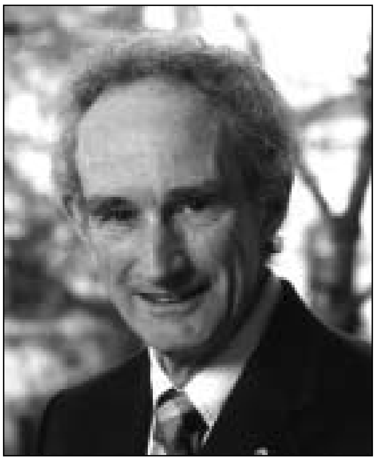
ADDRESS TO THE ANNUAL GENERAL MEETING OF THE PARLIAMENTARY AND SCIENTIFIC COMMITTEE HELD ON MONDAY 17TH MAY 2004



The Role of Science in a Changing World

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The UK must overcome enormous challenges in the next 10 years if it is to maintain its world class standing in science, engineering and technology. Despite our longstanding strength and sustained successes in science, we must continue to seek better ways of harnessing the creative potential of a nation that has produced truly groundbreaking contributions, from Isaac Newton's theory of gravitation to Tim Berners-Lee's world wide web.

In meeting these challenges, the scientific community can be reassured by the Government's plans to introduce a ten-year investment framework for science and innovation, to be published this summer alongside the results of the Spending Review. It shows that this administration recognises that the challenges that UK science faces lie beyond immediate political imperatives.

One, if not the most, important aim of such a framework must be to ensure that we continue to produce successive generations of highly skilled, innovative and creative individuals to drive forward the cutting edge of science. The UK has an enviable track record for producing world class scientists. For instance, in the past 15 years, 11 British scientists have been recognised by the award of Nobel prizes in the sciences, with many others receiving equally prestigious international awards.

Yet there are worrying signs that the supply of talented individuals may be faltering, and the declining popularity of the physical sciences, engineering and technology among school pupils and university students threatens the prosperity and quality of life of the whole nation and its progress during the twenty-first century. The huge falls in A-level entrants for physics, chemistry and mathematics are particularly alarming. Between 1991 and 2003 there were decreases in the number of A-level entries in Chemistry by 19%, in Physics by 30%, and in Mathematics by 25%.

The Government must respond to these disturbing trends by implementing the recommendations of two important reviews, one by Sir Gareth Roberts into the supply of scientists and engineers, published in April 2002, and the other by Adrian Smith into school mathematics, published in February this year. Both of these documents outline important ways of engaging more young people with science and mathematics, and to continue studying the subjects beyond the age of 16.

Both reports point out that there needs to be an improvement in the number and diversity of science graduates recruited into teaching, and who must have access and entitlement to high quality continuing professional development and well-equipped, modern laboratories. Their knowledge and enthusiasm for science, and hence that of their students, cannot flourish without opportunities to stay engaged with the ideas and excitement of genuine scientific endeavour.

The curriculum also must reflect the unique place of science and mathematics in today's society and must relate closely to the daily lives and experiences of pupils, as well as developing the creative potential of those who choose to study these subjects. I hope these imperatives will feature strongly in Mike Tomlinson's report on the future of 14-19 education when it appears later this year.

But it is not only at school level that we need to pay more attention to the development of creative talent in science. According to the most recent figures from the Higher Education Statistics Agency, between 1995-6 and 2001-2 there were falls in the number of first-year undergraduates in Engineering and Technology by 8% and in the Physical Sciences by 20%. We need to make sure that the higher relative cost of running many science and engineering undergraduate courses is not passed on through variable tuition fees, creating financial disincentives for students that would worsen present trends.

Of particular concern is how we persuade the best undergraduates of today to carry on their training to become the highly skilled research scientists of tomorrow. In the UK it is often assumed that this can only be achieved if undergraduates are directly exposed within their institutions to those who have already established research careers. However, in the United States for instance, a large number of the highest quality entrants to graduate programmes have emerged from teaching-only institutions. Whilst the model from the United States cannot be directly applied here, it is perhaps time that we considered whether our present set-up, with all departments within all universities pursuing the same mission of both teaching students and conducting research, is the best way of developing creative undergraduate talent.

I strongly believe that the best way of managing talented individuals, once they have moved into postgraduate and postdoctoral training, is by exposing them to institutional cultures in which they are free to express their creativity and set their own agendas, not being entrained in hierarchies of deference to their seniors, no matter how distinguished they may be. This is one of the guiding principles behind the Royal Society's University Research Fellowships, initially established in the 1980s primarily in response to a perceived lack of job opportunities in the UK. But the successful formula of providing the best individuals with the funds to study what they want, where they want, for up to 10 years without the burden of huge amounts of administrative work, means that this scheme is still a flagship success in the scientific community today, providing a solid career base for 300 of our brightest post-doctoral researchers.

Creative talent can only flourish if the systems of accounting for the money invested in our universities does not introduce either perverse incentives or unduly onerous administrative burdens. Researchers should be encouraged to collaborate across both disciplines and institutions without worrying about whether they will fit into a neat box on a research assessment form. They also need to be encouraged to share their creative talents with business, to exchange ideas and pursue innovations, without the fear that this will adversely affect their research rating and therefore the prospect of securing future funding. All of these are problems with the UK's present Research Assessment Exercise. Whilst the refinements devised by Gareth Roberts will no doubt improve the next Exercise, we should be thinking in the long-term how we might best account for public investment in research without stifling creative talent.

In particular, we need to stimulate more interaction between the creative talent in our universities and businesses. A series of reviews in the past few years have identified the UK's weakness in the expenditure by business on research and development. The UK, in common with many other Member States of the European Union, is lagging far behind the United States in this respect. In response, the European Union has set a target for expenditure on research and development to reach the equivalent of 3% of Gross Domestic Product by 2010. The recommendations contained in the Lambert Review outline many ways in which businesses might be encouraged to spend more with universities. But we must be sure that in trying to address these problems we do not damage either the fundamental research carried out in the Science Base, or the many successes in innovation that the UK currently has.

Finally, whilst over the next ten years we should rightly focus on developing the talent of UK scientists, we should not ignore the importance of assisting the development of science in other countries. Much has been made of claims of a brain drain from this country, primarily to the United States. But what is often ignored is just how much brain gain we have enjoyed, with very talented individuals from other countries bringing their skills and knowledge to the UK. For example, 17% of Royal Society University Research Fellowships are held in the UK by young postdoctoral researchers from 13 other countries. Not only does the UK continue to benefit from welcoming scientists whose strengths have been developed in other countries, but our scientific community gains from the knowledge created elsewhere.

For this reason, we must recognise that the UK benefits both directly and indirectly from a strong and healthy international scientific community across the world. The more diverse the community, the more fertile is the base from which groundbreaking ideas can spring. So, in the next 10 years, the UK should invest in international science and particularly in building the scientific capacity of developing countries that look to us for leadership and inspiration. In this respect, the UK scientific community and Government should embrace the contents of the report on scientific capacity building published earlier this year by the InterAcademy Council.

The next ten years will be an exciting time for international science, and a challenging one for UK science. We must continue to invest in the education and training of future generations of scientists, both here and abroad, nurturing their creative talent and providing them with the environment, tools and incentives to make the advances that improve the prosperity and quality of our lives.

In discussion the following points were made:

The reconciliation of effective accountability with a requirement for the minimum bureaucracy varies around the world to enable funding on a long-term basis. The procedures in the USA may take up to three times as long as those based on the UK-Scandinavian model where people get together, put up a proposal for peer review and a record is made of those involved and what they want to do and decisions are made, taking into account an assessment of the intrinsic qualities of the applicants. The backward-looking Research Assessment Exercise (RAE) in the UK, on the other hand, is much more bureaucratic, resulting in a large increase in the number of civil servants now required for self-serving and self-justifying administration and does not take adequate account of the personal qualities of those under review and it is to be hoped that 2007 will be the last one of that type.

The new Treasury funding for Science and Technology is based on the classical concept of capital plus labour combining to produce growth. However, new knowledge forms an integral part of this process and this is the quintessential activity that defines us as humans. We need to find young people, develop the science base and encourage innovation using the resources of the OST, the Treasury and members of both Houses of Parliament.

Although students tend to specialise at a younger age in the UK than in the US there is no evidence that US students are better informed. A lifestyle was described based on history and english at 12 years old that was transformed at the age of fifteen to one based on physics, chemistry, maths and engineering. There were no artificial barriers to this change in direction with the result that, at the age of 20, realistic science-based projects were being tackled; the whole educational process was streamed in every subject to ensure removal of all artificial restrictions to rapid progress. In the UK the only students who can still access such a traditional and effective system for promoting excellence and relevance to current needs for both students and society are those prepared to pay for private education. As elsewhere in the UK this infrastructure has unfortunately been dismembered.

For some people new information is never welcome, they know and like what they grew up with, but information is now more accessible than at any time hitherto and we are much more aware of problems that could arise in future. The demonisation of technology is one such case. If GM had been publicly funded and more focused on the needs of developing countries and more open to a better debate on the kinds of uses to which it could be applied, the outcomes could have been very different.