

Introduction

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THE TITLE OF THIS BOOK is drawn from a biological process involving the exchange of genetic material between chromosomes as part of the process of reproduction and inheritance. During meiosis, DNA segments are exchanged as two chromosomes – one from each parent – intertwine in their dance for heredity. The resulting chromosome is different from its two starter ‘parents,’ contributing to diversity, to occasional mutations, and, in the end, to a more robust gene pool.

This notion of crossing over is the metaphor we chose as the theme for the conference we held in Kananaskis, Alberta, on 25–27 April 2003. We invited a number of participants from diverse fields and backgrounds: economics, law, communications, the sciences, and bioethics. We had people representing different sectors or interests as well – policy-makers, civil society, industry, and academia. By examining the social world of biotechnology through diverse lenses, we anticipated that our understandings of the challenges to society posed by this relatively new technology and its applications would be enriched.

While researchers in the field of the social, ethical, legal, or environmental aspects of genomics have typically focused on *either* biomedical issues *or* on agricultural applications (particularly GM food), many of the issues that underlie each set of applications are also cross-over issues. This is true of governance questions, intellectual property challenges, commercialization of innovation conundrums, and questions around policy decision-making. In presenting the issues, we have selected section theme key questions that represent these commonalities.

It was fitting that our conference happened to take place on the fiftieth anniversary of the publication of the double helix in the journal *Nature* by two intrepid young scientists, James Watson and Francis Crick (1953). Much has happened since that period, from the arenas of intellectual property to the funding and financial architectures of research on strategic technologies such as biotechnology; and from the outcomes in the laboratory to the outcomes in the policy world. The markers that became singularly important included the discovery that we could actually transfer genes from one species to another, and the first legal judgment that genetically engineered organisms could be claimed as intellectual property. During this time, the human genome was also MAPPED, as were other whole organisms, from the model plant *Arabidopsis* to the fruit fly. The tools with which we stored and analyzed information – including genetic information – similarly grew in capacity and sophistication, making possible the establishment of genetic storehouses like gene banks. Society has had difficulty keeping up with these milestones.

The questions for us seem to have grown more profound: Should we own higher life forms, or, for that matter, any living matter? What structural arrangements for genomics research will ensure that technologies adopted are not just economically beneficial but also socially and environmentally sustainable? *How* we talk about these questions also becomes more urgent. What linguistic tropes do we employ and how do these influence how we act? What roles do the media play and what kinds of impacts do they have on which technological directions are taken? What ethical questions are implicated in considerations of these technological applications? What governance arrangements are appropriate for addressing these challenges? At the highest level, technology in the public sphere involves choices about what it means to be human, about the kind of society we want. It is toward a better understanding of technology and society that we hope these contributions will lead us.

The themes we explore to address these questions fall in six areas: the economic and organizational underpinnings of biotechnology (Part 1); the interactions between policy communities and various publics (Part 2); the different representations of the technology among publics (Part 3) and in the media (Part 4); the societal considerations that play important roles alongside the science (Part 5); and some of the future prospects of this technological landscape (Part 6).

In Part 1 of the book, a political economist and two anthropologists offer different perspectives on organizational arrangements and practices around biotechnology knowledge production. The first investigates the evolution of new organizational forms of knowledge production – in this case, through networks of research partnerships as these networks work through the challenges of developing intellectual property rights. The second takes an anthropological approach and describes the discourses of finance, as biotechnological knowledge moves through the development pipeline.

Part 2 deals with policy development, which occurs through interactions between different policy communities and various publics. The different nature and pace of biotechnology development in North America and Europe have come to symbolize how technologies are deeply embedded in social contexts that help shape different outcomes. Biotechnology policy in Europe is described through the interplay between the balancing of the demands (felt by many governments) of European competitiveness through this strategic technology development and the competing demands of various European publics for caution if not outright rejection. On the North American front, a different form of pressure is explored through stakeholders who are pushing technological development through legislative fiat. Two chapters highlight how different publics can push, shape, and force technology into intended and unintended forms.

Publics wear different hats, employing different metrics when they examine what is on offer, a topic that will be addressed in Part 3. As consumers, their purchase intentions may be governed by one set of criteria; as citizens, they examine technological products with other criteria. When confronted with the various messages about genetics, they do not evaluate these messages uncritically and are discerning in their assessments of genetic information.

In Part 4, the different interpretations of technology are further explored through the representations and judgments made by the media and by publics. These interpretations are examined by asking what happens to messages as they move through the dissemination channels. There are two common assumptions made about such a process: the first is that the messages that come out of the scientific transmission channel are 'distorted' once processed by the media. The second is that publics who receive these messages respond uncritically to media offerings. Both are clearly simplistic and are examined in several chapters. One empirical investigation of media coverage of gene discoveries demonstrates that the media do not necessarily always oversell or hype these scientific discoveries; the surprising finding is that such hyping can occur in the academic journals themselves. Another examination of what the media do with these sorts of stories describes the different roles media can play as they highlight technology development: they can provide venues for promotion and finance, they tell stories through favoured narrative devices, and they can dictate the menu of subjects on offer for their audiences.

As will be demonstrated in Part 5, the metrics of societal judgments show the increasing prominence of other considerations. Ethical considerations underlie how some publics have framed their hopes and concerns. Animal welfare and rights have taken on greater importance and they complement the self-interest that has been assumed to govern entirely the expression of public preferences. Interests in further discovery of medical cures are also modulated by competing concerns about how genetic information is protected, utilized, and commodified. The experience of Iceland with the establishment of a national gene bank

provides a cautionary tale for other jurisdictions considering the creation of similar institutions.

Finally, in Part 6, the future of genomics is explored in two ways: by examining what nanotechnology – an emerging technology with links to biotechnology – might look like, and by looking back through the lens of literature to see what past technological visions can tell us about technological futures.

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REFERENCES

- Watson, J.D., and F.H.C. Crick. 1953. Molecular Structure of Nucleic Acids: A Structure for Deoxyribose Nucleic Acid. *Nature* 171:737–38.