evidence for response in the face of new threats to public health and safety. A current example is in the development of guidance and plans to support the NHS in its preparations for a flu pandemic. The DH Health Scientific Advisory Group completed comprehensive reviews of evidence supporting the use of clinical countermeasures, publishing them in 2007.

Many of the innovations that improve the lives of Britons during the next sixty years are as yet unimagined. Much more certain is the knowledge that science – and scientists – will continue to be the bedrock of the NHS – as they have been for the past sixty years.

Science in Universities

Diana Warwick

Chief Executive, Universities UK

It is well known but worth repeating that the UK produces nine per cent of the world's scientific papers with a citation share of 12 per cent, second only to the US, and has continued to strengthen its share of the world's most influential papers. The UK's universities have underpinned this success, which has been achieved with relatively lower investment than competitors. The continued strength of research in the UK's universities is present across the sector in a full range of disciplines from engineering and physical sciences through to the arts and humanities.

Universities' research performance is closely linked to our country's future economic and social prosperity, with science and innovation rising up the list of priorities for political attention and public investment. For their part, the current Government has demonstrated political commitment through the substantial investment that has flowed from the 10-year Science and Innovation Investment Framework. Parties from across the political spectrum have recognised its importance. This is good news.

Much of the recent additional investment in university research has gone to sustain the research base. Termed 'full economic costing', the basic principle has been to sustain the volume of project-based research funding through the Research Councils, but to ensure that more of the costs are covered to allow universities to re-invest in their infrastructure. To some this might seem a mere accounting issue, but it has been fundamental in helping to turn around years of under-investment and set UK universities on a firm footing to take on the biggest challenges, with labs and facilities that are world class and fit for purpose.

The success of the UK's Higher Education Institutions (HEI) research has also been underpinned by another seemingly arcane, but nonetheless essential, policy – the dual support system. This provides public funds to institutions in two streams, one as part of their block grant provided by the devolved funding councils (known as 'quality related' or QR), and the other in the form of project-based grants provided by the UK-wide Research Councils. A key strength of this system is that the QR grant is unhypothecated – that is not restricted to a specific purpose – allowing university leaders the freedom to take strategic decisions about the research activities of their own institutions. This means that risky or more innovative research can be supported, when it might otherwise slip though the net.

Universities UK's 2006 publication, *Eureka UK*, outlined some of the most outstanding world-changing discoveries, innovations and research projects that have come out of UK universities over the past 50 years. Many of these developed from individuals or groups supported through QR funds. They were given time to evolve in supportive research cultures. Put simply, if UK universities are going to be able to continue to punch above their weight in an increasingly competitive international environment, they need the flex and dynamism that dual support affords them.

A sustainable and dynamic university system will mean that we can also improve the attractiveness of the UK to inward investors and potential partners, draw the best mobile talent, and capitalise on international collaborations. New knowledge can arise anywhere and international research collaboration is a direct means of accessing it and increasing the UK's strategic capability for innovation. A recent report by Universities UK shows that we are already doing well. UK researchers are hugely active in international collaborations and their number is 50% higher than 10 years ago. We cannot, however, be complacent. China, India and South Korea are now significant players in global science and innovation networks that channel flows of people, ideas and technologies.

Research in UK universities is not only strong internationally, but also relevant to business and public sector users at regional and national levels. Strength in this area comes from the diversity of the sector and universities have worked extremely hard to ensure that we do not miss opportunities to exchange knowledge that has the potential to underpin the development of innovative products and services that can benefit us all. The commitment to a permanent source of funding to help make this happen, through the Higher Education

Innovation Fund (HEIF), has been successful in stimulating knowledge exchange, business links and other forms of employer engagement such as continuing professional education.

There is little doubt that research in our universities underpins science and innovation. The challenge going forward will be to sustain the momentum of recent years and further strengthen our universities, in all their diversity. This will require ongoing political commitment. For their part the universities are committed to excel in all that they do and play a leading role in meeting the needs and challenges of the UK in the 21st century.

Diana Warwick (Baroness Warwick of Undercliffe) has been a Member of the House of Lords since 1999 and Chief Executive of Universities UK since 1995.

Engineering Skills: Investing in Tomorrow

Dr David Brown

Chief Executive, Institution of Chemical Engineers (IChemE)

For the past year or more, something of a wind of change has been blowing through the once-dusty corridors of the UK's engineering profession. Under a new generation of management, the professional institutions, once jealous of their independence and separation, have now come to work together – joining forces on a number of issues of common concern and common importance.

Uppermost among those issues is securing the 'talent pipeline' which underpins the current and future success of much of UK industry and provides a powerful magnet for exactly the kind of knowledge-based inward investment that Government has rightly made a priority.

Chemical Engineers are supposed to know about pipelines, and we in IChemE – The Institution of Chemical Engineers – have taken a lead in addressing this particular pipeline. In doing so we are building on a successful foundation: the 'WhyNotChemEng' campaign to promote chemical, biochemical and process engineering to young people has helped to increase application rates to universities by over 70% over a five-year period. Now, we have joined with the other engineering institutions under the auspices of the 'G15' group of Chief Executives, to develop a common understanding of the challenges at the 'upstream' end of the talent pipeline – the supply of young people trained in the science, technology, engineering and mathematics subjects – the STEM disciplines. Together, we have called for action on four specific topics.

Firstly, it's time that policy makers explicitly recognised that young people at secondary school should be taught STEM subjects by staff thoroughly trained and well-versed in the subjects that they are teaching – so physics is taught by a physicist, chemistry by chemists and so on. That of course means improved incentives to attract talented people into STEM subject teaching, including both financial incentives and other levers such as first-rate laboratories and physical resources, provision for continuing professional development and so on.

Secondly, we have called for increased incentives for young people not simply to take STEM subjects at university but subsequently to enter relevant careers. We have proposed that this could be achieved by a progressive write-off of student debt for those young people who enter appropriate industrial careers or indeed choose, ideally after a period of industrial experience, to move into teaching themselves. We are not averse to some graduates also going into general management and financial careers, since their skills are immensely valuable there and businesses by and large are likely to be better run with more engineering and technical understanding in the board room and through the management structure. But it's a supply of skill to technology-based industry and to education that most concerns us.

Thirdly, it is time for solid benchmark standards for careers support. If someone purporting to give you financial advice has to meet recognised standards that are properly enforced, how much more important is it that reliable standards of advice should also be available where advice concerns young people's careers?

Fourthly, and perhaps longest-term, we believe there should be a science 'spearhead' in every substantial primary school. Science co-ordinators are of course already in place, but they are not always science or engineering graduates, and we believe they should be. It's gratifying to see this latter proposal supported by the recent Conservative party policy paper on Innovation in the UK.

Meeting these requirements will not be cheap, nor will it be easily or quickly achieved. But the consequences of failure to invest in STEM education are, we submit, far more costly – and there is already evidence from research for UK Trade and Investment that the UK is losing ground in this vital area.+

+ Perceptions of the UK as a Science and Technology Partner, report by consultants Arthur D Little Ltd for UK TI, 2006