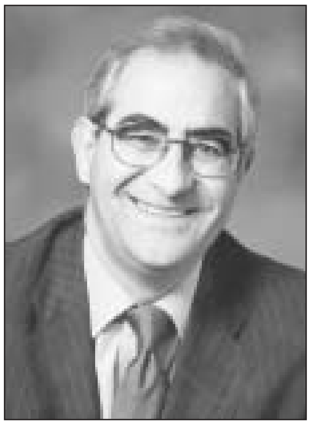
THE SCIENCE WEEK SEMINAR – THURSDAY 17TH MARCH 2005

THE UK – BEST PLACE IN THE WORLD FOR INNOVATION

The annual Science Week Seminar was held in the Attlee Room at Portcullis House and focused on the need to develop stronger links between scientific innovation and commercial development to realise full economic potential. The joint chairmen were Mr Richard Page MP, Chairman of the Parliamentary and Scientific Committee, and Sir David King FRS, Government Chief Scientific Advisor. The subjects addressed by the speakers are the Ten Year Plan; The technology strategy as a basis for future economic success; Technology strategy and collaborative policy in Government; Knowledge transfer within the Research Councils; and Science and Technology centres of excellence. The seminar was jointly organised by the Parliamentary and Scientific Committee, the Parliamentary Office of Science and Technology and the DTI and attracted a capacity audience who took an active part in a well-organised and successful meeting.
Report by Robert Freer

Mr Richard Page, Chairman, Parliamentary and Scientific Committee

Mr Page welcomed the delegates, and in opening the first half of the meeting, pointed out that the title "The UK - Best place in the world for innovation" should be read as a statement of intent. He also drew attention to the growing importance of the Parliamentary and Scientific Committee. A hundred years ago it was theoretically possible for an MP to understand the whole of science. Today that is impossible. As scientists climb up their individual silos they also find it increasingly difficult to communicate with each other let alone with the general public. An MP is a jack of all trades, often lacking sufficient scientific knowledge to understand the right way forward when science-based legislation looms. This is where the PSC's role is of growing importance as a bridge between the scientific world and Parliament, helping both sides to understand the needs and pressures of the other.



The Ten Year Plan

Sir Keith O'Nions, FRS, Director General UK Research Councils

I want to give you an overview of the 10-year Framework for Science and Innovation and of the role of the recent Science Budget allocation of £10 billion announced by Patricia Hewitt.

The headline aspects of government science policy both in the UK and USA have changed little over the past 60 years. US policy after the war in 1946 was to focus on the war on disease, on public welfare, national security, the international exchange of information (at a time when most basic science was being done in Europe) and the creation of jobs to provide economic growth. In the 1960's the Wilson Government set up the influential Robins committee which also placed great emphasis on economic growth. The difference today is that there is a much stronger focus on delivery and a commitment to maintaining long-term support for research activities.

The 10-year Framework is the clearest annunciation yet of Government policy. It has been well received by academics, and viewed with interest and envy from overseas. It aims to make Britain the most attractive location in the world for scientific innovation.

The UK has a strong base in science and technology but we must aim to be internationally competitive across the board. In much of science the quality and input of our research is second only to the US but in engineering research and the physical sciences we are more like third and fourth in the world and we need to address these areas.

The 10-year Framework strives for a research base that is responsive to the needs of the economy and public services (such as national security and the environment). Significant investment will be aimed at encouraging economic exploitation. Our aspiration, over the ten-year period, is for business R&D to rise from 1.2% of GDP last year to 1.9% and overall investment including the Government contribution to rise to 2.5%.

The 10-year plan seeks to address the supply of engineers and technologists. There has been a big increase in PhDs in the bio-medical and life sciences but in the physical sciences and in engineering we have not necessarily got the right people in the right places at the right time.

The largest part of new investment will be targeted at the sustainability of our universities and public research laboratories, filling the black hole left by many years of under-investment. Finally, the Framework gives priority to improving public confidence in emerging technologies such as nanotechnology.

The allocation of the £10 billion through the Research Councils, the Royal Society, the Royal Academy of Engineering and the British Academy lays the foundations for this 10-year vision. It covers the whole range of research activity from particle physics to the humanities.

To improve the sustainability of our infrastructure, £200m per year by 2007/8 has been allocated to cover a greater contribution of the full economic cost of undertaking research. Most of this will go to the universities on the back of existing grants. Ongoing investment in university infrastructure is being maintained at £500m per year over the next three years. Taking into account capital streams, our aim is for 100% of full economic costs to be met by the end of the next spending review. Capital funding for large facilities and Research Council Institutes will also be increased to £250m by 2007/8.

The importance of knowledge transfer has been well articulated over the last few years. In the Higher Education Innovation Fund there has been an increase in the money given to universities specifically to support linkage activities with business and for developing knowledge transfer capabilities. We need to support these activities both nationally and regionally and not just assume that they will happen naturally. A sum of £110m per year will be allocated for this purpose by the end of the review. An equivalent fund of £20m has been allocated to knowledge transfer in public sector research establishments, and £15m will be allocated later this year targeted specifically at taking forward the results of research funded through Research Council grants.

In allocating the total fund of £10bn, the Research Councils identified their own priorities and OST sought to balance investment across these priorities. We have made available an extra £40m to engineering (with particular focus on the life sciences interface), mathematics and the social sciences. An additional £30m has been allocated to support blue skies research in systems biology and big environmental projects, and £25m to clinical research to improve the translation of basic medical research to the bedside. Finally, EPSRC has been allocated an additional £25m to invest in energy research to produce a coherent programme of work to support future energy options from nuclear fusion to photovoltaics.

To summarise, the 10-year Framework identifies huge challenges and opportunities for our research base. The UK has a world-class science base, and the Government understands that its long-term sustainability is a prerequisite to successful exploitation.

The Technology Strategy as the Basis for Future Economic Success

Catherine Beech, Cambridge Gateway Fund

Catherine Beech introduced herself as the founder of the Cambridge Gateway Fund, a small venture capital fund based in Cambridge which invests in companies in the UK. She is also a member of the DTI Technology Strategy Board which offers an insight into the working of the DTI on technology transfer.

The UK has a strong base in science and technology and in fundamental academic research. Our scientists are innovative and publish more scientific papers per capita than any other country in the world but we are less good at commercialising the results. For example, MRI scanners were invented in this country but it was the Americans who made them a commercial product. We need to improve the commercial take-up of our new technologies. We need not only to find things out for the pleasure of doing so but also find the right market to sell them in.

Our spending on basic research is spread fairly evenly across the country but is less overall than in other countries For comparison, Germany, France and the US have all increased their spending on R&D, as a percentage of GDP, since 1981 but we have not. Where we are strong in research, such as pharmaceuticals, we are holding our own but in research on oil, gas and utilities other countries are spending more.

For an academic access to grants for basic research is not difficult and it is easy to find someone who can help you. But funding for early stage companies is more difficult to find. University challenge funds have been successful and are well used by academics who understand how they work but have not yet reached the stage where they are making an actual return.

In order to forecast what technologies will be needed in the future, we first need to consider what will be the cultural, social and demographic changes and what we should be looking for technology to provide. The DTI did some useful work last year on the underlying themes which address culture and society changes to help define where technologies should be focused. The public wants many things to be smaller, better and cheaper, and more personal mobility creates a demand for better communications. Large companies are very interested in early stage companies who can offer technologies which help them do better in their present programmes, and there is a particular need for better engineering in the life sciences.

There are a number of factors which are critical for success and to support a spirit of entrepreneurship in an early stage company. The opportunity to get advice and share information with someone who has successfully done what you are trying to do is particularly helpful. In Cambridge there are clusters of entrepreneurs where such help is available. Human capital is important as is the physical infrastructure, long planning delays to get new buildings can frustrate the development of small companies. Managers with global management and marketing skills can help to identify a current market need for a less than perfect product. By the time the perfect product is produced the market may have moved on. Government support for these managers would be helpful.

Access to money is always a problem. Academic grants are available for basic research, and university challenge funds are helping companies to develop their ideas. There are some Angel groups, including a strong group in Cambridge, but otherwise there are few funds available for early stage companies, and fewer funders prepared to take risks. Also, funders like to have a hands-on connection with the company. Venture capital is difficult. Private equity capital from London tends to go into management buyouts rather than to support early stage companies, and funders expect a return in five years, and we need to change our fear of failure.

There is now more emphasis on the business pull rather than the innovative technologies. This is an important step forward. Under the technology programme £250m has been made available; it is not enough but it is a start. The Government is making a real effort to help business to set priorities and to fund them. People are using the facilities and the competitions which have been set up which is a positive step. The objective in technology is to stick to what you know and do best and continue doing it. Technology platforms are important for venture capitalists as multiple products can be spun off with opportunities for repeated shots at goal, whereas with only one technology and product, nothing remains after failure. Some early stage technology companies would find it impossible to survive without the early stage tax credit. Of five small early start companies in a competition in Cambridge, two have contracts with the US, but none with the UK. There is therefore a need for improved procurement in the UK.

The Technology Strategy and Collaborative Policy in Government

Patrick McDonald, DTI Technology Strategy Board

Our programme provides two mechanisms to support business, collaborative development and knowledge transfer networks. The funding for this programme will rise to £180m by 2007-2008. This compares with £50m in 2003. In April 2004 we launched a competition for £60m of funding which attracted 400 projects of which 17 were funded at the end of the selection process. We also appointed an independent Technology Strategy Board which met formally for the first time on 1st November. On 29th November 2004 we launched another competition which attracted over 900 applications for £80m. Lord Sainsbury announced the next competition for £100m which will open on 26th April 2005.

The objective for Government support is to help businesses increase investment in R&D, promoted by market pull rather than science push. This analysis is also focused on the capability of firms to deliver market needs following an assessment of the potential for technology "stretch" which is a measure of market maturity. The funds allocated are sufficient for the needs of a project and are not spread thinly across a broad spectrum of activities just to reduce complaints. Judgement is needed in allocating funding for technology-specific small companies compared with the £20m-£30m required for validation of complex systems, such as demonstrators or technology test beds, that will be met by a new pilot programme in future.

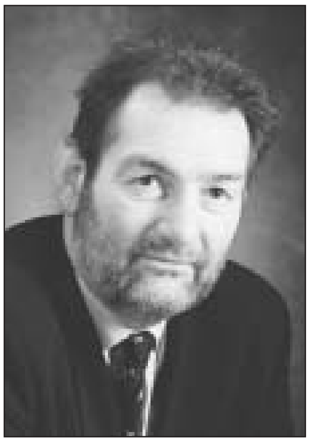
The DTI is extending the technology strategy to other government departments since an EU survey in 2003 showed that the UK takes about twice as long as our major competitors to bring a product to market. Can the Government help by becoming a more demanding customer? The Government spends about £1bn annually on fostering technology transfer companies, and about £10bn on its own research with an overall procurement budget of £120bn, a powerful financial lever to motivate business innovation.

The work of joining up government departments is proceeding well, having received £50m from Defra to be channelled through the technology programme, which benefits the work on sustainability where we have a common interest. The latest competition includes a £20m challenge to demonstrate aspects of the zero emission enterprise, such as waste reduction. A workshop is planned with Defra, other departments and the Research Councils, to help find areas of common interest.

The nine Regional Development Agencies and the three Devolved Administrations are at different stages with their regional technology strategies, and the Technology Strategy Board has an important intercommunication role with them. The relationship works best when discussing specific opportunities for regional collaboration such as micro-nanotechnology where the DTI can assume leadership and set a national agenda.

The DTI is developing a strategic approach for technology support but there is a long way to go with research teams needing longer term funding and businesses with better facilities in the run-up to the spending review in 2006.

Knowledge Transfer within the Research Councils



Professor Ian Diamond, Chief Executive, ESRC

Knowledge transfer within the 10-year Framework is the topic of this address, presented as chair of the executive group for the seven research councils, that cover the entire science base from social economics to particle physics and environmental medicine. The Government spending review reflects the national commitment, ranging from basic research to the use of knowledge generated from the science base for the general benefit of UK society.

The fundamental starting point is that no one can take public money for research if it is not communicated properly for the benefit of the population. This principle extends not only to business and industry but also to public policy and interactions with the Government. All Councils have their own policy to support knowledge transfer and they work together with the UK Research Councils (UKRC) to identify the added value. In ESRC we adapt our strategy to fit the research undertaken, supported by a range of policies, so that for each research topic an appropriate strategy is available.

The need for a strategy for small business research was recognised by the ESRC in the late 80s and a small business service has now been in operation since 2004. The application of research is not a linear process, it is necessary to interact with the user and time is necessary for the development of new ideas. The priorities for the Research Councils centre on collaboration, on supporting research workers and on the commercialisation of the results. Collaboration with education and training supports post-graduate training and ensures we have world class scientists coming on stream. Additional funding is available for PhD training with entrepreneurial skills.

The need for interaction between business and academics is recognised, and also the potential benefit that accrues for those PhD students who are supervised by both academics and by specialists from industry. This will produce a new generation of scientists who understand business, and those who go into industry will be better trained in understanding business. A third benefit will be development of a new network between the supervisors.

People are essential to successful knowledge transfer and we need to encourage networking to enable people to move between research, industry and Government. In the ESRC we also have the Connect Club which provides opportunities for industrialists to meet researchers, and we have 24 Faraday partnerships and other ways to support long-term research.

For instance, Rolls Royce are supporting aero engine development with a number of universities, and the University of Dundee is working with the MRC on pharmaceutical developments to understand how cells transmit molecular messages and how this information can be used to help develop drugs for a variety of diseases. As a result of these commercial activities over the last three years, 187 licences have been issued, 351 patents have been generated with more than £50m income from 30 spin out companies.

The research councils are also working with academics and other partners to take this forward. For example, ERSC is working with the Nottingham University Institute of Enterprise and Innovation and MRC to help the commercialisation of the work of over 180 bioscientists per year. Small groups are set up to prepare a business plan. These entrepreneurial activities are not picked up in five minutes but if you want to inspire PhD students with a small amount of money they will work hard. This work is people-intensive and takes time. We are committed to help scientists to understand business and all the research councils are increasingly aware of the issues to understand and develop business, financial and legal skills and to assist the next generation of scientists. For those councils for which it is appropriate researchers can apply for a further grant to develop the commercial opportunities of their work. For 24 such projects £1.4m has been allocated; it takes only a small amount of money to support this work.

The commercial application of research is not a linear process. It requires partnerships and needs interaction with industry. This takes time. We need to set up networks including Government and industry at a high level to deal with this, but it requires positive commitment from all those involved. UKRC is totally committed to knowledge transfer and we look forward to encouraging the commercial development of basic research.

Science and Technology Centres of Excellence

Sir Richard Sykes, Rector, Imperial College, London

Our Centres of Excellence in higher education carry out work of high quality and have a potentially significant impact on our lives and it is vital to maintain them. Our science base has been neglected in the past, particularly during the 1980s and 1990s, and we need to increase our investment if we are to keep up with the USA. This is now starting to happen and the science budget has risen from £1.45bn in 1997-98 to £2.4bn now, and will be £3.4bn by 2008. This is a welcome improvement and is better than in Europe generally but is still below the US level.

Government thinking supports the endeavours of leading universities in extending the frontiers of science, engineering and technology. But fine aspirations need to be focused and converted into actions and we need to avoid wasting the money by spreading it too thinly and regulating too strongly.

The solutions to the important needs of the world are never simple and are going to require not only a widely disparate knowledge base but we also need to align political practicalities with scientific possibilities if we are to achieve realistic solutions. Even within the scientific community we need to bring together different disciplines.

At Imperial College we believe in the value of interdisciplinary working and we have a powerful mix of disciplines covering the sciences, engineering and business management and we work hard to ensure these disciplines collaborate and interface with each other. A typical example is constrained robot surgery which requires the contributions of mechanical engineers, computer scientists and surgeons. In the past this collaboration rarely happened but today it is the usual practice. In advanced imaging techniques, our work is probably better than elsewhere in the world and for this we need good engineers, mathematicians and clinicians.

We encourage new entrepreneur companies. This has been a complete change compared with ten years ago. Since 1997 60 new companies have been founded on research work undertaken at Imperial College, 40% of them in biotechnology and health care, and we are adding 4 to 8 companies per year. £20m equity goes back into IC as well as licence income.

For these companies to prosper good science is not enough. We need to build national and global networks to provide not only the critical mass but also the insight, the vision and leadership these partnerships need. As an example of the operations by Imperial College in the field of international health care the Gates Foundation came to IC to seek help in running a complex health programme in Africa, together with Harvard and the local governments. Another programme funded by the Gates Foundation is for a £15m programme on HIV/AIDS. In a third programme the Wellcome trust is working with IC, Oxford and local governments on HIV/AIDS

In the medical sciences we have special advantages. The NHS is one of the finest systems in the world to deal with patient care and we have the finest practitioners in medical science and technology so we are seeking to bring them together. The multi-disciplinary approach in which clinical medicine is integrated with science and technology is the key to improved clinical care and can be applied to real health problems. One example is the new information network at the Hammersmith cancer centre which will co-ordinate clinical care at all the NHS hospitals. The network contributes clinical information to a data warehouse being built with the support of the Wellcome Trust, Imperial College and GlaxoSmithKline. The information collected can be fed back into the pharmaceutical industry to help the development of new cancer treatments.

Universities have a role in creating ideas and technologies and transferring them into industry and commerce. Industry develops ideas and practical products and the NHS uses the new products and services. And they all contribute to adding new skills to the pool of knowledge workers. Our medical regulatory environment in UK is good and achieves the right balance between protecting the individual and stimulating exploration. This has helped UK scientists to lead the world in stem cell research and in tissue engineering. We must be prepared to pay for the adoption of new technologies. We have the potential but if we don't also show we have the market for our creativity, our scientists and technologists will drift away to the USA. Another example is our work to understand and solve the issues around global climate change.

These examples of major problems in health and the environment can be addressed only by big science, by bringing people together in multi-disciplinary teams to create a critical mass. We need long-term contracts to provide stability and to ensure delivery and then we can compete on the global stage. In this country we have all the ingredients for success but we have to work together and recognise that it is a difficult game.

Sir David King FRS, Government Chief Scientific Advisor

Sir David summed up the meeting and thanked all the speakers and indicated that the topic was well chosen and very timely. The opportunities emerging from one of the strongest science bases in the world are immense for all of us.

In July 2004 he published a paper in Nature that listed the scientific strength of different countries by the number of citations per £ invested in the science base. The UK headed the list with 60% more than the next nearest competitor nation. Industry investing in the UK gets more bang for its buck. In this country we have strong science with a legacy going back 250 years or more, despite the brain drain to the USA which is now reversing.

We have now established hi-tech clusters which are the follow-through from the science base and which we had previously been missing for decades. The next phase is to develop the pull-through from the hi-tech clusters to industry. Within 3 miles of Cambridge there are now 1600 hi-tech companies employing about 40,000 people. These clusters, which are unique in Europe, are the opportunity for the future but we need a continuation of the change in culture which has happened in the universities. It is still to happen in some industries and in the City..

In discussion the following points were made:

The role of the Regional Development Agencies; need for long term investment; neglect of materials funding; method of measuring added value; links with humanities research boards; demise of SMART programme; intellectual property rights; costs of collaborative research; collaboration between NHS and academics; NHS priorities for research and patient care; SMEs and global collaboration; economic and social dimension to research; role of charities in funding research; criteria for the infrastructure; costs of research for SMEs; the regulatory system; training new engineers for new nuclear power stations; teaching science and engineering in schools; market opportunities for new companies; role of Technology Strategy Board; communication between science and the City.