

DINNER/DISCUSSION SUMMARY

The Wakeham Review of the health of physics in the UK

Held at The Royal Society on 19th November, 2008

The Foundation is grateful to the Institute of Physics and the Science and Technology Facilities Council for supporting this meeting.

- Chair:** **The Earl of Selborne KBE FRS**
Chairman, The Foundation for Science and Technology
- Speakers:** **Professor Bill Wakeham FEng**
Chair, Wakeham Review and Vice-Chancellor, Southampton University
Professor David Delpy FRS FEng
Chief Executive, Engineering and Physical Sciences Research Council (EPSRC)
Professor Keith Mason
Chief Executive, Science and Technology Facilities Council (STFC)
Professor Dame Jocelyn Bell Burnell DBE FRS FRAS
President, Institute of Physics

PROFESSOR WAKEHAM gave a summary of the main findings of his Panel's review of UK Physics. The overall conclusion had been that physics research in the UK was in a generally good state of health with departments performing curiosity-driven research of the highest international quality and having benefited from a significant increase in research expenditure in recent years. Unfortunately it had not been possible to obtain useful data to compare UK expenditure of physics research with that of other nations. However, analysis of outputs on the basis of citations showed that the UK ranked within the top five countries for most sub-disciplines and as number two after the USA in space sciences. With such a good showing in outputs it was reasonable to conclude that UK expenditure must have been at about the right level. Recently there had been signs of a slight increase in the number of students taking A-level physics after a long period of decline. Direct evidence from employers showed that physics is a very desirable training to possess, equipping people with skills of relevance and value in all sectors not only in the physics and engineering. Any decline in the numbers choosing physics at school and university level would therefore be damaging across the economy.

Teaching was not favoured as a career for enough physics graduates; unless steps were taken, similar to those taken in mathematics, to increase the number of teachers with a physics degree, there could be serious problems in the longer term. The Panel had noted that physics graduates were still drawn from only a small part of society; they tended to be white, male and middle class. Employers had also expressed concern to the Panel about the lack of adequate practical skills among graduates suggesting either that the nature of the discipline was changing or that universities were failing to provide enough laboratory time.

The Panel had noted that a great deal of physics research was now undertaken in other university departments and that physics research was heavily dependent on Research Council funding from several different Research Councils. There was a need to broaden the base of physics research funding by taking advantage of the extra money flowing into strategic areas such as health, the environment and energy for which physics research was essential. The Panel feared that physics was losing the intellectual leadership necessary to ensure that it was seen as a vital

strategic area capable of attracting high levels of funding from a variety of sources, including industry. Research Council and Universities needed to see the importance of physics as a discipline relevant to many different university departments and not just as something carried out in physics departments; current university structures were not well-suited to ensure adequate priority for physics.

PROFESSOR DELPY welcomed the Panel's report with its positive message about the healthy state of physics and its positive impact on the economy. He saw the need for physicists to be less inward-looking and to engage more actively with other departments and disciplines, especially in the pursuit of funding. There appeared to be a tendency for physicists to attach less importance to research proposals which had a high physics content but which were not "pure" physics. He hoped that the Research Councils UK (RCUK) response to the Panel report would include further steps to encourage the take up of physics at school and university level and to maintain the current strength of the UK physics research base.

PROFESSOR MASON said that the physical infrastructure to sustain physics research in the UK was excellent but it required a long-term vision to ensure levels of investment not only to build facilities with long lead times but also to ensure that they were maintained and used to maximum benefit. He also stressed the need for the barriers between disciplines to be dismantled and underlined the need for well-trained physicists to ensure that the research infrastructure was maintained and properly utilised. Physicists should not take for granted the support of the wider community in the UK for investment in the research base. Scientists were motivated to pursue their research by curiosity but Governments and taxpayers were motivated to allocate resources to the research base by the desire to see positive impacts on society and the economy. Scientists needed to be more pro-active in demonstrating to Government and taxpayers the positive impacts of what they do. An analysis being carried out by STFC into the benefits delivered by the now closed Daresbury facility was showing that it had paid for itself many times over. But such positive economic impacts were not delivered in the short term and they were not usually predictable. Both curiosity-driven science and application-based science were needed and were supported by STFC but neither had

a right to be funded; they had to convince those with funds that they deserved to be funded for the positive benefits which they could bring to the country.

PROFESSOR BELL BURNELL also pointed out that the positive benefits flowing from curiosity-driven research were long-term, considerable and unpredictable. She shared the concerns expressed by other speakers that physics lacked intellectual leadership to ensure that its voice was properly heard in the right places. She feared that the increasing dependence of physics on the Research Councils meant that such leadership was passing into the hands of the Councils. She shared the concerns of others about the risks that inadequate numbers of young people were taking up physics and especially the teaching of physics. There was at present, for example, in the city of Hull only one qualified physicist teaching physics. The supply of physicists could be increased if greater efforts were made to achieve greater diversity (sex, colour and class) among those attracted to the discipline. She welcomed the Panel report and urged speedy implementation of its recommendations.

In the following discussion some concern was expressed about a possible conflict between the Haldane Principle (that decisions on general research should be made by researchers free from political and administrative pressures) and regional policy considerations about where research facilities and activities should be located. It was argued by some that it was for politicians to resolve such conflicts and not for scientists and that the Research Councils needed to think in national terms and not purely in regional terms. However, the Councils needed to be aware of the resources that could be harnessed in different regions and also the fact that Regional Development Agencies had funds which could help sustain research activity.

Many speakers picked up the theme of “economic impact” which had featured in the presentations. There were some who felt that scientists should not be distracted from their primary role by the need to justify the contribution which their work made to the community at large and that scientific research should not be distorted by too much attention to applications and to purely financial benefits. However, others argued that there was no intrinsic conflict between curiosity-driven research and applications-based research and that the current emphasis on “economic impact” had existed in science policy for the past fifty years. It was also pointed out that good publicity given to the positive results flowing from good science could lead to big increases in funding for basic research as the extra funding for the Medical Research Council had shown.

Speakers underlined the fact that the increase in research funding in the past ten years could well not be sustained in the future and certainly that it should not be taken for granted. Not only did physicists need to work hard to educate the public into understanding the positive benefits of research in the widest possible terms but also they needed contingency plans to enable them to sort out among themselves difficult questions of priority in the allocation of such funds as were made available for basic research.

Speakers stressed the need for the physical sciences to seek out new sources of funding for research. It was noted that life sciences in the UK seemed able to attract significant sums from philanthropic sources but that the physical sciences seemed to have to rely on the Research Councils. However, others pointed out that the culture in the UK and the rest of Europe differed from that of the USA where the availability of philanthropic funding was so

considerable. One speaker drew attention to the large sums of money available from the department of Health for research now that leakage into clinical work of NHS research and development funds had been halted. There was some discussion about ways in which young people could be attracted into pursuing physics. It was noted that the high public profile of astronomy and particle physics did appear to excite the interest of young people. Perhaps more could be done by the design of syllabi. It was suggested that the point's system governing university entrance could be adjusted to give a favourable bias to students who had taken physics at A-level. But it was recognised that a key factor was the inspirational effect of good quality teachers and that action to improve the supply of such teachers was an urgent high priority.

The discussion showed general support for the key themes identified in the Panel report: the need to give greater prominence to the immense value to the UK of physics, the current strength of the UK physics, the need for physicists to assert their intellectual leadership and to reach out beyond their own discipline and departmental boundaries and engage with other fields where they could both derive and deliver major benefit, the need to think long-term about the investment in people and facilities and the need to improve the supply of qualified physics teachers in schools.

Sir John Caines KCB

Presentations from the meeting are on the Foundation web site at www.foundation.org.uk.

Web Links:

Cooksey Review of UK health research findings
www.hm-treasury.gov.uk/cooksey_review_index.htm
Department for Innovation, Universities and Skills
<http://www.dius.gov.uk/policy/science.html>
Engineering and Physical Sciences Research Council
www.epsrc.ac.uk
European Organisation for Nuclear Research (CERN)
www.cern.ch
The Foundation for Science and Technology
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Science and Technology Facilities Council
www.stfc.ac.uk
Select Committee on Innovation, Universities, Science and Skills
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