# Introduction

Richard Langlais

Laboratory of Environmental Protection,
Helsinki University of Technology,
PO Box 2300, FI-02015 HUT, Finland
E-mail: richard.langlais@nomadscience.com

Henrik Bruun

Helsinki Institute of Science and Technology Studies,
PO Box 2300, 02015 TKK, Finland
E-mail: henrik.bruun@hut.fi

**Biographical notes:** Richard Langlais, PhD, is a Senior Scientist at the Laboratory of Environmental Protection, Helsinki University, Finland, as well as an Associate at the Center for Science and Technology Studies, Uppsala University, Sweden. His current research involves a study of the social dimensions of neuroscience and a study of the processes of social cognition in the development of micro-array science in Sweden. He was Chair of the Scientific Committee of the Biotech Society International Research Conference.

Henrik Bruun, Docent, PhD, is a Senior Researcher at the Helsinki Institute of Science and Technology Studies. His research focuses on knowledge networking in science and innovation. Recent projects include a study of distributed problem solving in a Finnish engineering project; an assessment of the Academy of Finland's practices for supporting interdisciplinary research; and a comparative case study of knowledge networking in two biotechnology companies developing similar products. Bruun is the Chief Editor of *Science Studies*, an interdisciplinary journal for science and technology studies, and was a member of the Scientific Committee for the Biotech Society International Research Conference.

## 1 Introduction

This Special Issue of the *International Journal of Biotechnology* publishes a selection of four papers presented at *Biotech Society – An International Research Conference*, held at Dipoli, just outside of Helsinki, 29–30 September, 2003. The conference was an opportunity to discuss and examine biotechnology in a novel way. It brought together two research traditions that otherwise rarely meet: those who study the innovation, organisation and management of biotechnology, and those who do research on the impact

of technology on society, public responses to science and environmental ethics, among others. This novel confluence of autonomous traditions succeeded in living up to the organisers' intention of creating a unique and fertile opportunity for new insight into the rapidly developing role of biotechnology in society. Participants in the conference were informed that two journals, the *International Journal of Biotechnology* (*IJBT*), and *Science Studies*, were kindly prepared to dedicate substantial space to those who wished to submit papers for the standard referee procedure. This Special Issue of the *IJBT* is one of the results of those reflection, writing, criticism and editing processes, and we thank the publishers of the *IJBT* for this extraordinary opportunity to publish such a diversity of papers in one issue.

Biotechnology continues to be widely proclaimed as 'the next revolution'. Even after several decades of booms and busts, bubbles and bursts, many of its proponents are more confident than ever in predicting that its eventual impact will far surpass even what the 'Information Technology revolution' has instigated. Heads of state, directors of national innovation agencies, business leaders and prominent scientists are among the array of influential voices feeding the increased interest in all forms of biotechnology development and, not least, investment. At the same time, concerns about its costs, how public opinion will affect it, whether or not it is environmentally sustainable and its legal ramifications make it a hot topic in many fora.

The drivers of biotechnology innovation are varied. Any country, even some of the smallest industrialised economies, with any desire to retain a capacity for high technology has seen it as imperative to include biotechnology in some way or other in its strategic thinking. As the paper by Hermans and Kulvik attests, however, it is not at all obvious that biotechnology can play as large a role in a small country's overall economy as initially envisioned. In comparing the biotechnology sector to other more established 'pillars' of the Finnish economy – the forest, machinery and electronics industries – it becomes apparent that even one or two decades of investment in biotechnology cannot yet compete with the results that the older sectors have produced; indeed, several more decades of serious commitment may be needed.

The number of start-up companies in most industrialised countries has multiplied, while alliances with and acquisitions by already-established companies are quickly proliferating areas of business activity. These include pharmaceuticals, diagnostics, functional foods (nutraceuticals), biomaterials, enzymes, chemistry, forestry, mining and energy, among others. The general industry enthusiasm has fostered a wide and growing range of other attendant phenomena: conferences, dedicated magazines, journals and websites, trade fairs, specialised head-hunting agencies and investment agents, to name a few. Most of this activity is content-related, amplifying the financial, scientific and technological aspects of 'biotech' itself; still largely missing is a wider perspective that seeks to understand and influence the overall place, impact and role that biotechnology has, and will have, with regard to the rest of society.

The *Biotech Society Conference* also aimed to focus more attention on these broader dimensions of biotechnology, and in a manner reflecting the intense scrutiny of the different mainstreams of research that had gathered in that unusual forum. As we heard, the best way to support the development of biotechnology is an interesting question for most governments. The level of specialised knowledge required and the degree of investment that needs to be sustained, often over periods of many years, yet with little substantial guarantee of any concrete results, make it in some ways unattractive for

vote- or profit-hungry short-term actors. At the same time, only a long-term perspective seems to give it any chance at all of success. It may be felt that a country's level of know-how, technological development and intellectual capital may eventually suffer if active measures to encourage biotechnology are not taken.

When it comes to policies regarding biotechnology, there seem to be two main approaches. Roughly characterised, one of them seeks to enable or assist biotechnology in its progress, looking at it from the point of view of the industry, and considers what the best possible conditions would be for growth in the industry and success in its workings. The other approach looks at biotechnology from the perspective of the rest of the society in which it is located, and therefore ponders its governance, its regulation, its acceptance and its potential implications for society (and nature) at large. The first is more prone to seeing the contribution (and profit) that can be made, while the second asks the question, 'For whom?' and 'Why?' (and, 'What are the threats?').

For many countries, the resources available for satisfying a focus on either of the two above approaches, or a combination of them, are limited. A government may make a commitment to supporting biotechnology, at the same time (as research by some of our colleagues has shown) that there is only too often little public debate about that support, about the degree of the support, and about how biotechnology should be regulated, steered, or restrained. Some of our colleagues argue that it would be better if, instead of being used to support the industry, government resources were used to create and encourage processes of public participation. Others persist in saying that the money would be better spent on the actual development of the industry. It is also even possible that by choosing to support biotechnology, a government may see that attempts to govern it are undesirable.

The questions around these issues proliferate. Are there situations in which restrictions on biotechnology, and the empowerment of less influential groups in society, can go hand-in-hand with a strengthening of research and commercial development of biotechnology, in a win–win situation? Or is a strong support of biotechnology a zero-sum game? Are there examples of businesses that have gained competitive advantage by having been forced to adapt to stricter regulations (in their home country) before their competitors? Can stricter regulations force business to develop better business cultures? When are regulations good from a business perspective? In sum: is there a combination of the two approaches – the encouragement of the biotechnology industry, but at the same time in a situation of good governance – that can be found? What kind of studies would help us to learn more about these questions?

Apart from plenary sessions where a comprehensive effort in finding the possibilities of combining the various approaches was attempted, there were two workshops enquiring more closely into specific aspects of biotechnology. One of these was entitled, 'Building businesses for biotechnology', and two of the papers published here reflect that focus more closely, but, fortuitously enough, from two different perspectives. Both papers show how far from conventional business practices small- and medium-sized biotechnology enterprises often are.

## 2 Building businesses for biotechnology

Biotechnology is a highly networked, complex and multidisciplinary scientific and technological area. Links and collaboration between academic research and businesses are

close. Some of the networks are local, while others have a global span. The paper by Nilsson examines how value is created and added in highly research-intensive business development processes, where such networks play a key role. Both universities and businesses face new challenges because of the great economic potential of biotechnology. Universities have to solve, among other things, how to deal with intellectual property rights issues and how to demarcate the individual and organisational responsibilities and rewards. Research-based start-up firms, for their part, need to build their competencies in business management and be able to attract risk funding for developing their commercial activities. The paper by Renko et al., discusses the balance between research and market orientation, and how sensitivity to surrounding organisational networks plays an important role in creating new markets. All biotechnology companies, whether large or small, also have to deal with an increasingly complex environment of governmental regulation and public concern, caused by the risks and dilemmas that are associated with biotechnology.

The conference workshop on this theme addressed a range of issues connected to the development of biotech business, such as: what organisational capabilities do biotech firms and research organisations need? How can they create innovative working environments? What is the role of functional integration? How do research organisations deal with issues of intellectual property rights? How can start-up firms build their competencies in business management? How should risks caused by the uncertainty inherent in innovation and by a dynamic business environment be managed? Why do firms/research organisations engage in networking? With whom are they likely to ally, and why? The papers published here are a sample from those engaging discussions.

## 3 Governing biotechnology

The second focused workshop theme addressed societal implications and other aspects of biotechnology from the viewpoints of governance and the evaluation of technology, as well as the public concern about and acceptance of biotechnology. Biotechnology imposes new challenges to local and global governing and raises many unanswered questions. National and international authorities face difficulties in balancing legal, political, commercial, social and ethical needs, and in setting priorities between them. As the paper by Aaltola illustrates, the interaction between politics and ethics, in this case regarding animal experimentation, is always difficult and offers no ready-made approaches. It leads us to wonder further how biotechnology is actually governed through legislation, politics and market competition. What kinds of changes are needed in existing governing processes?

New important aspects in the governance of biotechnology are the issues of democracy and the engagement of the public in decision-making. This complexity raises such issues as: what is the role of public participation in decision-making processes, and what are the various ways of engaging the public? Do authorities regard public engagement as a way of transforming public concern into acceptance of new technologies? Much of the decision making is based on scientific evidence and on health and environmental risk assessment. How then are concepts such as the precautionary principle and societal risk assessment incorporated in decision making and in the evaluation of biotechnology?

## 4 The challenge of integrative approaches

While much of the work of the Biotech Society conference took place in the workshops, on specific themes by specialists in an exploitative mode of working *within* perspectives, there were frequent opportunities for more explorative communication *across* the groups' more usual boundaries. The plenary sessions and the panel debate, with their open discussion opportunities, and, not least, the informal breaks and social arrangements were fully intended to fuel this important, more exploratory function.

While it can be postulated that the two groups – 'business' researchers and 'governance' researchers – nevertheless form distinct scientific communities, with little cross-communication, we do not want to overemphasise the homogeneity of each grouping. The Biotech Society conference clearly shows that that would be a mistake. The 'business workshop' presentations included topics such as social capital, networks, regions, knowledge integration, R&D strategies, commercialisation, the supply of experts, economy-wide growth impacts, strategy, entrepreneurial logic and the protection of intellectual property rights. The 'governance workshop' was equally broad, with topics ranging from attitudes, acceptability and public participation, to regulation, safety, the precautionary principle, risk management, policy-making, reform and conflict in university departments, and state–science relationships in the age of homeland security. There were more than enough opportunities for interdisciplinary and transepistemic communication, both within and between workshops. We feel that the papers in this Special Issue of the *International Journal of Biotechnology* give a fair indication of the richness of the results.