University of Alberta

This is Not a Papaya: Understanding Representations of GM Foods and Crops

by

Heather Angela Wilson 

A thesis submitted to the Faculty of Graduate Studies and Research in partial fulfillment of the

requirements for the degree of Master of Arts

Department of Sociology

Edmonton, Alberta
Fall 2004

Your file Votre référence
ISBN: 0-612-95663-6
Our file Notre référence
ISBN: 0-612-95663-6

For my love, my partner, my husband,
Richard M. Geier
Thank you for you constant patience and support.

In memory of
Geoffrey Guy Wilson
and
Margaret Bailey

Acknowledgements

It is important to thank everyone that has been a part of such a strange journey. Getting to the final (although seemingly unfinished) piece of writing could not have been possible without the care and support of many people.

Thank you to my advisor Satoshi Ikeda for your wisdom and support, and for finally reminding me that my best work comes from 'getting mad'. It worked. Also, thank you to my committee, who have helped to shape my knowledge of sociology since entering into this strange discipline, Sourayan Mookerjea and Guy Thompson. I also would like to thank Mike Gismondi for his indispensable advice.

I would also like to thank the various current and former members of the departments of sociology and chemistry that have helped to lead me to this point. I especially would like to acknowledge the support of Margaret Armour, Doug Aoki, Derek Sayer, and Linda Derksen.

Thank you to Kathy Magher, Grant Moos, Laura Sewell, Margaret Speich and Mr. Fish (a.k.a. Dwayne Booth) for the permissions to use your material in this thesis.

I would also like to acknowledge the indirect, but extremely helpful, assistance from Joan Bolker and Tom Jankowski.

Thank you to my friends and family for all their support and love, especially to my parents, Robert and Carol Wilson. Also, thank you to my 'girls' for keeping me company throughout this process.

Table of Contents

LIST OF FIGURES

Chapter 1: Introduction

When Victor Frankenstein asks himself "Whence did the principle of life proceed?" and then as a gratifying summit to his toils creates a hideous phantasm of a man he prefigures the post-modern Prometheus. The genetic engineer whose power to reanimate matter - genes into life - us - is only as limited as his imagination is.

– **Fox Mulder** (From the X-Files)[1]

Genetically Modified Organisms (GMOs) are living organisms, where its DNA has been altered through artificial manipulation "in order to produce a desired characteristic" (Oxford English Dictionary 2004). A primary utilization of this process has been for use in agriculture. More specifically, food and crops such as cotton, soy, canola, potatoes and the Hawaiian papaya were altered to carry characteristics such as herbicide and pest resistance. The application of this technology is growing., but it is the source of controversy.

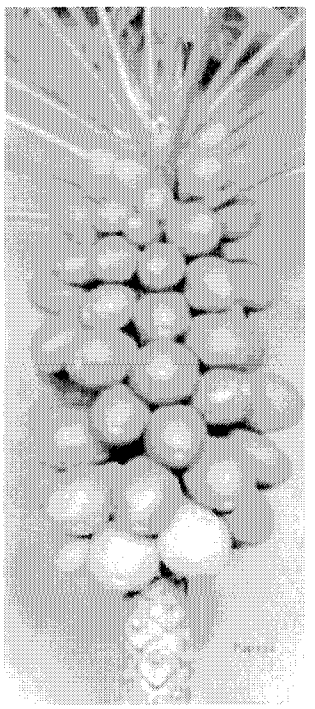

Figure 1-1: Papaya Tree Image from Council for Biotechnology Information Advertisement used and modified with permission. (2003)

Genetically Modified foods are on the grocery shelves in North America. Generally, Canadians do not want to consumes these foods, yet, they think that it is an inevitable part of the 21st century (Marzolini 2000). Jeremy Rifkin summarizes this paradoxical viewpoint by stating, "Genetic Engineering represents our fondest hopes and aspirations as well as our darkest fears and misgivings" (Rifkin 1998,

[1] Chris Carter, "Post-Modern Prometheus," *The X-Files* (Ten Thirteen Productions, 20th Century Fox Television, November 30, 1997), Fox Television.

xi). Companies, NGOs and governments play on these hopes and fears through representations.

Irani, Sinclair, and O'Malley (2002) suggest that many factors lead to varying views on GMOs worldwide; these include socio-economic status, education, gender and political views. They suggest that by increasing knowledge about the applications of GMOs and how they are tested and approved, public perceptions on GMOs would change.

Biotechnology companies including Monsanto that develop and sell genetically modified (GM) seeds present GM food as a saviour to many of the problems with today's agriculture. They make three main claims:[2]

1) GM crops will help lessen the impact agriculture has on the environment.
2) GM crops are good for farmers around the world.
3) GM crops will help end hunger and aid in solving nutritional problems throughout the world, especially in developing nations.

Monsanto uses different approaches such as education style websites to make these claims.

Another source for GMO representations is the Council for Biotechnology Information which is established by a coordination between many companies, including Monsanto and DuPont. They relate stories about how biotechnology has

[2] This is a summary of generalized claims made by many of the GM food producers. For example Monsanto states on their website, "Our current products with input traits include potatoes, corn and soybeans that produce better yields with fewer costly inputs through better control of pests and weeds. Already, we're growing potatoes that use 40% less chemical insecticide than would be possible using traditional techniques" (Monsanto, 2003). Dupont states, "Biotechnology crops are improving harvests while conserving water, soil, and the quality of our environment." In addition, "Biotechnology offers a promise for a world population expected to reach nearly nine billion by 2050 (Dupont, 2004) http://www.dupont.com/biotech/intro/index.html.

been beneficial, including the story of the ringspot virus that threatened the Hawaiian papaya and biotechnology allegedly saved the livelihoods of many people [Figure 1-1] (Council For Biotech Information 2003). In general, pro-GMO representation informs consumers about what GM crops have done, and could do for the agricultural industry, including their effect on nutrition, farm yields and the environment.

The research question this thesis asks is: How are GMOs presented to the public, and what are the problems associated with GMO representation? The presentation of GMOs is problematic because, as theories of sociology and cultural studies show, it is misleading and it ignores many factors concerning food supply, science and economics issues and short and long-term safety. Agribusiness manipulates science, knowledge, and representation to create hope over GM crops.

This thesis focuses on GMO representation for the mainstream public of North America, but because of the nature of our globalised world, it touches on many other regions of the world. In North America there are thousands of acres of farmland that is covered with GM crops. For example, in the United States over 60% of its soybean crop consists of GM soybeans (Anderson 2003).

Plant biotechnology is incorporated into several industries beyond food. However, plant biotechnology for pharmaceuticals and bio-energy will not be addressed, since food issues carry more controversy. Cotton, however, is briefly discussed since it is a common GM crop. Advertisements, stories and pictures are integrated into my thesis without disrupting its flow to give a clearer understanding of what is being discussed.

There is a scientific and social world that stands behind the food that is being produced. This research intends to contribute by combining sociological studies of science, technology and cultural studies. Sociology of science will lead to an understanding of science's role in agribusiness. Ecological modernisation allows for the study of how the technology affects society and the environment. In terms of representation, it is important to take note of cultural studies. The representation of GMOs gives meaning to technology. The representations explain how the product is purportedly good for the environment, or for farmers. As the debate on GMOs shows, contestation surrounding GMOs requires careful examination of representation regarding technology, environmental impacts and socio-economic consequences.[3]

An influence for the methodology of this study comes from a study on the Sony Walkman. In *Doing Cultural Studies: The Story of the Sony Walkman*, du Gay et.al (1997) examine the way in which the Sony Walkman's representation was developed in order to create a cultural identity. Although the consumption attributes of the Walkman and GMOs are quite different, the basis for creating a meaning around the products is similar. Through advertising, the corporations are attempting to shape consumers identification with the products.

Science studies are one way in which the subject of representation of GMOs can be examined. Haraway (1997) for example looks at technoscience advertising

---

[3] See http://www.ost.gov.uk/policy/issues/#gmfoods for debate in UK. In Canada: http://www.cbc.ca/news/indepth/foodfight/hachey.html. In the U.S., see http://www.the7thfire.com/GEfood.htm for various poll information. The Peter Jennings report *How to get Fat Without Really Trying* discussed the agriculture industry and obesity: http://abcnews.go.com/sections/WNT/Living/obesity_031208-1.html

in order to understand the sort of 'gene fetishism' that has been created by biotechnology.[4] Although she does not discuss agricultural biotechnology, her work helps to create a picture of how biotechnology and culture are interacting.

Social constructionism is also important to this discussion. This not only applies to how meaning is constructed from representations, but also to nature. The way a culture 'sees' nature helps to explain the value placed on it.

This research attempts a critical study on the representation of GMOs. Its purpose is to explain the way representations works, specifically for GMOs. It examines how both proponents and opponents use representation to create fear or doubt around the use and non-use of GMOs. The following explains the structure of the discussion.

Chapter Descriptions:

Chapter 2 reviews literature on GMOs. Topics such as patenting, ethics, and trade are frequently discussed in relation to GMOs. The purpose of this chapter is to justify my topic by illustrating the need to discuss representation and GM crops.

Chapter 3 is an outline of three sources of information that consumers have access to. They include the newest web-based advertising campaign by Monsanto which primarily uses images to sway opinion. Monsanto's main education websites will also be investigated because they are designed to 'teach' consumers,

[4] Haraway describes the Human Genome Project primarily and describes the search for gene's the same way as Marx' commodity fetishism.

or more specifically children, about their products. Also the Council for Biotechnology Information's print advertisements will be looked at.

Chapter 4 illustrates the way representation functions. Understanding Saussure's theories of representation enables me to examine why the advertisements presented in Chapter 3 are misleading. To understand photographic representations the work of Barthes and Benjamin will be discussed. This chapter also looks at how advertising works, connecting the advertisements to capitalism.

Since the information given to consumers often comes with a reassurance of scientific authority, Chapter 5 looks at power, knowledge and sociology of science. These topics show how representations of GM crops are situated in the realm of authority and public hierarchies. By evoking experts and reiterating government approvals, proponents of GMOs are reinforcing the biopolitical will of governments.

In Chapter 6 the representations are situated in our relationship with nature and the environment. The obvious reason for doing this is because of agriculture's interaction with nature. This chapter takes into account the social construction of nature and therefore, our ability to rationalize the use of GM crops as a way of conserving nature. Issues of risk and ecological modernisation outline the rationality of using GM technology as a solution to environmental problems.

Finally, it is important to discuss other narratives on GMOs. The anti-GM movement and transgenic art are discussed in Chapter 7. Discussion of the resistance to GM foods is important because it is a reminder that representation is

used and manipulated by all sides of a controversial subject. This chapter also uses as example of how technology can be used to resist biopower.

The agricultural biotechnology industry uses educational and informative models of representation to consumers. This is why representation becomes important. If attitudes concerning food are shaped by the information given to consumers, it is important to look at how information is given to consumers.

By using a unique approach to GM crops and food, this thesis not only examines the sociology of biotechnology, ethics, and the environment, but also applies cultural studies to produce an original piece of work on GMOs.

Chapter 2: Literature Review

The history of life on earth has been a history of interaction between living things and their surroundings … Only within the moment of time represented by the present century has one species – man – acquired significant power to alter the nature of his world.

– Rachel Carson[5]

Introduction:

In order to explain the hope, fear and doubt created by the commercial representations of GMOs to the general public, it is important to understand non-commercialized representations. Discussion on GMOs in the social science covers many issues including ownership, ethics, the environment and socio-economic impacts. Many sociologists, philosophers, concerned citizens, agribusinesses, and Non-Governmental Organizations (NGOs) represent the two primary and opposing views on the issue. These views tend to be the either optimistic or pessimistic about GMO use.

Agriculture has been primary to human culture since its development thousands of years ago. It has been key in our social development and our impact on the planet. From desertification and deforestation to pollution, agriculture has been a primary source of human degradation of the environment. During the industrial age, agricultural impacts increased in the West. Not only has capitalism created a system of yield and profit, but also mechanization and chemical inputs. The end of the 20th century brought new technologies to agriculture including biotechnology.

[5] Rachel Carson, *Silent Spring* (New York: Houghton Mifflin Company, 1962), 5.

There has been an explosion of non-scientific material on biotechnology in the past fifteen years to coincide with the increased use and development of this technology. Despite the amount of material on the subject there are only a few approaches that seem to be taken in the social sciences and most are representations themselves. Most of the literature tends to approach representation singularly focusing on with rhetoric about science, health, environment and hunger.

The material describing what GMOs are is extensive. Some of this literature focuses on why GMOs have been developed and how they are being used in the agricultural industry. For example, Jennifer Ackerman's "Food, how altered?" (2001) appeared in National Geographic magazine addressing basic questions of how significantly genetic engineering has altered the food we eat. This article points to processed foods as being the biggest source of genetically altered food in the North American diet.

Most of the literature tends very one sided, only discussing how good or bad GMOs are. One of the more balanced information sources on GMOs actually comes from Public Broadcasting System (PBS) in the United States. PBS's science show Nova ran a program in 2001 called "Harvest of Fear" (2001) and created a website that outlines the major issues of the program. The website outlines twelve major arguments for and against GM crops. Though not an in depth study it outlines social issues such as hunger and effects GM crops will have on farmers

Robert Bud's *The Uses of Life: A History of Biotechnology* (1993) is a history and introduction to biotechnology and examines the expectations of biotechnology from a point of view of the early 1990's. Historical origins of

biotechnology seem to come from processes such as pasteurization and yeast brewing, but these techniques cannot be applied as biotechnology per se. The 'marriage' between biotechnology and genetic engineering in the 1970's created the techniques that are considered biotechnology today, especially in agriculture. It is this technology that is the focus of this thesis.

Bud (1993) suggests historically there has been suspicion towards new technologies, the economic benefits that could be obtained from the technologies make it necessary for companies to convince the public that the fears of biotechnology are not necessary. This book, however, does not explain how companies go about convincing the public.

In the early 1990s, it became clear that the progress of the 1980s in genetic plant research meant that there was no turning back. Like Robert Bud, Busch et al. (1991) knew that the issue of biotechnology needed to be examined thoroughly. Busch et.al (1991) anchor their discussion in a basic understanding of the way science works (i.e. basic perspectives of the sociology of science). From this launching point, they examine the step that took molecular biology from a descriptive science to the controlling of bio-organisms. The final products of this change are now controlled primarily by agribusiness. Food companies could control what we eat, but there is a way of creating an informed public, which participates in the checks and balances of the industry (Busch et al. 1991). This discussion is important because it lies at a cross roads in plant biotechnology. The path chosen so far appears to be one without public consultation and an almost exclusively presentation of optimism by science and the industry.

An increasingly critical voice stemmed from much of the literature in the late 1990s. Rifkin's *Biotech Century* (1998) reflects on how far biotechnology may go in the twenty first century. This is very typical of the material of the late 1990s. This was a time period of increased concerns over the rise of US backed measures to allow their GM crops over borders, and pushing the technology into other parts of the world had been met with great protest. This included the overwhelming protests at the 1999 WTO meetings in Seattle, where biotechnology was among the issues being discussed (Rosset 2001).

However, much of the discussion in literature has not been so general. The work of Vandana Shiva, a physicist whose work has been confronting the work of science and technology on the environment, has studied biotechnology's cultural impacts on agriculture. Her early concern was reflecting on the long-term impacts that the Green Revolution had on the Punjab province of India (1991). Her work on biotechnology has shed light on a broad range of issues such as property rights (2000), biodiversity (1995), biosafety (2001) and bioethics (1997). All of these issues are concerns for anti-GMO writers.

Hunger is often a chosen topic among writers on GMOs. The International Forum on Globalization and The Center for Food Safety (2003) gives readers an outline of the common beliefs about food often given by proponents of industrial agricultural and its newest form, agricultural biotechnology. Their largest concern is that it is distribution and poverty that causes hunger, not lack of food (International Forum on Globalization and The Center for Food Safety 2003). Lacy (2003) on the other hand suggests that too many obstacles are in place to allow

biotechnology to help solve the world's starvation problems. Other researchers believe it is the selfish concerns of consumers in rich countries that is not allowing for the use of GM crops to solve hunger in places like Africa (Paarlberg 2002).

Many proponents of GM crops say they can be used to solve hunger and propose that the only ethical concerns lie in denying food for the hungry. Levidow (1995) suggests each of the main ethical concerns over GM crops have been 'taken over' by one group or another. Considering the risks of GMOs should be done by science, socio-economic issues are assessed by the consumer and bioethics is only the concern of experts in the field (Levidow 1995).

There is the concern of individual scientists over ethics. Nicholas (2001) discussed how genetic scientists take on moral responsibility for their work. Scientists have become more able to resist the possibility of working against their own moral ethics, but despite this they still tend to favour the belief that science is neutral (Nicholas 2001). It is a kind of utilitarian ethics that dominates work of genetic scientists (Levidow 2001).

Ownership is another ethical concern taken up by writers. Cartier Poland (2000) examines this issue by examining the history of the British patenting system, which, at one time was dismantled because patenting became unregulated. Cartier Poland's (2000) discusses how the US patenting system might be headed that way again since genetic patenting seems to be done without any explanation. Fowler's (1995) and Shiva (2000) concerns are over the issue of patents being granted which exploit farmers in developing countries. Shiva and Holla-Bhar (1996) specifically cite the neem tree as an example of how natural resources of

developing nations (such as India) have been essentially stolen by patenting. This moves resource control to developed nations such as the United States.

Trade concerns and GMOs role in globalisation has also been of concern to many. Coclanis (2003) outlines a historical view of agriculture and globalisation, essentially suggesting that arguments over trade and food were of great significance in the late 19th century. Pollack and Shaffer (2000) examine the specifics of GM food and trade, suggesting the US and the EU's differing stances on GMOs has caused the trade disputes between them. However, the EU has backed off their strict policies against GM food imports in recent years (CBC News Online 2004).

This thesis, however, is about representations and consumer attitudes are a large part of this. The biotechnology industry has been faced with many differing opinions on the use of GM food. In 2000 many biotechnology companies contributed to a campaign (now called the Council for Biotechnology Information) to promote the so-called benefits of biotechnology (Kilman 2000).

It wasn't until recently that the American public started to become aware of agricultural biotechnology (Shanahan, Scheufele, and Lee 2001). In Europe, however, awareness and attitudes over GM crops have been well established (Hampel, Pfenning, and Peters 2000). For the most part Europeans are not in favour of GM crops, and are highly suspicious of science and policy (Hampel et.al. 2000). Americans, on the other hand, are more likely to accept the use of such crops (Shanahan et.al. 2001). Despite the tendencies these studies indicate many consumers do not seem to be strongly in favour of (or against) GMOs.

The shaping of these attitudes is become a greater concern. Monbiot (1999), for example recognised that consumer's perceptions of the benefits of GM foods could be more heavily swayed by opponents of GM foods (Prince Charles for example) rather than proponents. A perception of accountability is needed if governments and companies want to gain more support for the use of GM crops (Irani et.al. 2002). There are, however, more reasons why both opponents and proponents of GM are not able to convince consumers strongly either way.

Wanisink and Kim (2001) suggest that both sides of the debate are making the wrong assumptions about consumers. They outline the assumptions of proponents as "(a) the biotechnology controversy will soon be forgotten, (b) consumers will be biotechnology advocates after they have the facts, (c) science sells and fear fails, and (d) biotechnology education is a trade association concern" (Wanisink and Kim 2001, 1405). They outline the opponent assumptions as "(a) consumers want to be informed, (b) consumers need to be informed, (c) risks of the unknown are more important than benefits, and (d) changes in consumer attitudes will lead to changes in behavior" (Wanisink and Kim 2001, 1405). Wanisink and Kim (2001) discount these assumptions and suggest continuous education on GMOs is necessary. This discussion takes a psychological approach of attitude formation, not social.

The problem with a strictly psychological approach to discussing GMOs is the lack of concern over social impacts. However, descriptive and more sociological discussions tend not to take into consideration that consumers are having information given to them in misleading 'bites'. Whether these 'bites' are

from proponents or opponents of GMOs, they are used because of the way in which science, risk, environmental and social concerns in general are represented to the consumer. The following chapter will introduce these 'bites' of information given the mainstream general audience.

By going beyond the material discussed here, it is important to understand what, why and how the topic of GMOs is being presented to consumers. The analysis in the following chapters is important because it not only touches on a relevant social debate, but also it utilises the tools of sociology more completely than previous studies. It also helps to explain why all sides of this debate often utilize hope and fear to make their points.

Chapter 3: Selling Hope and Fear: A Look at pro-GMO Advertisements

As we stand on the edge of a new millennium, we dream of a tomorrow without hunger... Worrying about starving future generations won't feed them. Food biotechnology will.

- Monsanto European advertising campaign, 1998 [6]

Introduction:

Public perception plays an important role when it comes to the acceptance of plant biotechnology. In 1999 biotechnology companies recognised that they needed 'honest brokers' to give consumers information on the benefit of GM foods (Butler, 1999). This came after two significant developments, the first being that of a failed and misleading Europeans campaign by Monsanto, and the BSE (Bovine Spongiform Encephalopathy) or Mad Cow Crisis in Britain. This undermined the public's trust in food safety regulation (Butler, 1999).

Food Biotechnology companies, however, have been using misleading advertisements to sway public opinion to their favour. These advertisements use simplified statements, emotional language, and compelling images to make their point. They also combine a sense of hope and rhetoric of fear to create doubt about other narratives concerning GMOs. Often they also provide consumers with pro GM food research in order to gain support for their products.

Advertising in and of itself is a form of representation intended to give the receiver a positive opinion of an idea, concept or product. Primarily advertising is

[6] Quoted from http://members.tripod.com/~ngin/feedingorfooling.htm

used to sell products, but is often used in public relations battles to convince the public that something is good. Advertising is a tool of capitalism used to create attention. In order to sell a product one must tell potential consumers about the product. Although most biotechnology companies are not advertising specific products to the public, they are selling ideas to help earn support for GMOs. In other words they have become public relations commercials. These ideas are focused and reflected in advisements through the three main claims:

1) GM crops will help lessen the impact agriculture has on the environment, and generally is good for the environment.
2) GM crops are good for farmers around the world.
3) GM crops will help end hunger and aid in solving nutritional problems throughout the world, especially in developing nations.

I have divided this chapter into three parts. The first section will look at the Council of Biotechnology Information print advertisements; these advertisements appeared in magazines throughout North America. The second section will examine the most recent web-based advertisements used by Monsanto. Lastly I will examine the knowledge-based websites of Monsanto; these are designed to be educational for the general public.

Description of Advertisements:

Council for Biotechnology Information

If 'honest brokers' are what the Agricultural Biotechnology industry is looking for, one group, which is sponsored by companies such as Monsanto, is

attempting to be one. The Council for Biotech Information uses a name that will make them look like they stand apart from companies.[7]

In many magazines, including National Geographic, the Council for Biotech Information put full-page colour advertisements. These advertisements picture a biotechnology crop and give the viewer captions that tell a story about the modified crop. These advertisements show photographic representations that separate the plant in question from its surroundings.

The subjects of the advertisements include corn, canola, soybeans, tomatoes and papaya. Each ad reflects on how biotechnology has been or can be helpful. For example the tomato ad reflects on the chemical lycopene, an anti-oxidant, and how biotechnology can help tomatoes have higher levels of lycopene.

The advertisements featuring canola and soybeans discuss the potential of biofuels. The canola advertisement cites that biotechnology is making canola less environmentally damaging by reducing tillage.[8] In the soybean ad we learn that biotechnology is reducing chemical usage for soybean crops. Both soy and canola are potential alternative fuels to oil and gas as well.

Finally, the advertisement for the papaya discusses a 'real-life' situation [Figure 2-1]. In Hawaii there was concerns over a virus threatening the papaya. Biotechnology was used to lessen the impact of the ringspot virus and help farmers save their livelihoods. The suggestion that biotechnology can specifically help the

[7] All of the advertisements are available for viewing from http://whybiotech.ca/canada-english.asp?id=3470

[8] What they are referring to here is the amount the land has to be worked before seeding, during seeding and for harvest.

economy, farmers and a whole village is a way in which the Council of Biotechnology Information is trying to sway public opinion.

Each advertisement depicts the crop in question in a very interesting way. One plant (or tree) is pictured, by itself, in front of a backdrop. The shadows suggest that the plant is actually in a studio in front of a backdrop. They are also perfect specimens. Each organism is bright, the colours are vibrant and there are no flaws. The 'perfectness' of the plant can make one suggest that the plant is not real. Of course there has to be something done to the picture since the plants are in an artificial environment. Moving the plant to an artificial environment makes one wonder if the picture has any real elements to it and symbolises the unnaturalness of the papaya itself. The plant and the image have been improved by human knowledge, and technology.

Each advertisement, combining text and image, is reminiscent of public service-type advertisements. On television 'the More you Know' campaign airing on NBC often includes celebrities speaking in front of a neutral backdrop.[9] The Got Milk campaign also uses similar advertisements with celebrities.[10] This suggests that the plant is being made a celebrity or a model. The plant is the model plant for that species, or the plant is a model of what plant biotechnology can be. These 'model' plants are helping to explain that plant biotechnology is 'good for us' as a whole, as a celebrity with a milk moustache is trying to convince us that milk is good for us.

---

[9] These can be seen at http://www.nbc.com/footer/tmyk/pgv_psa_childabuse.shtml or http://www.lostcolonyentertainment.com/news/nbc'sthemoreyouknowarticle2.html

[10] These can be seen at http://www.whymilk.com/moms/celebrities.htm

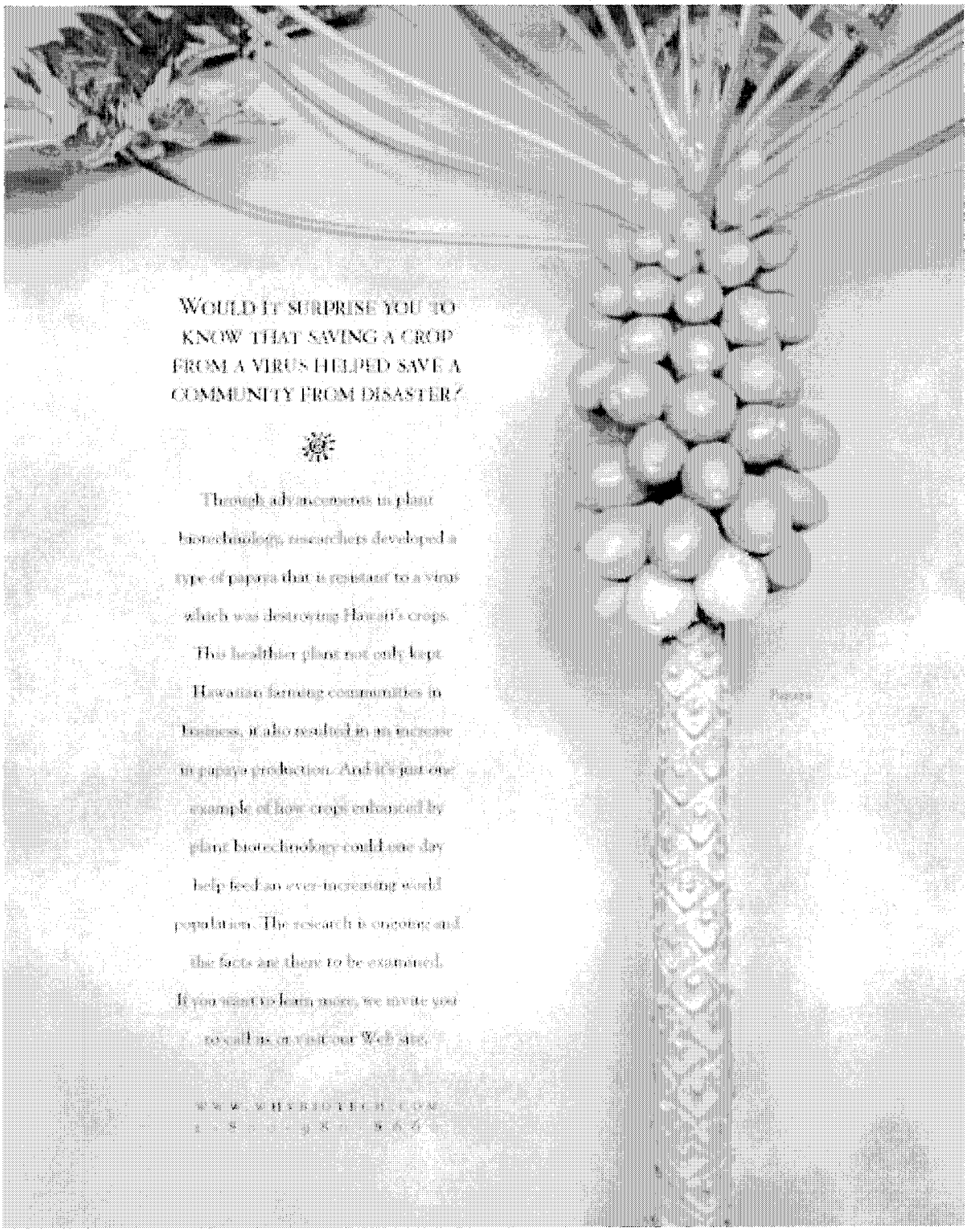

Figure 2-1: The Hawaiian Papaya (Council for Biotechnology Information 2003).

The advertisements, as a group, do make all three claims. The claims about the environmental impacts include less soil erosion, chemical use, and the ability to create 'green' fuel. The papaya advertisement in particular highlights the concept of plant biotechnology being good for farmers. Finally nutrition is highlighted through the tomato ad.

Each advertisement deals with North American issues. The environmental issues are aimed directly toward crops that are grown in North America. The papaya advertisement is about helping a North American village and community. Finally the cancer fighting potential of tomatoes is stressed because cancer is a common concern among North Americans. Not all of the advertisements focus on GM use in North Americans. Monsanto uses a different strategy.

Monsanto

Monsanto is one of the most visible companies in plant biotechnology. In the past few years they have participated in worldwide advertising campaigns focusing on areas where GM foods are not being accepted. In order to do this they have used several tactics. The primary tactic has been to associate their products with changing the food supply.

Monsanto's former tagline had been *Food. Health. Hope.*™ [11] The simple use of three words was intended to associate Monsanto with helping those less fortunate by giving them food and nutrition, in other words they are meant to create hope. It was met with criticism particularly in the UK where GM foods are not accepted (McCabe 1999). They also use tactics of morality, guilt and fear to try to

[11] This is a trademarked Monsanto slogan.

convince opponents and consumers that biotechnology was the answer to world food shortages.[12] The advertisements were not only met with outrage, Monsanto was reprimanded for the some of the specific advertisements in their campaign (McCabe 1999).[13]

In 2003, Monsanto changed its tagline to 'imagine' [Figure 3-2]. Now they are presenting a kind of utopian view of the future of agriculture. In April 2003 Monsanto stated that

Figure 3-2: Monsanto's new tagline (Monsanto 2004b).

> it will use a new tagline to illustrate the company's focus on delivering innovative agricultural solutions and benefits to growers, their farming operations and end-market consumers. The new Monsanto tagline, Imagine, emphasizes the "ag" in Imagine and reflects the company's strategic focus on investing in and developing new agronomic tools. (Monsanto 2003a)

This turn away from the '*Food. Health. Hope.*' tagline suggests that Monsanto wanted to distance itself from the controversy the previous tagline had created.

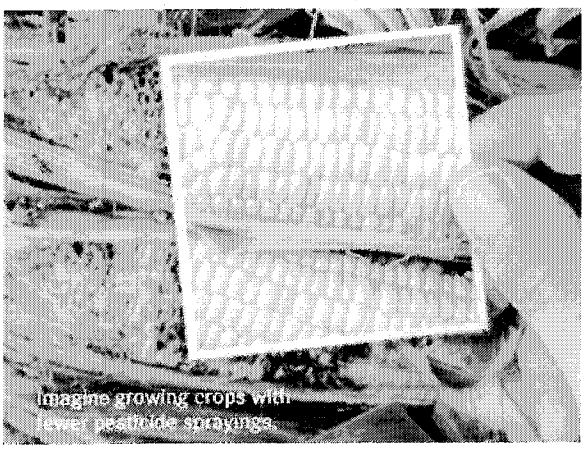

Figure 3-3: Monsanto's vision for corn (Monsanto 2004b)

In their new web based advertising campaign they use a series of images meant to illustrate the theme of 'imagine'. They are a

[12] The quote at the beginning of the chapter is one example of the controversial statements made in that campaign.
[13] The British Advertising Standards Authority (ASA) reprimanded Monsanto for wrongly depicting facts about genetically modified (GM) foods in its press advertisements" (McCabe 1999, 702).

series of agricultural photos with an image overlaid to show what Monsanto's imagination can potentially do.[14] The first of these images [Figure 3-3] shows two wrecked pieces of corn with a hand holding a parallel smaller image of 'perfect' corn over it. The caption "imagine growing crops with fewer pesticide sprays" puts the image into focus for the viewer by telling them that pests wrecked the corn. The corn farmer may recognise that and hence the caption has more to do with the idea that Monsanto can help save your corn. The idea of fewer pesticide sprays has two messages: 1) A farmer can save money on chemicals and 2) this product is better for the environment because of the use of fewer chemicals. The accompanying text highlights those issues. It reminds us "(i)nsects are a constant threat to the crops we grow and can lead to major losses in crop productivity" (Monsanto, 2004b). It also states that "Plant biotechnology helps increase the amount of a farmer's crop that is available for harvest, and it also allows them to use fewer pesticide sprayings, which is better for the environment" (Monsanto, 2004b). This ad is to show that biotech corn, specifically Monsanto's biotech corn, is better for farmers and the environment.

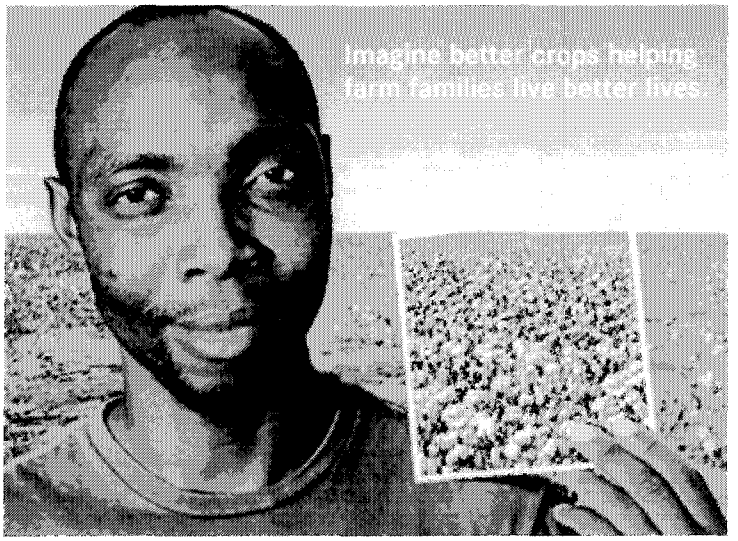

Figure 3-4: Cotton crops (Monsanto 2004b)

[14] These advertisements are located on Monsanto's website. On the front page they allow the viewer to 'learn more'. By clicking on this link a popup advertisement series is created.

On a similar theme, another one of Monsanto's pictorial advertisements shows a man standing in front of a sparse cotton field [Figure 3-4]. The African man is holding a small snapshot of an abundant cotton crop.

As with the previous case the viewer can guess what Monsanto is trying to say. Without reading the caption one can guess that Monsanto can help cotton growers. The caption "imagine better crops helping farm families live better lives," tells the reader/viewer this is a farmer Monsanto could give this 'better life' to. When reading the accompanying text one finds out that Monsanto helps small acre farmers to grow better cotton crops:

> In Makhathini KwaZulu Natal province in South Africa, smallholder farmers who planted insect-resistant cotton were able to produce more cotton per hectare with fewer pesticide sprayings, saving time and increasing profits. Families that are growing Monsanto Bollgard insect-resistant cotton have begun investing their extra earnings from larger harvests on education, equipment and better housing. (Monsanto 2004b)

The image created is one where Monsanto can help more poor farmers in developing nations through their research.

Figure 3-5: Monsanto's Golden Rice (Monsanto 2004b).

Another image from the series is a picture of a young girl with her eyes closed with a hand holding up an image of presumably the girls open eye [Figure 3-5]. On

close inspection, one might see that the girl is standing in front of rice fields. The caption "imagine helping others help children to see" goes along with the image to help draw out a response. The response is to convince the viewer that Monsanto is noble and helps blind children see. The accompanying text discusses that Vitamin A deficiency is a problem for about 400 million people and that this deficiency can cause blindness (Monsanto, 2004b). Rice, a staple for many throughout the world, has been a focus of research:

> It may now be possible, thanks to agricultural biotechnology, to make rice and other crops into additional sources of Pro-Vitamin A. With Monsanto's help, the developers of "Golden Rice" and mustard with more Pro-Vitamin A should one day be able to deliver their gift of better nutrition to the developing nations of the world through staple crops readily available to poor and vulnerable populations.
>
> Imagine sharing science to help others develop crops that could help reduce Vitamin A deficiency, a leading cause of blindness and infection among the young.

"Golden Rice" is an important tool for the biotech industry to illustrate that genetically modified foods can help with nutrition.

Monsanto's advertisements do illustrate the three main claims made by the industry. The first, that biotechnology will lessen the impact agriculture will have on the environment is evident in its advertisements that indicate that less dependency on chemicals will be achieved through the use of GM crops. The second claim, crops are good for farmers throughout the world is illustrated by the example of a South African province where Monsanto crops are changing the way

farmers live. The third claim, GM crops will help end hunger and aid in nutrition especially in the developing world is illustrated by the Golden Rice example.

Monsanto, and companies like it use other approaches to convince consumers that their products are 'good'. The next section discusses the way that authoritative or teaching voices are used as part of an approach to convince consumers of the benefits of GMOs in agriculture.

Educational Websites

Monsanto, Dupont and others have set up education-style websites. Monsanto has three websites set up to answer questions about biotechnology. The most obvious education - style site is called "Teaching Science" and it is a "resource for discovering and teaching biotechnology"[15] (Monsanto 2003b). The site has a menu with four categories, each with sub categories. Each subcategory has linked information. For example the 'Basics' category opens the "Biotech Basics" website within the page. This section is intended to explain the basics of Biotechnology, including the idea that biotechnology "may be one of the oldest human activities" (Monsanto, 2001). Almost all the information links are to other Monsanto sites.

Menu from the "Teaching Science" website:

Plant Biotechnology

Basics

Glossary

FAQ's

Classroom Tools

Curriculum

Activites*

Other Resources

Biotech Advantage

News

Links

Ask a Scientist

* This is the spelling used on the website.

[15] The Teaching Science website was located at http://www.teachingscience.org, since writing about this website it has been replaced as in now located at http://www.monsanto.com/monsanto/layout/sci_tech/literature/teachingscience.asp and no longer takes the same format.

The "Biotechnology – Good To Grow" is Monsanto's new information website. It is set up with bright colours and easy to use menus. It is supposed to be able to use by adults and children. The sections included are FAQs, "Did you know?" and "Fact or Fiction", all of which are designed to be easy to read and use.

There are clear biases to the information given. For example, the site's "Fact or Fiction" sections questions and answers, one question is "I've read there are long-term health impacts with biotech products, is this true?" Monsanto's answer is that it is "OK to ask the very important questions about safety, but at some point we have to make rational decisions on if and when to use new discoveries" (Monsanto, 2004a). This answer implies that to question the safety of the products is 'irrational'. The answer continues on by explaining that the products are vigorously tested and that other groups around the world "help make a rational decision to accept and use the technology" (Monsanto 2004a). Again there is a clear goal to make sure that people reading the website know that.

There is an interesting contradiction in Monsanto's Good to Grow website as compared to their older site, "Biotech Basics". In the Older site, in answering the question "why biotech matters?" the answer includes these statements:

> Most experts agree that the world doesn't have the luxury of waiting to act. By working now to put in place the technology and the infrastructure required to meet future food needs, we can feed the world for centuries to come and improve the quality of life for people worldwide. (Monsanto, 2001)
>
> Demand for food is increasing dramatically as the world's population grows. Biotechnology contributes to our meeting this growing demand without placing even greater stress on our scarce farmland. It can help us

> to grow better quality crops with higher yields while at the same time sustaining and protecting the environment. (Monsanto, 2001)

However in the new sight Monsanto answers the question, "Is it true that through biotechnology we might produce too much food?" with the following:

> GOOD TO KNOW: Most plant breeders in those countries want to have access to biotechnology to breed more productive and more nutritious crops.
>
> One may often hear biotechnology will feed the world. That's an oversimplified myth. By itself, no technology is going to solve the problems of hunger. Advancements in plant biotechnology are only an essential component of a solution - they are another tool to help enhance self-sufficiency and the sustainability of their farming practices. (Monsanto 2004a)

Although the first statements admittedly are not as strong as the statements made in their European advertisements Monsanto is suggesting that biotechnology is a main solution. The newer statement backs away from this by pointing out that the idea that biotechnology can feed the world is a 'myth'. The first part of the answer, suggests there is not being enough done in certain countries to feed people. Finally the statement, however, does say that biotechnology is essential. This indicates that biotechnology makes up an essential part of global food supply, and suggests that without it, food supplies will drop.[16]

The reason these companies create websites like "Good to Grow" is to give consumers information in an informative and authoritative manner. They select favourable information to answer questions about biotechnology. They commonly

[16] The idea of self-sufficiency is highly controversial. Many opponents worry that many farmers are becoming dependent on biotechnology companies.

address to whether GMOs are safe. They use science to make their points, indicating that scientific progress is what will help the world.

Conclusions:

Perhaps what is striking is that the advertisements try to create a sense of hope. Telling consumers that biotechnology can help an increasing population, or help stave off environmental degradation is a way gain support. Since many are exposed to images of children in Africa starving, or of constant concerns in the media over the environment, these 'solutions' could be appealing to many.

However, at the same time, a rhetoric of fear is used. Monsanto could as easily being saying 'imagine what the world will be like without these crops'. Hunger, devastation of crops, and blindness will become widespread without the use of GM crops.

The educational websites, in particular ,do not allow for questioning. Question and answer format shape both sides; what the viewers' questions might be and what format the answers should be. By deciding on both the questions and the answers, Monsanto is dictating the argument. This is done to keep viewers/readers from considering much of what is on the website, and create doubts about opponents' discussions.

It is not hard to find that there are many contradictory representations to these. Many anti-GMO organisations disagree over many issues, including the reduction of pesticide use and 'Golden Rice'. Chapter 7 will discuss the representations by anti-GMO organisations.

In order to further analyse the purposes, and the misleading nature of these advertisements it is important to understand the elements that are used to create a whole campaign. These include, the use of representation (through images and language), the use of knowledge authority (specifically the use of science as authority), and the social construction of nature by society. These will be studied in the following chapters.

Chapter 4: It Doesn't Taste Like a Papaya: Understanding Advertising and Representation

The future benefits (for consumers and the environment) will be enormous and the best is yet to come. In the meantime, let's have more information and less rhetoric.

- **Professor Jonathan Jones, a Scientist from John Innes Centre**[17]

Introduction:

The proceeding chapter outlined several representations of GMOs by the proponents of GM crops. These are from an organisation formed to promote the use of plant biotechnology and a leading company in the industry. These advertisements utilize hope and fear. They create images of a utopia where problems such as hunger and environmental damage can be solved by using GM crops.

In order to understand why these representations are misleading several elements informed by the basic theories of representation and advertising. Based on these themes, this chapter examines how advertisers use hope and fear to convince consumers to accept GM crops.

Representation, simply put, is how something is presented to a receiver. However, it is not this straightforward. This chapter relies primarily on the work of Stuart Hall (1997) and Roland Barthes (1977) to understand what representation is by taking a constructionist viewpoint on the subject.

[17] Quote from: http://members.tripod.com/~ngin/fav.htm, there is an analysis of that quotes and others like it on that webpage. Information on the John Innes Centre can be found at http://www.jic.bbsrc.ac.uk/.

To understanding how advertising works I will look at Paul du Gay's studies on the Sony Walkman (1997), a product that has become so iconic that the term Walkman has come to be used to describe any portable personal stereo/cassette player. The work of Schudson (1984) will also be examined in order to understand why plant biotechnology is being represented to the consumer in the way it is.. This chapter will conclude by tying together the ideas brought forward in this chapter.

Representation:

Stuart Hall provides a straightforward meaning of representation: "the production of the meaning through language" (1997, 16). Hall (1997) continues to explain two dictionary meanings, the first being to 'depict' an object; the second is to 'symbolize' an object. Representation goes beyond these meanings.

Representation is a part of what Paul du Gay et al. (1997) calls the 'circuit of culture'. They argue that any cultural text or artefact must be analyzed through the circuit in order to properly study it. Although the other aspects of the circuit (production, regulation, consumption and social identity) are important aspects of biotechnology's place in culture, the representations are of primary concern for this study.

To understand representation one must understand culture. Raymond Williams' work[18] explains how culture has its roots in the term agriculture (du Gay 1997). The term agriculture refers to the act of cultivating soil. The modern meaning of culture derived from agri-culture is "the process of human

[18] *Keywords* (1976)

development" (du Gay 1997, 11). A second meaning is a social definition in which culture is a description of a particular way of life "which expresses certain meanings and values not only in art and learning but also institutions and ordinary behaviour" (Williams 1976, 57 quoted in du Gay 1997, 12). These two conceptions are tied together by this idea of shared meanings, which occur because of language (du Gay et al.1997).

Language, according to Hall (1997, 4), is the medium that allows one to make sense of what is going on around them, or specific things or ideas. Meaning is produced through language, and it allows those meanings to be shared. Language is a representational system (Hall 1997, 4). It is through symbols, images, sounds that societies communicate.

It is important to reflect on the main theories of representation. These are: *reflective*, *intentional* and *constructive*. The first of these, *reflective*, is understood by the ancient Greek term of mimetic. This means that the truth is fixed throughout the word, but language reflects it (Hall 1997, 24). The second of these is *intentional*; this suggests the speaker, through language, that gives meaning to an object (Hall 1997, 25). Neither one of these approaches can be applied to advertisements. Not everyone is going to read an advertisement the same. In addition, as much as an advertiser wants it to mean a specific thing, the viewer might not see it in that way. It is the third approach, which is most relevant to this study.

The *constructionist* approach means that we (as individuals or as a culture) construct the meanings that are imposed on a thing (Hall 1997, 25). This is the best

approach to this study because it accounts for the many different possible interpretations of what is represented in advertising. There are two variations on the constructionalist approach, both of which will be used to analyze the advertisements. There is the semiotic approach and the discursive approach (Hall 1997, 15). The first, semiotic, comes from the theories of French Linguist Saussure, and the second is based on the theories of Foucault.[19] The latter will be discussed in the following chapter.

To understand these approaches, however, the concept of signs must be understood. Signs are what carry meaning and need to be interpreted (Hall 1997). Hall (1997) describes two forms of signs: iconic signs, visual cues that resemble what they are representing (traffic signs) and indexical signs, the language words given to an object (such as papaya to describe a certain kind of fruit). Hall points out that these are arbitrary (1997, 21). A papaya could have just as easily been called a banana in English, but it would not have changed what a papaya is. The meaning is not in the papaya, or in the word, we fix meaning on to the fruit.

Saussure's schema consists of understanding that language is a system of signs, which are made of two parts (Hall 1997). The signifier, which is the form of the sign, for example the word papaya, spoken or written is a signifier. What is signified is the idea or concept that word creates, the word papaya, for example, creates a mental concept of a fruit the size of a melon that has yellow skin with

[19] The work of linguist Charles Pierce could also be discussed here, however, Saussure is generally considered the forefather of Semiotics, which is the basis of Roland Barthes, and Michel Foucault's works on representations, both are very important to this study.

orangish flesh and black seeds. Saussure's stance was the relationship between the two was arbitrary and the result of social invention (Hall 1997, 31).

To Saussure, language is constructed of signs and meaning is derived from interpretation of those signs (Hall 1997, 30). Language is further divided into two parts, langue and parole (Hall 1997, 30). Langue is the language system, which contains the rules and the signs. Parole is the writing, speaking or drawing of the signs that are made possible by the language system (langue).

To understand a sign, however, we need to have a code. "Codes tell us which concepts are being referred to when we hear or read" a sign (Hall 1997, 21). They "fix the relationships between concepts and signs" (Hall 1997, 21). These codes are determined by the culture we live in, and the language we speak. However, the photograph, although it is considered a sign, may not fit into this interpretation clearly.

The photograph is often used in advertisements. Barthes writes that the photograph has become the "natural witness to what has been...(b)ut history is a memory fabricated according to positive formulas...and the photograph is a certain but fugitive testimony" (1981, 93). The idea of the photograph as fleeting proof has less to do with Barthes' suggestion that they are disintegrating into nothingness than it has to do with the constant deconstruction of the concept of proof.

Photography has been used in promoting many ideas either by proving an event or creating a possible event. In the 1950s the U.S. Atomic Energy Commission (AEC) allowed Life Magazine to publish images of nuclear bomb testing. Kirsch (1997), suggests that the use of these spectacular images were a

way to distract U.S. citizens and reduce public participation. The images simply showed fireballs and mushroom clouds in a vast, already barren looking, landscape. There is a separation from the viewer from the destruction and fallout of the explosion, making it 'victimless', but threatening to enemies (Kirsch 1997). The hope was that the public would become comfortable with the idea of nuclear testing (Kirsch 1997).

Barthes writes, "What does the photograph transmit? By definition, the scene itself, the literal reality"(1977, 17). A reduction, not a transformation, occurs, but this is not reality; it is an "analogon" to reality. An analogon or analogue is "a word or thing similar or parallel to another" (Cuddon 1998, 35). A photograph is similar to reality at a moment in time, but it is not reality, it is a copy.

Barthes (1977) contends that the photographic message is one without a code, a continuous message. More specifically a documentary photograph does not have a code. Photographic images are not connected to a linguistic system. They create a first order message, but do not have a second order message. In other words, when looking at a photograph one should immediately recognise that it is of something (a train wreck [Figure 4-1] or a papaya [Figure 1-1]), but not read anything further into the image (disorder or politics).

Figure 4-1: Trainwreck (author's image Copyright 2000)

The lack of coding that is associated with the denoted message "reinforces the myth of photographic 'naturalness'"(Barthes 1977, 44). This is because connotation and denotation require codes (Hall 1997). However, we can analyze photographs through denotation and connotation. The reason is, as Barthes distinguishes between the analogue (realism) and the 'art' of the photograph (Barthes 1977, 19). It is the latter of which that contains the code.

It is at the level of denotation that one can understand the lack of reality of the photograph. The photograph only gives a sense that the photographer was somewhere (Barthes 1977). The connotations are constantly changing from person to person, and over time. If a photograph's primary goal is to denote an event or a person, then the connoted message helps the viewer to understand both the social and historical references of the denoted message (Barthes 1977).

The "code of connotation was in all likelihood neither 'natural' nor 'artificial' but historical, or if it be preferred, 'cultural'"(Barthes 1977, 27). Three aspects of connotation occur when reading photographs. Perceptive connotation is the meaning derived from just viewing the photograph. There is also cognitive connotation; this is when the knowledge of the viewer is depended upon to understand a context of a situation. Barthes (1977) suggests that a good press photograph is one that allows for the knowledge of newspaper readers.

Lastly, Barthes suggests a third form of connotation that is the 'ideological' or 'ethical' connotation. Barthes describes it this way: "This is a strong connotation requiring a highly elaborate signifier of a readily syntactical order: conjunction of people, development of attitudes, constellation of objects"(29). This

is when one's values play a role in the reading of the photograph. The code used to understand a photograph "is at once arbitrary and rational"(Barthes 1977, 31). Therefore, Barthes suggests, the analysis of the codes, rather the signifiers, is what creates a better historical understanding of a society.

In photographs such as the image of the papaya we are seeing a message without a code. It is a representation of a papaya. However the techniques or 'art' applied to the image means that there are connoted messages that vary and change from person to person. For example one might understand that it is a perfect looking papaya (perceptive). From privileged information (from knowledge of the source and reading of the caption) the message that it is a genetically modified papaya will be received (cognitive). Finally one might get the message that the papaya is unnatural and because it is taken away from 'natural' environment and has been altered in some way (ideological). It is definitely clear that this is an artistic image of a papaya.

One of Walter Benjamin's essays, "The Work of Art in the Age of Mechanical Reproduction", discusses art in terms of its potential to be both repressive and democratizing. Benjamin argues that the reproduction of art causes a loss of 'aura'. That is, the piece of art is detached from its traditional domain and allows the audience to view or hear the art in their own situation, as often as they wish. Benjamin states that the loss of aura "leads to a tremendous shattering of tradition" and allows "connect(ions) with the contemporary mass movements"(1968, 221). The idea of aura is the distance between the potential

spectator and the work of art. It takes the image from a fetishistic or sacred place to a political place.

In Scott Kirch's study of the *Life* magazine photographs of nuclear testing, he points out "photographic images are rendered to be viewed as objects ... whereas narrative text demands more analytical cognitive processes" (Kirsch 1997, 242). He suggests that it is the ability to make spectacular images distracts a viewer from that which lies beyond the image. That is when looking at an image like Monsanto's corn 'image on image' advertisements; the viewer is to associate great corn with biotechnology and sick corn with anything that's not been altered by biotechnology, ignoring the possibility of any alternatives.

Photography is an art form, which allows reality to take on new appearances. For example "(t)he enlargement of a snapshot does not simply render more precise what in any case was visible, though unclear: it reveals entirely new structural formations of the subject" (Benjamin 1968, 236). Photographic images in advertisements, which are changed in some way are 'manufactured' scenes, create a different view on the subject. A close up of corn gives the views a 'precise' idea of what biotechnology does for corn.

Advertising:

Advertisements are representations of a product in order to sell it. Cable Television Standards Council (CTSC) defines advertising as follows:

> "[A]dvertising" is defined as any paid message communicated by Canadian media with the intent to influence the choice, opinion or behaviour of those addressed by the commercial messages. (CTSC 2002)

Advertisements are communicated messages that are trying to persuade the receiver of something.

Paul du Gay recognizes that advertising is a cultural practice that "must first appeal" (1997, 25). To appeal to a consumer "it must engage with meanings which the product has accumulated and must try to construct an identification between us – the consumers- and those meanings" (du Gay et al. 1997, 25). Advertising creates identification.

Identity itself is embedded in many constructionist theories. For now (because this will be discussed in the fourth chapter since it is important in the discussion of science and the environment) it is important to say that identity can come from many inputs (including what is seen in advertisements) and is outputted by the person through their actions, words, etc. Someone represents himself or herself in a way that best represents the identity they have created.

Advertising works if you can get people to see themselves in the people in the advertisements. However, "the people represented in the advertisements are designed to represent the kinds of ideal target consumers which the advertisements and their clients think *are* or *might be* typical product-users" (du Gay et al. 1997, 25). Most people do not actually expect to look like the person in the ad, or expect the product would give them the lifestyle viewed in the ad, but they do play on

desires of the consumer. Advertising creates an imaginary representation not a realistic one (du Gay et al. 1997).

In the GMO advertisements identification comes from the possibility of fulfilling the three claims presented in the previous chapter. North Americans have been told that people in places such as Africa need help. They also are told that they are damaging the environment. The possible fulfillment of these claims may help the viewer/reader feel hopeful because of this technology, and as such does not have to feel 'guilty' over having so much.

Advertising is linked to culture through language. "The language of advertising is not so much a reflection of cultural identities which are already formed, as *constructing* identities through representation" (du Gay et al. 1997, 39). It is suggesting how the world could be. Since we construct the world around us advertisers hope that we will use the producers' products in our endeavour, even when we know we cannot produce that reality.

Barthes discusses the existence of myth in modern popular culture. It can particularly be seen in advertisements. In an image there is a first sign created with a simple denoted message when the elements in the image unite with the signified. In other words, looking at the image of the girl in the Monsanto advertisement, at the first level you see that Monsanto is helping a child see. This sign becomes a second level signifier that unites with a second order signified. Referring to the same advertisement the second level signified is the background that includes cultivation of rice paddies or even the race of the child. A second sign or myth is seen. In the advertisement the myth is that Monsanto is helping Asian children see

with their rice.[20] It is a second order semiological system. The first is the linguistic system and the second is metalanguage, "in which one speak about the first" (Barthes 1972, quoted in Hall 1997, 68).

The Monsanto advertisements can be seen as creating myth. Because the meaning of its advertisements goes beyond growing cotton in abundance or making a child see, it is supposed to give you a feeling of hope and endless possibilities. Monsanto hopes that you see that there is a way of making a better world with their products.

Michael Schudson (1984) studied the issue of realism in advertising. He suggested that advertising is a reflection of capitalist realism. Capitalist realism, according to Schudson is "to label on a set of aesthetic conventions" and "to link them to the political economy whose values they celebrate and promote" (Schudson 1984, 5). The idea that there are a set of aesthetic conventions used in advertising means that there is a certain look or sound to advertisements that link them to the system of capitalism. This is compared to Socialist Realism.

Socialist Realism is the state governed practiced in the Soviet Union often referred to as propaganda. Schudson described the set of aesthetic and moral conventions used in Soviet art:

1. Art should picture reality in simplified and typified ways so that it communicates effectively to the masses.
2. Art should picture life, but not as it is so much as life as it should become, life worth emulating.
3. Art should picture reality not in its individuality but only as it reveals larger social significance.

[20] This corresponds with the accompanying caption that suggests this.

4. Art should picture reality as progress toward the future and so represent social struggles positively. It should carry an air of optimism.
5. Art should focus on contemporary life, creating pleasing images of new social phenomena, revealing and endorsing new features of society and thus aiding the masses in assimilating them. (Schudson 1984, 10)

Advertising works in the same ways to create the ability to sell products. Schudson describes the parallels between advertising and socialist art:

> It does not claim to picture reality as it is but reality as it should be - life and lives worth emulating. It is always photography or drama or discourse with a message - rarely picturing individuals, it shows people only as incarnations of larger social categories. It always assumes that there is progress. It is thoroughly optimistic, providing for any troubles that it identifies a solution in a particular product or style of life. It focuses, of course, on the new, and if it shows some signs of respect for tradition, this is only to help in the assimilation of some new commercial creation. (Schudson 1984, 7)

In each of these points it is clear that there are similarities been capitalist advertising and Soviet regulated art.

There also is an issue of whether advertising creates a doctrine. Schudson (1984) references James Rorty, who suggested that advertising makes up a body of doctrine, and Leo Spitzer, who likens advertising to 'preaching' since it attempts to teach morals. Schudson (1984) refutes these proposals, suggesting instead an illusion of detachment or independence is created when people do not believe in advertising. This means that a viewer gets more from the ad than what it is saying. The influence of an ad comes from the viewer's response of knowing there is an illusion being presented to them. "Advertising may create attitudes and

inclinations even when it does not aspire belief, it succeeds in creating attitudes because it does not make the mistake of *asking* for belief" (Schudson 1984, 17).

Capitalism is a learned ideology, as communism was in the Soviet Union. People generally have the attitude that capitalism is the best economic system out there because they can buy things like the Walkman. How is it that this ideology is learned? Schudson relates the work of Melford Spiro when looking at how ideology is learned:

1. Most weakly, they may *learn about* an ideological concept.
2. They may learn about and *understand* the concept
3. They may *believe* the concept to be true or right.
4. The concept may become salient to them and inform their "behavioral environment" - that is, they may not only believe the concept but organize their lives contingent on that belief
5. They may internalize the belief so that it is not only cognitively salient but also motivationally important. It not only guides it instigates action.

Advertising works best if it can reach levels four and five and Schudson (1984) argues that these are not successive. In other words, the idea that the consumer does not believe in the advertised message could still change their behaviour around it.

This is the goal of biotech advertising. Companies like Monsanto are not asking for the approval of the technology. Instead they are trying to convince the public that plant biotechnology is a necessity. They hope with advertising, such as the Council of Biotechnology Information's magazine campaign, the public will internalize the concept that plant biotechnology will help feed the world.

This internalization comes from repeatedly seeing messages that they may think are not affecting them. Even when there is a disavowal about their effects, advertisements might give one an aesthetic gratification (Jameson 1979). Monsanto's advertisements give the viewer the opportunity to see a better world; it appeals to their sense of humanity and their desire to help others. In his discussion of media images Jameson suggests that modernism fulfills fantasies and ideologies through materials, mass culture (such as the advertisements described here) represses fantasies through "the narrative construction of imagery resolutions and by the projection of an optical illusion of social harmony" (Jameson 1979, 141). In other words mass culture, including advertisements, create a utopia that the addressee thinks can be possible and distracts them from questioning these hopeful representations.

Iina Hellsten presents a different look at advertisements. She illustrates that 'life science' companies "highlight positive images and ...turn images of fear into those of hope and promise" (2002, 459). A rhetoric of fear is associated with these companies. Many try to reassociate themselves and their products with science and hope instead of fear. For example Monsanto is attempting to use the slogan 'imagine' along with their advertisements to create a possible utopist vision for consumers.

Fear and hope are part of a collective consciousness and allows the products of mass culture to alleviate fear in favour of hope (Jameson 1979). At the same time they reinforce the fear of inaction. The suggestion that GM crops is the only

way to change a desperate situation creates a feeling of doubt about other alternatives to farming with chemicals or solving nutritional problems.

Hope implies gaining knowledge and control whereas fear describes losing control. Science and progress are associated with controlling nature, and in turn is highlighted in many life sciences advertisements. In a February 1997 advertisement Novartis ran advertisements which included an image of a scientist in the background with typical lab equipment in the foreground with the text: 'new skills in the science of life'. Hellsten (2002) suggests that the message implies that the work in the life sciences by Novartis should be trusted because of science:

> ...the scientific community can be trusted, not only because it is composed of morally responsible individuals, but also because it is composed of morally responsible individuals [...] devoted to improving the human condition (Mulkay, 1993, p. 726 quoted in Hellsten)

The use of science and knowledge will be critically examined the next chapter.

Conclusions:

Everyday consumers receive different types of representations through advertising. They are in the form of images, text and sounds. This chapter looked at the basics of representations and advertising to begin to understand why representations of GM foods by proponents are misleading. They appeal to North Americans' desires to help others, and create hope by suggesting that GM crops will feed the hungry and ensure successful farmers.

The link between an object and how we describe it is based on our culture. Cultural coding is important to understand representation. There are several theories about representation, however it is the constructive approach that is of primary importance in this analysis. The constructivist approach discussed in this chapter was the semiotic approach. Essentially this means that society constructs meanings through different elements creating signs.

This chapter also looked at the way meaning is constructed from photographic images. When a photograph is seen as an artistic work, its meaning can be analysed regardless of whether or not it is intended to be viewed in such a way. The message from it is not stable, not everyone will see the photograph the same way. Images are used in many different ways, including advertising.

Advertising's goal is to sell something. This could be an idea or a product. It does this by creating identification between the viewer and the idea that is being represented. Advertisements usually try to create the best possible reality or myth that is imagined.

The photographic advertisements presented in the third chapter use representation to create an imagined reality. They are trying to convince the consumer that plant biotechnology can lead to a reality where agriculture becomes less environmentally damaging, helps farmers and provides for the nutritional need of the malnourished. This chapter, however, helps to understand that this reality is only the representation of the companies and organisations involved. The

following chapters will further explain why this reality is constructed and not possible.

Chapter 5: Voices Wearing White: Representation and Science and Knowledge

Leading scientists around the world have attested to the health and environmental safety of agricultural biotechnology, and they have called for bioengineered crops to be extended to those who need them most--hungry people in the developing world ... Nearly 3,500 eminent scientists from all around the world, including 24 Nobel laureates, have signed a declaration supporting the use of agricultural biotechnology.

– C.S. Prakash and Gregory Conko[21]

Introduction:

The previous chapter explained how representation creates meaning through language. It also examined how advertising works to support ideals, such as the three claims made by the biotechnology companies. This chapter builds on chapter 4 by examining the use of power and science in GMO representations.

In the early 1960s, Stanley Milgram ran experiments testing people's responses to authority, specifically when it meant harming another. A majority of subjects did what they were told because it was a scientific authority that was telling them to do so.[22] Although Milgram's experiment was designed to explain why many went along with the Holocaust in Europe during the Second World War, it also explains the impact scientific authority can have on one's actions.

Scientific authority is often used in agricultural biotechnology advertising to give credibility. This particularly applies to statements on web-based advertisements. For example Monsanto's "Biotech Basics" website reminds potential consumers that biotechnology is a science and "experts assert that

[21] Quoted from article called "Technology That Will Save Billions From Starvation" from http://www.agbioworld.org/biotech_info/articles/prakash/prakashart/save-billions.html

[22] The full finding of his experiment are published in *Obedience to Authority: An Experimental View* (1974).

biotechnology innovations will triple crop yields without requiring any additional farmland, saving valuable rain forests and animal habitats" (Monsanto, 2001). This chapter will discuss how science and knowledge is used and manipulated by advertisers to convince consumers that GM food is 'good'.

While the previous chapter looked at the basics of representation through language and image, this chapter is going one step further in the analysis of language. The work Michel Foucault will be examined in regards to representation, discourse and power. This leads to a discussion of technoscience and Donna Haraway's work on the subject of genetics. Finally a discussion of the sociology of science is needed to give us a sociological understanding of why science works the way it does.

Foucault and Language:

In the previous chapter I examined how language is used to represent through culturally constructed signs. These allow people to communicate through their common language. However, language is not necessarily so clear.

Michel Foucault's essay *This is Not a Pipe* (1983) examines the juxtaposition of language and representation. It was written in response to Margritte's 1926 painting "Ceci n'est pas une pipe". The painting is of a pipe with the words "Ceci n'est pas une pipe" (this is not a pipe) scrolled underneath it. Margritte is telling us that the painting is a representation, not a pipe.

By creating a juxtaposition of the pipe and the statement Margritte has created a heterotopic space. These are spaces where unlike 'things' are juxtaposed

(OED, 2004). Harkness (1983) calls Magritte and Foucault "cartographers of Heterotopia", in the sense that Foucault's work in *The Order of Things* (1970) and Magritte's painting deals with categories. In other words, the image of the pipe and the statement are two representational categories that are seemingly contradictory.

In *The Order of Things* (1994) Foucault discusses Borges' Chinese Encyclopedia. This encyclopedia gives us juxtaposed categories such as "suckling pigs" and "mermaids" (Borges cited in Foucault 1994, xv). Representation through language should fit a kind of order. It is when two things are juxtaposed that there is an issue. When observing Margritte's painting, one is supposed to read it and say 'but it is a pipe". When looking at an advertisement featuring a papaya it is important to recognize that it is not a papaya, rather it is a representation of a papaya. Like the words in Margritte's painting, the words, however, do suggest that it is not a papaya either; it is a product of science.

Borges' Encyclopedia creates anxiety to the reader because the order and the categories does not seem 'logical' or 'rational' (Foucault 1994). Heterotopias make people uncomfortable. When I say 'this is not a papaya' I am not only problematising language, I am also problematising the rationality of saying that changing the genes does not change the fruit. The intent of the new papaya is no longer that of an agricultural crop, it represents much more.

Discourse:

In *Representation* (1997), Stuart Hall reminds the reader that meaning in culture is dependent on many aspects including narratives, image groupings and discourses that operate across many areas of knowledge. It is the reminder that

language is not the only source of knowledge. Representation's role in creating social knowledge is primary in much of Foucault's work, although Foucault did not discuss representation in quite the same way as Barthes or Saussure (Hall 1997).

The primary concern of Foucault was the production of knowledge through discourse. Foucault's concept of discourse is

> a group of statements which provide a language for talking about – a way of representing knowledge about – a particular topic at a particular historical moment. ... Discourse is about the production of meaning through language. (Hall cited in Hall 1997, 44)

Thus language is important to the way meaning is constructed, but meaning is no longer linguistically dependent. It now becomes inclusive of actions.

This is where power comes into play. If you do not have the 'knowledge' of the subject as defined by the discursive formation, you cannot bring meaning to, or contest meaning of, the subject. Although this is tied to the human sciences (psychology, economics, sociology) and more particularly to the study of madness, as defined through the classical period, it can also be applied to modern biotechnology.

Hall (1997, 45) summarizes Foucault's examination of the study of madness as having the following elements:

1. statements on the topic (madness) gives us knowledge of it
2. the rules around which the topic is talked about in a particular time period
3. the 'madman' is the subject that personifies the topic in particular time period
4. how 'truth' is constructed in a particular time period
5. the kinds of practices that are employed in the institutions
6. an understanding that a different discourse will replace the existing one

This is a structured way of understanding a discourse in a particular time period. Like du Gay's circuit of culture, Foucault's historical study of the human sciences is a way of understanding some aspect of culture.

The study of GM foods could have the following elements:

1. statements on this topic (GM foods) gives us knowledge about it (such as those in the advertisements presented in chapter 3)
2. the rules around which the topic is talked about in a particular time period (must be scientific?)
3. there is a subject that defines personifies the topic for this time period (the scientists, consumers or the living things being modified?)
4. how 'truth' is constructed in a particular time period (through scientific knowledge?)
5. the kinds of practices that are employed in the institutions (based on common scientific practices?)
6. an understanding that a different discourse will replace the existing one (there are other discourses pushing to change the common narratives of scientific authority)

What is important to the discussion of representation of GM foods is how the discourse of plant biotechnology is separated from the consumer because he/she allegedly does not have the ability to add to the scientific knowledge. By having a scientific authority to tell consumers what is 'good' about plant biotechnology, the consumer cannot adequately engage with the knowledge that is given to them.

The consumer that argues against the scientific authority is dismissed as irrational or ignorant, and treated as not educated about science. However, there are scientific studies that suggest that GM foods are not all 'good'.[23] Often the representations of knowledge and 'truth' given to the consumers ignore the issue

[23] StarLink corn, for example, has a possible allergen that affects humans, but was approved to be grown for livestock feed. In 2001 Kellogg's had to pull some of its products because StarLink corn had contaminated a shipment of corn.

that the scientific community is not in complete agreement over every commercially available GM crop.[24]

Since the government is in charge of approving GM foods, it is their point of view that is dominant in representations. GM foods on the market are safe according to the Canadian government (CBC News Online Staff 2002). So statements made by Monsanto are intended to give the viewer knowledge about GM foods. They frame the discussion in a scientific manner. In this time period the truth is constructed through information based on approval by the government.

The role of government is important beyond the way in which information is presented to the consumer. Michel Foucault also discussed the issues of biopolitics and biopower. Biopolitics is simply the understanding that the state is in charge of your health, food etc. Government organizations such as Health Canada are a formalized way in which the government has control over what one eats, drugs you take and whether GM foods are acceptable.

Biopower occurs when biopolitics comes about. Not only is biopower the way in which the state exerts biopolitics through its institutions, they aid in the "segregation and social hierarchization... guaranteeing relations of domination and effects of hegemony" (Foucault 1990, 141). This allowed Foucault to problematise judicial theories of sovereign power (Cooper 2001). It also allowed for the possibility of knowledge hierarchies. What Foucault is getting at is the ability to create a capitalist society through control of the body.

---

[24] Organisations such as Physicians and Scientists for Responsible Application of Science and Technology will be discussed in the seventh chapter.

The United States, the largest producer and supplier of GMOs, is trying to ensure a capitalist agricultural hegemony.[25] Like Canada, they have many government organizations (such as the Food and Drug Administration) telling consumers that GM food is safe, healthy, and environmentally friendlier than other farming techniques. Hence these foods are acceptable (as dictated by the government not the consumers). This in turn allows the United States government to use their influence to make GM foods acceptable worldwide. If they can convince governments to accept agricultural then biotechnology companies can do business in those countries in an attempt to create an economic hegemony on the use of GMOs.

This suggests that many influences, such as science, can reinforce a biopolitical control of the food supply. Even though it is not directly the United States government, this gives the United States significant power over worldwide food choices. These companies benefit from the United States government's policies. This is often done with the rationality of Western scientific culture.

Biotechnology and Christian Philosophy:

My favourite computer games are of the 'Sim' variety. *Sim City* and *The Sims* are games where the player takes on a god-like role in creating communities. In Sim City, for example, although I have to respond to some uncontrolled variables (like the possibility of a meteor shower, or the 'freewill' of the Sims) I control many aspects of the game. If I play 'right' my Sim City will thrive. In Sims I get to create 'people' with a variety of possible personalities, and make them

[25] U.S. companies are becoming the largest companies in agribusiness.

live with (either in a neighborhood or household) with other Sims. I have even been able to create a simulation of my own household. These simulations allow me to create virtual life, clones and complex city maps.

One of the first Sim games by Maxis was a game called SimLife.[26] Instead of creating simulated humans, the player of SimLife creates various life forms (such as mammals, birds, marine life) and manipulate then at a genetic level. You can play with the map of their genes to create new life forms beyond the defaults of the program. All Sims games are 'map making' games, and as Donna Haraway points out "map-making is world making" (Haraway 1997, 132), an inherently Christian philosophy.

Map-making can be seen as the first step to the colonization of what is being mapped. As the earlier cartographers of North America, biotechnologists are exploring aspects of the world we have never seen before in order to exert power over those elements.

This 'world-making' is reflected in the dominant religion of Western culture. That is, even though science is supposedly separate from religion, the goals and values of science follow a similar path. The big bang theory, for example, is an explanation where something comes from nothing. It reflects the Creationism belief that 'in the beginning' there was nothing. Since humans cannot create 'life' out of nothing, biotechnology allows us to change life to our own, by 'map-making' (on the genetic level).

[26] Other Sim games include SimTower, SimCopter, SimIsle and SimSafari.

Central to Donna Haraway's work is the concept of figuration. In the sociological sense, figuration is a "nexus of interdependencies between people"(Jary and Jary 1995, 233). Donna Haraway's figuration "is a theory of representation that critiques the literal realism of science, scienistic thinking and 'secular Christian Platonism' and offers an alternative in self conscious troping, or embodied preformative images" (Bartsch, DiPalma, and Sells 1998, 166). Tropism is an involuntary movement in response to stimuli (like moving hand from a hot surface). Donna Haraway is making an attempt to respond differently to 'scientistic' thinking that is represented to us.

In the act of figuration in response to the representation of science Haraway is suggesting that it is the very notion of a scientific realism that is wrong. Science is a nexus of social relations; there are 'chains of function' that need to be studied in order to understand what and how science is represented both to consumers and within the scientific community. Haraway studies the advertisements of equipment that is to be used in discovering narratives within science of genetics (Haraway 1997).

Gene fetishism is a play on Marx's term, commodity fetishism. Commodity fetishism occurs when there is a 'use-value' placed on the object. Gene fetishism is a two-fold explanation for the obsession of figuring the genome to everything. The first is that it is a commodity (patenting and licensing certainly points to that), and a religious-like obsession to 'map' life, to control life itself.

Donna Haraway, however recognizes a difference between commodity and gene fetishism:

> Commodity fetishism was defined so that only humans were the real actors, whose social reality was obscured in the reified commodity form. But "corporeal fetishism," or more specifically gene fetishism, is about mistaking *heterogenous* relationality for a fixed, seemingly objective thing... The gene fetish is a phantom object, like and unlike the commodity. Gene fetishism involves "forgetting" that bodies are nodes in webs of integrations, forgetting the tropic quality of all knowledge claims. (Haraway 1997, 142)

She is suggesting that biopower is being applied to nonhuman life forms and they are now the subjects. They are disconnected from nature as humans are. The lesson to be learned from Haraway is that scientific thinking is bound up in western philosophical thinking. To map and manipulate are ways of controlling the world and molding it to how one sees fit. Both science and religion figure their own realisms, which are bound up in an idea of absolutes. In turn these absolutes are represented to society.[27]

Science is a powerful part of society and it is the "discourses and representations produced by science, and the discourses of science itself that perpetuate its immense power and prestige" (Grant 1998, 68). These discourses must be examined to understand the power of science. Sociology is one way that science can be examined beyond a philosophical understanding.

Sociology of Science:

Although it is important to look at issues of power and philosophical basis of western science the way science works from a sociological view is also

[27] Richard Lewotin's variation on this is 'biology as ideology' meaning that biology has become the 'answer' to everything, like religious doctrine. This is summarized in his book *Biology is Ideology* (1993).

important. Language is just one aspect of a study of science. Ludwig Wittgenstein stated that "language games are not simply exchanges of verbal behaviour, they are indissolubly linked to forms of life" (cited in Grant 1998, 75). Science is a language game linking nature and humanity.

Since the representation of science leads us to question the nature of science itself, it is important to add to the discussion understandings of science and technology. Sociology of science studies the social collectives that produce scientific findings. This section focuses on science as a production of knowledge in multiple fields. The two main divisions in sociological theory on science are modern and postmodern theories.

Modernity:

There are generally three basic categories to describe modern perspectives on science. The first is what Busch et al. (1991) calls *internal community views*, which means that individuals who take up the same or similar enterprises, such as science, are likeminded and share similar educational levels, values and approaches which are communicated through institutionally established channels. The second category is *externally determined views*, which suggest that social conditions such as perceived social problems and economic situations influence the science that occurs. The third category is the *dynamic view*, which is that science is driven both internally and externally.

The underlining aspect of modern or empirical science is positivism. August Comte's term that described the view that truth and knowledge have a

scientific basis (Quinton 1999). Positivism is not only a part of the natural sciences, but it also influenced economics and the social sciences.

One aspect of positivism is reductionism. Reductionism describes a system (social or biological) by examining their component parts. Not all sciences that are based on positivism require reductionist approaches, but biology is often dominated by reductionism (Busch et al. 1991). It is important that to recognise that the same doctrine promotes biological determinism, and has allowed for institutionalized sexism and racism in the forms of sociobiology and eugenics. This type of reductionist dogma keeps biology from looking at the bigger picture, such as the impacts that genetic engineering could have on the environment (Shiva, 1995). It also ignores the possibility of impacts to society itself.[28]

Busch et al. (1991) also examines views on agricultural science. The first of these is the diffusion model, based on the idea that when a scientist develops new technologies they in turn instruct 'extension agents' which train farmers to use the technology (Busch et.al. 1991). The term is borrowed from anthropological theories on the spread of cultural traits (Jary and Jary 1995). The farmer gives the scientist information on how the technology works in a farm situation (Busch et.al. 1997). The underling feature to update the theory is the idea that science is based on rationality, that is that for every end (such increased agricultural productivity) there is a means that is specific for each aspect of science (Busch et.al. 1997). Rational scientific practice includes the controlling of factors that may intervene in

[28] Impacts such as the changing role of farmers can have consequences for the structure of a society.

an experiment. However, it often has scientists ignoring other considerations such as socio-economic situations.

When it comes to the issue of technology transfer to the developing world often socio-economic factor plays more of a role for technology acquirements (Busch et.al. 1997). It is not enough that the technology would necessarily work; it must be paid for and wanted. There are several assumptions in the diffusion model described by Busch. It assumes an *ontological monism*, in that that there is a single world in which we live. This has been challenged repeatedly by non-Western cultures. A second assumption, *objectivity of technical language*, means that there is no consideration of the differences of language use between cultures, societies nations and individual sciences (well refuted by Foucault and other work previously discussed). The third assumption, *communication as monologue*, means that science is giving society the technology, but society as no means of communicating the suitability of the technology to their way of life. Busch describes the fourth assumption as *tradition versus modernity*. This view of positivism generally has a 'we versus them' mentality, and 'we' (modernity) are always right. Hence, the problem with this approach when relating to developing nations who have their own way of doing things and rationality is an attempt to destroy that. The assumption of separateness means that rational science is separate from the rest of society. Overall then the scientist basis their work on the misunderstanding that the same scientific rationality works the same as an 'everyday' rationality. The diffusion model of science then does not work,

especially when it comes to the ability of application of farming technologies to those living in non-Western cultures.

The *induced motivation model* is another view on agricultural science, which suggests technology, such genetic modification, is developed as a response to relative scarcity (Busch et.al. 1997). Patent laws play a role in this model. It is through patenting that companies who do the research receive the benefits for developing the innovation (Busch et.al. 1997). However, the problem is that this model assumes a science that recognises social change and adapts to it. This assumption is challenged when the technology applied does not bring about the expected outcome.

A more important criticism of science is the idea that science is value free. As a human enterprise, science has interests and ideals like other human enterprises (Busch et.al. 1997). There is also this idea that science is a means for action, not a means for goal determining (Brown 1998). That is science is used for creating actionables (being able to sell more of a companies herbicide) not for the advertised goals (reducing chemical usage).

Postmodernity:

Thomas Kuhn, in his 1962 work *The Structure of Scientific Revolutions* drew many of his ideas from Francis Bacon. "Nature, as Francis Bacon put it at the dawn of modern science, does not yield her secrets to the incantations of poets or the bookish disputations of philosophers; the experimental sciences most *force* them from her" (Grant 1998, 65). Technology is what gives scientists the ability to

study nature. As nature is understood more technology is developed. Kuhn helped to open up the natural sciences as a source of study by the social sciences. Science no longer would be considered the 'disinterested study of facts'. He showed that scientific plans were often dictated by opinions of faculty and funding group as much as problems and experimental results (Grant 1998). Thomas Kuhn argued that historically there are series of breaks and radical divergences in sciences, called paradigm shifts (Foucault's discourse formations).

Science is no longer the "disinterested quest for the truth about nature" (Grant 1998, 76), so it needs to survive economically. It is through new technologies that science becomes a performer (Grant 1998). It is through this performance that science has become interconnected to the capitalist economy.

What is new about this is that there is a devotion to profit gaining at any cost and science survives because of its contribution to this 'regime' (Grant 1998). Knowledge for knowledge's sake is not a part of postmodern science. Capitalism and techno-science are so intertwined that all science's language games are reducible to the "single rule of profit" (Grant 1998, 76). Biotechnology then is not the connection between nature and humanity, it is a business designed to produce profits.

Patents are part of this system. Many scientific discoveries are patented under either the U.S. or British patenting offices. In 1980, the Supreme Court in the U.S. ruled that life forms could be patented because they are chemical products (Kimbrell 1996). This has led to a rush of patenting and subsequent biotechnology boom. Although there is an argument that this simply protects scientists'

knowledge, there are concerns that scientists have been 'stealing' genes from farmers and those that occur 'naturally'. In the 1960's plant breeders were allowed to patent seeds, what occurred, however, was that many agribusiness and food corporation patented their clients' seeds, this created wealth at the expense of farmers.

Trust in science was shaken by *Silent Spring* (1962). The chemical industry took the brunt of the criticism. However, biology has had a growing faith attached to it. Van Rensselar Potter (1964) points out that biology was becoming increasingly important because of its 'proven' track record. However, he warned that the knowledge to control and manipulate life can be dangerous, and it can lead to serious unintended consequences, like that of DDT. He warns that this is a new and dangerous knowledge and that "the knowledge of the consequences of biological control is incomplete and inadequate" (Potter, 1964). It is likely that concerns over the science will become louder as more developments of biotechnology occur.

The theories on science have a common element. Science changes as societies and economics change. Modernity suggests that the change from chemical inputs to genetic modification is a rational change in science. That is when the scientific community realised that chemistry was not the 'best' science for increasing agricultural outputs. Since then it moved to biology. In other words it took on a much more reductionist view of crops.

In general, the idea that science can help agriculture is a very modern idea. However, postmodern theories look at more reasons for a development of GM

crops. First, science perpetuates its own authority and serves scientists' interests. Second, science serves economic interests. Crop yields must be high in to keep these technoscience initiative in business. They also insist that biotechnology is a safe alternative to chemical pesticides that are destructive to the environment. Risk and 'greening' are important elements to this process.

In sum sociology of science recognises that the relationship between society and science is complex. Irwin and Wynne (1996) summarize the way in which science looks at the general public. First they suggest that there is always an assumption of ignorance in the public, particularly if there is contradictory feedback form the public. Secondly, there is an idea that science experts know what's 'best' for society. In other words, science is privileged. Finally science tends to portray itself as value free. Each of these elements separates science from the rest of society.

Conclusions:

It is clear that "scientific knowledge is not absolute, but rather the subject of debate among scientists" (Brown 2001, 308). The problem arises when consumers are given absolutes: absolute truths about these products, absolute authority, and scientific absolutes. None of which are accurate, but theories of power and knowledge and discourses help us understand why and how this comes about.

Despite many of the good-intentioned scientists who feel that their projects will help many people, they still work for someone. Science is increasingly corporate driven and scientists are not researching for knowledge's sake. Studying

the complexities of nature is expensive when there is a demand for results. It is unlikely that scientists will truly be able to help feed the world or help malnourished children under the institutional framework dominated by profit driven corporations. Also, people cannot make choices under the present agenda of the regulatory agencies of government.

Science also serves to separate us from nature. The next chapter discusses how nature is constructed by science and society. It is also important to understand risk factors and how the 'greening' of science is an attempt to sway consumers further to acceptance of GM foods.

Chapter 6: Understanding Nature: Representations and Reflections

And God blessed them, and God said unto them, Be fruitful, and multiply, and replenish the earth, and subdue it: and have dominion over the fish of the sea, and over the fowl of the air, and over every living thing that moveth upon the earth.

– Genesis 1-28

Introduction:

Chapter 5 examined how science and authority are used in representations to promote the use of GM crops. The role of science is to examine and explore so that aspects of nature can be controlled. This chapter looks at how nature is defined. It also examines why companies such as Monsanto create products that are seemingly environmentally friendly.

What is nature? It seems to be a simple question. Nature, to many, is what we exist in. For others it is what exists in parks or outside of the city. Or it separates 'artificiality' from something that is not. It also refers to traits, such as 'human nature', traits that exist because of our biology, before or despite social input.

'We' define nature and our relationship to nature. This chapter examines how the concepts of nature and the environment are constructed in order to understand how we relate to it. Since the representations discussed through this thesis is Western in their perspective, it is important to look at Western philosophy on nature.

Defining environmental problems is similarly problematic. Debates rage over whether humans are causing environmental damage or if changes can occur in

cycles.[29] Despite some companies such as Monsanto do recognise that humans are causing some damage to the earth, they in turn attempt to capitalize on these problems with 'environmentally friendly' products.[30] This constitutes a 'greening' of agribusiness.

Agribusiness companies have been suggesting that biotechnology will lessen the impact of agriculture on the environment (and nature). Theories of environmental 'management' and 'problem solving' include the concepts of *risk society* and *ecological modernisation.* They why the agricultural industry is moving away from environmentally unfriendly practices to seemingly 'friendly' ones and representing them as such.

It is important to recognise the way society relates to nature since it is reflected in portrayals of nature. Although crops may not be considered as nature (papayas do still grow in the wild[31]), the importance of the natural environment is clear. Farming is 'bad' for the environment, and so we need 'solutions'.

What is Nature?

The Oxford English Dictionary online (2004) defines nature, the noun, as "the phenomena of the physical world collectively." Although this is the eleventh meaning giving to the word, this is the sense which it is used here.[32] Nature means birds, plants, mammals (including humans), insects, bacteria, rocks, water, and so

[29] A great resource for examining this debate is Jim Norton's Info-pollution website, specifically his section on anti-environmental myths http://info-pollution.com/myths.htm.
[30] Perhaps a great irony of this is that Monsanto attacked Rachel Carson's *Silent Spring* (1962) by going so far as to publish a parody called "The Desolate Year". They insisted that DDT was safe. DDT was banned less than a decade later.
[31] http://plantsdatabase.com/go/60417/
[32] http://dictionary.oed.com/

on. Although this is the sense the word nature is used, it doesn't explain how we *view* nature.

During the Enlightenment many philosophers and poets began to recognize that humans 'exist' in nature (Harper 2001). Prior to this there were few attempts to understand how we perceive or notice nature (Harper 2001). It seems ridiculous to think that Europeans never really discussed this before, but the distinction here is not that we never discussed our natural world, we didn't move to separate man-made from natural. Or alternatively, we never discussed our impact on the environment, it just was.

The Romantics of the early nineteenth century sought a metaphor to separate what was 'good' or natural, from the 'bad' or artificial (Harper 2001). They wanted to go beyond the previous views and representations of the world, which were very strict and religious. This movement not only was interested in nature, but also in 'primitive' ways of life, expressing moods, being spontaneous, imaginative, and interpretive (Cuddon 1998). Famous names of the movement include Keats, Tennyson and Wordsworth.

Before moving on, however, it is important to reflect on where the general understanding of nature in western philosophy comes from. An important reflection on how 'we' view nature comes from Lynne White's essay "The Historical Roots of Our Ecological Crisis" (2001).[33] Humanity, he explains, has always changed its surrounding, by starting fires for hunting grounds, or farming; all species do something to modify their contexts. Although, he writes, "... the

[33] Originally published March 10, 1967 in *Science.*

Baconian creed that scientific knowledge means technological power over nature can scarcely be dated before about 1850" (White 2001, 14). He attempts to clarify how this 'creed' came about by examining agriculture.

Originally farming was simply subsistence, that is, farming was about feeding yourself and your family. Much like hunting and gathering humans effected their environment just enough to survive; farmers used enough land for survival. It wasn't until the 7th century C.E. that the invention of a new plough changed things. White (2001) suggests that this plough became the defining factor of how much land can be exploited, over that of need of a family. In other words "man had been part of Nature; now he was the exploiter of Nature" (White 2001, 16). However, the acceptance of being able to exploit nature was already there.

Christianity, White (2001) suggests, has the underlying beliefs that help change man to the dominator of nature. Before Christianity pagan religions tended to celebrate nature and had a belief in cyclical time (no beginning). Christianity has linear reasoning (a beginning), which it inherited from Judaism. In pagan religions there is a sense of animism, that every object of nature has a spirit. Christianity, on the other hand, puts man above all other things, living or nonliving. But it is the idea that God's will is for man to exploit nature that creates an indifference to nature.

White (2001) admits that Christianity is far more complex than this, but uses it to outline his argument for an alternative view (St. Francis of Assisi). In response to White, Lewis Moncrief (2001)[34] agrees the West's exploitation of

[34] The response to White's article was first published in the October 30, 1970 issue of *Science*.

nature is more complex than just Christianity. He suggests that the combination of the rise of capitalism and democracy along with urbanisation, wealth, population growth and individualism has contributed to increased environmental degradation. This suggests that our view of nature is in part determined by our economic system.

The work of Marx and Engels reflects on capitalism and our changing relationship with nature. Marx believed that 'Man' should be sovereign to nature (Sayer 1991). With this being said, however, Marx and Engels also knew that Capitalism fully alienates human society, this includes human societies connection to nature. Engels, especially, reflected on the possibility that nature could have 'revenge' if society is insensitive to it (Dickens 1997).

The roots of capitalism, however, lie in Christian philosophy. Weber, for example, believed that capitalism came about because of the Protestant ethic that stressed rationality and discipline (Sayer 1991). Both White and Moncreif then are arguing the same thing: that the roots of rationality (Christianity) has allowed for the human degradation of nature in the West.

This link between rationality, capitalism and science can be seen in Haraway's work. As discussed in the previous chapter, it is Christian philosophy that has created this map-making obsession (Haraway 1997). This obsession is another example of exploiting nature. The rationality of it, as seen in representations created by proponents of GMOs, is repeated through use of experts and defines the argument. Rationality reinforces the conception that nature must be controlled in order for humanity to survive.

The Value of Nature:

A common element of the previous discussion is that nature is useful and as such has value. Philosophizing the value of nature is often a starting point for a discussion of environmental ethics. In response to the awareness that 'humanity' has been ruining the environment, movements have come about to slow, stop or reverse environmental degradation. One is *conservationism* that wishes to preserve nature because of its value (as resources) (Rogers 2000). For example Ducks Unlimited preserves wetlands to ensure duck habitat. The reason this is important to them is that they are duck hunters. There is also the *deep ecology* movement, which is concerned with preserving every aspect of nature no matter what value they hold to us (Rogers 2000).

Rogers (2000) presents a critique of both conservationism and deep ecology. According to Rogers (2000) conservationism puts the value of nature in the wrong place and suggests that only parts of nature that have economic or intrinsic value for us that should be preserved. Deep ecology, however, is not a realistic goal since humanity will always value certain things over others not simply because of vanity, but because of survival (Rogers 2000). Rogers instead suggests that we should reflect the value of nature the same way we value art. We should value authenticity, appreciate replicas (but recognise that they are replicas), recognise rarity, and know that some of the greatest masterpieces will never be for sale (Rogers 2000).

Even with environmentalism, nature is still raw material to make 'objects'. Whether it is because of capitalism, Christianity or another force there seems to be

a need to change our relationship to nature. Since capitalism is the dominant force in our relationship to nature today it is important to understand how Capitalist production is responding to environmental degradation.

Reflexive Modernisation, Risk Society and Ecological Modernisation:

During and following World War II the chemical industry was very productive. Not only were chemicals important to the war, but they also improved life. 'A better life through chemicals' was a catch phrase of the 1950's. DDT was a primary chemical (aside from plastics) that exemplified this; not only was deemed safe (as shown by footage of picnickers being sprayed by it) but also appeared to have ended the threat of pests that plagued America's farms. In 1964, *Silent Spring* ended the honeymoon period with chemicals. Never before was the chemical industry so openly questioned (Schmitt 1999). Companies began to feel the pressure when government regulations such as the banning of lead in gasoline, and CFC's were put into place. Companies, such as Monsanto, who produced DDT, needed to move to a more environmental friendly technology to stay in business. One way of describing what happened is *reflexive modernisation.*

Reflexive modernisation is a term coined by Ulrich Beck and others. Beck (1994, 174) asserts that "an elementary thesis of reflexive modernization states this: the more societies are modernized, the more agents (subjects) acquire the ability to reflect on the social conditions of their existence and change them in that way". What occurs is that in modern society individuals and institutions begin to 'self-confront' the problems created by being 'modern'. The 1960s movements were

confrontational. They not only questioned the Vietnam War, but also many other aspects of Western society. The civil rights and feminist movements questioned the way society treated parts of its populations. Moreover, with the help of Rachel Carson's book, *Silent Spring* (1962), industry and science were questioned.

Industrial society, or modernity, is based on rationality and the reliance of experts. The 1960's led to a questioning of modernity. This, Beck states, is because we are part of *risk society*. Risk society creates a 'crisis of modernity', in that social, economic and environmental risks are escaping the institutions of monitoring and protection and giving the members of society the ability to question it. Governments are not able to protect its populace from the risks created by new technologies, and aid in creating new risks by allowing new technologies to cause risk (the use of nuclear power is one example). Beck (1994) states this happens in two phases. First, the production of risks occurs without public knowledge. Hence, North Americans lived with the use of DDT without questioning it. Secondly, when the risks of industry are dominant in the public, industrial society becomes problematic (socially and politically). "'Reflexive Modernization' means self confrontation with the effects of risk society that cannot be dealt with and assimilated in the system of industrial society" (Beck 1994, 6). Industrial society causes the risk society to develop. By the time of the Union Carbide accident in Bhopal, the chemical industry was forced to find new and safe products. Research was invested in reusable, recyclable and biodegradable goods.

Policy also became problematic. "On the one hand society still makes decisions and takes action according to the old industrial society, but on the other,

the interest organisations, the judicial system, and politics are clouded over by debates and conflicts that stem from the dynamism of risk society" (Beck 1994, 5). Popular culture also became enshrined with debate. For a time many public service announcements used stars to inform people about the importance of recycling.

Because of popular and political pressures, there are transformations in three areas of industrial society. The first is that industrial society's relationship to natural and cultural resources. Society re-evaluates the planet's ability to provide infinite resources. Secondly, there is a transformation in "the relationship of society to (the) threats and problems produced by it" (Beck 1994, 7). Essentially this means that society becomes aware of pollution problems and attempt to alleviate them, but their not sure how. Thirdly, collective sources of meaning such as faith in progress are suffering exhaustion and so individuals are living with " a variety of different, mutually contradictory, global and personal risks" (Beck 1994, 7). Science is questioned, religion is questioned, and the government is questioned. This creates uncertainty and a society where problems are produced without any answers. Beck (1997) uses Marxism to point out that modern industrial society changes constantly in order to maintain bourgeoisie domination. It is in reflexive modernization that one form of modernization can undercut another – collapsing in on itself. However, it seems this is a "victory" for capitalism in that a new modernity is born (Dickens 1997). What occurs is industry changes and adapts to the growing environmental concerns by creating so called 'solutions'. This is the 'trick' of capitalism, there is always a solution to whatever problems it creates.

Genetically Modified Organisms in agriculture is a proposed industrial and scientific solution to the ecological crisis of industrial society. Primarily it is a solution to the 'chemical treadmill' of pesticides, herbicides and fertilizers used in agriculture (Levidow 1995). When referring specifically to the environmental crisis in a risk society a related concept - *ecological modernization*- is used.

Arthur Mol states that the definition of ecological modernization depends on context. There is a difference between ecological modernization as a social theory and ecological modernization as a "political program" of change. The latter is used to define the actually change in direction of ecological politics. Environmental sociologists, however, "starting from an analysis of changing social practices in production and consumption, environmental politics and environmental discourses, ...have constructed a theoretical approach to generate a sociological understanding of transformations in contemporary industrial societies in dealing with ecological changes" (Mol 1997, 139). There is also a difference between the "analytical/descriptive and the normative/prescriptive conception of Ecological Modernization" (Mol 1997, 140). The prescriptive conception is well illustrated by the language used by agribusiness companies like Monsanto:

> We are a company committed to opening new doors, to improving the way we grow food, all around the world. Each day we're unearthing small things which combine to help solve much larger problems. Like growing safe and more abundant food with less pesticides. And developing integrated approaches that improve productivity while protecting the environment and reducing the costs of farming. Our people are making this happen today, at Monsanto. Imagine tomorrow's possibilities. (Monsanto 2003a)

Opponents to ecological modernisation as a prescriptive measure state that it is sustaining and continuing the processes, which created the environmental crisis to begin with (de Paiva Duarte 1999).

The core feature of ecological modernization is a "concept dealing with the institutions of modern technology, market economy, and state intervention" (Mol 1997, 140). In other words, ecological modernization is a process to examine the science and the response to GMOs by governments and the companies involved.

Another main characteristic of ecological modernization is that science and technology are important institutions in the "ecologysing economy" (Mol 1997). Many businesses have gone from begrudgingly accepting state regulations on environment and safety to actively greening their business in order to seek a competitive advantage (Graham 2000). This is why this theory is so important when addressing the issue of GMOs. It is through biotechnology that agribusiness is trying to *ecologyse*. Mol points out that environmental concerns caused the chemical industry to go through a restructuring. The shift also is indicated by the fact that many chemical companies, such as Monsanto, have moved away from chemistry to create biological solutions to chemical problems.

In risk society, nature becomes a product or a social project: "Here a policy of creation produces a world of living creatures which can conceal the manufacturing character it creates and represents" (Beck 1994, 27). GMOs are a solution, according to biotechnology proponents; the potential problems are not

considered. However, the more GMOs are used the more likely there will be new problems created, public concerns over GMOs will increase.

This process of ecological modernization does not help the environment crisis; it only serves to reinforce it. De Paiva Duarte writes that "despite the rhetoric of social change frequently used in the environment/development debate, it plays a crucial role in the maintenance and reproduction of industrial society, through three interrelated processes: the institutionalization of environmentalism, the reformist turn of the environmental movement[35] and the political project of ecological modernisation" (1999, 63). Ecological modernisation then does not address environmental concerns. "Our current sense of being 'at risk' is as much a consequence of our way of life as of any external environmental crisis. The modern loss of faith in 'science, truth and progress' leads to our current sense of insecurity and external threat. The 'environmental crisis' is in essence a social crisis for our institutions and our own existential beliefs (that is of who we think we are)" (Irwin 1997, 220).

Beyond Modernity, Social Construction of Nature:

Through the reflexive nature of this new modernism we can see that capitalism is continuing to shape the way that nature is seen. However, it is more complicated than this. The theme of this thesis is representation from a

[35] The reformation in environmentalism is a change from what is commonly referred to as 'extreme' or anti-technology environmentalism to a moderate form that allows for ecological modernisation.

constructionist standpoint; therefore it is important to look at how social constructionism explains our view of nature.

Social constructionism of the environment or nature has been an important area of discussion in environmental sociology. Perhaps the biggest concern of this approach has been whether this is an approach to help solve environmental problems or simply a tool of understanding. Although this is touched on, however, the primary concern here is to understand how we view nature and our impacts on it. Social constructionism of nature is in some respects what was discussed in the beginning of this chapter. We define our relationship to the physical world. This was also touched on in the previous chapter. The idea of mapmaking as world making is an important aspect of understanding nature and culture. We map, but as with playing a Sim game, you are never really a part of it. This notion of separation is an important aspect of our vision of nature.

Social constructionism is essentially a reaction to the notion of ontology. Sociologists such as Durkheim, followed this philosophy, and suggested that there are social facts (Jary and Jary 1995). In terms of nature we have tended to have a biological determinist approach. Rationalism, the basis of modern science suggests that science is supposed to study nature and also that science will determine the facts of nature.

The representations of plant biotechnology take advantage of the fact that, for the most part, many people believe in science's ability to tell us that there is a problem with the environment, but also that there are scientific ways of fixing these

problems. What social constructionism does is to help separate the 'facts' out and consider that there are other ways of understanding environmental degradation.

In environmental sociology there has been discussion over the merits of social constructionism. Burningham and Cooper (1999) outline this discussion. They suggest that realists feel that it is "unacceptable not to acknowledge the independent objective reality of nature and to ignore the moral imperative of attempting to protect the natural environment" (Burningham and Cooper 1999, 300). This is based on two assumptions about social constructionism, that there is a denial of physical reality, and it disables political criticism.

Social constructionism does not suggest that nature or environmental problems does not exist. It gives an alternative view to environmental realism and rationalism that suggests that there are facts and absolute truths about environmental problems (Burningham and Cooper 1999). This goes back, once again, to representation. The way in which we see nature is reflected and produced by what we see in advertisements.

Although none of the advertisements specifically show anything 'natural', they are an attempt to reflect on the point that GM crops are better for the environment, hence nature. How nature is constructed for us is done, in part, by representation. Environmental reality does not exist in the sense that it is constructed by the way society describes it. Social constructionism of nature allows for an understanding of where these ideas have come from. It is not a denial of the

problem, but an understanding that our prescriptions are based on constructed ideas.

Conclusions:

The Western view of nature could be the reason why environmental degradation has occurred. White (2001) suggests that Christian thinking created an attitude, essentially, that it is all right for humanity to exploit the planet to its ends. Moncrief's (2001) emphasis that this is an oversimplification and advertisements the processes of urbanization, population and wealth growth and individualism that occurs in other places that has led to the problems of the environment.

Capitalism also plays a role in Moncrief's thesis. To understand capitalism it is important to understand our relationship to nature that has been changed by capitalism. Marx and Engels acknowledged that we have become alienated from nature, and (Engels primarily) recognized that we have to be careful about the way we exploit nature. There is a notion that capitalism has its own seed of destruction, but is also capable of adapting to threats, such as environmentalism.

The move from an 'obviously' damaging chemical to a safe 'solution' is one of the motivations for the use of GM crops. Ecological modernisation is about sustainable capitalism creating ways in which agribusiness can survive as an environmentally damaging industry. Ecological modernisation is not a solution to environmental degradation caused by modernisation; it continues and exaggerates the Risk Society or the 'crisis of modernity' that we are experiencing.

In order to resolve this crisis, society and nature must be seen as interwoven. In order to produce a society that is less harmful to the environment, society (and science) should move away from dominating nature. In this line of thinking, Genetically Modified Foods cannot possibly solve environmental problems caused by agriculture. This is because it only serves to reinforce the domination of nature and further environmentally damaging techniques.

It is important to understand that we see nature based on several different notions is important. Although there is no doubt that there are materialist foundations of nature, there is most definitely something cultural in the way we perceive it. This could be shaped by many inputs. It could be we tend to have a more rationalized or ontological view that does not deny that there are scientific truths. Or there is a recognition that our view is shaped by cultural inputs, such as advertising.

It is clear that companies such as Monsanto and organisations such as the Council of Biotechnology Information are attempting to use rationalism and representation to shape people's views on biotechnology. They use the views (Western) society has on science, nature and the environment to try to convince the viewer/reader that plant biotechnology is good for the environment.

There is also another group that is trying using some of the same tactics to convince people that GMOs are not good for societies or the environment. The next chapter will reflect on the anti-GMO movement.

Chapter 7: Of Glowing Rabbits and Dark Monsters: Alternative GEO Representations

Science brings gifts of convenience
To the modern man
Modern man then continues
Continues to expand
But what happens when man creates
Something oh so wrong
Nature bites back in a big way
Good heavens what have I done!

I kept it in a box
I watched it grow a lot
It chewed right through the lock
And ate all the new kids on the block.
A scientist creates a beast
In a secret laboratory
Nature plots revenge
It's blood that it seeks
That's where we begin our story!

The Cat with 2 Heads

College brought education
To this privileged man
High school diploma
A science major
with a government grant
Four years later an experiment
To mutate domestic pets
It turned into a nightmare
So lock your doors
Hide your hot dogs
This cat's upset

–The Aquabats, The Cat with Two Heads[36]

Introduction:

In attempting to understand the narrative from the corporate point of view, the previous chapters discussed that issues of representation, power, knowledge and science. One of the ways the proponent of plant biotechnology attempts to control the discussion is by using the term genetically modified organisms (GMO). Opponents use the wording of genetic engineered organisms (GEO). It seems that there is something to this slight language change. Engineered might sound more

[36] From: http://www.lyricsondemand.com/a/aquabatslyrics/thecatwith2headslyrics.html (1997), See also http://www.theaquabats.com

fearful than modified. Apart from a word choice opponents of GEO have chosen other forms of representation to tell their stories.

There are different levels of resistance to corporate biotechnology, not only through the anti-GEO movements, but also through genetic artistry. The anti-GEO movement is important because it tells us how pessimistic views on GEOs and all sides of this debate use representation.

They use hope, fear and doubt in their own ways, in order to encourage resistance to the use of GEOs. This includes more active expressions of representation. However, they also use scientific authority to create doubt about the optimism surrounding GMOs. Understanding how technoscience is used for other debates (for example the controversy over the AIDS drug AZT) gives insight into how alternative narratives concerning science and technology come about.

I also will examine a new move toward GE art. These narratives bring up issues outside the simple two-sided debate. They are allowing for other discussions of this technology. This includes society's relationship to nature.

I have decided to approach this chapter by first strictly looking at the anti-GEO movement. This consists of many organisations but only three will be discussed, these are Greenpeace, Council of Canadians and the Physicians and Scientists for Responsible Application of Science and Technology (PSRAST). The first is a worldwide environmental activist group, the second is a Canadian grassroots foundation that discusses a whole facet of issues, and the last is a group of scientists speaking out about safety issues of GEOs.

During the discussion of each I will discuss the ways in which each uses representation to make their points. Because the theories of representation, science, discourse and power have already been discussed I will not re-emphasize them. There are theories and issues that I will be discussing throughout this chapter including narratives and activism.

Anti-GEO movements:

Greenpeace:

Greenpeace is one of the oldest and most prominent environmental groups. On their website they outline their beginnings in 1971 when a small group boated to Alaska to be "non-violent witnesses" to underground nuclear testing. Greenpeace is perhaps best known for using the ship "Rainbow Warrior", their first flagship, sunk by French secret service in the 1980s,[37] to bring attention to potential threats to the environment.

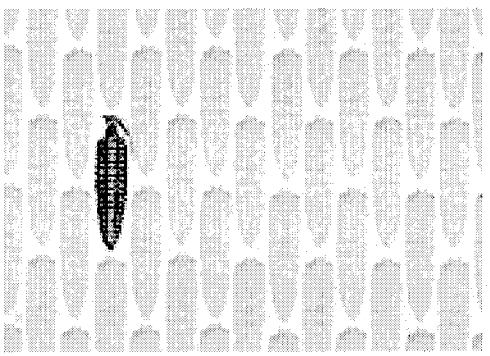

Figure 7-1: Corn Grenade
Copyright Statchett (October 4, 2002)

Their Genetic Engineering campaign has one of the most detailed and active websites on the Internet.[38] Greenpeace outlines not only the potential problems with GE food and crops but also ways to resist genetic engineering. What they believe:

---

[37] For more information on this event go to http://library.christchurch.org.nz/Childrens/NZDisasters/RainbowWarrior.asp

[38] Figure 7-1 is an example of one representation from Greenpeace's website. http://www.greenpeace.org/multimedia/download/1/40498/2/corngrenade_big.jpg

> Genetically engineered organisms should not be released into the environment, as there is not adequate scientific understanding of their impact on the environment and human health.
>
> We advocate immediate interim measures such as labelling of genetically engineered ingredients, and the segregation of genetically engineered crops from conventional ones.
>
> We also oppose all patents on plants, animals and humans, as well as patents on their genes. Life is not an industrial commodity. When we force life forms and our world's food supply to conform to human economic models rather than their natural ones, we do so at our own peril. (Greenpeace 2004)

They use news, reports and information to stress their position.

Activism is one of Greenpeace's most important endeavours. Protests are common, usually they have found many ways of gaining attention. In 1999 a group of Greenpeace activists went to the British government's patenting office wearing 'Dolly' masks. This was done to protest the patenting of live forms, such as the cloned sheep. Dolly. They have been known to climb tall structures to unfurl large banners. They also have labelled food on grocery shelves with their 'Genetic Experiment' stickers.

The symbol they used on their genetic engineering campaign for years is an 'X'. This X is the same one that appears in the television show X-Files. This is done for many reasons. The television show, X-Files, is about government conspiracies to cover up alien visitors. A main storyline in the 1998 movie[39] includes bees pollinating corn to create a virus. This can be interpreted as commentary on GE crops, since talk of crops that can grow in infertile soil and with little water were prevalent at the time. Greenpeace uses this 'X' in the hopes

[39] This movie is called "Fight the Future".

that those would associate it with the ideas of extraterrestrial, government conspiracy and cover-ups.

In Canada, Greenpeace has been working to get labelling laws in place. In the meantime, Greenpeace Canada has published a shopping guide to inform consumers about which products contain genetically engineered foods.[40] In their online version they use traffic light colours to illustrate their point. Red meaning 'stop' since those products contain GE ingredients. Yellow means that Greenpeace is unsure whether the product does not contain GE ingredients. Green means that the product does not have any GE ingredients. The traffic light colours are recognizable sign, meaning a consumer can quickly know which products have GE ingredients.

The Council of Canadians:

The Council of Canadians describes itself as "Canada's pre-eminent citizens' watchdog organization" (The Council of Canadians 2004). They are a lobby group that tries to keep issues such as social programs, free trade and the environment at the forefront of Canadian politics. They presently are running a Biotech Campaign.

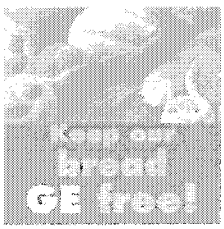

Figure 7-2: The Council of Canadians bread campaign (2003)

Their website is primarily made up of news articles, however, there are a few campaigns by The Council of Canadians including a campaign to stop GE Wheat. The "mail your slice of bread" campaign was launched in 2003 [Figure 7-2]. This campaign

[40] http://www.greenpeace.ca/shoppersguide/

consists of mailing a slice of bread, along with a handbill to the Prime Minister's office or their local MP. As of January 2004 approximately 3,500 Canadians sent a slice of bread in the mail (Morley 2004). Later in 2004 Monsanto dropped its plans to introduce GM wheat to Canada (CBC News Online 2004).

There are many reasons why this campaign worked. First, bread is a staple food that most people eat, therefore any concerns over the safety of its main ingredient would prompt greater interest. Second, the physical act of actually sending a piece of bread through the mail would gain greater reaction than simply sending a piece of paper. In other words it was a memorable campaign both for the receiver and the sender.

PSRAST:

There are scientists that worry about the use of GEOs, despite Monsanto and the Council of Biotechnology Information's claims that science is behind them. Scientific groups have been voicing their concerns over the way in which GEOs have been portrayed and pushed by corporations.

PSRAST's website is a very simple text-based website that deals with other safety issues, but their primary focus seems to be GEOs. They avoid any embellishments because they want people from all over the world to use the site. This means there are few graphics, no animations, sounds or scripting. They even have alternative translations and links to web-based translator tools. This is not the only way in which this site contrasts with Monsanto or the Council for Biotechnology Information.

Their genetically engineered food site is "(w)ritten so that *everybody can understand* the essential problems without prior knowledge about genetics" (Physicians and Scientists for Responsible Application of Science and Technology 2004). In their 'first step' they give their main conclusions about GE foods. They state that the commercial use of such foods "cannot be scientifically justified and carries with it unpredictable and potentially serious consequences" (Physicians and Scientists for Responsible Application of Science and Technology 2004). This is a completely different science-based view than that of Monsanto or the Council for Biotechnology Information. They also give their reasoning behind their conclusions.

In the second section of their website, they outline the safety problems with GE foods. They discuss potentially harmful effects such as genetic mutation of GE crops in the environment and human health issues. Once again, this flies in the face of what Monsanto and the Council for Biotechnology Information tells us. PSRAST recognises that there will be scepticism and states:

> You may be perplexed to read this and may doubt it. If so, it may be the first time that you encounter an impartial account. This is not surprising as powerful corporations have invested many millions in flooding the media with biotech propaganda, often disguised as apparently impartial feature stories by hired leading journalists in TV, newspapers or journals. Or you may have heard of endorsing statements by scientists who pretend to be objective, but who are, in reality, serving the biotech corporations.
> By studying this site you will understand that the points above are supported by scientific facts. (Physicians and Scientists for Responsible Application of Science and Technology 2004)

They also have outlined many issues in clear ways giving readers the option of looking at as little or as much information they may want.

The representations by this organisation are almost strictly text. There are only a few graphic and illustrations. This may be more compelling than Monsanto or the Council for Biotechnology Information because it suggests two possibilities. The first is that their information does not need to be backed up with fancy graphics. In other words the information speaks for itself. Secondly it reminds us that large corporations do not support this group. It seems that the more money an organisation has, the fancier the website becomes. The apparent separation from money would give it more value to those suspicious of corporate motives.

The Monster and Death:

There are two main metaphors for activists against GE foods. These are the metaphors of Frankenstein and death both of which illustrate the language many activists have been using. Frankenstein evokes the metaphor of death is less common. This metaphor is used to suggest the GEOs kills indiscriminately.[41]

The metaphor of death is most prominent in Brewster Kneen's *Farmageddon* (1991). The title itself plays on the word Armageddon, the place of biblical battle at the end of the world.[42] To Kneen, battle over GEOs is taking place on the farm.

---

[41] Silent spring is an example of the death metaphor.

[42] From Revelations 16:14 "For they are the spirits of devils, working miracles, which go forth unto the kings of the earth and of the whole world, to gather them to the battle of that great day of God Almighty" http://www.sacred-texts.com/bib/kjv/rev016.htm#014

Kneen's argument about death is two-fold. The first is that GE plants that are commercially available today are designed to work with herbicides or have pesticides 'built' into them. Kneen states that this is "(k)ill the enemies" (1999, 11) thinking, which is related to industrial monoculture that has dominated farming for much of the century. The second is the idea of 'terminator seeds.' These are seed that have their natural reproductive processes interrupted. This means that the seeds produced by the plant are sterile and hence new plants cannot be grown.

The metaphor of death isn't just related to plants or weeds. Death of bacteria, viruses, and potentially other life forms, such as mammals, concerns Kneen. It is a culture of scientific agriculture that wants to destroy anything it perceives as a threat, and that there is little consideration for other potential problems (Kneen 1999).[43] This criticism that this science is creating a destructive 'monster' is a common.

The book *Frankenstein* (1994) was written by Mary Shelly and first published in 1818. The story is about Victor Frankenstein, a medical doctor, who found death abhorrent. He found a way to bring a human being back to life. However, the monster is uncontrollable and kills those that are closest to Frankenstein. It is a parable written in the Romantic period. As stated in the previous chapter, this period was when the Western world began to relate to nature differently. Science was on its way to become more important than religion.

Jon Turney (1998) discusses the way in which Frankenstein is used as a framework for the discussion of Biotechnology. To him "fictional representations

[43] Kneen backs the argument that there is too little known about the potential effects of GE food for humans. He also cites the potential for fatal allergies as a cause of death from GE food.

matter, that the science and technology we ultimately see are partly shaped by the images of the work that exists outside the confines of the laboratory report or the scientific paper" (Turney 1998, 3). Hence Frankenstein is an important contribution to how we view science.

The alternative title of Shelley's book is *The Modern Prometheus*. It relates to the Greek Myth of Prometheus who gave humans fire and other technologies and was punished for it. It is myth that is supposed to teach lessons about acquiring knowledge and defying power. It is similar in meaning as the story of Eve and Adam being exiled from Eden (Turney 1998). Like those myths, *Frankenstein* is a reminder that we cannot be ambivalent to knowledge.

Many, including scientists, contest images of life sciences. Many insist there is an 'anti-science' movement in the media (Turney 1998). As discussed previously, however, the 'other side' seems to think the opposite.[44] It, perhaps, is because of the often-used word 'Frankenfoods' that concern these scientists. Despite the concern many see Shelley's tale as an important lesson for science.

Frankenstein is a myth, a modern one, but a myth nonetheless. Turney points to the *Oxford English Dictionary* for a definition of myth. The new online edition defines it as "a traditional story, typically involving supernatural beings or forces, which embodies and provides an explanation, aetiology, or justification for something such as the early history of a society, a religious belief or ritual, or a

[44] Turney points out that the response tends to be rhetorical only and that the community of scientists won't be specific about what 'antiscience' threats are out there (Turney 1998).

natural phenomenon."[45] There is suggestion that the mythic standing of Frankenstein has to do with the use of metaphor, or that it is associated with scandal, or misrepresentation (Turney 1998). I prefer Barthes' myth to any of these. Frankenstein has a first level and second level signifier. The first is the story and the second is the idea that the story represents.

Many of those against GEOs have embraced the use of Frankenstein to represent the problems with the life sciences. They are trying to evoke the notion of the monster produced by a mad scientist that thought he could play God. The Frankenstein myth plays on our fear that science might get out of control. Greenpeace's adoption of the 'X' from the television show the X-Files is an attempt to do the same thing [Figure 7-3].

Figure 7-3: Sticker used by Greenpeace. (scanned) Used with permission.

"Trust no one" was the main theme of X-Files and it epitomized the belief of the main character Fox Mulder. Whether it was the government or even his sceptical partner, agent, doctor and sceptic Dana Scully, Mulder was determined to discover the 'truth' about aliens. It too was a parable that incorporated mad scientists and monsters (in this case the monster ended up being a genetically engineered alien virus).[46] Instead of "trust no one" Greenpeace is saying "don't buy it". In other words

[45]http://dictionary.oed.com/cgi/entry/00320409?query_type=word&queryword=myth&edition=3e&first=1&max_to_show=10&sort_type=alpha&result_place=1&search_id=dKza-Qi5fmc-1157&hilite=00320409

[46] There was even a satirical episode called "The Post-Modern Prometheus" that plays on the recognised link between X-Files and as a "postmodern" Frankenstein. The episode was done in black and white and attempted to use similar cinematography as James Whaley's 1931 movie Frankenstein.

Greenpeace is telling consumers, not only to boycott the product, but also to not believe what is being said about GE food.

Technoculture:

Genetic engineering is also becoming a new media technology, which will be discussed below. In the past century new technology has given movements the ability to resist the state's control of information (Penley and Ross 1991). This information includes information about science. The countercultures to media domination by the west have included piracy and manipulation to end a one-way flow of culture (Penley and Ross 1991). Technoculture is essentially the culture created around new technologies. Penley and Ross (1991) describe technoculture as a "result of social processes and power relations" and is "aimed at deskilling, information gathering, surveillance and the social management of large populations" (xii). In this sense the application of genetic engineering is, like previous agricultural technologies, creating its own technoculture.

Agricultural technology is a technoculture for different reasons. First it deskills farmers because it creates a new system for farming. GE crops often takes the timing out of the hands of farmers and allows Monsanto to dictate timelines.[47] Second it takes control of the seeds away from the farmer since new technologies create a situation where the corporations have the say over the use of all seeds produced by a plant. Farmers have to pay a licence fee for the seeds every year if

[47] Monsanto 's products include Roundup Ready crops. This crop is herbicide resistant, meaning that the herbicide Roundup can be used without destroying the crops, allowing it to be used and different periods of the growing season than it was before.

they continue to use the seed. Third, by creating a situation where seeds are provided to the farmers specifically grown for specific food processors, the farmer is deprived of some of his/her independence. They no longer work for themselves but for corporations.

There are ways to counter technoculture. A lesson about responding to science and regulations around science is the counter culture created by ACTUP! For biotechnology there has been the organic food movement and genetic artistry. The next section examines those groups

Telling Alternative Stories:

It is a reoccurring theme that the release of GEOs is part of an experiment. Those who are eating this food are 'subjects' of a study. This is because many insist that the effects of eating GE food are not clear (The Council of Canadians 2004, Greenpeace 2004). There are also concerns over the way in which government has reacted to safety concerns. Understanding that there are ways of approaching science and that non-scientific groups can appropriate the culture of science is not a new issue. The following sections will reflect on a more historical counterculture (AIDS activism) and new ones (genetic art) to technoculture.

ACTUP!

There is a long history in the US of dealing with ethics on the use of human subjects. There were concerns about when human subjects should be informed or when they shouldn't be. Treichler (1991) mentions the Tuskegee syphilis study. This study is perhaps the embodiment of experimental science at all costs. This

forty-year study of 600 black men, most with syphilis, had researchers ignoring medical treatments and the suffering of their families just to see how the disease played out. Local physicians were even asked not to treat the men.[48] The response to critics of the Public Health Service (PHS) was essentially that is was a study to "learn the natural history of untreated syphilis, that treatment would have compromised this goal, that the men would not have understood their condition or benefited from treatment, and that critics of the research did not understand science" (Treichler 1991, 60). This was in 1972. This attitude of science for science's sake had many concerned and disturbed. The incident sparked investigations and the way in which human subjects are tested, and as a result stronger ethical protocols were established.

In the 1980's a new disease emerged and the way subjects and scientists relate changed again. The AIDS crisis of the 1980's highlighted issues of scientific authority and inequality. Treatment seemed to come slowly and the drugs that were available were expensive and dangerous. Patients seemed to be the last ones consulted and the first to be ignored. However groups began to emerge to challenge those traditional views of patients and the discriminatory views on homosexuality.

Paula Treichler has studied the medical system and how groups are treated by it. In her studies of the way AIDS has had an effect on groups, she had looked at ACTUP! an advocacy group for AIDS patients. The way they have reacted to science and technology has been important. They are one of many groups that have

[48] More information can be found at the Centers for Disease control website http://www.cdc.gov/nchstp/od/tuskegee/index.html

resisted the oppression of technoculture, enlisting "the strongest challenge to current conditions comes not from those who dismiss or denounce technology, but from those who seize it for its progressive political purposes" (Treichler 1991, 69). I disagree that technoculture or science is necessarily progressive and one can seize it, especially in the case of genetic engineering. However, there are lessons to be learned from the AIDS movement and relations to medical science that can be applied to the movements against GE foods.

What parallels the condition of many AIDS subjects and those who are supposedly going to be helped by GE crops is that they were not consulted. Many farmers in developing countries and people in general know little about GE foods other than what they are told either by their government or by the corporate representatives.

AIDS activists were able to subvert the system through different means by creating alternatives to dominant narratives. From patients refusing to be passive subjects and pushing interests that were beyond science and medicine, there was recognition that there is a "clinical construction of culture" (Treichler 1991, 92). This construction, like many other social constructions based on scientific beliefs, needed to be challenged. They also created narratives around equality and technology and pushed for affordable treatments and choice about those treatments (Treichler 1991).

It is important to recognize that scientific 'facts' are developed over time. These 'facts' come from results of scientific research and support for these 'facts' is constructed and manipulated to support an idea (such as the idea that GEOs are

solutions to environmental problems). To "dispute these 'facts' becomes increasingly difficult over time, because gradual acceptance of one interpretation tends to naturalize the processes and assumptions through which it was arrived at" (Treichler 1991, 92). Over time these 'facts' are accepted as truth and there is an end to discovering more.

In other words there are goals to create the 'reality' of science. Whether it is about AIDS or GEOs, there are people who challenge the scientifically created 'reality'. Treichler states that 'reality' can be defined as "that set of statements that has become too costly to give up" (1991, 93). There are too many interests involved in particular 'facts'. To further apply this to GE foods, it is important to recognize that as these products become more popular in the food industry, the harder it will be to remove them from it. This is not just for the potential profits, but also because of a culture created around the products sustained by corporations, farmers and scientists.

Finally it is important to recognize the parallels between scientific conviction used by drug manufacturers and GEO producers. In the fierce debate over the drug AZT, there were concerns whether any treatment was better than no treatment, no matter what the cost to the life of the patient. AZT did seem to work, but the patient suffered from the overwhelming toxic effects.[49] For many in the scientific community there was no need to argue; AZT was the most effective drug thus far and there should be no issue whether patients should take it.

[49] HEAL describes some of the more series side effects on their website: http://healtoronto.com/azt1.html

In the debate over AZT medical scientists insisted AZT was the best drug at the time and it was ridiculous to consider not using it because the lives of those who were HIV positive were at stake (Treichler 1991). Today GEO scientists often say similar things. Ingo Potrykos, the head scientist in the production of 'Golden Rice' was very upset that people protested his rice stating that it would be "irresponsible, not to say immoral, not to use biotechnology to solve this problem!" (quoted in Nash 2000).

Genetically Engineered Art:

Aesthetics and biotechnology are closely related. The aesthetically pleasing presentation of GE foods like models posing in front of the camera shows how deeply the Council for Biotechnology Information wants to make their plants look 'pretty'. Monsanto's ad campaign that includes the juxtaposition of 'sick' corn with healthy and vibrant corn is an example of using aesthetics to make a strong impact on people's opinions. We have a general idea of what a 'good' apple is supposed to look like, and grocers often reject produce that doesn't look 'right'.

New forms of biological aesthetics have come about with GE. Although it can be argued that plant breeders are the first genetic artists (Tomasula 2002),[50] the ability of biotechnology to manipulate life at a genetic level is a way to manipulate aesthetics of an organism beyond just creating a unique flower. Most art concerning GEOs has come in the form of commentary against the process, but

[50] As proponents of Genetic Engineering often point to plant breeders as the original biotechnologists (Pueppke 2001).

genetic artists have embraced the techniques of genetic engineering and have added them to their artist's toolbox.

On of the most controversial and best known is Eduardo Kac. His 'creation' is a chimerical rabbit called 'Alba'. His art project was called simply 'GFP Bunny', GFP standing for Green Fluorescent Protein, which was designed to include the glowing bunny living in a living space as a pet (Kac 2004). Alba, an albino bunny, glows green in the dark when she is placed under the correct light. The gene that was spliced into her genome was an enhanced version of the one that makes a certain species of jellyfish fluoresce (Kac 2004). Kac insists that he had asked the lab to create Alba for him, but the lab has yet to given Alba to Kac explaining that they had no intention of doing so (Travis 2000). Kac (2004) insists that the bunny does not break any 'social rules' since human beings have determined the way rabbits evolve for centuries - Alba is not a monster.

Non-utilitarian breeding (for aesthetics, not for useful traits commonly associated with agricultural) is not new; breeds of cats, dogs and rabbits are plentiful and other animals and plants have been bred for desirable traits. In this sense creative genetic manipulation has been done for a long time. However the engineering of plants and animals is skipping steps in evolution and breeding; it also allows for traits that would never appear through breeding, such as the GFP bunny. Other transgenic art includes creating semi living objects, such as pigs' wings, and cacti that grow human hair (Cinti, Catts, and de Menezes 2004).

From Monty Python and the Holy Grail (1975) (a lesson in not underestimating bunnies)

TIM: There he is!
ARTHUR: Where?
TIM: There!
ARTHUR: What, behind the rabbit?
TIM: It is the rabbit!
ARTHUR: You silly sod!
TIM: What?
ARTHUR: You got us all worked up!
TIM: Well, that's no ordinary rabbit.
ARTHUR: Ohh.
TIM: That's the most foul, cruel, and bad-tempered rodent you ever set eyes on.
ROBIN: You tit! I soiled my armor I was so scared!
TIM: Look, that rabbit's got a vicious streak a mile wide; it's a killer!
...
ARTHUR: Go on, Bors. Chop his head off!
BORS: Right! Silly little bleeder. One rabbit stew comin' right up!
TIM: Look!
BORS: Aaaugh!
ARTHUR: Jesus Christ!
TIM: I warned you!
ROBIN: I done it again!
TIM: I warned you, but did you listen to me? Oh, no, you knew it all, didn't you? Oh, it's just a harmless little bunny, isn't it? Well, it's always the same. I always tell them--
ARTHUR: Oh, shut up!
(Gilliam and Jones 1975)

Arthur and his knights are attempting to find the hiding place of the Holy Grail by entering the cave of Caerbannog. The irony is that bunnies are not vicious creatures, just as they are not supposed to glow in the dark. Both bunnies are supposed to carry humorous connotation about rabbits.

There does seem to be a bit of 'because I can' mentality in this process. Kac states "moving beyond the metaphor of the artwork as a living organism into a complex embodiment of the trope, transgenic art opens a nonteleonomic domain for the life sciences" (2004). This stripping of the pragmatic aspect of GE, gene

artists are dealing with issues such as authorship and the nature of art (Tomasula 2002). The question of authorship from scientists to artists is key in the Alba controversy. Art nature boundary has been eroded even more by this new art form.

There is a worry that genetic scientists see themselves more as artists, and see themselves as creating a new renaissance. Will the creative drive be used to hide eugenic tendencies? What if a genetic engineer alters a baby's eye colour to be green, even though neither parent carries those genes? What about the ability to change the colour of skin or the slant of eyes in the womb? Is it possible the argument will be that this is to create a beautiful piece of artwork that happens to be a child? All of these concerns are valid. However, transgenic artists are creating new narratives and despite many misgivings, it is here to stay. Transgenic art is not reductionist, it is to Kac (2001) a rejection of reductionism and it reminds us of the social existence of animals and human influence on those existences.

What sets transgenic art away from the life sciences then? "Transgenic art, by contrast, offers a concept of aesthetics that emphasises the social rather than the formal aspects of life and biodiversity, that challenges notions of genetic purity, that incorporates precise work at the genomic level, and that reveals the fluidity of the concept of species in an ever increasingly transgenic social context" (Kac 2004). He is creating 'transgenic social subjects'. This idea that living creatures are social subjects is not new. However, many see the injection of artistry into genetic engineering as deceptive. GE is the embodiment of human power, making the decisions about which genes gets given to bunnies in the hopes of creating the

best piece of art (Rifkin 2003). Rifkin insists, "It is not art, but artifice" (Rifkin 2003).

Those who view such art determine the meaning of it, in the end. Alba is not a representation; she is an object, a work of art and a representation of what biotechnology is capable of. There are connoted and denoted meanings surrounding this artwork, even when the subject is the art itself. Transgenic art is an attempt to create a new narrative, separate from the proponents versus opponent debate, but a reminder that living things are a part of the social existence (Kac 2004).

Conclusions:

This chapter is about presenting alternative narratives to the larger story of GEOs. To change the language from GMOs to GEOs is one way in which the movement against GE foods and crops is attempting to swing favour away from corporations. 'Engineering' sounds more active, and perhaps more scary than 'modifying'. Alternative representations create alternative connotations and thus a different view on what GMOs/GEOs mean to society and the environment as a whole.

The groups described here are not necessarily against all biotechnology, but they are concerned with the way it is represented to us. Greenpeace and The Council of Canadians both want to keep GEOs out of our food. Greenpeace goes a step further and suggests that there are alternatives.

Science is of concern to all the groups, but none more than PSRAST. PSRAST is concerned with the idea that GEOs are being grown in fields without knowledge of long-term effects on human health or the environment. They are trying to dispute the well-known 'facts' that many have come to accept about GE foods and crops. Greenpeace portrays this process as a far-reaching experiment that needs to be stopped. They have resorted to representations that include a symbol from a popular television show to evoke fears of conspiracies and lies. They are all insisting that GE foods are dangerous.

The idea that GE is a form of Technoculture gives a new perspective on controversy over these products. The Technoculture of GEOs is illustrative of the global consequences of the use of these products. It is a form of Western domination that is affecting the lives of others. Like most technocultures it is difficult to create alternative narratives, but people are doing it.

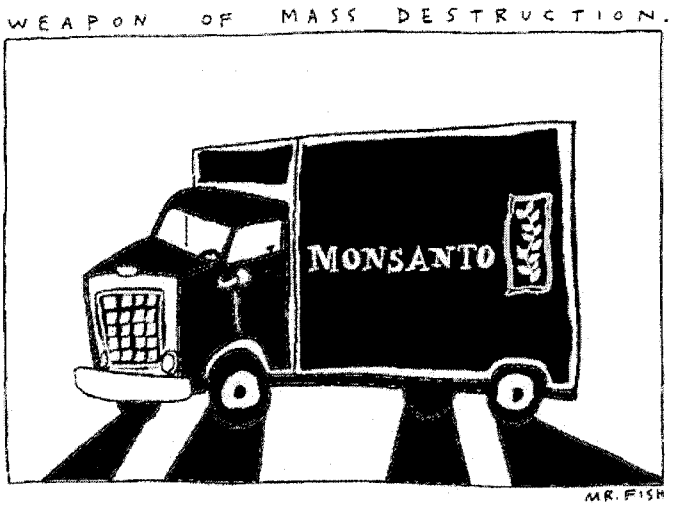

Figure 7-5:Weapon of Mass Destruction Copyright 2002, Mr. Fish. Used with permission.

Transgenic art is a way of moving from a utilitarian view of GE to one that incorporates aesthetics. Although aesthetics are a part of the choices made in agricultural GE products, there is little usefulness for a cactus with hair. Transgenic art is done because the technology is there and these

artists can do it. They are creating new heterotopias that intend to make viewers uncomfortable and think about what they are seeing.

Whether the alterative narratives to proponents of GEOs are evoking metaphors of death or monsters, or creating chemical living things, there are some important points coming from this discussion. Many people create representations of GEOs [Figure 7-5]. The viewers and readers of those narratives who are interpreting and creating their own meanings from those representations are important. The ability to make an impact on the viewer with your representation is important for how the viewer will form an opinion about the subject. Each group is attempting to do it in their own way.

Chapter 8: Conclusions:
Not a Papaya

The universe is not required to be in perfect harmony with human ambition.

– Carl Sagan[51]

The "control of nature" is a phrase conceived in arrogance, born of the Neanderthal age of biology and the convenience of man.

– Rachel Carson[52]

The hopes and fears fuelled by the use of genetic engineering are not going away. Public opinion is constantly being shaped by representations from all sides of the debate and through many tactics. This thesis set out to answer the question: How are GEOs presented to the public, and what are the problems associated with GEO representation?

The sources for information on GE foods are broad. Proponents and opponents alike have embraced the use of media, however, the proponents have been actively trying to sway public opinion to their favour. They have done this by creating organisations and information sources such as the Council for Biotechnology Information as an 'honest broker' that gives consumers seemingly unbiased information. In addition, companies such as Monsanto create their own information resources to sway public opinion.

These advertisements repeat three main themes:

1) GE crops will help lessen the impact agriculture has on the environment.

[51] http://www.quotegarden.com/environment.html
[52] Carson, *Silent Spring*, 297.

2) GE crops are good for farmers around the world.
3) GE crops will help end hunger and aid in solving nutritional problems throughout the world, especially in developing nations.

The reason they do this is to appeal to a sense of hope and 'rightness' in the North American consumer. They are telling consumers that by accepting the use of these products all these wonderful things will happen for the less fortunate. They play off the tragedies of poverty in the developing world, suggesting that it is the backwardness of those farming techniques that causes poverty, hunger and malnutrition.

Representation meanings are culturally constructed and so the chosen images for GE representation and text are used in very precise ways. The text shapes the images, but the images can also stand alone in their meanings. This is despite the multiple meanings that photograph can have. Each image used creates specific and intended meanings for the viewer. Even when the intended message is not received from the image, the accompanying text will ensure the viewer receives that information.

Advertising works this way in order to sell product or an idea and create a mythic realism that reinforces the ideals of capitalism. Although the advertisements are portraying situation that are not real, the notion that Monsanto, for example, can make blind children see, is supposed to convince consumers that their utopian vision is somehow attainable. They tell us biotechnology is a helpful and potentially life saving technology.

Language is also used to represent a view that biotechnology is a helpful and useful technology. Language should fit a kind of order, for example, in the advertisement of the papaya the language reinforces the image by saying that it is a papaya. However, it is not a papaya; it is a representation of one. By stating this there is some anxiety in the relationship between language and representation. Also by saying it is not a papaya I am illustrating the anxiety over whether the process of inserting genes into the DNA of a Hawaiian papaya changes the intent of the crop.

Proponents argue that changing the DNA does not change anything about the fruit. They try to control the discursive formation by reinforcing common beliefs about science and expert knowledge in their representations. They do this to alienate the consumer from the food that they are buying. Companies such as Monsanto do not want consumers to question the safety or usefulness of their crops by ensuring that the discourse is defined by specific knowledge.

In North America government agencies can also contribute to reinforcing expert knowledge. The government controls aspects of our health and the food we eat through organisations such as Health Canada. This is called biopolitics, meaning control is being exerted on citizens through biopower. In essence many of the food choices are made for us, including the fact that in Canada foods with GE crops do not have to be labelled, meaning that because a panel of experts have deemed these products safe, we do not have to think about whether they actually are.

Genetics is essentially map-making in order to create a new world. There seems to be an obsession with figuring everything out and commodifying it. GE food is part of this. By enforcing a conception that science and technology can solve all that ails us, companies such as Monsanto are reinforcing Western ways of thinking. This includes a fixation with controlling life and nature.

Science is driven by knowledge scarcity, social pressure and economics. It is far from being value free. Despite sociological work that asserts this to be the case, there still is an assumption of truth in scientific data. It changes over time, and the dominant theories of one time period will not be the same in the next. These paradigm shifts has led agricultural science from being dominated by plant breeders and chemists to geneticists.

This change has led to commercial products such as herbicide- and insect-resistant crops. These crops, however, are not the promised miracles that geneticists have been representing. One of the few developed crops that hold some promise of changing the nutrition of those in developing nations is Golden Rice. This is far from being a practical solution to Vitamin A deficiency, a problem that can be solved with a simple change in diet.

These companies are also reinforcing our separation from nature. Our socially constructed view on nature is complex and yet the separation is reinforced thorough language and actions. Proponents of GEOs remind us that we 'need' to control nature in order to help humanity, and such ideas are reflected in their representations.

The representation of GEOs by companies such as Monsanto is problematic because, as theories of sociology and cultural studies show, it is misleading and it ignores many factors concerning food supply, short and long-term safety and other scientific and economic issues. This study has shown how agribusiness manipulates science, knowledge, and representation to sell GEOs to the world.

Of course the same studies of representation, knowledge, science and nature apply to anti-GE movements as well. The simple act of choosing to use the word 'engineered' over 'modified' is a prime example of their approach to representation. This does not, however, mean that they are wrong about GE foods. Just as AIDS activists have been successful at attacking the clinical construction of illness, the anti GE movement has been somewhat successful and attacking the scientific construction of agriculture.

So is it a papaya?

No. It is a representation, an advertisement, a symbol of biopower, of science, technology and our relationship to nature. Its cultivation and development from a wild tree to an agricultural crop is reflected in the development of human culture. It is constructed through our changing relationship to nature.

References

Ackerman, Jennifer. 2002. Food: How Altered?. *National Geographic* 201, 5: 20.

Anderson, Luke. 2003. Taking Stock. *The Ecologist*, 32-33.

Barthes, Roland. 1977. Rhetoric of the Image. Chap. in *Image, Music, Text*. 32-51. New York: Hill and Wang.

------. 1981. Chap. in *Camera Lucida: Reflections on Photography*. New York: Hill and Wang.

Bartsch, Ingrid, Carolyn DiPalma, and Laura Sells. 1998. Review of *Modest_Witness@Second_Millennium.FemaleMan©_Meets_OncoMouse™*, by Haraway, Donna. In *Hypatia* 13, 2: 165-169.

Beck, Ulrich. 1994a. The Reinvention of Politics: Towards a Theory of Reflexive Modernization. In *Reflexive Modernization: Politics, Tradition and Aesthetics in the modern Social Order*, Beck, Ulrich, Giddens, Anthony and Lash, Scott. 1-55. Stanford: Stanford University Press.

------. 1994b. Self-Dissolution and Self-Endangerment of Industrial Society: What Does This Mean?. In *Reflexive Modernization: Politics, Tradition and Aesthetics in the Modern Social Order*, Beck, Ulrich, Giddens, Anthony and Lash, Scott. 174-183. Stanford: Stanford University Press.

------. 1997. Subpolitics. *Organization & Environment* 10, 1: 52-65.

Benjamin, Walter. 1968. The Work of Art in the Age of Mechanical Reproduction. In *Illuminations*, Arendt, Hannah. 217-251. New York: Socken Books.

Brown, Phil. 2001. Popular Epidemiology and toxic Waste Contamination: Lay and Professional Ways of Knowing. In *The Environment and Society Reader*, Frey, R. Scott. 301-319. Boston: Allyn and Bacon.

Brown, Richard Harvey. 1998. Modern Science and Its critics: Toward a Post-Positivist Legitimization of Science. *New Literary History* 29, 3: 521-550.

Bud, Robert. 1993. *The Uses of Life: A History of Biotechnology*. Cambridge: Cambridge University Press.

Burningham, Kate, and Geoffrey Cooper. 1999. Being Constructive: Social Constructivism and the Environment. *Sociology* 33, 2: 297-316.

Busch, Lawrence, William B. Lacy, Jeffrey Burkhardt, and Laura Lacy. 1991. *Plants, Power, and Profit*. Cambridge: Blackwell.

Butler, Declan. 1999. Biotech industry seeks `honest brokers'. *Nature* 398, 6726: 360.

CBC News Online Staff. Article. 2002. Modified Foods are Safe: Federal Group. *CBC News*. http://www.cbc.ca/storyview/CBC/2002/08/26/Consumers/foodsafe_020826: Canadian Broadcasting Corporation, August 28.

------. Article. 2004a. Monsanto backs away from GMO wheat. *CBC News Online*. http://www.cbc.ca/stories/2004/05/10/canada/monsanto_040510: Canadian Broadcasting Corporation, May 10.

------. Article. 2004b. EU ends 6-year ban on genetically modified food. *CBC News Online*. http://www.cbc.ca/story/world/national/2004/05/19/eu_gmo040528.html: Canadian Broadcasting Corporation, May 19.

Cable Television Standards Council. 2002. Definition of Advertising. *Canadian Code Of Advertising Standards*. http://www.ctsc.ca/eng/standards/advertising/2.html: Cable Television Standards Council.

Carson, Rachel. 1994. *Silent Spring*. New York: Houghton Mifflin Company, 1962.

Carter, Chris. 1997. Post-Modern Prometheus. *The X-Files*. Ten Thirteen Productions, 20th Century Fox Television. November 30, Fox Television.

Cartier Poland, Susan. 2000. Genes, Patents, and Bioethics-Will History Repeat Itself?. *Kennedy Institute of Ethics Journal* 10, 3: 265-281.

Cinti, Laura, Oron Catts, and Marta de Menezes. Interview. 2004. Art, but not as we know it. *New Scientist*. http://www.newscientist.com/opinion/opinterview.jsp;jsessionid=IKADPIGDLJBA?id=ns24361: Reed Business Information Ltd., February 28.

Coclanis, Peter A. 2003. Back to the Future: The Globalisation of Agriculture in Historical Context. *SAIS Review* 23, 1: 71-84.

Cooper, Melinda. 2001. Transgenic Life: Controlling Mutation. *Theory & Event*. http://muse.jhu.edu/journals/theory_and_event/v005/5.3cooper.html: The Johns Hopkins University Press.

Council for Biotechnology Information. website. 2003. *Council for Biotechnology Information*. http://whybiotech.com: Council for Biotechnology Information.

Cuddon J.A. 1998. *The Penguin Dictionary of Literary Terms*. London: Penguin Books.

de Paiva Duarte, Fernanda. 1999. From 'Saving the Planet' to 'Managing the Planet': Environmental and Development Politics in the Late-Twentieth Century. *Social Alternatives* 18, 3: 58-65.

Dickens, Peter. 1997. Beyond Sociology: Marxism and the Environment. In *The International Handbook of Environment Sociology*, Redclift, Michael and Graham Woodgate. 179-192. Northhampton, MA: Edward Elgar.

du Gay, Paul, Stuart Hall, Linda Janes, Hugh McKay, and Keith Negus. 1997. *Doing Cultural Studies: The Story of the Walkman*. Thousand Oakes: Sage Publications Ltd.

Gilliam, Terry, and Terry Jones. 1975. *Monty Python and the Holy Grail*. Michael White Productions. Columbia TriStar Home Entertainment.

Foucault, Michel. 1983. *This is Not a Pipe*. Harkness, James. Berkley: University of California Press.

------. 1990. *The History of Sexuality Volume 1: An Introduction*. New York: Random House, 1978; Vintage Books.

------. 1994. *The Order of Things: Translation of :Les Mots et Les Choses*. New York: Random House, 1970; Vintage Books.

Fowler, Cary. 1995. Biotechnology, Patents and the Third World. In *Biopolitics*, Moser, Ingunn and Shiva, Vandana. 214-225. London: Zed Books Ltd.

Graham, Otis L. 2000. Epilogue: A Look Ahead. *Journal of Policy History* 12, 1: 157-176.

Grant, Ian Hamilton. 1998. Postmodernism and Science and Technology. In *The Icon Critical Dictionary of Postmodern Thought*, Sim, Stuart. 53-64. Duxford: Icon Books.

Greenpeace. 2004. Genetic Engineering. *Campaign overview - Genetic Engineering*. http://www.greenpeace.org/international_en/campaigns/intro?campaign_id=3942: Greenpeace International.

Hall, Stuart. 1997. The Work of Representation. In *Representation: Cultural Representations and Signifying Practices*, Hall, Stuart. 1-12. Thousand Oakes: Sage Publications Ltd.

Hampel, Jurgen, Uwe Pfenning, and Hans Peter Peters. 2000. Attitudes Towards Genetic Engineering. *New Genetics and Society* 19, 3: 233-249.

Haraway, Donna. 1997. *Modest_Witness@Second_Millenium.FemaleMan(c)_Meets_OncoMouseTM.* New York: Routledge.

Harkness, James. 1983. Translator's Introduction. In *This is Not a Pipe*, Harkness, James. 1-12. Berkley: University of California Press.

Harper, Charles L. 2001. *Environment and Society: Human Perspectives on Environmental Issues*. Upper Saddle River: Prentice-Hall.

Hellsten, Iina. 2002. Selling the Life Sciences: Promises of a Better Future in Biotechnology Advertisements. *Science as Culture* 11, 4: 459-479.

International Forum on Globalization and The Center for Food Safety. 2003. Seven Deadly Myths and Facts About Hunger. *Media Packet on the USDA Conference on Agricultural Science and Technology*, International Forum on Globalization. http://www.ifg.org/pdf/hunger&pov-hunger_myths.pdf.

Irani, Tracy, Janas Sinclair, and Michelle O'Malley. 2002. The Importance of Being Accountable: The Relationship Between Perceptions of Accountability, Knowledge, and Attitude toward Plant Genetic Engineering. *Science Communication* 21, 3: 225-242.

Irwin, Alan. 1997. Risk, the Environment and Environmental Knowledges. In *The International Handbook of Environmental Sociology*, Redclift, Michael and Woodgate, Graham. 218-226. Northampton: Edward Elgar.

Irwin, Alan, and Brian Wynne. 1996. Introduction. In *Misunderstanding Science? the public reconstruction of science and technology*, Irwin, Alan; Wynne, Brian. 1-17. Cambridge: Cambridge University Press.

Jameson, Fred. 1979. Reification and Utopia in Mass Culture. *Social Text*, 1: 130-148.

Jary, David, and Julia Jary. 1995. *Dictionary of Sociology*. Glasgow: Harper Collins Publishers.

Kac, Eduardo. 2004. GFP Bunny. *Kac Web.* http://www.ekac.org/gfpbunny.html.gfpbunnyanchor: Kac, Eduardo.

Kilman, Scott. 2000. Biotech Ad Campaign Attempts to Shape U.S. Attitudes Toward Modified Crops. *The Wall Street Journal* (April 4): 1.

Kimbrell, Andrew. 1996. Biocolonization: The Patenting of Life and the Global Market in Body Parts. In *The Case Against the Global Economy and For a Turn Toward the Local*, Mander, Jerry and Goldsmith, Edward. 131-145. San Francisco: Sierra Club Books.

Kirsch, Scott. 1997. Watching the Bombs Go Off: Nuclear Landscapes, and Spectator Democracy. *Antipode* 29, 3: 227-255.

Kneen, Brewster. 1999. *Farmageddon.* Gabriola Island: New Society Publishers.

Lacy, Peter G. 2003. Deploying the Full Arsenal: Fighting Hunger with Biotechnology. *SAIS Review* 23, 1: 181-202.

Levidow, Les. 1995. Whose Ethics for Agricultural Biotechnology?. In *Biopolitics*, Moser, Ingunn and Shiva, Vandana. 175-190. London: Zed Books Ltd.

------. 2001. Utilitarian Bioethics? Market Fetishism in the GM crops Debate. *New Genetics and Society* 20, 1: 75-84.

Lewontin, R. C. 1991. *Biology as Ideology.* Concord: Anansi.

Marzolini, Michael. 2000. In Your Opinion. *Canadians' Attitude Toward the 21st Century.* http://www.pollara.ca/new/Library/SURVEYS/century.htm: Pollara Inc., July.

McCabe, Heather. 1999. Monsanto rapped for misleading press advertisements. *Nature* 400, 6746: 702.

Mol, Arthur P.J. 1997. Ecological Modernization: Industrial transformations and environmental reform. In *International Handbook of Environmental Sociology*, Redclift, Michael and Woodgate, Graham. 138-149. Northampton: Edward Elgar.

Monbiot, Raymond. 1999. GM foods prove real power lies with perception. *Marketing* (London), 12.

Moncrief, Lewis W. 2001. The Cultural Basis of Our Environmental Crisis. In *Environmental Ethics: Readings in Theory and Application*, Pojman, Louis P. 19-23. Scarborough: Wadsworth.

Monsanto. 2001. *Biotech Basics*. English. http://www.biotechbasics.com: Monsanto Company.

------. 2003a. Monsanto Company Rolls Out New Tagline: Imagine. http://www.monsanto.com/monsanto/layout/media/03/04-07-03.asp:April 7.

------. 2003b. *Teaching Science*. http://www.teachingscience.org: Monsanto Company.

------. 2004a. *Biotechnology GTG*. http://www.biotechgoodtogrow.com/: Monsanto Company.

------. 2004b. *Monsanto.com*. http://www.monsanto.com/monsanto/layout/default.asp: Monsanto Company.

Morley, Sherry. 2004. White-bread protest wants GM wheat to be toast. *Capital News Online*. http://temagami.carleton.ca/jmc/cnews/30012004/n3.shtml: Capital News Online, January 30.

Mowen, John C. and Carlson, Brad. 2003. Exploring the antecedents and consumer behavior consequences of the trait of superstition. *Psychology & Marketing* 20, 12: 1045-1065.

Nash, Madeline J. 2001. "Grains of Hope." *Annual Editions: Global Issues 01/02 Seventeenth Edition*, Jackson, Robert M. 46-53. Guilford, CT: Dushkin/McGraw-Hill.

Nicholas, Barbara. 2001. Exploring a Moral Landscape: Genetic Science and Ethics. *Hypatia* 16, 1: 45-63.

Norton, Jim. website. 2004. Anti-environmental myths. *Info-pollution*. http://info-pollution.com/myths.htm:August.

Orlando, Laura. 2002. Industry Attacks on Dissent: From Rachel Carson to Oprah. *AlterNet*. http://www.alternet.org/story/12910/: Independent Media Institute, April 19.

Oxford English Dictionary. 2004. *Oxford English Dictionary*. http://dictionary.oed.com: Oxford University Press.

Public Broadcasting Service. 2001. *PBS - harvest of fear*. Http://www.pbs.org/wgbh/harvest/: pbs online and wgbh/frontline/nova.

Paarlberg, Robert L. 2002. The Real Threat to GM Crops in Poor Countries: Consumer and Policy Resistance to GM Foods in Rich Countries. *Food Policy* 27: 247-250.

Penley, Constance, and Andrew Ross. 1991. Introduction. In *Technoculture*, Penley, Constance and Ross, Andrew. viii - xvii. Minneapolis: University of Minnesota Press.

Physicians and Scientists for Responsible Application of Science and Technology. 2004. Genetically engineered food - Safety Problems. *Physicians and Scientists for Responsible Application of Science and Technology*. http://www.psrast.org/intro1.htm: PSRAST, June 23.

Pollack, Mark, and Gregory Shaffer. 2000. Biotechnology: The Nest Transatlantic Trade War?. *The Washington Quarterly* 23, 4: 41-54.

Potter, Van Rensselaer. 1964. Society and science. *Science* 146, 3647 (Nov 20): 1018-1022.

Pueppke, Steven G. 2001. Agricultural Biotechnology and Plant Improvement: Setting the Stage for Social and Economic Dialogue. *American Behavioral Scientist* (Urbana) 44, 8 (April): 1233-1245.

Quinton, Anthony. 1999. Positivism. In *The New Fontana Dictionary of Modern Thought*, Bullock, Alan and Trembley, Stephen. 669. London: Harper Collins Publishers.

Rifkin, Jeremy. 1998. *The Biotechnology Century: Harnessing the Gene and Remaking the World*. New York: Putnam.

------. 2003. Dazzled by the science. *EducationGuardian.co.uk: Higher*. http://education.guardian.co.uk/higher/sciences/story/0,12243,874469,00.html : Guardian Newspapers Limited, January 14.

Rogers, Ben. 2000. The nature of value and the value of Nature: a philosophical overview. *International Affairs* 76, 2: 315-323.

Sayer, Derek. 1991. *Capitalism & Modernity: An Excursus on Marx and Weber*. New York: Routledge.

Schmitt, Bill. 1999. Chemical Century: Formulating for the Future. *Chemical Week* (New York) 161, 49 (Dec 22): 24-27.

Schudson, Michael. 1984. Advertising as Capitalist Realism. Chap. in *Advertising, The Uneasy Persuasion: It's Dubious Impact on American Society*. 209-233. New York: Basic Books.

Shanahan, James, Scheufele, and Eunjung Lee. 2001. The Polls-Trends: Attitudes about Agricultural Biotechnology and Genetically Modified Organisms. *Public Opinion Quarterly* 65: 267-281.

Shelley, Mary. 1994. *Frankenstein; or, The Modern Prometheus*. MacDonald, D.L. and Scherf, Kathleen. The 1818 Version. Peterborough, Ontario; Broadview Press.

Shiva, Vandana. 1991. *The violence of the green revolution Third World agriculture, ecology, and politics*. London: Zed Books.

------. 1995. Biotechnological Development and the Conservation of Biodiversity. In *Biopolitics: A Feminist and Ecological Reader on Biotechnology*, Moser, Ingunn and Shiva, Vandana. 193-213. London: Zed Books Ltd.

------. Article. 1997. Bioethics: A Third World Issue. *Vandana Shiva: Bioethics: A Third World Issue*. http://www.ratical.org/co-globalize/bioethics.html: ratical, July 30.

------. 2000. North-South Conflicts in Intellectual Property Rights. *Peace Review* 12, 4: 501-508.

------. Article. 2001. Who Is Afraid Of Biosafety?. *Vandana Shiva's Response to Jimmy Carter's August 28, 1998 New York Times Corporation's article, "Who's Afraid of Genetic Engineering?"*. http://www.ratical.org/co-globalize/VSrespToJC.html: ratical branch, accessed January 31.

Shiva, Vandana and Holla-Bhar, Radha. 1996. Privacy by Patent: The Case of the Neem Tree. In *The Case Against the Global Economy and For a Turn Towards the Local*, Mander, Jerry and Goldsmith, Edward. 146-159. San Francisco: Sierra Club Books.

The Council of Canadians. website. 2004. Biotechnology. *Biotech Campaign*. http://www.canadians.org/browse_categories.htm?COC_token=23@@5b9aaef6edc52cbcf285b7f68c9d598f&step=2&catid=71&iscat=1: The Council of Canadians.

Tomasula, Steve. 2002. Genetic Art and the Aesthetics of Biology. *Leonardo* 35, 2: 187-144.

Travis, John. 2000. Genes on Display: DNA becomes part of the artist's palette. *Science News* 158, 25: 392-394.

Treichler, Paula. 1991. AIDS, Africa and Cultural Theory. *Transition* 51: 86-103.

Turney, Jon. 1998. *Frankenstein's Footsteps: Genetics and Popular Culture.* New Haven: Yale University Press.

Wanisink, Brian, and Junyong Kim. 2001. The Marketing Battle over Genetically Modified Foods: False Assumptions About Consumer Behavior. *American Behavioral Scientist* 44, 8: 1405-1417.

White, Lynne. 2001. The Historical Roots of Our Ecological Crisis. In *Environmental Ethics: Readings in Theory and Application*, Pojman, Louis P. 13-19. Scarborough: Wadsworth.

Williams, Raymond. 1976. *Keywords*. London: Fontana.