THE FOUNDATION FOR SCIENCE AND TECHNOLOGY

DINNER/DISCUSSION SUMMARY

Making Science Work

Held at The Royal Society on 20th June, 2012

The Foundation is grateful for the support for this meeting from BP, the Institute of Physics, The Michael John Trust, the Society of Biology and The Kohn Foundation.

Chair: **The Earl of Selborne GBE FRS**
Chairman, The Foundation for Science and Technology

Speaker: **Sir Paul Nurse PRS FMedSci**
President, The Royal Society

Respondents: **David Eyton**
Group Head of Technology, BP
Dr Andy Richards
Chairman, Abcodia and life sciences entrepreneur
Professor Rick Rylance
Chief Executive, Arts and Humanities Research Council and Chairman, Committee of Research Council Chief Executives

---

SIR PAUL NURSE said that, although he would focus mainly on research leading to applications of science, science should not be judged solely in a utilitarian manner. For centuries scientific inquiry had been concerned both with acquiring knowledge and with applying that knowledge for the public good. Scientific research was needed for both. Research throughout the continuum from new knowledge to successful innovation was of equal value and importance, shared the same values and required the same skills and methodologies.

In decisions about what research should be supported at any stage along that continuum the most important factor was the quality of the scientists carrying out the research. They needed to have in-depth knowledge but also to be receptive to inputs from other sciences. They needed to be creative and, as with any other creative activity, to have freedom of and room to manoeuvre. They needed to adhere to the essential values of science – respect for reliable data, scepticism and commitment to the pursuit of truth. They needed to be motivated by a passionate curiosity about the natural world. They needed to be able to demonstrate an ability to deliver good quality research and not just good quality applications.

Decisions about what science to support had to resolve the inevitable tension between the desirable freedom for scientists to pursue the projects of their choice and the understandable desire of society to expect science not only to increase knowledge but also to add to the quality of life and to economic growth.

He saw the Haldane Principle (defined recently by the Science Minister as politicians, informed by external advice, confining themselves to decisions about the size of the overall science budget, the allocation between Research Councils and certain key priorities and leaving decisions on specific funding proposals to researchers using peer review) as the best way of resolving that tension. He would like to see greater efforts by the research funding bodies to confine themselves to high level priorities and to push detailed decisions further down the funding chain. However, a greater degree of prescriptive behaviour was desirable for funding decisions about programmes aimed at achieving specific goals or applications. But such decisions needed inputs, including financial inputs, from those wanting to use the outcomes.

Turning to the question of scientific leadership he would like to see less emphasis on ring-fencing of resources and more emphasis on efforts by leaders to persuade researchers to be so motivated by the same vision and enthusiasm that their proposals contributed to that vision.

As regards factors affecting decisions about science closer to application, he believed in the need for team-work involving not just other scientific disciplines but also areas outside science, such as finance, market analysis and the law. Such team-work was not easy to achieve in a world of increasing specialisation.

There was a need for much greater permeability between sectors within the science community and between that community and other sectors. Such permeability had existed at the time of the Industrial Revolution and needed to be recreated. The young needed wider intellectual exposure during higher education and research training.

Bridging the gap between the generation of new knowledge and the application of that new knowledge needed contributions not just from the science side of the gap but also from the industry side of the gap.

He thought that the current focus on impact, while in many ways desirable, needed to be handled with care so as to avoid the risk of forcing it into areas where it was irrelevant for assessing a research proposal.

In conclusion he said that the UK had a high reputation for science and that many features essential for good science were well embedded. For science to continue to flourish and make its unique and essential contribution to the UK's future economic prosperity we needed patience (the research time-scale was often much longer than the political or business time-scale). We needed to take risks and be prepared to accept failure. We needed to maintain the flow of high quality scientific talent both from the UK (education policy needed to ensure a greater proportion of science teachers with specialist qualifications in science and greater emphasis on practical science in schools) and from the rest of the world (current immigration policy was unhelpful). We needed fewer barriers between scientists, technologists and engineers and between those communities and industry and public services.

He ended by saying "science is not only central to our culture and quality of life it is also the foundation of our economic growth".

Three speakers then responded to what Sir Paul had said.

MR DAVID EYTON said that about 40 per cent of BP's R & D was carried out in the UK (about £0.5 billion) and the company therefore cared deeply about the health of UK science. His role as Head of Technology was "making science work" for BP, contributing to the safety and reliability of the company's operations and maintaining the competitive strength of its businesses.

His team needed to be multi-disciplinary and intimately connected with the businesses. It needed to be of high quality to manage not only its own programmes but also to manage collaborations with universities and other partners (half of its expenditure was with third parties). It needed to have sound processes for learning from past success and failures and for translating ideas into practical applications. Against that background he had four conclusions for UK science: first, the need for a level of R & D spend that was competitive; secondly, the need in the research base for the right balance between competition and collaboration; thirdly, the ability to attract into UK science the brightest minds and the best scientists; and, fourthly, processes for making the right investments in R&D and supporting innovation.

He drew attention to the work of the Council for Industry and Higher Education (CIHE) of which he was the co-chairman. Three relevant reports to this debate were published or to be published[1]. The Council would be likely, among other things, to draw attention to the fact that large corporations were better placed than Small and Medium Enterprises (SMEs) to play a big role in making science work, not least because it was easier for a large corporation to cope with the failure of an innovative project. He saw the need for greater appreciation of the value and importance of the publicly-funded science budget as a basis for the UK's competitive position in the world, for an industrial strategy developed in partnership between government, academia and business and designed to increase UK value-added, for more collaboration and less competition in the use of the publicly-funded science budget and for a greater contribution from the UK's strong financial sector to the support of the science infrastructure and to SMEs.

DR ANDY RICHARDS said that SMEs and entrepreneurs could play a bigger role in making science work. But, mechanisms were needed to encourage scientists to be entrepreneurial and entrepreneurs to be scientific and to lower the barriers to risk-taking. SMEs needed to be well connected to Higher Education Institutions and research centres. He saw "clusters", such as those around Oxford and Cambridge, as a key way of bringing this about. These could provide a low risk environment for individuals who could work for a high risk SME with an expectation that if the company failed of easily finding employment with another SME.

He was optimistic about the interest in and support for science among the general public. He cited examples of active amateur scientists throughout the UK and saw great scope for citizen science projects. He encouraged learned societies and the Research Councils to be ready to support such initiatives.

[1] The UK R&D Landscape: Enhancing Value Task Force, Alan Hughes and Andrea Mina, CIHE and UK~IRC, March 2012 - see www.cihe.co.uk/category/knowledge/publications/

PROFESSOR RICK RYLANCE suggested that in five year's time the science landscape could look very different. There might well cease to be any real distinction between basic research and applied research. There would be much greater collaboration among scientists and much less competition between them. There would be a much greater emphasis on knowledge produced at the boundaries between disciplines and across disciplines. But, he warned that interdisciplinarity was very hard to achieve in practice. Existing funding structures, institutional structures and career structures as well as physical structures were all potential or actual impediments to successful interdisciplinarity.

In the two discussion periods before and after dinner there was considerable focus on the next Comprehensive Spending Review, now expected to be brought forward to 2013. There were many suggestions about how the science community should approach this and ensure that science was given the priority and importance which it needed, given the fundamental importance for the UK's economy in the future of science.

The politicians and the public needed to be persuaded that comparative advantage in effective and innovative brain-power were essential for the creation of wealth and hence quality of life. Business and academia needed to provide coherent and co-ordinated advice to Government as well to the public generally. But, a number of speakers urged that the scientific community needed not just to persuade but also to listen carefully to the concerns and views of Government and the public and to ensure that it had taken those aboard. Also the science community should not seek to temper its advice to Government by second guessing what Government wanted to hear.

One speaker was concerned that the scientific community had lost the ability to communicate intelligibly not only with the public at large but also with other scientists. A number of voices commented that much of *Nature*, the international weekly journal of science, was no longer accessible to non-specialist readers. *Nature* had originally been launched as a magazine to inform the general reader about science.

There were also many contributions about the relationship between the world of finance and the worlds of business and science. There was general support for the comments made in the four presentations about weaknesses in the present funding structures and the ways in which they might be overcome, not just in relation to financing SMEs but also in helping to bridge the gap between new knowledge and the commercial application of that knowledge. The benefits of the US Government procurement rules that required a percentage of government programmes to be purchased directly from SMEs were praised.

Two particular areas of research were highlighted by speakers as in need of greater attention and effort: nuclear energy and mental health. This intervention received general support. There was also general support for the idea that much greater use could be made of the data generated by trials and other programmes in the NHS.

Several speakers commented on how few women were in senior positions in science and technology. Although in biological sciences, for example, employment by women in the earlier career stages was 50 per cent, it dropped to no more than 10 per cent at more senior levels. There had been only two new female Fellows of The Royal Society elected this year out of 44 new Fellows. The Institute of Physics founded in 1874 had recently had a female President but the next President would be female. There was general acceptance that the present situation was an unsatisfactory waste of potential talent.

In comments on Dr Richards' advocacy of research clusters it was pointed out that the CIHE was looking into this area and reference was also made to current research work into how these might best be developed. But, one speaker warned that there might be limits to the growth potential of firms operating within clusters.

In comments on the question of "impact" it was argued that "publications" and "pounds" were not necessarily the most important metrics. Scientific quality and the contribution to long-term knowledge were other important indicators of "impact".

Intellectual property issues received some attention. Some doubted the likely beneficial impact of recent tax changes to encourage the exploitation in the UK of new knowledge but others supported the changes.

Other factors than tax (such as NHS bureaucracy which made it easier to set up clinical trials in the USA than in the UK) could hamper the vital need to keep exploitation of knowledge in the UK.

Concerns were expressed about the threat of important research IP being lost through cyber attack.

Sir John Caines KCB

Useful web links:
Abcodia
www.abcodia.com

Arts and Humanities Research Council
www.ahrc.ac.uk

Biotechnology and Biological Sciences Research Council
www.bbsrc.ac.uk

BP
www.bp.com

British Academy
www.britac.ac.uk

Council for Industry and Higher Education (CIHE)
www.cihe.co.uk

Department for Business, Innovation and Skills
www.bis.gov.uk

Economic and Social Research Council
www.esrc.ac.uk

Engineering and Physical Sciences Research Council
www.epsrc.ac.uk

EngineeringUK
www.engineeringuk.com

Foresight Report - Technology and Innovation Futures: UK Growth Opportunities for the 2020s
www.bis.gov.uk/assets/foresight/docs/general-publications/10-1252-technology-and-innovation-futures.pdf

The Foundation for Science and Technology
www.foundation.org.uk

Higher Education Funding Council for England
www.hefce.ac.uk

Institute of Physics
www.iop.org

Kohn Foundation
www.ralphkohn.com

Medical Research Council
www.mrc.ac.uk

Natural Environment Research Council
www.nerc.ac.uk

Research Councils UK
www.rcuk.ac.uk

The Royal Academy of Engineering
www.raeng.org.uk

The Royal Society
www.royalsociety.org

Science and Technology Facilities Council
www.stfc.ac.uk

Science Council
www.sciencecouncil.org

Sir Paul Nurse Biography
www.royalsociety.org/people/paul-nurse/

Society of Biology
www.societyofbiology.org

office@foundation.org.uk
The Foundation for Science and Technology
A Company Limited by Guarantee
Registered in England No: 1327814
Registered Charity No: 274727