Putting science and engineering at the heart of government policy – supplementary evidence

Institute of Physics response to a House of Commons Innovation, Universities, Science and Skills Committee inquiry

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20 April 2009
Dear Sir/Madam

Putting science and engineering at the heart of government policy – supplementary evidence

The Institute of Physics is a scientific charity devoted to increasing the practice, understanding and application of physics. It has a worldwide membership of over 36,000 and is a leading communicator of physics-related science to all audiences, from specialists through to government and the general public. Its publishing company, IOP Publishing, is a world leader in scientific publishing and the electronic dissemination of physics.

The Institute welcomes the opportunity to respond to the House of Commons Innovation, Universities, Science and Skills Committee’s call for supplementary evidence to inform its inquiry into ‘Putting science and engineering at the heart of government policy’.

The attached annex details the Institute’s response to the issues raised in the call for evidence.

If you need any further information on the points raised, please do not hesitate to contact me.

Yours faithfully

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Chief Executive
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What form a debate or consultation about the question should take and who should lead it?

It is not clear from Lord Drayson’s speech what is meant by favouring those areas that have a clear competitive advantage. Should we infer that advantage is used here in an industrial, financial, or intellectual sense? One interpretation of the question is that a drive towards exploiting the UK’s competitive advantage will be reflected in further movement towards directed/thematic programmes (for which there has been a steadily increasing bias in recent years) at the expense of responsive mode support for curiosity-driven research. On that note, RCUK has just announced three new areas for directed programmes.

If there is going to be an open debate then a wide-ranging consultation exercise should be led independently by RCUK, involving requests for written submissions and meetings/workshops with all stakeholders to discuss the question in depth.

Critically, the premise of such a consultation will depend on which quantitative measures are used to define research endeavour that has ‘a clear competitive advantage’. Will it be: the international reviews of physics, chemistry, etc.; PSA target metrics for the UK research base; the RAE2008 results (but UoAs are not comparable); or the number of spin-offs and licenses?

Whether such a policy is desirable or necessary?

The research councils are already adopting policies which imply that the emphasis is shifting to one of funding research that shows potential, in advance of a research project being undertaken, of economic and societal impact. This is evinced by the request for two-page impact plans for grant applications and, in EPSRC’s case, a shrinkage of 15% in its responsive mode funding budget to support its mission-based programmes.

It is important to understand that many of the areas in which the UK has a ‘clear competitive advantage’ are firmly based in the area of independent curiosity-driven research, where the creative talents of a large community can be harnessed. Such areas frequently involve the activities of several competing research groups, where a mixture of competition and collaboration leads to rapid progress and puts the UK in a leading position.

Such curiosity-driven research has created completely new technologies and industries. Evidence for this is the recent report by the Russell Group which showed that curiosity-driven research can have a far greater social and economic impact than research carried out with a specific commercial application in mind. It showed that the commercialisation of curiosity-driven research generated average returns of £44

2 The Economic and Social Benefits of Research; http://www.russellgroup.ac.uk/home.html
million for Russell Group universities; more than twice the average returns from applied research. The report concluded that the government’s push to direct more funding at applied research, where economic impact is predicted in advance, would have resulted in a loss of £1.2 billion to the UK economy.

Both the recent RCUK Review of UK Physics and the RAE2008 results showed that UK physics is in a good state of health and that physics departments perform curiosity-driven research of the highest international quality. Much of this curiosity-driven research is funded through the responsive mode mechanism, where the focus is exclusively on the quality of the research proposed. The RAE2008 physics sub-panel’s report, quite emphatically stated that:

“Many of the world-leading research outputs observed in submissions originated from small responsive mode grants. The sub-panel believes that continuing availability of such grants is absolutely vital to encouraging and sustaining groundbreaking research activity. Both national and European funding agencies are concentrating heavily on large collaborative programmes which, though worthwhile in themselves, if pursued to the exclusion of smaller scale grants, may place the nation in a weak position in the future....The physics and science community cannot know where future developments will come from, and attempts to focus funding too narrowly into priority research areas (or priority departments) will limit rather than enhance the prospects of breakthroughs at the highest level.”

It is also important to realise that such research has been the main driver in enhancing the international impact of the UK academic sector so making it more attractive to foreign students who bring in substantial income and often end up contributing to increasing the skill level of the UK workforce.

One of the main problems the UK has to overcome is that is simply not being innovative enough in commercialising this scientific endeavour. More attention has to be given to the translation of research into product, which is perhaps where the debate should actually lie.

**What the potential implications of such a policy are for UK science and engineering, higher education, industry and the economy as a whole?**

The potential risk is that some stakeholders may have to shift their focus from customary areas of expertise into less familiar territory, such as directed programmes. The International Review of UK Physics and Astronomy Research 2005 reported that such programmes can play an important role as a response to new developments and/or as a means to enable collaboration between two disciplines. However, one drawback is that there is insufficient transparency in the selection of themes. Hence, such programmes should be used with restraint and not at the expense of responsive mode funding.

**Were such a policy pursued, which research sectors are most likely to benefit and which are most likely to lose?**

Within science and engineering, it is likely to be the engineering disciplines and the more applied sciences that will benefit while the purer aspects will be reduced in emphasis. For example, those areas of physics, which are long-term in their planning and nature, and involve collaboration with many other countries (e.g. the Large
Hadron Collider at CERN), will not be viewed as being able to deliver short-term economic impact.

Such a policy would lead to a reduction in research grants that will have a major impact on the ability of physics departments to attract and retain internationally leading research staff. Furthermore, critical mass in these areas, once lost, would be extremely difficult to recapture, as is clear from the shortage of trained people in nuclear physics and engineering which threatens the UK’s plans for new nuclear build and decommissioning.

In conclusion, it is essential for the UK to support a broad research base and not attempt to pick winners. It is not clear whether focussing on select, narrow areas will result in short-term economic gains, but it is obvious that in the medium- to long-term, it will undermine the UK’s ability to retain the highly trained, inventive and innovative scientists and engineers who will maintain and strengthen the UK’s international competitiveness. It is these people, particularly those that have been attracted to the UK by a funding system and academic ethos that allows them to pursue curiosity-driven research, who will enable the UK to respond to new discoveries for which the economic and societal impacts are manifold, but which are much more diffuse and harder to quantify than for example, profits in a manufacturing company.
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