for some varieties of oilseed rape from 50 to 100 metres. These distances were expected to keep contamination of neighbouring crops to 1% or less, as the previous distances were intended to do. Having consulted with various stakeholders therefore, the government continued to follow guidelines that would satisfy hierarchists. Nevertheless, when complaints were lodged against a trial site two miles from the HDRA's organic research centre in May 2001, Meacher appealed for the site to be withdrawn, as did MAFF and the Prime Minister. This was despite the fact that both scientists and industry believed that the trial should go ahead; as a SCIMAC representative said, the scientific procedures for choosing sites should remain 'sacrosanct.' The government therefore appeared to be acting in a more egalitarian way, although an Aventis representative stated that it was more likely to be "election fever" (Lean, 2001).

As the trials approach their final year, the government has again given the impression that it will consider a broad range of views. Following the advice of the AEBC, DEFRA issued a press release entitled 'Public to choose issues for GM debate', within which Environment Secretary Margaret Beckett explained:

"The government wants a genuinely open and balanced discussion on GM. There is clearly a wide range of views on this issue and we want to ensure all voices are heard.

"We share the AEBC's analysis that the public debate will help deepen public understanding of all the issues surrounding GM. If there are gaps and uncertainties in knowledge these need to be ascertained, acknowledged and addressed.

"The government wants to provide people with the opportunity to debate the issues openly and reach their own judgements."

Beckett, July 2002

While consulting more widely however, it appears that the government will again take a narrowly hierarchical approach. Before the debate was announced, the Independent reported that the debate had caused a rift in the Cabinet Committee on Biotechnology because some individuals, including Lord Sainsbury, wanted to 'stick to science' (Woolf, 2002). Furthermore, Beckett's announcement did not clearly state that the government would consider issues beyond its own scientific remit. Within the 'terms of reference for dialogue', DEFRA stated that the debate would identify the public's questions, and would provide

comprehensive evidence-based information on 'scientific, economic and other aspects'. By failing to define 'other aspects' and by focusing upon 'evidence-based information', it appears that political, social and ethical concerns will again be marginalised. Indeed, within the second paragraph of Beckett's statement above, it seems that the debate is primarily concerned with improving public understanding. Moreover, the government is clearly separating this debate from its own decision-making processes, as DEFRA has outlined:

'government wants to ensure a clear separation between this overall dialogue and the much later decision-making process on the very specific issue of possible commercialisation of particular GM crops. The process will be based on an objective assessment of all the available evidence including the Farm Scale Evaluations, other scientific evidence and information about the costs and benefits to the UK.'

(DEFRA, 2002b)

Although the debate may not enable broader concerns to enter the policy arena, it seems that decision-making processes will become more transparent. In addition to the public debate, the government intends to review the scientific issues relating to GM and to study the overall costs and benefits. According to DEFRA, the scientific review will be published, beginning with 'concerns already identified from public meetings and correspondence', and encompassing 'other issues as they are identified in the public debate' (DEFRA, 2002b). The science upon which decisions are made might become more available therefore, as should the government's cost-benefit-analysis. However, although this is more open and transparent, it is likely that decisions will again be narrowly hierarchical and apparently apolitical.

Improving Inclusiveness

While the government's forthcoming public debate could enable a greater understanding of government decision-making and public attitudes, it is different to the modes of participation that social scientists recommend. As described in chapter 2, Grove-White *et al* (1997) state that independently organised regional consensus conferences, citizen panels and focus groups are required that would be guaranteed serious attention, while the ESRC (1999) states that public values need to be incorporated, while keeping a central place for scientific information and analysis. Unlike the government's public debate, these forums would be managed independently and, it seems, would incorporate the public's values to a far greater extent. To what extent however, could affect the inclusiveness of decisions, since it is likely that the public would also favour a particular viewpoint, and most probably that of the egalitarians.

From their descriptions of public attitudes to GM crops, it is clear that Grove-White *et al* (1997), the ESRC (1999), Purdue (1999) and Wakeford (1998) all detected egalitarian and fatalistic tendencies. For example, Grove-White *et al* (1997) discovered that the majority of participants believed that GM crops were unnatural, that testing should be undertaken for perhaps a generation, that companies put profits first, and that industry and the government have mutual interests that override their concern for safety. Such concerns strongly reflect the egalitarian position. Indeed, Grove-White *et al* (1997: 15) state that the voice of the NGO representative was perceived to be the 'counter-balancing moral voice in a sea of self interest.' The ESRC (1999) meanwhile, presents the egalitarian point of view by stating that 'we don't know what we don't know', that the policy world needs to be more explicit about uncertainty, and that unknown factors could lead to surprises. Furthermore, participants in Wakeford's (1998) study decided that GM was unnecessary, that the long-term effects were unknown, that controls are too weak and that labelling and caution are required.

While egalitarian tendencies seem to prevail in studies of public attitudes, those of fatalists can also be observed. For example, Grove-White *et al* (1997: 6) describe how half the participants would purchase GM food, even if they were against it, because their reactions were 'coupled with a sense of fatalism and resignation' (Grove-White *et al*, 1997: 6). Furthermore, they state that the world was increasingly perceived to be beyond the control of participants, likening it 'to a lottery or roller coaster, where no-one knows what will happen be it good or bad' (Grove-White *et al*, 1997: 13). This description mirrors that of cultural theory's fatalists exactly, as does the fact that these individuals could not trust anyone to provide them with accurate information. Purdue (1999) meanwhile, describes how participants at the 1994 Biotechnology Consensus Conference were able to do little more than present the experts' conflicting points of view, even after 14 hours of deliberation.

With or without the provision of information therefore, public decision-making appears to favour egalitarian and fatalistic outlooks, which suggests that those involved favoured the outlook that they held prior to participation. As described on page 40, cultural theorists state that it is not the limits of information that generate bias, but rather the way that individuals actively shed anything that contradicts their point of view. Indeed, they state that even when individuals see the need to challenge their perspective, it takes considerable time and effort to do so (see page 57). The fact that those organising the 1994 Consensus Conference on Biotechnology actively selected individuals who did not have a hard position for or against biotechnology, and that these individuals then concluded in a similar manner, certainly supports this notion. Furthermore, Peters (2000) found that articles and films on genetic engineering had a different influence on different people, which showed that 'the committed

are hard to persuade.’ As Peters (2000: 379) states, ‘The evaluations generated during media reception are greatly dependent on the recipients’ pre-attitudes and tend to correspond with them.’ He therefore found that, since pre-attitudes were on average moderately negative, the majority of evaluations were also critical of genetic engineering. Furthermore, it took me a considerable amount of time and effort to unlock myself from the egalitarian outlook, and certainly far longer than would have been available at a citizen’s jury or consensus conference.

It could be argued that whether individuals favour the outlook of one type over another does not matter, since decisions made in this way are merely aimed at being more democratic. If society tends towards egalitarianism, perhaps decision-making should do so too. However, according to cultural theory, good decisions are not necessarily those that are supported by the majority of people, but rather those that consider the wisdom of each type (see pages 50-3). With regard to GM crops therefore, it may be no more sensible to follow egalitarian recommendations than it is to follow those of hierarchists or individualists. However, by considering the wisdom of each type, it is at least possible to understand the risks and benefits that could result from the chosen decision. Thus, if an egalitarian course of action is taken, it would be understood that an alternative strategy might be required to feed a growing population, and if an individualistic course of action is taken, it would be understood that unknown dangers could result because the technology had been introduced more quickly.

While cultural theory states that the wisdom of each group needs to be treated equally, placing the types along a continuum suggests that the hierarchist still has a major role to play. Since the hierarchist is positioned in the middle of the continuum, carefully weighing the risks and benefits that each extreme perceives, it is likely that this type will be most able to establish a compromise, and the least likely to experience a catastrophic surprise. By identifying such a pivotal role for the hierarchist, it could be said that placing the types along a continuum has encouraged the belief that one group is more correct than any other, despite Thompson, Rayner and Ney’s warning against this (see page 50). However, rather than favouring hierarchy, the continuum merely suggests that those hierarchists who consult both extremes (such as Sarah and Neil) are likely to have acquired more wisdom, and might therefore be most able to determine the best way forward. The emphasis is thus upon extensive consultation prior to determining where the best answer might lie, rather than deciding exactly where the answer lies without any consultation whatsoever. And as Sarah explained (see page 197), the best solution is likely to upset both extremes.

The extent to which scientists and regulators of GMHT crops have already considered the perceptions of other types is not entirely clear. According to Joe, different groups, 'including plant breeders, regulators, and some of the environmentalists,' were brought together in the early 1990s 'to talk about what the issues were and what the concerns were.' However, according to many environmentalists, they had not been consulted at all. Certainly the government consulted on a number of issues, such as the management of GMHT crops in July 1997 and the separation distances required for the FSEs in June 1999, but on most issues it seems that they did not consult anyone but hierarchists. Nevertheless, Neil stated that regulators did consider the scientific concerns of campaigners, and that they were far more precautionary because of BSE. Moreover, by interviewing scientists, it was possible to establish that they had indeed given much thought to the egalitarians' scientific concerns.

While it was possible to find personal reassurance, individuals campaigning against GM crops often felt that their concerns were not acknowledged at all. On the majority of issues campaigners were not consulted, on almost all occasions decisions were not explained, and it was almost impossible for campaigners to access the evidence that advisory committees relied upon. Indeed, Friends of the Earth had to threaten DEFRA with court action so that they could gain access to information on glufosinate ammonium, and when DEFRA acceded, Aventis stated that they would go to court to prevent the release of such information (anon, 2001). When the government's discourse about risk assessment favours an apparently narrow hierarchical viewpoint, and when its behaviour often reflected that of individualists (for example, when policy protocol was not adhered to), it seemed that advisors were either unaware of egalitarian concerns, unable to consider them because they were too expensive, or unwilling to admit that they did not have the evidence to support their decisions.

Just as Grove-White *et al* (1997) and the ESRC (1999) identify, this research shows that much of the concern about GM crops stemmed from a lack of trust in the regimes that govern official decision-making. Indeed, this was also a key finding of the final report on 'Public Perceptions of Agricultural Biotechnologies in Europe' (PABE), which states that the predominant lay knowledge was based upon the 'past behaviour of institutions responsible for the development and regulation of technological innovations and risks' (Marris *et al*, 2001). As a result of this lack of trust, requests have been made for more transparency. In 1999, for example, the Chief Medical Officer and the Chief Scientific Advisor recommended that the regulatory procedures be opened to public scrutiny (May and Donaldson, 1999), and in 2001 the AEBC stated that 'departments should aim to publish widely the scientific advice and all the relevant papers so those outside can satisfy themselves about the process by which advice was formulated and that the conclusions are correctly drawn' (AEBC, 2001: 21).

It is because of these calls for greater transparency that the government announced its forthcoming open review of the scientific issues relating to GM crops. As described above, this review is intended to answer the concerns that have already been identified, and to answer those that arise during the public debate. However, if the policy arena is to be truly inclusive, and if trust is to fully return, this process will need to be permanent. As new concerns arise, and as new evidence is acquired, it is important that regulators show that these issues have been carefully considered and acted upon. With the widespread use of the internet, campaigners are quick to distribute their concerns, and contributors to AgBioWorld are quick to retaliate. However, there has been no independent hierarchical voice to respond to these issues, just as there has been little coverage of the hierarchical outlook within the media.

While a more transparent process is to be welcomed, this, or any other attempt to demonstrate that the policy arena is (perhaps) already inclusive, is unlikely to improve trust without other major changes. As Marris *et al* (2001: 11) assert, 'restoring trust would require not just better public relations strategies, but more profound changes in institutional culture and practice.' Without these changes, government information, and even that from independent scientists, is unlikely to be trusted. Indeed, Macnaghten *et al* (1995) state that information from organisations that are already mistrusted might actually increase levels of mistrust. Already the media have reported that the government's public debate 'will be a sham'. In the Guardian for example, Vidal (2002) stated that critics believe the debate is 'a thinly-veiled massaging of the public to accept' GM crops,' while in the Independent Lean (2002) reported that 'Ministers are determined to grow GM crops commercially in Britain as soon as possible and are setting out to persuade the public to accept them.' Furthermore, it was reported that the Prime Minister was 'lukewarm' about the debate, that he only agreed to spend £250,000 instead of the proposed one million (Brown, 2002), and that the Central Office of Information could be put in charge, which 'is effectively the government's spin machine' (Poulter, 2002).

What is likely to determine the success of the forthcoming GM crop debate, is how the government deals with what it calls 'other issues.' As the Marris (2001: 85) *et al* state, scientists and regulators have not previously included 'other issues', which are usually described as 'political, ethical or social,' because they believe that they are private, individual value judgements that are not amenable to societal deliberation. However, and as the ESRC (1999) and Grove-White *et al* (1997) state, without taking broader issues into account, it is unlikely that trust will be regained. As described above, the perceived links between science, the government and industry were a key source of mistrust and motivation for interviewees campaigning against GM crops. Furthermore, these issues featured highly within the media and on campaigning websites and magazines. However, when campaigners were in public,

they were often forced to restrict their comments to the technicalities of the risk assessment process. As the PABE (2001: 85) report states, 'at meetings organised by scientists, public policy makers or industry, members of the audience who raise broader questions which are considered to be of a political nature were almost systematically cut off by the organisers and told that "this is not the right place" for such discussions.'

If the public debate on crop biotechnology is again 'not the right place' to discuss these 'other issues,' it begs the question 'where is?' According to more hierarchical interviewees, issues such as globalisation, the influence of the WTO, the links between government and industry and the diminishing amount of public spending on science should be restricted to political elections. However, there is a widely held belief that these issues are not adequately dealt with at political elections either. Recently a number of books have been published outlining this problem, entitled 'Captive State: The Corporate Takeover of Britain' (Monbiot, 2000), 'No Logo', (Klein, 2001), and 'The Silent Takeover: Global Capitalism and the Death of Democracy' (Hertz, 2001). In 'The Silent Takeover' for example, Hertz likens the situation today with late nineteenth century America, when President Rutherford B. Hayes stated that 'It is a government of corporations, by corporations for corporations', only 'the geographical extent is worse.' Describing how more people voted in the final round of 'Big Brother' than for any of the British political parties in 2000, Hertz states that voters see 'no apparent gain from changing government' because the policies of the dominant parties are 'almost indistinguishable' (Hertz, 2001: 259). Furthermore, Hertz states that people can see political parties are unable to resist pressure from big business. As a consequence, she declares that people have put their trust in those who are not associated with industry or the government, and so vote through protest instead.

When 'other issues' remain unacknowledged, both within the GM debate and the wider political arena, protests against GM food are likely to continue. While some, like Megan, use the campaign against GM crops to mobilise broader concerns, many more seem to be concerned about GM crops precisely because of these 'other issues.' As Joshua, a leading campaigner against GM crops stated, despite the fact that he had intuitive concerns about genetic engineering, if it was created by a 'different mind' he might well accept it:

'In a way I think a lot of people see [genetic engineering] as some kind of violation, particularly with the mind that it's being done with. If it was a different mind that was doing it, if we lived in a different world where things were done because they were necessary, and because they were the best ways of doing things, and because they were done with respect and humility and all the rest of it, then I think genetic

*engineering might be related to different things. But that's just not the practice. [...]
It's like, "maize, rye, wheat, blah, blah, monoculture, monoculture!" No, that mind
is so ugly. It's such an ugly mind, totally engrossed with profits.'* [Joshua]

Indeed, following Joshua's interview, I disclosed that some scientists shared his concerns about the power of multinational corporations and the influence of the WTO (like Pete the 'closet communist', see pages 199-200), to which he replied that if he heard scientists say this in public, he would have far more reason to trust them. Moreover, it seems that it was by discussing these 'other issues' with scientists, that I too began to trust the risk assessment process. Although being able to ask scientific questions indicated that egalitarian concerns had been considered, it was through discussions with scientists about broader issues that I was able to see that they favoured the individualist's viewpoint no more than they did the egalitarian's.

To demonstrate that the interests of industry influence neither government Ministers nor independent scientific advisors, might be the best form of information that the government could provide. It is likely that this would require publicly funded scientific institutions to be responsible for the regulation and monitoring of biotechnology, and it would certainly require the imposition of 'heavy sanctions in cases where mismanagement and fraud is identified', as Marris *et al* (2001: 11) also recommend. It also would require scientists to be far more open about discussing their attitudes and belief-systems, which, when they refuse to do so (as outlined on page 80), suggests that they have something to hide. Moreover, it would require the government to be more open about why a publicly funded social scientist was refused access to field scientists, and why DETR officials failed to reply to requests for interviews.

By taking such measures, the discourse of governments and corporations should become more easily differentiated, as the alliance between hierarchists and individualists is broken. Furthermore, it is likely that people would no longer feel the need to scrutinise the decisions of their scientific advisors. Certainly this has been the experience of the Netherlands, where public attitudes to biotechnology are reported to be relatively positive, despite the fact that the Dutch are to a larger extent financial supporters of international environmental organisations like Greenpeace. According to Gutteling (2002), part of the reason for this difference is that the media presents a more balanced view. But more importantly, Gutteling states that it is because a large majority of the population expresses its trust in the government, which is perhaps because the government allows societal organisations to participate in decision-making. Just as Schwarz and Thompson assert therefore, by ruling-in different framings of the debate, the Dutch system appears to have avoided controversy (see page 52).

While new modes of public participation could lead to more representative decisions, they also risk favouring one viewpoint, simplifying the scientific evidence upon which decisions are made, and shifting responsibility from those who should be making good decisions already. Perhaps most importantly however, focusing upon public participation fails to encourage the government to prove that its institutional arrangements can make inclusive decisions. With the discourse of cultural theory's ideal types presented along a continuum, it is clear that hierarchists have a pivotal role to play, by consulting individuals at both extremes in an open and transparent manner. Not only should hierarchists consult and acknowledge the various perceptions of risk, but they should also acknowledge the 'other issues' that concern individualists, egalitarians and hierarchists alike. By doing so, the debate is likely to take the form of a broader political discussion, which would deal with issues that currently only emerge within the more private domains of each ideal type.

Summary

Within the public debate, the individualistic outlook appeared to be a minority view that focused upon the perceived benefits of biotechnology and the fact that industry had fulfilled its regulatory obligations. When individualists focused upon the environmental benefits of GM crops and tried to form alliances with egalitarians, it is likely that this was a reaction to the egalitarian nature of society. Other individualistic arguments were also utilised in public, such as the idea that biotechnology was not new, that the alternatives were risky and that destroying tests plots and refusing to eat GM food was undemocratic, but these arguments gained little public support. Within more private domains, industry's discourse was more individualistic, and this was particularly so in the US. Of particular interest was ePublic Relations' website, which demonstrated that the hierarchical alliance was no longer sufficient and that it was necessary to steal the egalitarians' tactics, which included widening the debate to incorporate other issues. Nevertheless, within the UK's public debate, both individualists and egalitarians focused upon the risk assessment procedures, which was particularly noticeable at the FSE town meetings. Other than this forum however, the discourse of hierarchical scientists was confined to specialist conferences and journals, while that in the national media was said to have been distorted, making hierarchists appear to favour one extreme or the other.

Much of the egalitarian's public discourse focused upon challenging the rigour of testing procedures, which became the focus of many stories within the national media. This also ensured that egalitarians of all shades presented the same scientific arguments, even though

some interviewees were clearly motivated by a more fundamentalist philosophy or by a lack of trust in those in authority. Nevertheless, the issue of trust also received a great deal of attention from campaigning organisations and the national media. This was particularly noticeable within the publications of smaller organisations, within magazines targeted at campaigners and upon less prominent websites. As the discourse of campaigners became more private, concern about multinational companies was also more apparent. However, within the national media such issues were mentioned far less frequently than their scientific critiques, which was also true for the individualists and hierarchists.

The reason for the focus upon scientific issues and the risk assessment process was that the government had limited discussions to 'rational' concerns. When presenting its own point of view, the government communicated the hierarchical perception of risk, but it did not always follow hierarchical rules and regulations. Because of this, and because ministerial language was sometimes seen to favour individualistic interests, the government was often considered to be in collusion with industry. However, the government denied such criticisms and tried to make institutional arrangements more open and transparent. It also seemed that the government took a more egalitarian approach, such as with the FSEs, but such instances still resulted in hierarchical outcomes. It is likely that this will also be the case with the forthcoming public debate, although the government's scientific cost-benefit analyses should become more transparent.

The government's forthcoming debate differs to the modes of public participation that social scientists request, because it is not organised by an independent body, and the results will not be separated from the official decision-making process. To what extent social scientists require public attitudes to be a part of the official decision-making process however, will affect their inclusiveness. Previous studies of public attitudes show a predominance of egalitarian and fatalistic discourse, which indicates that their decisions are likely to favour these types. However, cultural theory states that good decisions are made when all three types are considered equally. By positioning the ideal types along a continuum, this research suggests that there is a pivotal role for hierarchists, who need to consult in an open and transparent manner on all concerns, and especially those of a more political nature, which have previously been referred to as 'other issues'.

Conclusion

This research utilised the categories and concepts of cultural theory as tools to analyse the GM crop debate and considered whether new modes of public participation still appeared to be the best way to make institutional arrangements more inclusive. It also determined how individuals engaged in the GM crop debate utilised the discourses of cultural theory's ideal types, and considered whether this had any implications for improving the inclusiveness of decision-making.

The findings were based upon 55 semi-structured interviews, which were conducted with individuals engaged in the GM crop debate during 2000, and a review of information obtained from a variety of sources from 1996-2002, which included national media coverage, local meetings, government press releases and the internet. Interview transcripts were analysed to determine how each of cultural theory's three active types framed the GM crop debate, as presented in chapters 5-7. How individuals utilised the discourse of the ideal types within their interviews was then determined, as presented in chapter 8, and how this is best modelled was discussed in chapter 9. With reference to secondary sources of information, the wider debate was then discussed in chapter 10. This considered how the ideal types were represented in the wider public debate, the extent to which government actions reflected the concerns of the ideal types, and how the debate could be made more inclusive.

The research found that analysing the GM crop debate through the lens of each of cultural theory's three active types made it possible to view contradictory perceptions equally. The fact that the researcher was once a campaigner and had held strongly egalitarian beliefs, and yet did not favour the egalitarian viewpoint within this analysis, demonstrates the value of the vocabularies of cultural theory as a means of maintaining distance from personal interests. Furthermore, by actively seeking the views of each ideal type, and presenting them accordingly, it has been possible to show that cultural theory can be used to demonstrate a researcher's commitment to 'ruling-in' a diversity of opinions.

Rather than introducing new modes of public participation, this research concludes that the government should employ independent scientists and social scientists to conduct a full consultation with those already engaged in the GM crop debate on all issues. The aim should be to identify, communicate and consider the full range of opinions available so that decisions

are both fully informed and transparent. Since this research found the categories and concepts of cultural theory useful tools for this purpose, a similar approach could be taken. Furthermore, it is recommended that the government acknowledges and acts upon all new information and concerns rapidly so that decisions continue to be fully informed and communicated. These recommendations were devised by considering the following findings:

1. Government discourse focused upon risk. Most actions appeared to be narrowly hierarchical, but some were perceived to favour individualists.

Government discourse focused upon risk, and its position appeared to be narrowly hierarchical. Some consultation occurred, but it is not clear to what extent the concerns of others were considered, or why they were not incorporated into the risk assessment process. Occasionally government actions appeared to be more egalitarian, but these instances again resulted in an apparently narrow hierarchical position. When government representatives did discuss issues beyond the risk assessment process, it was usually to outline the benefits that individualists perceived. Furthermore, the government was seen to ignore policy procedures and to withhold information on the risk assessment process, which was perceived to favour industry interests. Government action did not appear to acknowledge all viewpoints therefore.

2. The government failed to acknowledge many of the political, ethical and socio-economic issues that concerned campaigners.

While some campaigners were motivated by scientific concerns, it was clear that many more were motivated by a fundamentalist egalitarian position against genetic engineering and multinational companies, or by a lack of trust in industry, government and scientific advisors. This lack of trust usually stemmed from the belief that the government favoured industry interests, and that industry funded and therefore influenced scientists. Occasionally the government denied being 'in collusion' with industry, but it did not properly acknowledge or outline its own position with regard to these concerns. According to authors like Hertz (2002), it is because of this that people have taken to voting through protest. The findings of this research support this assertion.

3. Many scientists interviewed for this research had political, ethical and socio-economic concerns, but these were not communicated in public.

Scientists did not publicly acknowledge political, ethical and socio-economic concerns. However, within one-to-one interviews it was clear that these interviewees also believed that industry had too much power and that science needed to become more independent. Many

expressed concern about the WTO and patent law. Indeed, while grid-group discourse and myths of nature discourse usually corresponded as cultural theorists assert, some scientists were noticeably more egalitarian with regard to their grid-group discourse. Although many scientists were concerned about these issues however, they asserted that they were not relevant to the risk assessment process. As such, they remained unacknowledged.

4. Industry representatives failed to discuss political, socio-economic and ethical issues, which ensured that their discourse was similar to that of the government. This was indicative of an alliance between individualists and hierarchists.

Like the government, individualists failed to discuss political and socio-economic issues, and focused only upon their perception of the risks and benefits from GM crops. As a result, the language of government and industry representatives was difficult to differentiate, and usually consisted of a combination of hierarchical and individualistic discourse. Even the most individualistic interviewees utilised a combination of these discourses. Since this trend was also identified by Ellis and Thompson (1997), it was suggested that this was indicative of a long-standing alliance between the hierarchists and individualists, which was troubling both campaigners and scientists. As a result of this alliance, individualists were able to avoid communicating their position on political and socio-economic issues.

5. Within more private arenas, industry representatives communicated a more individualistic position with regard to political, ethical and socio-economic factors. An American organisation called 'ePublic Relations' states that this is necessary because egalitarians have become the most powerful group.

The website for the American organisation 'ePublic Relations' recommends that individualists be more explicit about their position on other issues, because their alliance with hierarchists no longer provides them with enough power. To a certain extent the more individualistic interviewees communicated their position on these political, ethical and socio-economic issues, but their comments were not as individualistic as those on websites. It was suggested that this could be because the most individualistic comments originated from the US. Nevertheless, it is hypothesised that such views are also held within the UK, but are not explicitly discussed.

6. Industry representatives often adapted their discourse to reflect the concerns of egalitarians, which dominated the national media. When individualistic discourse was utilised, it did not generate public support.

While industry representatives utilised a combination of hierarchical and individualistic discourse, they also focused upon environmental benefits that would result from crop biotechnology and asserted that they would like to work with environmentalists. Since industry made such claims before the public debate on GM crops emerged, it seems that they adapted their discourse to incorporate the egalitarian values that are held by wider society. In addition to the alliance that individualists maintained with hierarchists, it seems that they also formed alliances with prominent egalitarians like Patrick Moore, who co-founded Greenpeace. It was asserted that they did so because of the perceived power of egalitarians, whose discourse dominated the national media. When individualistic discourse was communicated, it did not appear to generate any public support.

7. Social science studies of public attitudes demonstrate that members of the public predominantly aligned themselves with the egalitarian viewpoint. As such, they would bring little more to the public arena and new modes of public participation would risk favouring one viewpoint.

Social science studies of public attitudes to GM food demonstrate that members of the public predominantly aligned themselves with the egalitarian position. Since all but the public's most fatalistic comments were made by individuals engaged in the GM crop debate, it was asserted that focusing upon public attitudes is unlikely to bring anything new to the policy arena. Furthermore, new modes of public participation are likely to favour this outlook. Since both cultural theory and empirical research demonstrate that information is assimilated according to an individual's former viewpoint, this is likely to be the case even with the provision of information from diverse sources.

8. By interviewing a wide range of individuals engaged in the GM crop debate, this research identified perceptions that were not well acknowledged by public attitudes research, the national media or government. Since cultural theorists state that the perceptions of each ideal type need to be thoroughly considered, it is asserted that an approach is required that audits all viewpoints.

By interviewing a wide range of individuals engaged in the GM crop debate, this research identified a number of perceptions that were not well acknowledged by public attitudes research, the national media or government. Social science studies and the national media have provided a detailed account of many of the issues that concern egalitarians, and the government has presented the hierarchist's perception of risk and to some extent the individualist's perception of benefits. However, there were a number of issues that received relatively little attention. In particular, the individualist's viewpoint was concealed by its

alliance with hierarchists and egalitarians, which ensured that the individualistic perception of risk and political and socio-economic issues was rarely communicated. Furthermore, the hierarchical perception of anything other than risk was rarely discussed, even though it was clear that many scientists interviewed for this research had concerns about political and socio-economic issues. Since cultural theorists state that the perceptions of each ideal type need to be thoroughly considered, it is asserted that an approach is required that audits all viewpoints.

9. This research determined that the discourses of cultural theory's ideal types are best illustrated along a continuum, with the hierarchists occupying the central position. Hierarchists therefore have a key role to play in auditing viewpoints and making decisions.

By framing the debate from the perspective of each ideal type, and by analysing the discourse of individuals, it was clear that the discourse of cultural theory's ideal types was best illustrated along a continuum, as Ellis and Thompson (1997) suggest. Although cultural theorists assert that it is important not to consider one viewpoint as more correct than the others, it seems that hierarchists, who occupy the central position along the continuum, have a key role to play. By consulting with individuals at various points along the continuum, scientists and social scientists could construct a full audit of all the issues to be considered. For the audit to be trusted, it would need to be conducted in an open and transparent manner. The government would then need to acknowledge all concerns, and would need to communicate its own position if it too is to be trusted.

10. To a certain extent, the government's forthcoming public debate could show that the government has considered other viewpoints. However, the government should consider making this line of communication permanent.

The government's forthcoming public debate intends to communicate the scientific evidence supporting the commercialisation of GMHT crops, and the government's cost benefit analysis. Unlike previous communications, it also intends to respond publicly to the concerns that others have expressed, and to respond to any further concerns that emerge during the public debate. However, it is asserted that this system needs to become permanent. With the widespread use of the internet, opponents were quick to distribute their concerns, and proponents were quick to retaliate, but there was rarely an independent hierarchical voice to show that the government had/would consider these issues. A facility such as this would improve communication between the public and the government, and would help improve levels of trust.

11. Crucial to the success of the government's public debate will be how it deals with 'other issues'. This research determined that 'other issues' were a key motivational force for campaigners and a concern of many scientists. If decision-making is to be inclusive, and if levels of trust are to improve, these issues will need to be tackled.

Much of the success of the government's public debate will depend upon how it interprets 'other issues', and to what extent it acknowledges and communicates its own position on such issues. This research has determined that 'other issues', which are usually interpreted as political, ethical and socio-economic concerns, were a key motivational force for campaigners and a concern of many scientists. By publicly debating these issues, the government is likely to find that there is widespread concern about the power of industry interests over government and scientists. This research asserts that tackling 'other issues' would be the best way for the government to make its decisions inclusive, and to improve levels of trust. If the task is undertaken thoroughly, government and industry would no longer utilise the same individualistic/hierarchical discourse, and the real concerns of each type would be equally acknowledged and considered within the policy arena. If all the concerns of those engaged in controversial matters are dealt with in this way, public participation is unlikely to be required, because all three active viewpoints would be publicly acknowledged. Public participation would probably not bring anything new to the policy arena, and would therefore only show which type the public aligned themselves with. This would make decisions more democratic, but not necessarily more inclusive.

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Appendix One

Chronology of the GM Crop Debate, February 1996-December 2001 (not exhaustive)

1996:

February	Plant Genetic System's GMHT oilseed rape was authorised for seed production (first food crop approved for marketing in the EU).
April	EU authorised Monsanto's GMHT soybean for animal feed and food use.
November	Monsanto's GM Roundup Ready soya entered EU ports.

1997:

January	EU authorised herbicide-tolerant and insect-resistant GM maize by Ciba Geigy (later Novartis) for cultivation, animal feed and food use.
June	EU authorised GMHT oilseed rape by Plant Genetic Systems for seed production only. France withheld final authorisation.
July	MAFF announced a new discussion paper called 'Weed Control on the Farm: Management of Genetically Modified herbicide-Tolerant Crops'. Crops were expected to become commercially available in 1998.
October	Greenpeace released their first major report on GMOs called 'GE: Too Good to be True'. Supermarket actions by campaigners increased around the country. The Green Party launched a campaign asking Local Education Authorities to prevent GM food from entering school dinners.
November	The UK's first full-length documentary on GM foods, 'Frankenstein's Food' was shown on BBC2's 'Close-up West'. Greenpeace blocked one of the first shipments of GM soya beans destined for Rotterdam.
December	Newspapers reported that by New Year up to 60% of foods would contain GM ingredients. English Nature announced that there could be negative ecological impacts if GMHT oilseed rape was grown on a large-scale. FOE launched a briefing report on GMHT oilseed rape.

1998:

<p>January</p>	<p>MAFF received around 300 responses to its discussion paper on GMHT oilseed rape.</p> <p>The EU considered labelling requirements for GM foods.</p> <p>The British Medical Association requested better risk assessment and a ban on antibiotic-resistance markers.</p> <p>British Sugar announced that it would not process GM sugar beet.</p>
<p>March</p>	<p>Fifty people demonstrated at an oilseed rape trial in Cupar, Scotland, and cut back the crop to stop it flowering.</p> <p>Iceland Frozen Foods announced that its own-brand products would not contain any GM ingredients, including oil and lecithin. Other companies took similar steps over the following months.</p> <p>Prince Charles announced his support for the Soil Association's campaign to remove GM foods from food shelves by 2000.</p>
<p>April</p>	<p>The HSE found that six out of twenty-eight test plots inspected broke guidelines stipulated by ACRE.</p> <p>Organic farmer Guy Watson started campaigning against a planned GMHT maize trial within 2km of his farm. On 28th April 600 locals visited the farmer who was hosting the trial.</p> <p>A new campaign called 'Genetix Snowball' was started to encourage people to pull up test plots of GM crops.</p> <p>The EU approved GMHT oilseed rape by AgrEvo for importation (banned by France and Greece); GMHT maize (T25, which includes Chardon LL) by AgrEvo for cultivation (subject to legal challenge by France); insect-resistant maize by Monsanto for animal feed and food (subject to legal challenge by France); and GM herbicide and insect resistant maize by Novartis for animal feed and food.</p>
<p>May</p>	<p>FOE set up a Website to help people identify local test sites.</p> <p>Campaigners in Marlborough visited a local farmer who was planning to have a GMHT oilseed rape demonstration crop. He withdrew.</p> <p>Campaigners occupied a test site in East Anglia for two weeks</p> <p>Guy Watson sought a High Court Injunction.</p> <p>Monsanto apologised over the way GM soya was introduced to the EU.</p>

<p>June</p>	<p>Monsanto launched a £1 million advertising campaign.</p> <p>Prince Charles spoke out against genetic modification.</p> <p>Stephen Nottingham launched the first book detailing arguments against GM crops, entitled 'Eat Your Genes'.</p> <p>MP Alan Simpson launched a motion to ban GM food imports.</p> <p>GEN reported that seven fields were destroyed in one night.</p> <p>A MORI poll conducted for GeneWatch found that 77% of the British public felt that there should be a ban on growing GM crops, 73% were concerned about GM pollution and 61% didn't want to eat GM food.</p> <p>The biotechnology industry stated that the locations of trials should be withheld. Five of AgrEvo's 40 sites had been attacked.</p>
<p>July</p>	<p>The 4th July marked the first 'snowball' action at Model Farm, Watlington, Oxfordshire. Arrests were made for the first time, but the five women were released without charge. Ten days later they were served injunction papers ordering them not to pull up Monsanto's Roundup Ready test field crops, or to conspire with others.</p> <p>Dr. Mae Wan Ho published a book outlining the dangers of genetic modification, called 'Genetic Engineering: Dream or Nightmare?'</p> <p>English Nature announced that GMHT crops could impact upon farmland wildlife. The media published articles stating that 'altered crops could wipe out farmland birds' (Guardian 8/7/98).</p> <p>FOE announced that 8 of the 13 advisors on ACRE had ties with biotechnology companies. The head of the Environment Agency, Lord de Ramsey, agreed to allow GM test plots on his land.</p> <p>Organic farmer Guy Watson failed to get an injunction and was not given a Judicial Review. The test plot of GMHT maize could therefore stay. However, the High Court found the Government had broken its own regulations: of about 300 trials, the Government had not asked for data for 163. This was data for NIAB tests, not safety data.</p> <p>Monsanto signed up Third World leaders for their advertisements. Aid agencies spoke out against this.</p> <p>The French ordered a two-year moratorium on GMHT oilseed rape due to the potential for cross-pollination with related weed species.</p>

<p>August</p>	<p>Campaigners in Totnes destroyed the GMHT maize trial that was 2km from Guy Watson's farm.</p> <p>Various articles in the media outlined how superweeds could develop.</p> <p>MAFF proposed to shorten testing procedures after Guy Watson's case found that many of the trials were illegal. They stated that the additional trials were 'irrelevant'.</p> <p>On the 11th August nutritional researcher Arpad Pusztai disclosed on 'World in Action' that rats fed for 110 days on GM potatoes were smaller and less resistant to infection. The potatoes had a gene from a snowdrop and a gene from the jackbean to confer insect-resistance. Pusztai was suspended from the Rowett Research Institute two days later. It was reported that he had not fed potatoes with the gene, but potatoes spiked with the insecticide itself. Because of this his data was deemed inappropriate and it was asserted that conclusions were drawn too early.</p> <p>The media stated that bees could obtain GM pollen from test plots, which could then get into honey.</p> <p>GM food was taken off the menu at the House of Commons.</p> <p>The Independent reported the results of a survey they conducted, which showed that 'scientists are worried by modified food risks'.</p> <p>Eleven protesters were arrested at a GM crop site in Boothby Graffoe, Lincolnshire.</p> <p>The Independent reported that Monsanto was 'tightening its grip on the food chain' (16/8/98), while the Guardian outlined Monsanto's history as a producer of products such as Agent Orange (23/8/98).</p> <p>Monsanto announced that 'birds and bees love genetic crops' (Financial Times 25/8/98), and that golden rice could save 2.5 million lives (Sunday Times, 30/8/98). Environmentalists criticised these statements.</p>
<p>September</p>	<p>GM oilseed rape crops were reported to cross-pollinate more frequently than conventional oilseed rape crops.</p> <p>The Royal Society announced that the development of GM crops should be encouraged and called for a 'super-regulator' to oversee the development of GM crops.</p> <p>It was reported that GM crops have lower yields.</p> <p>The Independent reported that 'Clinton leant on Blair to allow modified foods' (8/9/98)</p>

September cont.	<p>Monsanto apologised for using a quote from an NFU representative in one of its advertisements without permission.</p> <p>A special edition of 'The Ecologist', which focused on Monsanto, was pulped. The printers feared that there could be legal consequences. It was later published by another company.</p> <p>GEN reported that 36 GM crop test plots had been damaged this year.</p>
October	<p>The media reported that the Government was considering a three-year moratorium on the commercial planting of GM crops in Britain. On October 8th companies had talks about a voluntary code that would delay wide-scale planting until at least 2002.</p> <p>The Observer reported that biotechnology firms would not co-operate with a moratorium on GM crops (11/10/98)</p> <p>A new four-year research project looking at the 'Botanical and Rotational Implications of Genetically Modified herbicide Tolerance' (BRIGHT) was launched. It was to be undertaken by NIAB.</p> <p>Five of the 49 trials inspected this year failed to meet the conditions set. As a result, genetic pollution was said to be certain (Financial Times, 17/11/98)</p> <p>The Government announced the farm-scale evaluations, which looked at the wider impacts of GMHT crops on biodiversity.</p>
November	<p>Documentation showed that Monsanto was concerned about the public's opposition to GM crops.</p> <p>The Observer published a long article criticising the activities of Monsanto.</p>

1999:

<p>January</p>	<p>Dutch scientists published research which showed that DNA remained intact for several minutes in the large intestine. It was deduced that genes could jump from GM food to bacteria in the gut of farm animals. If antibiotic-resistant genes were used, it was asserted that 'serious health implications' could result.</p> <p>Dr. Stanley Ewen of Aberdeen University backed Pusztai's research, after having conducted an independent analysis. Twenty leading scientists published a memorandum supporting Pusztai's findings. These included Dr. Vyvyan Howard and Dr. Mae Wan Ho, who were interviewed on BBC news. Newspapers claimed that the Rowett Institute received £140,000 from Monsanto, suggesting that it was not in the interests of the Rowett to support Pusztai's research.</p>
<p>February</p>	<p>MPs told Blair that they wanted a three-year moratorium on GMOs. A Labour MP quoted a scientific paper by Dr. Antoniou, which linked 37 deaths to a GM vitamin B2 supplement.</p> <p>FOE stated that the first commercial GM crops could be planted in the following months.</p> <p>Science Minister, Lord Sainsbury, was linked to GM food firms. As a result of these 'vested interests', campaigners called for his resignation.</p> <p>GM soya was found in Linda McCartney products, despite efforts to source non-GM ingredients.</p> <p>Blair backed GMOs and requested that people put science above scares. He stated that he was happy to eat GM food himself.</p> <p>The Sunday Express reported that Buckingham Palace Officials were approached to persuade Prince Charles to withdraw criticisms of GMOs from his website.</p> <p>The Local Government Association recommended a 5-year ban on GM foods in schools, old people's homes and town halls.</p> <p>Environment Minister Michael Meacher assured that commercial growing would not be allowed in Britain until the Government was convinced that GMHT crops did not damage wildlife. The voluntary agreement with the biotechnology industry was to run for one year. Meanwhile, ACRE published a report on the potential impacts of GMHT crops on wildlife. A new committee involving organisations such as the RSPB was to be set up. The Government pressed for three years, but it was reported that the biotechnology industry was not keen (Guardian, 18/2/99).</p> <p>Monsanto was fined for failing to provide an adequate buffer zone around a GM oilseed rape test plot.</p>

<p>March</p>	<p>Research by the National Pollen Research Unit, commissioned by the Soil Association, showed that current buffer zone distances would not stop GM crops from cross-pollinating with non-GM crops and weeds.</p>
<p>April</p>	<p>Friends of the Earth wanted one of the four farm-scale trial sites to be ploughed up because AgrEvo publicised the trial in the Gloucestershire Echo, rather than the Swindon Evening News, which is the more popular local newspaper in the trial's vicinity.</p> <p>It was reported that English Nature had doubts about the small scale and design of the farm-scale trials, but the biotechnology industry only had enough seed for 4 sites this year (BBC News 9/4/99).</p> <p>Sir Robert May, the Government's Chief Scientific Officer, backed GM crops.</p> <p>NIAB research showed oilseed rape could cross-pollinate with wild turnip when grown within four metres. GM and non-GM also hybridised.</p> <p>The Daily Mail reported that scientists warned of GM crop links to meningitis. The article stated that if workers breathed in dust as crops are processed, antibiotic resistance could be transferred to bacteria in their throats. Furthermore, it claimed that people could get resistant bacteria in their gut from eating GM crops.</p> <p>The Government was reported to be split over GM foods. Cabinet Minister Jack Cunningham said that all regulatory hurdles were cleared and commercial planting of GM crops could begin the following year. Two days later Michael Meacher said that Britain was not going to move to commercial planting for some considerable time.</p> <p>Meacher was said to be replacing 10 of the 13 experts on ACRE 'because of their links with the biotechnology industry'.</p>
<p>May</p>	<p>The British Medical Association called for an open-ended moratorium on commercial planting and a ban on releasing GMOs into the environment. It also condemned the use of antibiotic markers. A 16-page report was published.</p> <p>A report by the John Innes Centre, commissioned by MAFF, concluded that 1% of organic plants in any field could become GM hybrids through cross-pollination. The Department of the Environment and the Soil Association met to discuss 'acceptable' levels of contamination or organic crops.</p> <p>The Nuffield Council on Bioethics launched a report and stated that there was a 'compelling moral imperative' for making GM crops readily available to developing countries.</p>

<p>May cont.</p>	<p>Reports stated that GM Bt crops could kill Monarch butterfly larvae. In laboratory tests caterpillars were fed milkweed leaves dusted with Bt-corn pollen.</p> <p>A voluntary code on the growing of GM crops, underpinned by legally-binding contracts between seed suppliers and farmers, was published by SCIMAC. English Nature stated that they were adequate for the farm-scale evaluations, but not for commercial releases.</p> <p>Jack Cunningham, Cabinet Office Minister, announced the creation of the Human Genetics Commission and the Agriculture and Environment Biotechnology Commission (AEBC) to examine ethical, environmental and health issues. The New Food Standards Agency would be the key Advisory body on GM food.</p> <p>A report by Sir Robert May (chief scientist) and Professor Liam Donaldson (chief medical officer) was published saying that GM food on sale is not harmful.</p> <p>CPB Twyford withdrew from GM crop trials because of attacks by campaigners.</p> <p>It was announced that a new team of scientists would oversee the GM farm-scale evaluations, to be led by the Institute of Terrestrial Ecology.</p>
<p>June</p>	<p>The Women's Institute called for a 5-year ban on GM crops.</p> <p>A farmer in Wiltshire destroyed his 26-acre crop of GM oilseed rape (part of the farm-scale evaluations) after pressure from his farm's trustees. Six sites were left in the evaluations.</p> <p>Prince Charles met with Pusztai and publicly announced his support for Pusztai's research to continue. Previously, Pusztai was prevented from commenting on criticism from the Rowett Institute and his data had been confiscated.</p> <p>The Government was reported to have had numerous meetings with the biotechnology industry.</p> <p>One farmer who had taken part in the farm-scale evaluations decided to burn his GM crop after the Soil Association threatened to withdraw his organic certification. His organic beans were 6 metres away from the GM crop. Four sites were left in the farm-scale evaluations, in addition to 140 smaller experimental plots of GM crops.</p> <p>The John Innes Report was published. The media stated that there was a real risk of other plants becoming contaminated. The Government announced that acceptable levels of cross-pollination would have to be set.</p> <p>The National Assembly for Wales pursued a policy to make Wales a GM-free zone.</p>

<p>June cont.</p>	<p>The Environment Council met in Luxembourg. Members concluded that the controls on trialling and approving GM products should be tightened. No new authorisations were to occur until new legislation was in place. The outcome was reported to be a <i>de facto</i> moratorium.</p>
<p>July</p>	<p>The Observer reported that Monsanto's lobby firm paid an MP in charge of the House of Commons committee policing food policy.</p> <p>The yields of GM crops in the US were reported to be lower those of conventional crops.</p> <p>Reports reached Britain about Canadian farmer Percy Schmeiser who was charged with growing Monsanto's GM oilseed rape illegally. Schmeiser claimed that the GM genes must have blown in, while Monsanto claimed that he must have saved GM seed.</p> <p>Arrests occurred when a 25-acre crop of oilseed rape, grown as part of the farm-scale evaluations, was damaged in Watlington, Oxfordshire. A total of 500 people visited the site for a mass rally where various high-profile individuals spoke.</p> <p>Members of Greenpeace, including Lord Peter Melchett, were arrested after destroying a GM maize crop in Lyng, Norfolk, which was part of the farm-scale evaluations. 28 were arrested.</p> <p>A GM communications unit was set-up in the Cabinet Office. The Daily Express contacted AgrEvo for information, and the Cabinet Office returned the call. The Express suggested that the Government was acting as the biotechnology industry's PR company, rather than giving balanced information.</p> <p>It was reported that there could be a total of 75 farm-scale sites next year, covering a total of 125 acres. This year there were six.</p>
<p>August</p>	<p>Six acres of non-GM maize were destroyed at Spittal-in-the-Street, Lincs. Thirty-five people were arrested.</p> <p>It was reported that two scientists involved in the farm-scale evaluations were also paid by Aventis to look at the environmental benefits of GM crops. Another was paid to make a case for biotechnology as a member of 'CropGen'.</p> <p>The Advertising Standards Agency upheld 4 of 13 complaints made against Monsanto's advertising campaign last year.</p> <p>Ministers were reported to have discussed designating one tightly controlled area in Britain as a GM testing zone.</p> <p>The UK Government's advisory body for organic food, the UK Register of Organic Food Standards, was said to be pressing ministers to agree to a 6-mile 'notification zone' for organic farmers.</p>

<p>August cont.</p>	<p>The DETR announced that four sites would be planted in the autumn as part of the farm-scale evaluations. It is reported that their locations would not be kept secret, despite industry requests.</p> <p>The Guardian (21/8/99) reported that this autumn's GM trials did not have new licences, but old ones were amended. FOE took the case to the High Court. The original application to AgrEvo was for spring oilseed rape and was amended to autumn oilseed rape.</p> <p>A farmer pulled out from the winter farm-scale evaluations due to opposition from neighbours.</p>
<p>September</p>	<p>Food outlets were reported to be unaware of the deadline for labelling GM ingredients. New regulations were announced in March. It was reported that only 45% would be able to comply.</p> <p>The Conservatives called for a Royal Commission to examine the conduct and monitoring of GM trials for one year. They also stated that trials should not be allowed on land officially protected for conservation, or on Sites of Special Scientific Interest (SSSIs). The Liberal Democrats supported the introduction of a 5-year moratorium.</p> <p>The Government was reported to have had over 100 meetings with the biotechnology industry.</p> <p>GM foods were reported to be 'more worrying than BSE', and opinions towards the farm-scale evaluations and labelling were said to have hardened.</p> <p>A US-based coalition planned to launch an anti-trust lawsuit in several countries alleging that just a handful of companies exerted damaging control over food production around the world.</p> <p>The Government did not contest FOE's judicial review proceedings, and agreed that applications for the autumn crops should not have been amended versions of those submitted for spring crops. However, Meacher stated that the crops should not be dug up because AgrEvo planted crops 'in good faith'.</p> <p>Fast food chains banned GM food.</p> <p>The Times, Express and Independent led their front pages with reports that stated that the Government faced a huge setback over GM crops.</p> <p>The head of food safety at Sainsburys retired and warned that the pesticide safety limit for glyphosate had been raised 200 times for residues in glyphosate-resistant soya.</p> <p>A sign in the House of commons canteen stated that GM foods were 'avoided where possible'.</p> <p>Labour members spoke out against Blair's position on GMOs.</p>

<p>September cont.</p>	<p>The Daily Mail reported that secret plans to allow the commercial growing of GM crops next spring had been prepared. Cunningham said that he saw no point in delaying commercial planting if a crop had passed the necessary trials. The RSPB stated that they would quit the trials if this happened. The head of the FSE committee was reported to have said that proper investigations could take as long as 2008. It was also reported that over half the farm trial sites had not been monitored.</p> <p>GM oilseed rape was found 4.5 km from a farm-scale trial. Monitoring was organised by FOE, and was undertaken by the National Pollen Research Unit and a bee specialist. Pollen was found in all six hives (500m-4.5km). Airborne pollen was found up to 475m from the trial.</p>
<p>October</p>	<p>It is reported that Pusztai's research would be published in the Lancet.</p> <p>It is reported that the 'terminator gene' will not be commercialised.</p> <p>Science policy experts published in Nature, arguing that the concept of 'substantial equivalence' was vague and unscientific.</p> <p>Monsanto apologised for PR failures and pledged to answer safety concerns.</p> <p>A Channel Four News special reported on the European Commission's concerns about glyphosate.</p> <p>'The Politics of GM Food' was published by the ESRC. The media reported that the scientific approach to safety was not enough and that more political and ethical issues needed to be considered, as did public participation. There was a call for a temporary halt to the FSEs.</p> <p>The Food Ethics Council, set up last year with funding from the Joseph Rowntree Trust, published a report called 'Novel foods: Beyond Nuffield'. It stated that ethical concerns demanded a much more precautionary approach.</p>
<p>November</p>	<p>The Editor of the Lancet claimed that he was threatened by a senior member of the Royal Society who said that his job would be at risk if he published Pusztai's research. An influential group within the Royal Society was said to have set up a 'rebuttal unit' to push a pro-biotech line.</p> <p>The Government announced that unrestricted GM crops would remain banned until 2003 at the earliest. The ban would not be lifted until the farm-scale evaluations were over. Products would be labelled. The Government stated that 'no one will eat this produce if they do not want to.'</p>

<p>November cont.</p>	<p>It was announced that trials would be held on spring and autumn-planted oilseed rape, maize and possibly sugar beet. Plantings would be limited to between 20 and 25 fields per crop, about 200 ha, spread around the country. A company spokesman said that if licences were granted during the three years, strict controls would be exercised on how they were used.</p> <p>Iceland Frozen Foods announced that they would remove meat and poultry reared on GM feed. Many other supermarkets followed.</p> <p>There were warnings of the dangers of super-trees, which were being grown in field trials. It was claimed that they could cross-pollinate with native trees over 400 miles away.</p> <p>It was reported that GMHT soybeans were splitting in the heat of southern states in the US, with losses of up to 40%.</p>
<p>December</p>	<p>The Church of England's Ethical Investment Working Group decided not to allow GM crop trials on church land.</p> <p>FOE urged farmers to remove the oilseed rape crops that were illegally granted permission for trial purposes.</p> <p>The Guardian reported that the caterers who supplied Monsanto's canteen in High Wycombe had a policy to remove GM ingredients from their food.</p>

2000:

<p>January</p>	<p>A report by the National Pollen Research Unit, commissioned by the Soil Association, found that there was a high risk of contamination from three of the five GM crops involved in the farm-scale evaluations. The Soil Association again requested a six-mile isolation distance.</p> <p>A House of Lords committee report stressed the need to make risk assessment and regulatory procedures more rigorous, but stated that the benefits of GM crops far outweighed the risks. English Nature was reported to be disappointed that the committee failed to understand the implications for farmland wildlife of growing GMHT and IR crops.</p> <p>The Times reported that pest-resistant oilseed rape had been bred by CPB Twyford, casting doubt on the need for genetic engineering.</p>
<p>February</p>	<p>It was reported that US lawyer Steven Drucker was leading an action against Monsanto and that he accused the FDA of deliberate deception. According to Drucker, FDA papers stated that GM foods could not be presumed 'substantially equivalent' because they posed unique risks. He also claimed that the FDA approved GM tomatoes, later sold as paste in the UK, despite tests showing that rats fed on them had developed 'erosions' in their intestines.</p> <p>According to the media, the number of farmers growing GM crops in the US and Canada was likely to drop by 20-25%. The drops were attributed to concern that they would not be able to sell GM produce internationally.</p> <p>It was claimed that Prime Minister Tony Blair had backed down. He stated that he understood the 'cause for legitimate public concern'.</p> <p>It was reported that not enough farmers were coming forward with sites for the farm-scale evaluations.</p> <p>A ship carrying GM soya from the US turned back after a two day occupation by Greenpeace.</p>
<p>March</p>	<p>It was reported that Wales had an effective veto on the commercialisation of Chardon LL, and was keen to block the application, but there was no legal basis for doing so.</p> <p>On March 17th Meacher announced new GM crop sites for the farm-scale evaluations. It was reported that scientists and Government officials would host a series of public meetings across the country to explain and answer questions about the evaluations. FOE claimed that not enough sites had been found to make the experiment scientifically rigorous. Meacher stated that GM maize from the trials would be fed to livestock, which could be slaughtered and processed into food.</p>

<p>March cont.</p>	<p>Two farmers pulled out of the trials within a week of their announcement. Six more trials were announced a week later.</p> <p>Equinox: 'The Rise and Fall of GM' (Channel 4) was criticised by anti-GM campaigners for being biased.</p> <p>The European Court of Justice ruled against France in the GM maize case. The maize was cleared at EU level but France declined to give the final authorisation and referred the matter to the court. It was reported that the EU's approval process had been in limbo since April 1998, which increased trade friction with the US.</p> <p>An investigation by Farmers Weekly found that farmers involved in the FSEs could make up to three times as much as they would from growing the equivalent conventional produce. Despite the 'generous payments', not enough farmers were coming forward.</p> <p>Two farmers had already dropped out of the farm-scale evaluations.</p>
<p>April</p>	<p>Greenpeace campaigners (including Lord Melchett) went to court after damaging a GM maize trial site last July. They were charged with criminal damage and theft.</p> <p>Greenpeace and FOE revealed which farms the FSE sites belonged to. They believed that the Government should have provided this information.</p> <p>The DETR posted a leaflet entitled 'GM corps – take a closer look' onto the internet. It was also distributed at public meetings.</p> <p>A new US report, intended to provide scientific basis for US government regulatory policy, was reported to be compromised by its authors' links to the biotechnology industry (Guardian 6/4/00)</p> <p>Austria banned T25 GM maize, which included Chardon LL.</p> <p>Aventis announced their intention to put Chardon LL on the National Seed List. Members of the public had until April 25th to register objections.</p> <p>The Church lent its support to calls for a moratorium on GM crops.</p> <p>MAFF internal minutes showed that a firm manipulated scientific data so that seeds in trials appeared to perform better than they really did (for dry matter content at harvest).</p> <p>Rain delayed crop sowing and it was reported that it could affect the farm-scale evaluations.</p> <p>The Greenpeace trial in Norwich Crown Court lasted from 3-19 April. It resulted in an acquittal on the charge of theft, but failure to reach a verdict on the charge of criminal damage.</p>

<p>April cont.</p>	<p>Thirty chefs spoke out against GMOs.</p> <p>Thirty-four farms were reported to be at risk of losing their organic status. Five were particularly said to be at risk.</p> <p>A farmer in Tittleshall pulled out of the FSEs after village protests.</p>
<p>May</p>	<p>A GM oilseed rape farm-scale trial was abandoned 2 days before locals were due to vote. A GM site planned for Cornwall was abandoned after a local milk company threatened to stop collecting milk from the farmer. Another was abandoned after it was discovered that the trial was in Wales, despite being listed as Cheshire. Two Hampshire sites for forage maize were also dropped.</p> <p>The Crown Prosecution Service announced that it would seek retrial of the Greenpeace 28.</p> <p>GM pollen was found in honey. The Bee Farmers Association advised members to put their hives at least 6 miles from trial sites.</p> <p>Nick Brown, the Minister of Agriculture, was accused of delaying a warning that GM oilseed rape had been inadvertently planted on 600 farms. Advanta informed the Ministry of the error on 17th April. The Scottish Executive and Welsh Assembly were only told on 12th May, 5 days before the Government publicised the problem in a written answer to the House of Lords. Initially there were no plans to destroy the crops said to cover 11,750 acres. A further 22,000 acres were sown and harvested last year, and oil extracted from these had already entered the food chain. In response, a new campaign called 'Dig it Up!' was launched.</p> <p>Prince Charles stated that GM technology was 'playing God'.</p> <p>It was reported that 5-15% of this year's European maize crop could have been contaminated with GM material. Most of Britain's maize seed was from France, where 1% GM material was allowed.</p> <p>A farmer with contaminated oilseed rape decided to dig his crop up immediately, and another soon followed. Supermarkets said that they would not buy crops from farmers who planted contaminated seed. According to Brown, the Government did not have the power to order farmers to destroy crops and could not offer compensation. The NFU said farmers would lose £3 million.</p> <p>On the 29th May Nick Brown, Agriculture Minister, advised farmers to destroy contaminated GM oilseed rape crops. He said that they could be harvested in the UK, but not sold. Brown announced that farmers who replanted before 15th June would still be eligible for grants. MAFF was to discuss compensation with Aventis.</p>

<p>May cont.</p>	<p>A US industry representative, who screened agricultural produce for GM material, found that more than half of 20 random samples of conventional seed taken from American distributors contained some GM seed. Genetic ID, in tests last year, found 12 out of 20 random American consignments of conventional maize seed contained detectable traces of GM maize.</p> <p>A four-year study from Germany found that the gene used to modify oilseed rape transferred to bacteria living inside the guts of honeybees. The herbicide-resistance genes in the oilseed rape occasionally transferred across to the bacteria and yeast inside the intestines of young bees. Adult bees flew in a netted area of oilseed rape where there were pollen traps at the entrances of hives. Pollen was removed and fed to young bees. They extracted the intestine and found that the gene had transferred in the bee gut to microbes. It was reported that this meant genes from GM crops could spread to wildlife.</p> <p>Monsanto soybeans were found to contain 'rogue DNA'. Years after creating the Roundup Ready soybean, researchers found two rogue fragments of DNA. Campaigners claimed that this proved the technology was unknown and imprecise. Monsanto stated the pieces were inactive and, since they were present when the soybean was tested, they were also safe.</p>
<p>June</p>	<p>Advanta agreed to pay compensation to farmers who planted contaminated oilseed rape.</p> <p>The Government announced that the separation distances between GM and non-GM crops would be reviewed.</p> <p>Parishioners near a farm-scale trial in Wivenhoe voted 88% against the trial, with a 38% turnout.</p> <p>Princess Anne and Prince Philip spoke in favour of GM crops.</p> <p>It is reported that the University of Nebraska found GM soya produced, on average, 6% less than similar conventional varieties, and 11% less than the highest yielding varieties.</p> <p>Meacher told MPs that whatever the distance between GM and other crops, some contamination could occur. He stated that it was therefore necessary to find an acceptable level of contamination.</p> <p>It is reported that ten of the GM trial crops could be destroyed because they were too near to organic farms. The Sunday Express stated that it might be necessary to have 6-mile buffers around organic farms.</p> <p>The European Commission proposed that Member States temporarily allow contamination of conventional seeds by up to 0.5%, half the tolerance wanted by European seed manufacturers, but five times greater than Iceland Frozen Food's limit.</p>

<p>June cont.</p>	<p>A Government plan to allow seeds labelled as conventional to contain up to 1% GM seed was rejected by English Nature. GM crops not approved in the UK but approved elsewhere would be included in the 1% threshold.</p> <p>Crisis talks apparently surrounded the farm-scale evaluations. The plan was to have 60 sites but there were only 48. A minimum of 44 was believed to be needed.</p> <p>The Wivenhoe trial was being undertaken on a farm with rhyzomania, where access should be minimised. Withdrawing the site would have brought the number of maize trials to below the minimum required.</p> <p>Villagers backed a GM crop trial in a Yorkshire village.</p> <p>A conventional oilseed rape crop in the farm-scale evaluations was contaminated with GM material (Daviot, Aberdeenshire). It was reported that it would still be compared with the GM side as planned.</p> <p>Organic farmers in Herefordshire were not aware of a GM maize farm-scale evaluation nearby. There was no legal requirement to advertise GM maize, but SCIMAC had been doing so. The Soil Association allowed them to keep their organic status because there was an intervening wood.</p>
<p>July</p>	<p>Advanta announced that it would pay at least £337 per ha to farmers in the oilseed rape mix-up.</p> <p>Campaigners damaged half the Daviot farm-scale trial, while 90% of an oilseed rape trial in Hertfordshire was destroyed. A trial at Over-Compton in Dorset was also attacked.</p> <p>It was reported that the EU would apply tougher approval rules for GMO products while awaiting final legislation.</p> <p>Europe was reported to be 'caving in to US firms' on the approval for GM foods.</p> <p>Advanta reported that distances between its GM oilseed rape in Canada and conventional oilseed rape were 4000 metres (80 times those in the UK) and yet this was where the seed in the oilseed rape mix-up became contaminated.</p> <p>9 out of 48 farm-scale trials had been damaged or destroyed during three weeks in July.</p>
<p>August</p>	<p>Twenty-five sites for winter crop of oilseed rape were announced for the farm-scale evaluations.</p> <p>Novartis was said to have banned GMOs from its own foods.</p>

<p>August cont.</p>	<p>Iowa State University announced more evidence to show that pollen from maize could kill Monarch butterflies. Novartis stated that the study was flawed.</p> <p>It was reported that the Government was to consider proposals for the first experiments feeding home-grown fodder maize (from the farm-scale evaluations) to cattle.</p>
<p>September</p>	<p>Research by Andrew Watkinson of the UEA, outlining potential negative impacts of GMHT crops on bird populations, was published in Science.</p> <p>Lord Melchett and other Greenpeace members returned to court, charged with criminal damage. Melchett was reported to say that GM crops were worse than nuclear waste. All were acquitted later in the month. The jury unanimously agreed that the protesters believed that GM crops were harmful and that the countryside needed protecting.</p> <p>GeneWatch UK revealed that Monsanto was involved in a global campaign to promote GM foods by influencing independent scientists (Guardian, 6/9/00)</p> <p>An organic food boom was predicted, mainly as a result of the GM controversy.</p> <p>DETR announced that the winter oilseed rape trials would go ahead with separation distances of 50m between GM and conventional varieties. However, this would be increased to 200m for organic and seed crops, and 100m in the case certain types of oilseed rape – called Varietal Associations – as they appeared to be more susceptible to cross-pollination. A MAFF review was considering separation distances. If separation distances were changed during this process, the flower heads of GM crops were to be removed.</p> <p>A food scare in the US led to millions of taco shells being withdrawn from supermarkets and restaurants. The tacos were said to contain GM corn (StarLink) that had not been cleared for human consumption. The discovery was made by an environmental lobby group, which tested some of the shells.</p> <p>It was announced that there would be a public hearing concerning the National Seed Listing of GM maize (Chardon LL), which would cost £500,000. Campaigners utilised previously unused official procedures laid down in 1982 to object to the commercialisation of this maize. Sixty-eight groups and individuals paid £60 to be heard, and a further 220 paid £30 to lodge protests in writing.</p>

<p>October</p>	<p>On the 1st it was reported that officials had kept a crucial test secret. At Dartington, Devon, where Guy Watson complained about GM maize near his organic farm, NIAB gathered information from the site two months after it was thought that the crop had been destroyed. This information was used as evidence to justify placing the maize on the National Seed List. The Farm Association suspected that the results had 'fabricated', but MAFF said there had been a second GM crop on the site that had not been destroyed. On the 8th it was reported that secret trials were under way in five British counties. They were authorised by Nick Brown, Agriculture Minister, but it was reported that he was under no obligation to tell his colleagues about the sites. The tests were for NIAB, not for the farm-scale evaluations. MAFF would only disclose, at most, the parish. On the 16th MAFF publicised the 21 'hidden' GM trials and said that the locations of these National Seed List trials had always been in the public domain. They were then published on the internet.</p> <p>Aventis were told that they must present evidence at the public hearing to get Chardon LL put on the National Seed List. Aventis accused the chairman of being biased in favour of campaigners.</p> <p>Aventis admitted they grew GM sugar beet without permission at 2 trial sites in the UK. The crops were destroyed when inspectors from the Central Science Laboratory found 0.5% unauthorised beet. They used this batch at 10 small sites and found contaminated beet at two.</p> <p>English Nature said that if the biotechnology industry could not control the spread of transgenes under experimental conditions, there was little chance of containment if commercial releases took place. Evidence in the US and Canada showed that gene stacking and accidental transfer were becoming widespread.</p> <p>A study by the Advisory Committee on Animal Feeding Stuffs revealed that transgenes were surviving the manufacturing process that turned GM crops into animal feed. It was reported that DNA (including genes for antibiotic-resistance) could transfer to bacteria in the gastrointestinal tracts of animals fed on this material</p>
<p>November</p>	<p>It was discovered that Chardon LL was not tested to EU standards. New information from the French Government stated that Chardon LL was tested in France for one year, not two. The hearing was postponed.</p> <p>FOE employed scientists from the University of Bristol to review a study by Aventis, supporting its case to put Chardon LL on the National Seed List. They found 'a failure to investigate suspicious trends' in the death of chickens. Ten male broilers out of 104 died after eating the GM maize (7.14%), while 5 died after eating conventional maize (3.57%). Aventis stated that a normal mortality rate at this age is between 5-8%, but a poultry industry representative stated that over 4% indicated a problem. The scientists also found that nutritional tests were 'inadequate' and that tests were not repeated adequately. The maize had not been tested on cows, for which it was intended.</p>

<p>November cont.</p>	<p>Liability lawsuits were being prepared in the US following the StarLink contamination incident. In some states, such as Iowa, it was asserted that as much as half of the corn crop could have been contaminated.</p> <p>Greenpeace activists dressed as chickens shut down the UK's only soya mill in order to publicise the fact that most animal feed was GM.</p> <p>McDonalds stopped using meat reared on GM feed.</p>
<p>December</p>	<p>More research suggested that altered pollen could harm Monarch butterflies.</p> <p>Greenpeace prevented the unloading of a GM soybean shipment from the US.</p>

2001:

<p>January</p>	<p>Prince Charles claimed that 'sustainable agriculture' (referring to research by Jules Pretty) would feed the world, not GM crops.</p> <p>The Guardian reported that 'the strength of the GM food lobby in George Bush's new cabinet, and its links with the GM global leader, Monsanto, are greater than anything that came before'. It was feared that they would have undue influence on the new Government, and would put pressure on others.</p>
<p>February</p>	<p>Members of the European Parliament approved a revised EU GM directive regulating releases to the environment. Denmark, France, Greece, Italy, Austria and Luxembourg stated that they would not accept any GMO approvals and would retain the 'de facto' moratorium.</p> <p>Environment Minister, Michael Meacher, announced 58 more farm-scale trial sites. Greenpeace called for the trials to be halted and for flower heads to be removed from all GM crops currently growing. Two were reported to be within the foot-and-mouth exclusion zone.</p>
<p>March</p>	<p>Laboratory testing revealed that a Kellogg's product in the US was made with StarLink corn. This variety was not approved for human consumption. GM soy was also found in 'GM-free' products.</p>
<p>April</p>	<p>The Guardian reported that a farmer withdrew from the farm-scale evaluations because of foot-and-mouth disease, but later issued a press release stating that he withdrew 'due to the unbearable level of intimidation and threatening behaviour that has been targeted towards me and my family'. The article concluded that the Government and Aventis had manipulated the facts again.</p> <p>MPs and environmental groups feared GM crop trials could spread foot-and-mouth disease. 28 of 100 trials were in FMD infected areas.</p> <p>Canadian farmer, Percy Schmeiser, lost his case against Monsanto.</p> <p>Scientists investigated possible contamination of two conventional varieties of oilseed rape by modified genes. Both were new varieties being grown in crop trials.</p> <p>The Guardian reported that 72% of the public no longer trusted the Government over food safety (14/4/01).</p>
<p>May</p>	<p>Organic farmers in West Wales complained that they were not consulted about a local farm-scale trial site. Aventis should have consulted with local farmers at least 10 days before planting was due. The wrong grid reference was also given.</p>

<p>May cont.</p>	<p>The British Trust for Ornithology (BTO) was not required to look at bird populations in the farm-scale evaluations.</p> <p>There was controversy over plans for a GM farm-scale trial site within two miles of the Henry Doubleday Research Association, where organic research is carried out. Meacher asked for the site to be dropped. The RSPB threatened to withdraw from the trials if it was not. SCIMAC decided to abandon the site 10 days later.</p> <p>Meacher informed MPs that producers of GM crops could be made liable for any damage that occurred as a result of their activities.</p> <p>Agriculture Minister for Wales arranged a meeting with a farmer in Flintshire to try to persuade him to quit the farm-scale evaluations. The Welsh Assembly had fought for six months to 'go it alone' and to prevent GM crops from being grown in Wales.</p> <p>Environmentalists took legal advice to see whether they could stop all trials near organic farms, following the success of the HDRA. 31 of the trials were at least the same distance from organic farms.</p>
<p>June</p>	<p>New plans were presented by the European Commission to allow traces of up to 1% of GM crops approved in the US, but not in the EU, to be sold in produce as 'GM-free'. Six countries were expected to raise objections. Britain was not sending a minister or civil servants, and was believed to support the proposals.</p> <p>Six of 13 GM oilseed rape trials were destroyed in that past few weeks. Two more were believed to have failed naturally. Thirty of the 104 farm-scale evaluation trial sites were opposed by local communities.</p> <p>Seven protesters who cut down and trampled a GM maize crop in Dorset last July were acquitted. It was the first time that magistrates rather than a jury acquitted GM protesters.</p> <p>Eleven protestors were acquitted of damaging a crop trial in Wivenhoe last summer.</p> <p>US farm representatives, who attended EU meetings considering the appropriate GM threshold standards, said a 5% contamination level was more workable than 1%, and one-tenth of a percent was unreasonable.</p>
<p>July</p>	<p>Eight people were arrested during a protest against Wale's last remaining GM crop trial in Sealand, Flintshire.</p> <p>A large area of the farm-scale trial in Wivenhoe was destroyed.</p>

<p>August</p>	<p>The Daily Mail reported that EU proposals to save conventional farms from GM contamination could make GM crops unfeasible in Britain. FOE revealed a memo demanding separation distances for commercial crops to be increased to 5km.</p> <p>Syngenta (Novartis and Zeneca merged in 1999) applied to DEFRA to test a terminator gene.</p> <p>Research in Canada showed that GM oilseed rape could cross-pollinate over 800 metres and could produce superweeds. The contamination was reported to be affecting the organic market. One group of farmers planned to take Monsanto to court.</p> <p>America was to challenge EU plans to label food with over 1% GM ingredients under world trade law. It is reported that US exports could effectively be blocked. Britain was said to be under pressure.</p>
<p>September</p>	<p>The Agriculture and Environment Biotechnology Commission (AEBC) published 'Crops on Trial'. BBC News concluded that the 'GM crop trials are flawed'. The Daily Telegraph reported "“secrecy” over GM crops attacked”.</p> <p>The European Commission consulted the Food Standards Agency and similar bodies in other Member States on labelling. The FSA voted against proposals to label derivatives of soya and maize such as modified starch and lecithin.</p>
<p>October</p>	<p>Brussels was reported to be mounting a campaign to increase the amount of GM crops and food grown and eaten throughout Europe. The European Commission wanted to lift the three-year moratorium. No new products had been approved since October 1998, while in the US and Canada around 50 GMOs had been approved.</p> <p>Ten thousand hectares of unauthorised GM cotton were found in India. 'Nature' questioned whether developing nations could regulate the introduction of GM crops.</p> <p>The High Court ruled that the charge of 'aggravated trespass' could not be used in a case against GM campaigners. In cases of 'criminal damage' protestors had been acquitted. It was reported that the CPS could appeal to the House of Lords.</p>
<p>November</p>	<p>Scientists found DNA from genetically modified crops in wild maize growing in remote mountains in Mexico (62 miles from the nearest industrially farmed crops). Mexico had a moratorium on planting GM maize since 1998 but allowed the import of GM crops for consumption. The news is said to shock scientists.</p>

November cont.	<p>The New Scientist reported that GM oilseed rape pollen and seed had become so widespread in Canada that it was difficult to grow uncontaminated conventional or organic strains.</p>
December	<p>A new report by CropGen was published called 'One Hundred Per Cent Safe? GM Foods in the UK'. It offered a guide to the data collected on the four GM crops approved for consumption in the UK, and an overview of the regulatory procedures in the UK. FOE stated that it would like all GM safety data to be made publicly available.</p> <p>FOE called for outdoor trials of GM crops to be stopped and Aventis to be prosecuted after GM oilseed rape volunteers, already in flower, were found growing on a site used in the farm-scale evaluations earlier this year. The Government asked Aventis to deal with the volunteers 5 days later.</p>

Appendix Two

Key Websites and Electronic Mailing Lists

- Agricultural Biotechnology Council:** <http://www.ukabc.org>
- Agricultural Environment Biotechnology Commission:** <http://www.aebc.gov.uk>
- AgBioWorld:** <http://www.agbioworld.org>
- British Society for Plant Breeders:** <http://www.bspb.co.uk>
- Corporate Watch:** <http://www.corporatewatch.org.uk>
- CropGen:** <http://www.cropgen.org>
- DEFRA (FSEs):** <http://www.defra.gov.uk/environment/farm-scaleevaluation/index.htm>
- Do or Die:** <http://www.eco-action.org>
- Ecohype:** <http://www.probiotech.fsnet.co.uk>
- ePublic Relations:** <http://www.epublicrelations.org>
- Five Year Freeze:** <http://www.fiveyearfreeze.org>
- Friends of the Earth UK:** <http://www.foe.org.uk>
- Genetic Engineering Network:** <http://www.geneticsaction.org.uk>
- GenetiX Snowball:** <http://www.fraw.org.uk>
- GeneWatch UK:** <http://www.genewatch.org>
- GM Food News:** <http://www.gmfoodnews.com>
- Greenpeace UK:** <http://www.greenpeace.org.uk>
- Greenspirit:** <http://www.greenspirit.com>
- Institute of Science in Society:** <http://www.i-sis.org.uk>
- Monsanto UK:** <http://www.monsanto.co.uk>
- Natural Law Party:** <http://www.natural-law-party.org.uk/keyfr.htm>
- Norfolk Genetic Engineering Network:** <http://www.members.tripod.com/~ngin>
- Primal Seeds:** <http://www.primalseeds.org>
- Royal Society for the Protection of Birds:** <http://www.rspb.org.uk>

Appendix Three

Friends of the Earth article, December 1998

Last December I decided to visit various groups within the United States to discover how well GM crops had really been accepted. Surely they're not as popular out there as the Monsantos of this world would have us believe, I asked myself...

Having spoken to US biotech representatives prior to my visit, I was aware of the differences that I may well encounter. I realised that I would be unlikely to meet many GM activists on my travels, but ensured that my accommodations in Washington was close enough to wholefood shops and cafes where, I presumed, people would hold just a bit more scepticism than the average American citizen – I presumed too much!

Thinking that I may have missed something, I asked the owner of a nearby wholefood shop, where a variety of organic foods were sold, to what extent customers and the public in general were concerned about GM foods: "Other than the BST controversy a number of years ago," came the reply (concerning the GM growth hormone that is injected into cows to increase their milk yield – while decreasing health and life expectancy), "not at all. But then this is a 'natural food store', you might want to try a 'health food store' where they sell food supplements. That's where all the health fanatics go." So, GM foods really are unquestionably 'natural' in the US...

Talking to Jane Rissler, co-author of 'The Ecological Risks of Engineered Crops' (MIT Press, 1996), and senior scientist at the Union of Concerned Scientists (UCS), it became apparent that issues concerning food and agriculture, particularly in an environmental sense, are topics with which it is extremely difficult to raise awareness within the US. Therefore, while concern about the health, environmental and even socio-economic impacts of GM crops has escalated within the EU, US consumers have continued to be concerned about pesticide residues and *e.coli*, but most importantly about price and quantity.

With the aim to discover further why Americans view GM foods so differently, I took a trip to the agricultural plains of Missouri, home to multinational giant Monsanto and numerous GM farmers, or 'producers' as it seems they prefer to be called. Travelling from Washington to St. Louis and then on through farming lands, it became progressively more apparent that there is a far clearer distinction between the attitudes held in the US and UK concerning the role of

agriculture than I had previously imagined. For, while many British people have retained a certain respect for the balance that agriculture can achieve with nature (albeit often from the vantage point of their car as they race to work, or perhaps as they make a visit to the countryside at weekends), Americans remain isolated in their cities, having conquered wild foreign lands and then handed them over to their agribusinessmen. In fact, they appear to no longer have a need to ever pass by an agricultural crop... except perhaps by plane as they fly to a National Park to commune with nature... So why should they ever worry about the impact that GM crops have on the wildlife and landscape of their agricultural regions? For these areas have been tamed by man and are there for production, and production alone. They are not expected to also look attractive or support wildlife. That's the domain of nature reserves and National Parks.

At first I felt that perhaps this theory of mine was, well, maybe just slightly harsh. But having met and in fact feasted upon GM foods with US farmers, I can confirm (though with a limited sample admittedly) that, having had to explain why we don't want all our birds exterminated from our agricultural fields, and how in fact we appreciate the value of our hedgerows ("oh, d'you mean 'scrub'? That's strange"), the sustainable form of agriculture that is requested by UK citizens is very different to that envisaged by those involved in the US.

For they really do believe that they are onto something good here. It's not all rhetoric. Employees of Monsanto really do believe that they have the most important piece to the 'feed the world's starving millions' jigsaw puzzle. And GM technology is really the only way that this jigsaw can be made sustainably. It's implausible to think otherwise, although there will, perhaps, admittedly, be some negative socio-economic implications. But then, having a few giant farms run by farm managers, with all the decisions, risks (and profits) taken by biotech companies... will be far more efficient... And anyway, farmers only really farm because they like driving tractors. This way they will be able to drive their tractors and go home without a care in the world, knowing that they don't have to worry about pests, diseases, weather or even world market prices. For the industry will provide them with their pay packet too.

But then, if you believe in retaining small farms, the biotech industry can do that too. In the future it will be entirely possible to order seeds designed to suit the specific climatic, soil and pest requirements of a particular farm. Although... wasn't that what we once had before industrial agriculture introduced its vast swathes of monocultural crops? In fact, wasn't that at the behest of these same agricultural scientists?

No, that can't be right. For I now have it on good authority that biotechnology will save the world and provide us all with the most safe and prolific food supply possible. It *is* the height of sustainability... Well, the enthusiasm that Monsanto employees have for this belief is so overwhelming that it must be true. Even an ecologist employee, "once possible sceptic", says so. In fact, the atmosphere at their headquarters is so positively buzzing that it has reached the point of being contagious...

Well. Almost!

But before writing-off the whole place as teeming with deluded would-be saviours of the world (although, doesn't everyone want to believe that what they're doing is somehow going to do some good somewhere?), I could see how this belief had perhaps come to be, at least concerning US agriculture. Spending the best part of two days on a 2,000 acre GM soya and corn farm – yes, that's all the whole region grows year after year – I realised that the problem is far more than GM technology, or a simple switch from conventional to organic. The farmers that I met in Missouri, seeing nothing wrong with using copious amounts of pesticides, had no inclination to make their farms more environmentally or socially sustainable. Among the main reasons for introducing GM crops were that they made life easier, created cleaner, weed-free fields, decreased the amount of 'scorching' that plants had experienced with more potent herbicides and made it more likely that they could manage larger farms in the future. Not once were food residues or impacts on wildlife mentioned. As one farmer stated, concerning his attitude to pesticides: "Okay, maybe with DDT there were a few problems with the eagles, but nothing serious. And anyway, if you can treat a sick person with medicine, why not a sick field with pesticides...?"

Certainly I tried to query perhaps why a field was 'sick' in the first place... But since I hadn't openly identified myself as GMO sceptic, and was in fact stranded at night on a 2,000 acre GM farm where organic farmers were considered to be queer misguided folk, who grew more weeds than beans, possibly due to the fact that all they did was hug trees and practice transcendental meditation in their fields... I decided to take another mouthful of the genetically modified dinner that they had so kindly prepared for me.

All things considered therefore, it must be tempting to believe that herbicide and pest-tolerant crops will improve the lot for the environment, while also reducing food residues. Especially if it means not having to tackle US farmers' 'productivist' attitudes. And when there are so few environmental activists that challenges to this belief are not heard; in fact so few environmental activists, that fields can be clearly advertised with signs boasting that they

contain GM crops... why would you choose to question it? Particularly when the few voices that *are* heard are those from Europe: a place full of technophobes, a place that will soon “turn into an historic theme park where you can experience what agriculture once used to be”; or, as a farmer more bluntly put it: “The next third world country.”

But regardless of the fact that no one particularly cares about the conservation value of US agricultural land, it does seem strange that there is also no concern about the possible health effects. For while it is rumoured that a small minority on the West coast do care, the majority of US citizens either appear to have no awareness or at least concern about the existence of these crops. According to officials, the accepted reason for this difference is that US citizens are better educated in the sciences, more embracing of new technology and were far better prepared for the introduction of GM technology. More importantly by far however, is the fact that the US public *totally trust* their regulatory bodies. As one professor said: “If the FDA said drink acid, the American public would!” Suddenly I’m grateful for BSE, without which we too may well have trusted our regulatory system.

But of course, while we can be grateful that Britain is an easier place to contest the value of GM foods (not only because the British public are more sceptical, but also because at least we live near fields that are also small enough upon which to make an impact...), we will continue to be host to pressure from the United States. Meeting with people closely connected to the White House, I have witnessed the force with which they will encourage the introduction of these crops to the UK. As one representative stated, “Under no circumstances are we going to tolerate Europe preventing the entry of these foods.” While another practically slammed his fist on the table as he tried to demonstrate just how much of a “radical environmentalist” he was.

Well, I wasn’t going to argue then and there. I’m just glad I live in the UK where we can still stop the cultivation of GM crops, and where news of our actions are sometimes the only thing that keep our American counterparts from giving up altogether.

Position Statement, August 2000

This summer, as the empirical element of my PhD study, I interviewed around fifty people involved in the controversy surrounding this year's farm-scale evaluations of GM crops. As I stated in my introductory letter to potential interviewees, 'this will be a highly objective piece of work. It is not intended to support the aims of any organisation or group, and full anonymity will be offered as required. It may also be of interest for you to know that, although my own personal opinion should in no way influence the results that I produce, I remain open-minded on the issue of GM technology'. I believe that this statement was, and still is, entirely accurate. I did not believe (whether rightly or wrongly) that my past involvement with Friends of the Earth was relevant to my work, particularly since I have not been involved with this or any similar organisation for well over a year now.

Although I no longer associate myself with Friends of the Earth, my 'concealed' involvement with them in the past has understandably caused much concern for potential interviewees. I realise now that perhaps, due to the sensitivity of this subject, I should have explained in more detail my own personal beliefs about genetically modified crops, despite the fact that within a truly academic piece of work (which I believe is the only type of work for which one can receive a doctorate) it would be impossible to be anything but objective. I would therefore like to clarify my position by explaining exactly how I have been involved in the GM debate, and to reaffirm exactly where I stand today.

When I completed my MSc in Resource Management at Edinburgh University (for which I interviewed crofters about their land management decisions and received a distinction), I spent some time working for Friends of the Earth Scotland where I heard about the forthcoming introduction of GM foods. With a strong interest in agriculture and land-use issues I decided that I wanted to understand the subject further, and so left Friends of the Earth in order to pursue a PhD in the subject. At that time I was very concerned that GM technology was being introduced before the full environmental impacts had been ascertained, and so, upon moving to Bath, joined the local Friends of the Earth group there.

By the time my PhD started in October 1998, I became increasingly concerned that perhaps my own position on GM technology would influence my work. I therefore found myself in many discussions with other academics as to whether or not I could be objective enough for my proposed study. As a result of my discussions, and as a result of reading books concerning social science methodologies however, I eventually became clear in my own mind that I could remain outside my academic work. I could not have claimed to be either

'objective or 'open-minded' with regard to this technology in my own personal life, but neither did I attempt to do so. Nevertheless, despite my own personal feelings, I had no desire to misrepresent people, events or facts within a debate which I have always felt has been appallingly handled by the media. I am sure that there are many who could verify my own personal dilemma at that time.

At the end of 1998 I had the opportunity to visit the United States to try to understand the context and origins of the technology better. I believe it was at this time that I began to realise that a) I could be objective within my academic work, despite my own personal opinions, b) the debate was far more complex than I had previously understood it to be, and c) within the context of their own experiences, other people's realities could be just as correct as my own.

Nevertheless, upon my return to the U.K., when I was asked by the local Friends of the Earth group to write an anecdotal piece on my trip to the US, I saw no harm in doing so, treating it as a chance to experiment with a style of writing far-removed from that of academia. In a way it was a final test to see whether or not it was academia or campaigning that I wanted to pursue, and with the article complete, I realised that I was unhappy with the 'campaigner style' that I had adopted. However, knowing that the local group were desperate for something to print, I sent it anyway. I certainly had not anticipated the attention that the article would receive almost two years later.

As my PhD progressed, I decided that I should distance myself from Friends of the Earth so that I could try to be as objective as possible. I did not think that I could personally lose my own beliefs, but I wanted to be in a position where I could listen and understand those of others, without feeling that I had an allegiance to any one organisation. As with all aspects of my life, I enjoy challenging my own thoughts in the belief that it can only lead to greater understanding, and I welcomed the opportunity, through the work of my PhD, to explore this issue fully, without the constraints that are so often experienced through work.

It was this philosophy that I took with me to my pilot interviews earlier this year, and I soon realised that, despite my own scepticism about whether or not this was possible, I realised that I was now both objective and open-minded on the issue of GM technology. Indeed, such objectivity has allowed me to appreciate what a privileged, if somewhat daunting place a social scientist can inhabit, being all too familiar now with the questions such as 'but what do I think? who am I in this debate?' at the end of a day's interviews. Nevertheless, it is also a far more exciting and challenging place to be, lost within a controversy, rather than being dogmatically stuck at one end or the other. By the time I came to write to potential

interviewees, I am certain that my attitude not only to my work, but also to the issue of GM crops, was, and still is, thoroughly objective.

Although I backed-up my introductory letter to potential interviewees with a letter from my supervisor Professor Michael Winter (an unusual practice, but one that I felt was necessary due to the sensitivity of this subject), I began to realise that the process was not going to be as straight-forward as I had previously experienced. Campaigners in particular were extremely wary of me, and apparently exchanged many e-mails trying to discern exactly who I was and what they should do about me. Scientists involved in the farm-scale evaluations meanwhile 'had too much work to do' and so also could not be available for interviews.

It was not until a campaigner in East Anglia contacted me concerning whether or not I was the Liz Rushbrook from Bath Friends of the Earth, whose article she had read on the internet, that I remembered what I had written and how it had obviously progressed from being local. Ironically, while it transpires that this was the article that had been spotted by a scientist's parents in Bath (so obstructing many valuable interviews), it has also helped me gain access to the campaigning world. Even this was not without its dilemmas however, since I then had to explain to campaigners that although I was grateful for their time, I was not going to be favouring them in my thesis any more than I would favour a geneticist.

Most campaigners have understood this position, but there have been some who have tried to continue contact and have attempted to persuade me to confide in them about the angle that they should take with a particular scientist or farmer for example. Although I would question what possible value the information that I have collated could be to either party, I am not aware of any occasion where I have divulged information that I acquired within the setting of a confidential interview. Nor do I intend to.

It is extremely unfortunate that my past associations with Friends of the Earth, while proving a valuable tool for obtaining some key interviews, has created an image of myself which has proved to be a major obstacle in obtaining many others. Within a field as contentious as this, and with a background such as mine, I can fully understand how people felt they were being misled by the letter that they received from me. However, if I had been given the opportunity to express the extent to which I 'no longer agreed with myself' (as I described my position to others this summer) perhaps many people would not have had to concern themselves with this situation. Certainly I would have been able to avoid a number of awkward incidents, and in one case an extremely threatening one.

It is a strange place to have abandoned one's own beliefs in the pursuit of trying to understand those of others, but it is perhaps the only place from which we can move forward in this debate. I can only hope that others will treat me with the same open-mindedness.