House of Commons

Science and Technology Committee

Bioengineering

Seventh Report of Session 2009–10

HC 220

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Report, together with formal minutes, oral and written evidence

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The Science and Technology Committee

The Science and Technology Committee is appointed by the House of Commons to examine the expenditure, administration and policy of the Government Office for Science. Under arrangements agreed by the House on 25 June 2009 the Science and Technology Committee was established on 1 October 2009 with the same membership and Chairman as the former Innovation, Universities, Science and Skills Committee and its proceedings were deemed to have been in respect of the Science and Technology Committee.

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A list of reports from the Committee in this Parliament is included at the back of this volume.

Committee staff

The current staff of the Committee are: Glenn McKee (Clerk), Richard Ward (Second Clerk), Dr Christopher Tyler (Committee Specialist), Xameerah Malik (Committee Specialist), Andy Boyd (Senior Committee Assistant), Camilla Brace (Committee Assistant), Dilys Tonge (Committee Assistant), Melanie Lee (Committee Assistant), Jim Hudson (Committee Support Assistant) and Becky Jones (Media Officer).

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Summary

We found that the UK has an excellent research base but is still failing to maximise its potential by translating research into wealth and health. Considering that the UK is emerging from a recession and a difficult economic climate still prevails, this is worrying. The road to economic recovery will depend, in part, on exploitation of the UK's research base, which in turn requires efficient translation to generate returns on investments.

Some areas of bioengineering, such as stem cells, have clearly benefited from strong Government leadership and support, backed up by generous levels of funding from both the public and private sectors. Others, such as genetically modified (GM) crops, are less well supported and funded. This is curious when GM crops are considered by the Government to be safe and offer potential benefits. GM crops are certainly the poor cousin in the bioengineering family, and we strongly urge the Government to signal its support for GM crops as well as improving the regulatory situation in Europe.

Regulation of bioengineering is complex but, on the whole, adequate in theory. However in practice problems arise and researchers have found that regulations inhibit research and translation, either because of regulatory complexity (stem cells) or a flawed operation of the regulatory process (GM crops). We have made recommendations to address these problems.

We found good indications that the UK is learning from past experiences in bioengineering when handling new emerging technologies, such as synthetic biology. The Government and Research Councils have recognised the value of synthetic biology early, and are providing funding. There is good activity in public engagement on synthetic biology. However we are concerned that while research is well funded there is not enough forethought about synthetic biology translation, for example developing DNA synthesis capability, which would provide the UK with an excellent opportunity to get ahead internationally. If this is not addressed, synthetic biology runs the risk of becoming yet another story of the UK failing to capitalise on a strong research base and falling behind internationally.

1 Introduction

Why bioengineering?

1. Bioengineering is the application of engineering principles or methods to biology or medicine. It could also be viewed as "turning ideas into reality" for biology and medicine.[1] Humans have a long history of engineering biological systems, for example agriculture developed about 10,000 years ago and formed the basis of modern civilisation. Since then, farmers have been applying selective breeding to food crops, a process further accelerated by the discovery of the role of genetics in plant breeding in the 20th century. Such bioengineering has resulted in the modern grains and vegetables that are familiar today yet would have been alien to our distant ancestors.[2] Similarly, for many thousands of years humans have been engineering medical devices and interventions—with various degrees of success—with the aim of improving health and prolonging life. The desire to manipulate biological systems is certainly not new, but over the last century the tools have become increasingly complex and sophisticated as our understanding of biology and medicine has matured.

2. The biological sciences encompass a wide range of disciplines and engineering is equally diverse. Bioengineering, the overlap between (at least) these two groups of disciplines, includes activities ranging from cellular-based research in tissue engineering to mechanical engineering-based applications such as orthopaedics. In this report on bioengineering, we are referring to a broad, highly interdisciplinary area overlapping science and engineering.

3. We chose bioengineering as an important topic for scrutiny for three reasons. First, the Government considers bioengineering to be amongst the strategically important enabling technologies for the 21st century.[3] This is partly because of its great economic, health and societal importance to the UK and partly because the UK has so far held an internationally competitive position in bioengineering, with a global lead in some areas.

4. Second, the powerful combination of the UK's global status in bioengineering and its actual and potential impacts on our society, means that bioengineering, as the Prime Minister might put it, virtually "picks itself"[4] as an area in which the Government should consider investing heavily. The Government has often expressed interest in the notion of selecting strategically important sectors for investment, a debate that has been particularly pertinent since the UK entered an economic downturn in 2008. Under the Haldane Principle the Government sets an over-arching strategy, while researchers themselves establish detailed priorities and apportion funding on the basis of peer review. Against the backdrop of the recession and possible funding cuts the Government has shown increased interest in using the discretion afforded by the Haldane Principle to identify strategic priorities, known to some as "picking winners". Lord Drayson sparked the debate in February 2009, when he asked in a speech:

1 Innovation, Universities, Science and Skills Committee, Fourth Report of Session 2008–09, *Engineering: turning ideas into reality*, HC 50–I

2 For example broccoli, a flowering mutant of kale, is thought to be only 500 years old.

3 Ev 55 [BIS, Defra and DH], para 1

4 Oral evidence taken before the Liaison Committee on 12 February 2009, HC (2008–09) 257–i, Q 41