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978-0-521-77317-1 - Biotechnology – The Making of a Global Controversy
Edited by M.W.Bauer and G.Gaskell
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1 Researching the public sphere of biotechnology

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Biotechnology is one of the fastest-growing areas of scientific, technical and industrial innovation of recent times, and it is also one of the most prominent in public discussion. Following the development of recombinant DNA techniques in the early 1970s, modern biotechnology has burgeoned in diverse areas including pharmaceuticals, diagnostics and testing, cloning and xenotransplantation, genetically modified seeds and foods and environmental remediation. Such is the breadth of impacts across previously unrelated sectors that a new collective category, 'the life sciences', has been adopted within the industrial and scientific communities. Accompanying this research, development and commercial exploitation has been a widening range and growing intensity of public debates. These have featured issues such as the use of genetic information, the labelling of genetically modified foods, intellectual property rights, the privatisation of research activities and biodiversity, but these have also been paralleled by more fundamental considerations of the rights and wrongs of modern biotechnology as a whole.

While debates on these issues have appeared, and indeed disappeared, in different countries and at different times in Europe and the United States, modern biotechnology has become increasingly sensitive, socially and politically. In contemporary times, public opinion is not merely a perspective 'after the fact'; it is a crucial constraint, in the dual sense of the limitations and opportunities for governments and industries to exploit the new technology. Whereas the biotechnology industry assumed that regulatory processes were the sole hurdle prior to commercialisation, it is now apparent that a second hurdle, national and international public opinion, must be taken into account.

This book takes up themes explored at a conference at the Science Museum, London, in 1993, which was convened to explore the structures and functions of resistance in the development of new technologies. At that meeting, three base technologies of the post-war years were contrasted: nuclear power, information technology and genetic engineering. The main thesis of the conference was that resistance is not a problem

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residing in the public, rather it is a signal that something is going wrong with the technology; and that resistance acts as a catalyst for organisational and institutional learning (Bauer, 1995). With an exclusive focus on biotechnology, this idea is further developed and expanded in this volume.

Here we present results of a four-year international research project conducted between 1996 and 1999. The project, 'Biotechnology and the European Public', brought together social scientists from a variety of different disciplines, including science and technology studies, sociology, social philosophy and psychology, consumer behaviour, communication science and political science. All the members of the project, based in fourteen countries – Austria, Denmark, Finland, France, Germany, Greece, Italy, the Netherlands, Poland, Sweden, Switzerland and the UK, with associates from Canada and the USA – had at least one thing in common. They shared a keen interest in monitoring and understanding the reception of modern biotechnology in the public spheres of Europe and North America. In the research, the public sphere is defined as the intersections between public opinion as evidenced in public perceptions and media coverage, and regulation and policy-making. The objective was to chart the dynamics of public opinion and regulatory activity that accompanied the development of biotechnology, from its beginnings in 1973 until 1996, in a multinational and comparative framework.

In our previous book (Durant, Bauer and Gaskell, 1998), we published the basic empirical data together with descriptive commentaries on the national developments in regulation and public opinion. In the present book, we step back from the data and reflect on biotechnology in Europe and North America in the years up to 1996/97. With the benefit of hindsight, this proved to be a watershed in the development of this strategic technology. Towards the end of 1996 the annual cargo of American soya was shipped into Europe. For the first time this was a crop of soya that included genetically modified soya (GM soya) grown from engineered seeds made resistant to Roundup herbicide. The seeds for this new GM soya were developed by the American multinational company Monsanto, whose name became synonymous with GM products. In the heady days of new developments of genetically modified seeds, with their promise to introduce a second green revolution, Monsanto may have been pleased to see their name as the brand leader. But this unusual cargo, intended or unintended as it may have been, had consequences that changed the image of biotechnology among the European public, and spilled over into the other parts of the globe. A few months later, in February 1997, the Scottish veterinary research station at Edinburgh claimed to have achieved what hitherto had been thought impossible: it had transferred

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the genetic material from an adult sheep to a uterus cell, and raised a cloned, genetically identical, offspring. 'Dolly the sheep' turned science fiction into a reality. Both these events, though local in character, became global markers and symbols of the genetic society cultivating contrary visions of progress and awe against doom and anxiety.

At other times, these two events might have quickly evaporated into thin air following the knee-jerk reactions of sensationalist mass media. But it is significant that they followed a slow build-up of public debate and concern about biotechnology that had been rumbling since the early 1970s. This book demonstrates how the build-up of public awareness and information, and the contrasting euphoria and gloom that accompanied the early developments of biotechnology, set the context for the reception of these two events. By understanding this earlier period, we can appreciate why the two events achieved their significance, and how that significance influenced the development of a global biotechnology controversy in the latter part of the 1990s. In sum, we explore the preconditions of what historians may come to call the 'great European biotechnology debate' which unfolded in the last few years of the twentieth century concerning a novel technology with commercial applications in the fields of crops and food production and pharmaceuticals and medicines.

Throughout this study, the term biotechnology is generally used to mean 'modern biotechnology', i.e. those processes, products and services that have been developed on the basis of interventions at the level of the gene. In the literature, modern biotechnology thus defined is generally contrasted with 'traditional biotechnology', i.e. those processes, products and services that have been developed on the basis of interventions at the level of the cell, tissue or whole organism. Although these are justifiable distinctions from the point of view of the biotechnologist, it is important to note that, in any particular social situation, they may or may not accord with the representations of biotechnology in the public sphere. Since the public sphere is our principal object of interest, it is vital that we acknowledge what the public understands by biotechnology, irrespective of whether this 'lay definition' complies with scientific definitions.

The fact that the project dealt with eight different languages led to some semantic challenges. The denotation of 'biotechnology and new genetics' has to be recovered from a changing lexicon of words and phrases both across languages and over time. It became clear, for example, that as the technology has developed so too has the vocabulary that denotes it. In English, for example, the term 'recombinant DNA' (rDNA) was current in the 1970s but disappeared later on; the term 'biotechnology'

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was not commonly used until around 1980; and terms such as 'genetic engineering', 'genetic manipulation' and 'genetic modification' all appear and disappear later on, in what seems to be a complex game played with semantics in the public sphere. Indicators for this semantic uncertainty are the Ernst & Young bi-annual reports on the state of the European biotechnology business which over recent years used different terms from 'biotechnology' (1996) to 'life sciences' (1998) to 'Evolution' (2000).

The public sphere: conceptual framework and empirical foundations

We consider biotechnology as an emerging scientific-industrial complex – a growing activity complex of research, development, production and service provision. By this, we do not mean to imply that biotechnology is a unified field, complete with a single, hierarchical mechanism of command and control; rather, we regard it as a heterogeneous coalition of many different actors, institutions and interests engaged in a competitive game over the control of this complex for purposes of commercial advantage. The biotechnology complex evolves alongside and within established societal spheres – economic, legal, mass media, political, religious, and so on – that collectively constitute its environment. Developmental change occurs in part through 'challenges' of one societal system upon another, and responses to these challenges. For research purposes, any particular societal system may be foregrounded as the focus of attention. For our purposes, it is not biotechnology itself – its locations, business logic, manpower, capitalisation, and so on – but certain aspects of the political systems as part of its environment that are foregrounded in this way. In particular, we are interested in the way in which old and new structures of a modern public sphere (Habermas, 1989) shape the contents and trajectory of a new technology.

The economic, legal, political and media environments each give more or less attention to biotechnology at different times, frame the technology according to a particular logic, and all have 'eyes' on other issues. As each turns its gaze to biotechnology, it may construct a different representation of the 'object'. Thus, for the financial system the representation is likely to emphasise investment opportunities, risk and stock market performance; whereas for the mass media it may consist largely in the 'news value' of particular developments tied to novelty, human interest or scandal. In this sense, the symbolic environment of biotechnology is made by a set of observers with different levels of attention and different ways of seeing. But these are more than merely passive observers. Their gaze is an active process of selection and framing that may facilitate and/or constrain

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the development of biotechnology in particular ways. The presumptions underlying this research are that, in the course of its twenty-five-year development: first, biotechnology regularly presented challenges to observers within the public sphere; and, second, these observers at times responded with counter-challenges or resistance that contributed to shape the continued development of biotechnology itself.

By systematically observing the observers of biotechnology in the public sphere, we aim to document the presence and the potential influence of the public counter-challenges upon this emerging technology. Our research observes the public sphere as a tripartite structure of policy, media and perceptions, and through what we term 'representations' of biotechnology (see chapter 13). For present purposes, a public representation is simply conversation and writing within the public sphere referring to biotechnology, which is 'objectified' for the conduct of research (Bauer and Gaskell, 1999).

The research was organised in the following way. First, each participating country conducted a longitudinal (historical) analysis of the development of public policy for biotechnology over the period 1973 to 1996 (a similar longitudinal study of policy developments at the European level has also been undertaken). This period was chosen to embrace the entire history of modern biotechnology from the discovery of rDNA technology up to 1996, the year in which our research project commenced. Second, each participating country conducted a longitudinal analysis of media coverage of biotechnology in the opinion-leading press, also from 1973 to 1996. Third, all participating countries contributed to the development and analysis of a representative sample survey of public perceptions of biotechnology, Eurobarometer 46.1. This survey was carried out in October/November of 1996 in each member state of the European Union (EU). Similar surveys were also developed and carried out by affiliated teams in Norway, Switzerland, Canada and the USA.

Public policy: chronology and domains of regulation

Public policy is an important expression of the aspirations, attitudes and values of a country. Public policies may have various explicit or implicit aims: they may seek to promote public goods (for example, through the encouragement of innovation), or to prevent public harms (for example, through the imposition of health and safety regulations); they may seek to protect the interests of producers (for example, through the patent laws), or those of consumers (for example, through product labelling requirements); and they may seek to reconcile conflicting ideals or interests (for example, in the provision of guidelines for the acceptable

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conduct of research on human embryos). Public policy is the outcome of activities in political forums. In pluralistic democracies, these activities are necessarily multiple and multi-valent. In other words, at any particular time no single actor or interest group is likely to dominate the policy-making process to the exclusion of all others. Instead, different actors and interest groups vie for influence in a political process (part private, part public) involving competition, cooperation, lobbying, public relations campaigns, coalition-making and breaking, and compromise. In the European Union, policy-making for biotechnology takes place at both the national and the European levels. To the complex of actors and interests operating at the level of the individual nation-state must therefore be added a second complex of actors and interests (including the European Commission, the European Council and the European Parliament) operating at the level of the fifteen member states. In the end, what transpires as official policy may be something that no single actor or interest group originally intended.

In reviewing the history of biotechnology policy-making, we have concentrated in the main on formal policy-making processes; that is, on the institutionalised activities by which official public policy has been established. However, wherever possible we have also paid attention to informal influences (such as lobbying by business organisations, or the opposition activities of non-governmental organisations) on the formal sector. We have been interested in questions of three main types: those that concern the characterisation of 'frames' of biotechnology within the policy field; those that concern the mechanisms by which policy has been framed; and those that concern the relationships between individual nation-states and the European Union.

In the first category, we considered questions such as: which issues have been debated? how have these issues been framed by the selection of themes? which have been the principal sponsors/constituencies of particular themes? how has the policy process dealt with opportunities and risks in relation to biotechnology? have policy-makers concentrated on the control of processes or products? In the second category, we considered questions such as: what have been the distinctive 'policy cultures' for biotechnology in Europe? what have been the principal mechanisms for generating biotechnology policy in Europe? what has been the influence of public opinion upon policy-making? have policy-making processes tended towards the 'technocratic' or the 'participative' mode? and is there evidence of 'institutional learning' as policy-makers develop new instruments and forums in light of previous experience? In the third category, we considered the timing of policy processes: how early or late do particular countries become engaged with biotechnology policy-making?

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how far do particular countries 'lead' or 'follow' in particular areas of policy-making? and what are the relations between national and European initiatives on biotechnology?

We developed a chronology of key policy developments in each country for the period 1973–96. This chronology was based partly on published sources and partly on interviews with key actors from different arenas, including government, industry and non-governmental organisations. The aims of the chronologies were: to document concisely the most important policy initiatives in each country; to provide a base-line of data for comparison with the chronology emerging from the mass media study; and to provide a base-line of data for purposes of international comparison. Once the chronologies had been completed, these were converted into a 'policy template', providing in a standardised form a concise summary of policy developments in each country over almost a quarter of a century. Policy events were classified into ten areas: reproductive technologies; gene therapy; genetic screening; transgenic animals; genetically modified food; releases of genetically modified organisms (GMOs); GMO contained use; health and safety; research and development policy; and intellectual property rights.

These chronologies and templates were complemented by a review of the 'policy culture' in each country. By policy culture in this context we mean the prevailing styles of policy-making at the national level. These were judged to be vitally important for the interpretation of national similarities and differences (see, for details, Durant, Bauer and Gaskell, 1998).

Media coverage: intensity and contents of coverage

The mass media constitute a major arena of the modern public sphere. There is general agreement in the literature that the mass media are influential, but much less agreement about the exact nature of this influence. It is variously argued that the mass media serve to 'frame' issues in the public domain, that they serve an 'agenda-setting' role, and that they pander to and therefore, by way of appeal, express public perceptions. For our purposes, the mass media are viewed as one of several modes of representing biotechnology in the public sphere. They function both to explain and legitimate formal policies ('top–down'), and to signal issues and themes to policy-making that arise from informal political forums ('bottom–up'). Throughout, it is the complex interrelationships between media discourses, policy discourses and public perceptions with respect to biotechnology that are the focus of our attention. In order to study this interrelationship empirically, we constructed a media database following the paradigm of 'parallel content analysis' (Neuman, 1989).

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The media analysis comprised two elements: first, an indicator of intensity of coverage over time; and, second, the characterisation of this coverage in a longitudinal content analysis from 1973 to 1996. We established an indicator of the intensity of media coverage by estimating the number of all relevant articles on a year-by-year basis. The second key element was the creation of a corpus of media material in each country for purposes of comparative analysis. As we were dealing with the emergence of a new technology in the public sphere, we selected the opinion-leading press for study. By 'opinion-leading' we refer to outlets that are read by decision-makers for information and by other journalists for inspiration. We assumed that for each country it is possible to identify outlets that stand as proxies for the nature and intensity of media coverage more generally. In most participating countries national newspapers still act as opinion leaders. If this is doubtful, the criterion 'opinion leader' provides a functional reference for selection independent of other characteristics such as circulation or quality. In some contexts, this criterion may lead to the use of more than one newspaper within the longitudinal study. One newspaper alone may not cover the opinion-leading function, or the newspapers may change their function over time. Furthermore, newspapers make convenient and reliable sources for purposes of data collection.

Establishing a comparable sampling frame for media analysis across twelve countries was a challenge in itself. Our strategy was to establish functional equivalence across the countries. Some newspapers offer a historical index of articles. This constitutes a self-classification by journalists. For the early years, several of us relied on this entry point, although we were aware that this classification was not necessarily exhaustive. Such indices were checked by manual scanning, under a protocol according to which the number of issues scanned was inversely proportional to the amount of relevant material they were expected to contain (the smaller the number of expected articles, the greater the number of issues that need to be checked in order to establish a reliable intensity index). With on-line resources such as FT-Profile or CD-ROMs from certain newspapers, the complexity of sampling is reduced to the question: what are relevant keywords or search strings? To answer this question, the project defined a core set of key words translatable into all of the eight languages involved. These were: *biotech**, *genetic**, *genome*, and *DNA*.

The coding method indicated for our purpose was classical content analysis (e.g. Bauer, 2000). We chose this approach from a multitude of textual analysis techniques because: first, it allows for systematic (i.e. publicly accountable and replicable) comparisons on the basis of a common coding frame; second, it can cope with large amounts of

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material; and, third, it is sensitive to symbolic material, albeit through a process of coordinated local interpretation. The aim of the analysis was to deliver a systematic and comparable interpretation of the mass media traces of biotechnology since 1973.

The coding frame provided a grid of comparison of coverage in terms of framing, thematic structure and evaluation of biotechnology. Frames, themes and evaluations were further differentiated. The unit of analysis was the 'single press article', which was read by the coders and interpreted in the light of the questions posed by the coding frame. As most coders were highly educated members of the national research teams, their readings are likely to reflect the subcultural features of those who produced the articles and thus to constitute in this sense a valid, albeit not a universal, reading.

For each article, the coding frame assessed journalistic features such as the section of the newspaper in which it appeared; the size of the article, as an indicator of news importance; the format of the article; and whether the article appeared to be controversial. The news event was characterised by authorship, the actors identified with biotechnology, the themes, their location, the attributed consequences in terms of risks and benefits, and the implicit evaluation of biotechnology. A key feature of the coding was the identification of 'frames' of coverage (see Gamson and Modigliani, 1989).

Quality management of the process included careful negotiation of sampling and coding procedures, familiarisation with the procedures in the context of local constraints, revision of the coding frame to take account of local pilot work, and formal reliability checks for both within-country and cross-country consistency (see Durant, Bauer and Gaskell, 1998: 297–8 for reliability assessments).

Public perceptions: knowledge, attitudes and images

The third module of the research was concerned with measurement of public perceptions by means of random sample social survey. By 'public perceptions' in this context we mean all of the considerations, expressed in interviews, that people may have concerning biotechnology. As such, the term embraces interest and involvement in, understanding of and attitudes towards biotechnology; but it also includes the images, hopes, fears, expectations and even forebodings that people may experience when they think about biotechnology. The term 'perception' includes the processes of imagination at any moment in time. The importance of imagination lies in its capacity to go beyond the present reality by re-presenting 'things' independently of space and time: to locate events that happen at other places, to recollect or link past events, and to anticipate a negative or

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positive future that inspires present-day actions, even to play on fantasies without any constraints such as science fiction. In the case of biotechnology – literally, the technology of life itself – the importance of individual and collective imagination can scarcely be exaggerated. The cultural resonance of key phrases – 'test-tube baby', 'genetic engineering', 'cloning', 'the blueprint of life', 'frankenfood', 'Boys from Brazil' – has as much to do with their metaphorical and mythopoeic powers as with their scientific and technological significance.

From the outset, our research was organised around the opportunity to conduct a social survey through the Eurobarometer Office of the European Commission. After extensive qualitative research using individual and focus group interviewing in the spring of 1996, a survey instrument was designed and pilot tested. Following necessary modifications, the Eurobarometer on Biotechnology (46.1) was conducted during October and November 1996. The survey was carried out in each member state of the European Union, using a multi-stage random sampling procedure providing a statistically representative sample of national residents aged 15 and over. The total sample within the European Union was 16,246 respondents (i.e. about 1,000 per EU country). In addition, similar samples were achieved in Norway and Canada (1996) and in Switzerland and the USA (1997).

The survey drew on the questionnaire employed in 1991 and 1993 in previous Eurobarometers on Biotechnology (35.1 and 39.1). Where possible, questions were repeated for purposes of trend analysis; but changes both in biotechnology itself and in the public debate about biotechnology dictated the need for a number of new question sets in the survey instrument. The revised questionnaire included items on the following topics: optimism/pessimism about the impact of specified technologies (including biotechnology and genetic engineering); elementary scientific knowledge relating to biotechnology; beliefs about the role of nature and nurture in the development of human attributes; specific attitudes on six applications of biotechnology measured on four dimensions of usefulness, risk, moral acceptability and support; general attitudes towards the regulation of biotechnology and its agencies; confidence in different institutions to tell the truth about biotechnology; future expectations about the contributions of biotechnology to society; the importance of the issue, sources of information and attentiveness to the issue; political orientation; and, finally, socio-demographic characteristics such as age, religious orientation, sex, income and level of education.

By integrating the results from the 1996 Eurobarometer (46.1) with the systematic media and policy analyses, the project maps the main contours of the different 'national public landscapes' within which biotechnology is

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