RICHARD HINDMARSH

Edging Towards BioUtopia

A New Politics of Reordering Life & the Democratic Challenge

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Foreword

Rather serendipitously, I was thrust into the politics of genetic engineering back in 1976, a mere three years after Stanley Cohen and Herbert Boyer discovered recombinant DNA molecule technology. The City Council of Cambridge, Massachusetts called upon its two world-class universities, Harvard and MIT, to postpone certain classes of gene transplantation experiments until a citizen panel could study the risks and make recommendations. My appointment to what I have referred to as a 'citizens' court' for science (called the Cambridge Experimentation Review Board) was without precedent. Each citizen participant was asked to provide stewardship for the safety of the city's residents while also respecting the tradition of scientific freedom at our research universities.

The charge to the citizens' court was fairly narrow: assess whether recombinant DNA research and the development of novel organisms could endanger laboratory workers and those with whom they come into contact and whether the newly issued guidelines of the National Institutes of Health were sufficiently protective of the city's residents. However, the citizens' court of Cambridge issued its final recommendations on December 1976 with a warning about broader challenges that molecular genetics has brought upon us:

> *The social and ethical implications of genetic research must receive the broadest possible dialogue in our society…[That dialogue] should raise the issue of technology assessment in relation to long range hazards to our natural and social ecology…Decisions regarding the appropriate course between the risks and benefits of a potentially dangerous scientific*

inquiry must not be adjudicated within the inner circles of the scientific establishment.[1]

The Cambridge recombinant DNA controversy became a threat to the opinion leaders of the scientific community who were intent on protecting science from external regulation. The Director of the National Institutes of Health during that period, Donald Fredrickson, devoted his memoir to explaining the role of his office in preventing the US Congress from becoming involved in regulating the uses of gene-splicing technology.[2] The lobbying of scientific societies proved successful. By 1980 there were no viable bills left in the US Congress for placing genetic engineering under regulatory oversight. That was also the year that science journals proclaimed the birth of the biotechnology industry. Leading molecular geneticists worldwide recognised the business opportunities in transgenic microorganisms, crops and animals. They were pursued by investors to embark on new venture capital opportunities. The result was a government–university–industry biotechnology complex. Scientists turned from questioning hazards to watching the stock market. At no time in history has a field of basic science been so quickly commercialised.

Universities were eager to become equity partners in faculty-initiated businesses. Government policies in the United States, later mirrored in other scientifically advanced countries, provided incentives for university–industry business partnerships, gave up all intellectual property for discoveries from publicly funded research, and provided the legal authority for patenting genetically modified living organisms, cell lines and even genes.

Social scepticism over the new biotechnology industry led to the growth of national and regional public interest groups. I was a founding member of the first of these US groups, the Committee (now Council) for Responsible Genetics. The Council's mission was to make available to the public and the scientific community critical, but scientifically supported, responses to industry claims about the products of the new biotechnology industry and to dispel the myths of genetic reductionism. At the time we were facing the prospect of a new generation of biological weapons, a vision of a global, transgenic monoculture producing the world's food,

and groups like the Transhumanists, who, with their followers, advocated redesigning the human species through genetics.

The public interest movement spread globally with the Gen-ethics Network in Australia, GeneWatch UK, the German Green Party (*Die Grünen*) anti-biotech activists, and Greenpeace International. The new threat to science was now not to laboratory research, but to critics of the products and ideology of the new biotechnology sector, which was funding universities. Scientists played down the differences between classical and molecular techniques in transforming living things. The National Research Council issued statements that there were no unique risks with the use of recombinant DNA techniques, and that if anything, they provided more precision than classical breeding in moving genes from one biological system to another.[3] The US Food and Drug Administration used these results to support its 1992 decision that adding foreign genes to a crop does not constitute a food additive and therefore requires no special testing. The term 'Substantial Equivalence' was created as an antidote to the 'Precautionary Principle' applied to transgenic crops.

While the novel aspects of genetic engineering and its potential as a transformative technology were highlighted by scientists speaking to the investment community, when scientists were faced with potential regulations, there was nothing very novel about gene splicing. Even as science had progressed to a more complex and nuanced view of genetics, uncritical advocates of agro-biotechnology treated the plant genome like a set of Lego. Adding a new gene would simply successfully or unsuccessfully add a desired property. In fact, the plant genome is more like an ecosystem. Genes interact with one another; place them in one part of chromosome and they behave differently than when they are positioned in another part. And now we know that the so-called 'junk DNA' may play a role in the life of an organism.

In the discourse among stakeholders, cultural battles are continually being fought over the meaning of *natural*, the concept of risk, the value of exercising greater control over nature, and the idea of progress. Those are the critical ideas that influence the public's response to the products and processes of biotechnology.

Edging Towards BioUtopia contributes the most comprehensive analysis to date of biotechnology policy in Australia. It connects the events in

Australia's regulatory policy with similar controversies in the United States and United Kingdom. Richard Hindmarsh has used the method of narrative analysis to help the reader make sense out of these contested issues. Moreover, he shows us that ideology, including utopian ideology, more than science, has shaped this ongoing debate and that dominant narratives are the result of concentrations of political and economic power. Current biotechnology enthusiasts, who neglect to turn a critical eye on themselves, are carrying out the utopian vision of transforming our living environment (which has its roots in the work of 17th century philosopher-scientist Francis Bacon)—namely that biological life on the planet represents only the starting materials or feedstock for a future where living things, like the ores and chemicals of the earth, can be redesigned to fulfil the desires of human imagination.

From its inception, the biotechnology sector has produced a plethora of techno-myths about human and ecological transformation. These myths drew people's attention away from the risks and social injustices but kept their attention on a future of plenitude and optimism. The techno-myths included plentiful, inexpensive and individually tailored drugs, transgenic crops and animals that will end world food shortages and mass starvation, treatment for what are currently recalcitrant inherited diseases, and a sustainable agriculture that maximises yield and is consistent with modern industrial farming. While there have been some new drugs and medical treatments as well as a new generation of genetically modified seeds, these innovations hardly rise to the level of a utopian vision.

Like the citizens in Cambridge, USA three decades ago, people throughout the world are demanding a democratic voice in guiding genetic technologies. A case in point illustrates what can happen when the industry–government complex ignores the voice of its citizenry. Percy Schmeiser, a farmer in Saskatchewan, Canada grew traditional canola that was contaminated from nearby farms, which had grown a genetically modified strain that was herbicide resistant. The highest court in Canada ruled that Schmeiser was responsible for the errant seeds that landed on his property and contaminated his crop because the seeds were patented and cannot be grown except under contract with the manufacturer. Genetic pollution from transgenic plants is now

changing the way farmers think about food security and the integrity of their crops.

Hindmarsh's work helps us understand how civil society is addressing this important issue of the environmental release of genetically modified organisms in Australia and challenges us to question whether the democratic control of technology is within the grasp of modern society.

Sheldon Krimsky
14 October 2007

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Edging Towards BioUtopia

This book deals with one of the most important controversies in recent science and technology history: that over recombinant DNA (rDNA) or, more generally, genetic engineering, which faces consistent and mounting democratic challenge from the public, including environmentalists, civil servants and concerned scientists and, more recently, business interests, especially in agriculture. Following the history of the origins of the rDNA endeavour, and the fantastic promised future of a genetically reordered *futurenatural*, I refer to that endeavour as the pursuit of 'BioUtopia', where 'bio' is derived from the Greek term *bios*, meaning 'life'.

As Geoffrey Lawrence and I wrote in an earlier book on genetic engineering, *Altered Genes II: the future?*, BioUtopia 'confronts us with a new medium by which to imagine a future nature, one very different to the nature we have known for millennia,' one Frederick Turner has referred to as 'an invented landscape'.[1] The outcome of genetically choreographing nature, imagines technology futurist Michio Kaku, is to open up an 'Age of Mastery' where the biomolecular revolution 'will ultimately give us nearly godlike ability to manipulate life almost at will.'[2]

The pathway to reordering life lies not only through licence to pursue such a future, as ultimately granted by governments to rDNA science and big business, but also through the shaping of the regulation of the development and environmental release of genetically modified organisms (GMOs): organisms novel or hitherto unknown in nature. If that regulation is dominated by interests explicitly involved in developing the technology, and is consequently weak or flawed, environmental release of GMOs can be made much easier, but also may be of more

consequence. For those concerned about potential adverse ecological and social consequences of environmental release, regulatory control is a prime concern.

In 1988, when the possibility of environmental release was consolidating, a dualistic narrative emerged that basically remains unchanged today:

> *The genetic engineer, like a contemporary Daedalus, claims to be providing society with a vast range of innovations…On the other hand, as a result of the application of genetic engineering, the triggering of catastrophic ecological imbalances by the release of novel organisms into the environment, the creation of new agents of biological warfare and the increased power to manipulate and control people, may each become realities in the near future.*[3]

Since that time, and focusing on the environmental issue, the spectre of irreversible 'genetic pollution' has emerged. Forecast by critics but long denied by biotechnology developers and regulators, widespread contamination emerged in the early 2000s with gene-flow from genetically modified (GM) maize and canola crops to their equivalent non-GM crops.[4] Indeed, such is the concern about large-scale environmental release of a broad range of GMOs—which has not happened yet—that leading scientific campaigners against environmental release predict *biodystopia*. Mae-Wan Ho, director and co-founder of the UK Institute of Science in Society, refers to genetic engineering as 'bad science' or 'Frankenstein science'. Ho and her colleague, geneticist Joe Cummins of the University of Western Ontario, believe that genetic engineering amounts to a worst-case scenario of genetic determinism that 'offers a simplistic, reductionist description which is a travesty of the interdependence and complexity of organic reality', with the potential to destroy all life on earth.[5]

It is not hard, then, to understand why control of regulation of environmental release is given so much weight, and why regulatory control largely by biotechnology interests since 1975 has become intensely controversial. Public interest groups, especially environmental groups, concerned scientists and, more recently, farmers groups and commodity dealers opposed to or critical of GM crops, have long campaigned for regulation to be opened up to a plurality of scientific and other

interests. This is the central democratic challenge to regulation of genetic engineering, underpinned by the notion that the public has an inherent right to question the creation and use of novel organisms because of the potential adverse social and environmental consequences that threaten to affect everyone's lives in one way or another, as discussed in detail in chapter 3.

Biotechnology interests have long resisted this democratic challenge. Indeed, in response to the intense scientific dissent to early gene-splicing experiments in the USA following the invention of the rDNA technique in 1973, the critical historical account highlights that the threat of external regulation was a central reason for a call for a temporary moratorium by scientists involved in the early research. The ensuing 1975 International Conference on Recombinant DNA Molecular Research at the Asilomar Center in California aimed to prevent external intervention.

While the explicit aim of the Asilomar conference was to canvass the potential hazards and risks of rDNA in the absence of any specific regulatory policy, the implicit aim of conference organisers was to facilitate the progress of genetic engineering.[6] That meant checking only the most serious excesses that might prove self-destructive, and containing external intervention that might make genetic engineering research and development much more difficult than if its regulation were controlled in-house. Instead of attempting to comprehensively identify and manage the potential harmful effects of rDNA, the real legacy of Asilomar was the creation of in-house self-regulatory oversight steered by minimalist guidelines.

Following the conference, a narrative was disseminated that positioned the scientists as taking a wise approach that produced responsible regulatory guidelines that aimed to 'reassure the wider society that their fears would be successfully ameliorated, and the dangers controlled.'[7] But, what also occurred, as David Bennet, Peter Glasner and David Travis point out, was that:

> *The call for the moratorium, and the subsequent generation of hazard scenarios by some leading scientists, was seen to indicate a threat not only because of possible biological pollution by new disease entities, but also through the potential pollution of the moral environment by scientists*

> *'playing God', altering genetic endowment, and transgressing the natural boundaries between non-interbreeding species.*[8]

According to science historian José Van Dijck, 'In the politicised mood of the 1970s, genetics got annexed as an environmental issue; this new configuration manifested itself in changed images of genetics, genes and geneticists.'[9] Intensive and unprecedented debate continued earnestly about regulation and the meaning of rDNA risks,[10] highlighted by a powerful 'town–gown' confrontation to democratise rDNA regulation (see chapter 4).

By the late 1970s, regulatory oversight had been reduced to the minimum scientific management of laboratory risk. That manoeuvre, as political scientist Herbert Gottweis of the University of Vienna and I describe, involved a specific framing of the nature of the genetic engineering problematic in a way that redefined the dynamics of policy-making from safety to commercial opportunity, scientific prestige and international competitiveness. This made rDNA work not only more possible but also socially desirable.[11] At the basis of these dynamics were persuasive bioutopian narratives or visions of a genetically engineered cornucopia (again, see chapter 2).[12] Such has been their dissemination in research and scientific texts, government reports, media, and many new social and cultural spaces that Lawrence and I have referred to this as a 'new bio-culture'.[13] For example, in the prominent scientific text *Molecular Biotechnology: Principles and Applications of Recombinant DNA* we find the following:

> *On October 14, 1980, within 20 minutes of the start of trading on the New York Stock Exchange, the price of shares in the biotechnology company Genentech went from $35 to $89…This may very well have been the first time that a major technological revolution was acclaimed by the clanging of stock exchange bells…The frenzy of buying…was due to both an assessment of the potential of recombinant DNA technology and dreams of future possibilities that this unprecedented methodology engendered. Many people thought that recombinant DNA technology was the 20th-century version of the horn of plenty of Greek mythology that would fill itself with food and drink according to the wishes of the owner. Based on*

> *the enthusiasm of reports that appeared in newspapers, magazines, and television, and, of course, effective promotion by stockbrokers, the dreams, often tinged with science fiction fantasies, were limitless. Amazing biological menageries of manufactured microorganisms, plants, and animals were conjured up.*[14]

Over time, enduring resistance to genetic engineering, especially catalysed by anxieties about the advent of GM food crops in the mid to late 1990s, led in many cases internationally to self-regulatory models and approaches more accommodating of public views. In Australia, however, it is notable that such moves strongly continued progress to bioutopian visions cast at Asilomar and thereafter. Australia represents a highly controversial bastion of regulatory control by its scientific, government and industrial developers such that, of the many jurisdictions around the world where controversy about regulatory control of rDNA continues, Australia's rDNA regulatory regime is in the vanguard of technical nepotism and subsequent public distrust. Significantly, unlike other early and leading international rDNA regulatory functions in the USA and the UK, upon which the Australian approach drew heavily, there has never been any significant lay representation on the Australian committee making the decisions about rDNA experimental proposals. Indeed, I believe that only one technical committee member might be considered lay—Phillip Toyne of the Australian Conservation Foundation—but he was appointed as an individual expert on environmental impact assessment at a highly politicised time in the debate over regulation (see chapter 8).

This book focuses upon this Australian rDNA regulatory controversy and why regulation has remained largely in the hands of the bioscientific club despite enduring and growing dissent. Although situationally specific, this book has global relevance in retrospectively deconstructing the Australian controversy as an instructive, revealing and challenging investigation of biotechnocratic regulation. Australia represents a prime site of the strong technocratic or 'enclosed' expert top-down regulatory policy style that developed from the mid 1970s,[15] in which decision-making relies heavily on the findings of technical experts who embrace a scientific and technological worldview; a style that withers democratic government, as Frank Fischer notes.[16]

This Australian 'biotechnocracy' now holds out, seemingly desperately, against increasing local resistance to GM food crops and the emergent civic or participatory policy style now sweeping across the European Union, New Zealand and elsewhere. In particular, strategies of regulation have been adopted in Australia that play a central role in both addressing and containing public and scientific controversy about the overall purpose and safety of genetic engineering, especially with regard to environmental release of GMOs.

A good example of regulatory tactics was provided in revealing documents I obtained through Australian freedom of information procedures from a federal agency at the heart of strategic manoeuvring in support of genetic engineering, and which has played a central role in the Australian biotechnology policy network: the Department of Industry, Science and Technology, in its various manifestations. In the early 1990s, as in other parts of the world faced with escalating public resistance to genetic engineering,[17] this Australian network of bioindustrial, bureaucratic, scientific and regulatory players turned to strategising on how best to popularise genetic engineering amidst rising concerns about the prospect of molecular farming and GM foods. In their discussions, they acknowledged: 'We know that creating trust [in] the regulatory process is the most effective single factor in gaining public acceptance of gene technology.'[18]

The biopolicy network thus set about creating that trust, but in ways that inadvertently created more distrust. A central reason for this distrust was in seeking public acceptance of GM futures while ignoring open and inclusive public debate about their desirability and potential costs. Another reason was the construction and wide mobilisation of a narrative that stated rhetorically: 'Australia has the best GM regulation in the world.' The problem was that this suggestion diverged sharply from reality. Regulation was controlled by vested interests from a narrow range of laboratory-based bioscientists, and blocked from including a wider number of interested parties, including representatives of the public. Perhaps more importantly, at the start of environmental release experimentation in the mid 1980s, when the bioscientists on Australia's regulatory committee admitted they lacked the expertise to assess ecological impacts, broader representation of scientists was systematically marginalised, especially those most understanding of field conditions—ecologists.

Strategies of regulation also combined with strategies of bio-development—where 'bio' here is also short for 'biotechnology'—which involved the development of biotechnology infrastructure programs, and strategies of information. The latter most often saw persuasive public acceptance programs put in train through top-down science communication programs to soft-sell propaganda.[19]

The main focus in this book is on the historical evolution of that regulatory apparatus to 'manage' both the release of GMOs into the environment and the debate surrounding it. That debate, cast as a 'biopolitical struggle',[20] is situated in the new public policy area of biotechnology policy, which has co-evolved with the development of the 'life sciences' to refer to transformations in health, medicine, food, agriculture and the environment,[21] especially since the early 1980s with the rise of a global bioindustry. In this context it offers a new politics of reordering life and a democratic challenge to the proposed reordering; what Susan Wright has also called 'molecular politics'.[22]

This debate and politics, often cast by biotechnology developers as sites and formations of resistance, has been engaged in by environmentalists, consumer groups, scientists, women's groups, industry, government agencies, the media and, recently as biocommercialisation has become more of a reality, farmers, plant breeders and commodity dealers. Central issues include a narrow scientific and business elite controlling regulation; tinkering with nature and playing God; environmental hazard from the creation and release of GMOs,[23] contamination of non-GM crops through gene flow from GM crops and the associated loss of conventional and organic agricultural commodity markets; non-labelling of GM foods, consumer choice and the right to know whether or not these foods contain GM additives; and the long-term safety of ingesting GM foods.[24] In addition, patenting of genetic materials and privatisation of the 'DNA commons'; increasing control of monoculture agrifood production by transnational life sciences corporations like Monsanto or Bayer CropScience with implications for the future direction, depth and scope of environmental sustainability. By association, the increasing gap between the first and the third worlds resulting from the high input costs of agricultural biotechnology; and the emergence of new plant diseases and uncertainty generally about the impact of genetically altering primary food sources.[25]

Such controversies also build on more general concerns about risk, hazard, uncertainty and public distrust in the ability of government to resolve environmental problems. A catalyst for public distrust about government regulatory processes in general was the failure of food safety regulation in the issue of bovine spongiform encephalopathy (BSE), or mad cow disease, in Europe in the late 1980s.[26] Another controversial aspect of getting regulation right is how to adequately address the inherent uncertainty found in mega-environmental problems, an uncertainty well illustrated with climate change. Yet another concern is the questionable environmental and social track records of life sciences corporations like Monsanto. Heightening these concerns is a lack of civic participation in decision-making,[27] especially about the profound question of whether novel organisms should be released into the environment; and, if so, which ones, how and when.

In this broader context of inquiry and debate about the development and regulation of genetic engineering, another aim of this book is to give contemporary readers and those re-examining the history of modern biotechnology in the future the opportunity to understand what questions were being asked, what narratives and representations were being related, what options and alternatives were available, and what regulatory decisions were being made when the industrial application of genetic technologies was still quite new. A chronicle and clear guide to the debate in Australia surrounding the regulation and development of recombinant DNA technology is an appropriate and instructive means of offering insights and lessons for future society and policy.

Accordingly, this book embraces two main themes. The first is to reveal who is laying the foundations for the proposed BioUtopia and how this is being done, through investigating regulation and the train of events that emerged to permit and legitimate GMO field trials and commercial release. The second is to explore how a central mission in laying the foundations of BioUtopia has been the consistent marginalisation of the enduring questioning of bioutopian inclinations, visions and narratives by dissenting publics, scientists and bureaucrats. This excursion into the new politics of reordering life is thus situated within the contours of environment and sustainability, and technoscience and democratic politics.

Faced with a headlong but chaotic race to embrace BioUtopia, *Edging Towards BioUtopia* is written with a conviction that we need not move so blindly into the age of synthetic biology as we have done with prior chemical and nuclear mega-technologies. The consequences of those technologies being used inappropriately, where consideration of their risks lagged far behind their development,[28] represent a prime reason for adopting a significantly more questioning and precautionary approach towards mega-technologies that aspire to change the very substance and scope of life.

So how do I undertake my excursion into the Australian history of the legacy of Asilomar, a legacy informed historically by the foundational social organisation of science where science was positioned as an elite affair insulated from public view and participation?[29] Informing my excursion are questions such as: how do we understand Australian rDNA regulation as a disciplinary device constructed and controlled by a biotechnology policy elite, to facilitate the interests of GM developers even as sustained dissent to genetic engineering arose and has endured; what policy narratives were developed to shape policy meaning and orientation to form the arguments and grounds for policymaking; what regulatory strategies ensued or were developed, and how and why were they developed; how did those narratives and strategies shape the relevant issues, the necessary knowledge, and the appropriate expertise to expedite the environmental release of GMOs; how did they accommodate and/or act upon scientific debate, public attitudes and responses; and, what lessons might be gained from this questioning to inform enhanced democratic, environmental, social and regulatory outcomes in contrast to those that exist today.

Such questioning is addressed by considering how the social agenda behind the development and regulation of genetic engineering has been constructed or shaped to exclude public knowledge, debate and participation. As implied above, the analysis recognises that science and technology do not develop in a political and economic vacuum as a value-free, objective undertakings, as science would have us believe.[30] As Richard Lewontin, Steven Rose and Leon Kamin wrote over two decades ago:

> *Science is not, and cannot be above 'mere' human politics. The complex interactions between the evolution of scientific theory and the evolution of*

> *social order means that very often the ways in which scientific research asks its questions of the human and natural worlds it proposes to explain are deeply coloured by social, cultural and political biases.*[31]

Science is thus embedded in existing economic and political relations or, as some would say, in social power relations. To secure the favourable outcomes sought by contesting policy actors, be they environmental groups or biotechnology policy networks, those actors strive to achieve dominance through the strategic exercise of power (through tactics, campaigns, forays and countermeasures, for example) that aims to shape agendas of development, regulation, research, change and, ultimately for rDNA enthusiasts, attaining bioutopian dreams and hopes through a biotechnologically reconstructed nature.

As the famous French analyst on 'science in action' Bruno Latour emphasised:

> *Technoscience is war conducted by much the same means. Its object is domination and its methods involve the mobilisation of allies, their multiplication and their drilling, their strategic and forceful juxtaposition to the enemy.*[30]

In this apparent 'war of conquest', where science and technology have become the industrial medium for gaining social power and shaping society, 'actors work out their impulses to grow, to transform themselves from "micro-actors" to "macro-actors" by subduing others…' In other words, scientific knowledge at any one time not only involves scientific inquiry as well-defined method, but is significantly influenced by the social construction of that knowledge through negotiation, enrolment of allies to particular views, and the strategic blocking of other views.

For example, with regard to rDNA regulation, through in-house self-regulation, my investigation clearly shows that Australian biotechnology proponents, in an almost business-as-usual approach, actively engage in 'organising off' the regulatory policy agenda consideration of ethical and ecological issues associated with environmental release, as well as social issues like the consequences of the technology's application for the everyday living and working conditions of people such as farmers.

But while rDNA proponents consider agenda-fixing tactics as essential for bio-colonising the future, conversely, others see them as suppressing equally important issues and other modes of production they consider more viable for a sustainable future, such as agroecology or chemical- and GM-free agriculture. Shaping the policy agenda in this way is known as the 'mobilisation of bias'.[33] Mobilising bias through fixing policy to predominantly a genetics regulatory basis obviously makes it so much easier for genetic engineering to proceed.

In-house regulatory control is bolstered by the dissemination of images and text constructed to project sanitised and favourable aspects of the rDNA technique and to downplay, ignore or trivialise its negative aspects. Edward S Herman and Noam Chomsky would refer to this process as 'the manufacturing of consent' or 'the creation of necessary illusions'.[34] In the classic study of Australian propaganda, Alex Carey would define it as 'setting the terms of debate' or 'managing public opinion', and, within an industrial context, as 'protecting corporate power against democracy'.[35]

The capacity of biotechnology proponents to undertake such political manoeuvres and also secure enormous research and development funding for gene technology is visibly strengthened by their location in existing dominant structures of influence in the policy terrain of Australia—especially the scientific and technology establishments—represented here by, for example, the Australian Academy of Science and the Commonwealth Scientific and Industrial Research Organisation; industry bodies such as the corporate-dominated Australian Food and Grocery Council and Ausbiotech Ltd (formerly the Australian Biotechnology Association); and government agencies such as Biotechnology Australia.

The understanding of the nature, deployment and impact of these political strategies or manoeuvres, or what might also be called discursive practices, is further informed by Michel Foucault's concept of 'political technologies'—discourses,[36] techniques, devices, interventions, apparatuses, procedures and strategies deployed to secure favourable outcomes for those who construct them. Exploring the evolution and play of strategic manoeuvres and political technologies in the regulatory terrain of biotechnology promises to provide a better understanding of how bioindustrial interests in Australia and elsewhere have manoeuvred

both to enrol publics and discipline dissenting publics towards a favourable disposition towards genetic engineering futures.

The construction and implementation of such manoeuvres amounts to a 'campaign of legitimacy', directed through social, institutional and political avenues aimed at the entire social body through the three interactive media of biodevelopment, information and regulation. Constructing and implementing those manoeuvres is a powerful cluster of allied biotechnology discourse coalitions that demonstrate strong inter-organisational network relations,[37] enabling them to be described as a biopolicy network.[38]

This network is led by a biopolitical elite,[39] what I refer to as a 'bioelite', formed by corporate industrialists (typically representing life science corporations, technology developers and financiers), scientists (typically representing the biosciences both in the public and private research and development sectors), bureaucrats (typically those in state agencies of science, technology, commerce, trade, agriculture, health and industry development), and science and technology advisers to business and government (typically, a mix of the former three, as well as corporate lawyers). This formation can also be described as a bioindustrial complex of intermeshed state, national and transnational business and scientific interests.[40] A typical representation of this network is found in Ausbiotech Ltd.

Canadian biotechnology policy analyst Peter Andrée has demonstrated that a useful way to analyse the evolution of strategic manoeuvres and political technologies is to identify key discursive events or 'moments'.[41] In more straightforward language this means that a political landscape—in this case the development and application of policy for regulating rDNA—can be seen as a dynamic and rambling affair involving the confluence or interface of various policy streams flowing through the political landscape at any one time.[42] From that confluence a significant event may emerge that strongly influences the overall course of policy. In this inquiry I refer to these significant events as key regulatory events or moments that, in the Australian biopolitical landscape, so far represent self-regulation, government inquiries or legislation.

It is also clear that such moments or events underline the periodic intervention of a regulatory invisible hand to manage dissent to genetic engineering, which, however, has also revealed, perhaps significantly, that

after the formation of each key discursive moment, or 'key regulatory event', a tendency or reaction also emerged that saw dissent renew and build, decade after decade, through discursive practices of resistance. In Foucauldian terms, the construction of these discourse techniques of regulation and resistance represents a discursive formation or field of discursivity; in this case the political landscape shaping GM regulation and trajectories of biodevelopment, informed by differing and contesting perceptions and values of how to relate to and treat nature, and how to conduct decision-making processes.

So deep and broad is this field of discursivity that the GM debate worldwide is characterised by biopolitical struggle. As social studies of science analyst Tee Rogers-Hayden has outlined, a similar struggle to that found in Australia has also occurred in New Zealand;[43] and a highly influential struggle is found in the European Union—a global centre of biodevelopment—as both Gottweis and fellow political scientist Gabriele Abels relate.[44] However, Australia's almost unyielding biotechnocratic policy style offers a stark contrast to the new 'Brussels' policy style of biotechnology regulation that would converge science with democratic process involving public participation as a major legitimising source for regulatory decisions; and later moves in New Zealand, where major funding now supports research into deliberative or participatory forms of life sciences governance (see chapter 3).[45]

The Australian case is more aligned to the US policy style of regulation, which Sheldon Krimsky describes as 'reductionist':[46] a self-regulatory model for scientific research adopted for industrial processes situated within a market-driven framework that dominates science policy, and gives special preferences to the biotechnology industry in law, regulation, taxes and access to intellectual property. This is the context in which the Australian case best fits.[47] Its phases of regulation and biodevelopment, underpinned by the manifestation of the four key regulatory events that I reveal and interrogate in this book, support this view.

The Investigation of *Edging Towards BioUtopia*

Chapter 2, 'BioUtopian Visions', expands on this introduction and its contextualisation by delving into the fascinating history of bioutopian visions, from their beginning in utopian visions to their contemporary

positioning as bioindustrial utopias. In characterising their rise, an overview is given of their construction through the rise of modern science, the engineering ideal of biology, and subsequently molecular biology.

Chapter 3, 'Biodystopian Narratives and the Democratic Challenge', summarises some of the key concerns and issues critics have of recombinant DNA experimentation and development in relation to GM crops and foods. It then goes into more depth about the subsequent and increasing calls for, and moves towards, science and technology democratisation.

Chapter 4, 'Biohazards, Regulatory Foundations Cast', covers the first period (1970s–81) of regulatory negotiation that followed the discovery of the rDNA technique and the almost immediate controversy about US gene-splicing experiments. It reports on the rise of the rDNA technique, the scientific dissent that followed, countermoves by bioscientific interests, and the initial rise of science democratisation movements and then their containment by a political formation of powerful bioscientific interests acting in concert to quash any moves towards legislation. Many policy narratives of biotechnology were developed through this period, aiming to normalise genetic engineering and regulatory control by rDNA exponents. Powerful narratives came out of scientific meetings—most closed to the public, some apparently secret. Central elements framing such manoeuvring were the process and outcomes of the Asilomar conference.

This first phase of social negotiation, or agenda setting, forms the international context for the Australian rDNA regulatory approach. This saw the emergence of a biopolitical movement parallel to or entwined with the overseas movement, orchestrated by Australian bioscientific interests, notably in the Australian Academy of Science and the CSIRO. This emergent biopolicy network negotiated the legitimisation of regulation by a peer review in-house committee, the Australian Academy of Science Committee on Recombinant DNA Molecules (ASCORD), set up in 1975—the first key regulatory event. The biopolicy network then organised to protect its self-regulatory approach from external elements that sought stricter regulation, or even to halt experimentation. By the end of the period the groundwork had been laid for a minimalist self-regulatory approach, the marginalisation of public concerns and the

incorporation of bioscientist-empowered regulatory committees into supportive government departments, as the basis upon which rDNA experimentation and commercialisation could best proceed.

Chapter 5, 'Forging Alliances, Containing Public Debate', reveals how bioscientific interests in the Australian Academy of Science, the CSIRO and the Department of Science negotiated and constructed narratives and texts to depict a low-risk characterisation of genetic engineering experimentation, and to set the commercialisation agenda. But this occurred amidst dissent both inside government about lack of public debate, and the findings of the 1977–78 University of Melbourne Assembly inquiry into the adequacy of regulation, which found serious failings in regulation. The investigation delves into behind-the-scenes biopolicy network manoeuvres to absorb dissent that produced a key bioelite text, entitled *Recombinant DNA: An Australian Perspective*. The text aimed to thoroughly debunk the University of Melbourne Assembly inquiry's report. It facilitated the relocation of the Australian Academy of Science rDNA committee into the jurisdiction of the federal Department of Science, which publicly sanctioned the regulatory bioscientists with political legitimacy to control regulation. This was the second key regulatory event.

Chapter 6, 'Battles Inside the Bureaucracy, Environmental Release Looms', follows the battles inside the corridors of government bureaucratic power between contesting environmental and pro-bioindustry bureaucratic forces over the location of the new Recombinant DNA Monitoring Committee. In the long, and perhaps bitter, battle the environment department finally conceded defeat as the industry minister, to keep the committee out of 'greenies hands', and with the support of Prime Minister Bob Hawke, arranged to transfer the regulatory committee to a 'neutral' agency, the Department of Administrative Services. There it crystallised to retain its primary form and composition of bioscientists and was thus afforded further political legitimacy to continue minimalist regulation and the commercialisation agenda.

Chapter 7, 'Regulatory Maze: Public Dissent Swells', follows rising contestation and dissent in Australia about the environmental release of genetically modified organisms. Calls for moratoriums emerge, similar to overseas; contesting discourses clash in the media; and the world's

first GMO—strain K1026—is released in Australia. Its regulation, in one of the first battles by non-government organisations contesting the field, and contrary to the claims of GM interests, demonstrates a maze of inadequate regulations for assessing the safety of GMOs. This is the catalyst for the emergence of more critics, and the mounting groundswell of voices calling for a parliamentary inquiry.

Chapter 8, 'Uproar over "Mutant Meat", Federal Inquiry' analyses the intriguing tale of Australia's first parliamentary inquiry, catalysed in 1989 by Adelaide newspapers headlining 'Uproar over Mutant Meat' in reporting a highly controversial breach of the voluntary regulatory guidelines. The investigation follows the actors' manoeuvres in the contested terrain while the inquiry proceeded, which, by its terms of reference, was proactively biased towards biobusiness; and finally, the critics' defeat and their entrenched pronouncements that the inquiry was a 'set-up'. The main recommendation of the inquiry report was to support an Australia-wide mandatory regulatory system aiming to enable harmonious biodevelopment across Australia while controlling wayward researchers. But with its recommendation only for public comment on field release proposals, the role assigned by the inquiry for public participation was clearly tokenistic. The inquiry, which is the third key regulatory event, further reinforced bioelite control of GMO regulation and the existing minimalist regulatory regime. In turn, it facilitated commercialisation practices of field trials of GMOs in the next phase of biodevelopment (the 1990s), which also saw the advent of GM foods.

Chapter 9, 'Framing the Gene Technology Bill 2000' tracks the difficult state–federal negotiations following the parliamentary inquiry to the final outcome eight years later of the drafting and introduction of the Gene Technology Bill 2000. It reveals how the process was tightly steered by GM interests to the detriment of the civic sphere and environmental interests, who nevertheless contested the terrain (and the birth of biotech food) and, to some degree, came under surveillance by the regulatory committee and counter strategies of information.

Chapter 10, 'Passage of the *Gene Technology Act 2000*' begins with an account of the Senate inquiry into the controversial Gene Technology Bill 2000. Despite the inquiry finding that the proposed legislation should be made stricter and more responsive to community concerns, and despite a

Tasmanian moratorium emerging in response to regulatory breaches and 'genetic pollution', the bill passed easily due to manoeuvrings of interest between the government and opposition, to become the *Gene Technology Act 2000*. The investigation then looks at the Act's characteristics, its implications and opposition from groups like the Australian GeneEthics Network and the Organic Farmers Federation, and identifies it as the fourth key regulatory event in the history of Australian regulation, and the last one to date.

Finally, chapter 11, 'At the BioUtopian Frontier', maps out some key outcomes following the passage of the *Gene Technology Act 2000*. Central among these are the decisions by the Gene Technology Regulator to approve GM canolas (rapeseed) of Bayer CropScience and Monsanto for commercial release; the implementation of moratoriums in all canola-growing states by Australian state governments in response; and the reaction of farmer and environmental groups. The investigation identifies bias on the part of the Gene Technology Regulator—a regulator widely seen in environmental circles as being strongly pro-biotechnology—as it finds that the 'science-based' decision making advocated by the Act, in practice relied on what is analysed as flawed value-based risk assessment.

Such outcomes, which constitute edging towards wide-scale commercial releases of GMOs, disturbingly point up the controversy of biotechnocratic control of recombinant DNA regulation and its continuation. They highlight the purpose of this book in analysing this controversy in detail and why it is important for society, socially and environmentally to gain a good understanding of the rDNA regulatory agenda and the motives, practices and actions of those who would genetically choreograph the world.