Ross Anderson FRS FREng
Professor of Security Engineering

Dr James Wilsdon
Director, Science Policy Centre
The Royal Society
6–9 Carlton House Terrace
London SW1Y 5AG

UNIVERSITY OF CAMBRIDGE

Computer Laboratory

September 11, 2009

Dear Dr Wilsdon,

The Fruits of Curiosity

I have some experience that I would like to contribute to this inquiry.

Until 2002, academics at Cambridge enjoyed full intellectual property rights in our discoveries and creations. We retained copyrights and the right to patent inventions to the greatest extent permitted by funding agreements; and even where funders insisted that the university own all the IP resulting from a project, the inventors could exploit it on favourable terms. In consequence, a number of academics set up successful companies to exploit their ideas – the 'Cambridge Phenomenon' or 'Silicon Fen'.

In that year our governing body moved to kill the goose that paid the golden eggs. It proposed that the University own most academic IP and share in the proceeds. Cambridge was to move from having the most liberal IP policy of any British university to the most restrictive. As this would have made my own work impossible, I organised a number of colleagues into the 'Campaign for Cambridge Freedoms'. I was elected to Council, the governing body, in 2002 and after a struggle of several years we managed to ensure that the IP policy which was eventually passed was very much toned down. Thereafter I was elected again to Council in 2006, when I topped the poll.

The experience prompted a vigorous discussion of science policy, which can be accessed via `http://www.free-cambridge.org` and which I commend to the Advisory Group. In this note I'll mention a couple of the lessons I learned.

Research policy

British policymakers have complained since Victorian times that foreign companies get more benefit from British science than British companies do. But this was bound to happen. Britain's share of gross world product fell from 40% to 5% between 1831, when Faraday discovered electromagnetism, and now.

Computer Laboratory
JJ Thomson Avenue
Cambridge CB3 0FD
England

Tel: +44 1223 334733
Fax: +44 1223 334678
E-mail: Ross.Anderson@cl.cam.ac.uk

The dominance of the British Empire ensured that Faraday's discoveries were well exploited by British firms; today, the best exploitation path for a discovery at our lab may be via Microsoft or Samsung. In fact, the complaints started in 1851, by which time firms in Germany, France and the USA were starting to challenge British hegemony. Prince Albert became concerned about foreign competition in technology, and organised the Great Exhibition to try to push back. British policymakers have been complaining ever since then that 'our' science is mostly exploited by foreigners. British scienttists are accused of being no good at innovation. This has led to a vicious circle of near-market research coupled with a protectionist mindset that hinders the exploitation of the discoveries we do make. But so long as science is seen as a way of boosting national income, all this is inevitable.

America's next. At present America finances science generously, as it enjoys the dominant position that Britain did 150 years ago, especially in technology. In many areas of computer science, my own field, U.S. firms have over half the market, so U.S. taxpayer-funded research will mostly be exploited at home – just like Faraday's research. But America is about to face the same problem that Victorian Britain did, as India and China develop and the world gets less unipolar. Scientific discoveries made in Cambridge, Massachussetts, will be ever more likely to be exploited by foreign firms, just like discoveries in Cambridge, England. Congress will complain, like British politicians, that 'foreign firms are stealing our science' and 'we're no good at innovation any more'. The US science budget will shrink, and by more than the Indian and Chinese budgets rise. The ideas needed to make energy sustainable, deal with climate change and fight disease won't be produced at anything like the optimal rate.

The simple fact is that scientific research is a global public good: once something has been discovered and published, all humans can use it thereafter (subject possibly to patent restrictions on specific exploitation pathways that are rather temporary in the grand scheme of things). Providing public goods is hard, and there is a constant temptation to sell science to government as an applied discipline that provides practical benefits to the national economy. But the resulting parochialism is destructive in many ways. It undermines collaboration, and is likely to hurt global science spending as the world becomes more multipolar.

Historically, European countries have dealt with the public-goods problem by moving more and more science spending from Member States to Brussels. Perhaps the Royal Society might lobby for an international treaty allocating some of the receipts from the international component of future carbon taxes (such as taxes on jet fuel and marine bunker fuel) to a multinational science funding body. However there is a deeper lesson. We should not be selling science just as a useful art.

Mechanics of exploitation

Our Cambridge experience underlines this. Although patents are of very limited use in most branches of technology (other than pharmaceuticals), the idea that universities could make money from them led UK institutions to create large 'technology transfer' departments that contribute little or nothing while imposing substantial costs. Even in Cambridge, where we fought the technology transfer movement long and hard and escaped with a less predatory regime than elsewhere, we have suffered. Instead of having two people doing technology transfer, we now have over 40, and bureaucratic rules have proliferated. Over the last two days, for example, I have been involved in dealing with the problem that a co-PI on a grant proposal is a college fellow rather than a university teaching officer; we have had to run around and get the college master's signature on a letter with the words that our officials demand (never mind that the grant proposal in question makes clear that all the results and all the software we write will be put in the public domain, so there will be no royalties worth arguing about).

Our technology transfer unit, which was sold to the University as a vital future revenue stream, now claims that it cannot be expected to make money; it is not satisfied with its current £2m a year and wants its budget increased to £3m a year. So there is a direct financial cost in addition to the increased effort involved in applying for grants. There has also been a scandal, in which a promising startup by a leading academic was ruined after Cambridge Enterprise licensed its key patent to a competitor, in which the chairman of Cambridge Enterprise had an interest. This case went to arbitration, and our Technology Appeal Tribunal found in favour of the academic and against the university.

Meanwhile, the actual rate of new company formation appears to have slowed. While this may be hard to disentangle from the effects of the recession, the definitive study of the Cambridge Phenomenon by Segal, Quince and Wicksteed argued that the large number of high-tech businesses spun off from the University owed a lot to the fact that academics owned our patents and copyrights, so those who were inclined to doing business start-ups could just get on with it. (The second edition remarks that it is probably already harder, from an IP perspective, for academics to drive spin-out creation.) For more detail, see `http://www.cl.cam.ac.uk/~rja14/ccf-old.html`, and for links to research on the economics of IP in universities, see `http://www.cl.cam.ac.uk/~rja14/expropriation.html`. In short, the economic studies are solidly in favour of leaving exploitation to academics, and this is supported strongly by our experience. The 'technology transfer' movement is harmful; we should never have embraced it.

This practical experience underlines the general point. Science is not fundamentally about making money but about understanding the world. Useful things do follow, but often much later and along pathways that no-one could have foreseen. Many useful discoveries were initially thought to be far too esoteric to be of practical use; famously, Julius Conroe's survey of Nobel prizes in physiology or medicine in 1977 put Watson and Crick's work on the structure of DNA in this category. In my own field, number theory – which Hardy proudly claimed to be of no practical use whatsoever – is widely used in cryptography, while Russell and Whitehead's work on higher-order logic is used in protocol verification. Other discoveries are serendipitous; my thesis adviser, the late Roger Needham, once described scientific research as 'looking for a needle in a haystack, and finding the farmer's daughter'.

The nature of value

Finally, good research is often destructive rather than creative: see 'Cambridge University – the Unauthorised History" which I wrote to celebrate our octocentenary (it may be found at `http://www.cl.cam.ac.uk/~rja14/unauthorised.html`). Our business as academics is not just discovering truth but exposing error. Just as a fire regenerates a forest, so also universities regenerate human culture by burning away the rubbish. Big new things come from that. The ground cleared by Cambridge scholars made us the cradle of evangelical Christianity in the sixteenth and seventeenth centuries, of science in the seventeenth and eighteenth, of atheism in the nineteenth, and of all sorts of cool new stuff since – including the emerging sciences of life and information.

This is Darwin's anniversary year. May I suggest him as a yardstick? More specifically, when drawing up your report, you might ask yourselves how your recommendations for science policy, funding and exploitation would apply to his work (and to that of Erasmus, Tyndale, Newton, Maxwell, Babbage, Russell and Turing),

Yours sincerely,

Ross Anderson