

# Engineering and Physical Sciences for the 21st century

*John O'Reilly, Chief Executive, Engineering and Physical Sciences Research Council*



Medical imaging, genetic fingerprinting, flooding prediction, energy efficient building design, the lasers used in CDs and DVDs, the optical fibres which have revolutionised our communications systems and enabled broadband internet access – these are just a few of the technological developments upon which we rely in our everyday lives that have resulted from breakthroughs in engineering and the physical sciences.

While the technology of today is based on knowledge we currently possess, future technology will be based on knowledge that we have yet to acquire – through research. The Engineering and Physical Sciences Research Council (EPSRC) is the UK's main funding agency for research and training in these areas and invests over £500 million a year in UK universities and other research organisations across a broad range of subjects from mathematics to materials science,

from information technology to structural engineering. Our aim is to ensure the UK is equipped with the research knowledge and expertise to maintain the UK's technological leading edge, build a strong economy and improve people's quality of life.

EPSRC supports more than 5000 research projects across a broad remit ranging from research on "optical tweezers" to enable the manipulation of individual molecules, to sustainable processing and manufacturing to address climate change; from the atomic scale intricacies of quantum computing, to the design of living areas which are less susceptible to crime.

However, the shape of science is changing and real world problems do not respect the boundaries of established academic disciplines. We are therefore increasingly working in partnerships with other Research Councils, with Government Departments and with industry to tackle the research challenges in areas such as energy (both the development of cleaner renewable alternatives to fossil fuels as well as technologies and processes to improve energy efficiency), climate change, transport, crime prevention and detection, information technology and communications and healthcare.



*The award winning David Wilson Eco-House on the campus at the University of Nottingham is a test bed for innovations in "green" living with EPSRC providing support for both research and public engagement.*

## Out of the labs and into society

One of the main strands of the Government's 10 year Framework for Science and Innovation is to ensure that the scientific knowledge generated by our universities is used by business to create wealth. Knowledge transfer is an integral part of our business. In the last decade more than 500 start-up companies have been formed built upon EPSRC sponsored research and more than 45% of our research grants involve partnership with industry and other external partners. We also promote industrial involvement in the training of our postgraduate students and the first employment destination of over 50% is industry, with the postgraduate students taking their newly acquired knowledge and skills out into the workforce.

For the future we believe that we can best contribute to improving the UK's innovation performance by seeking further to raise the appetite of business for research and high level skills, and acting as a catalyst for collaboration across the business/university interface.

## Training the next generation of scientists and engineers

Creating a workforce equipped with high level skills in engineering and the physical sciences is essential to drive discovery and innovation and position the UK as a key knowledge hub in the global economy. EPSRC is the largest supporter of PhD training in the UK in engineering and physical sciences; we currently support over 7000 PhD students who will become the next generation of research leaders in both industry and academia.

## Securing the future

The physical sciences and engineering are remarkable in their importance and pervasiveness throughout the economy. As identified in a recent report by the Science and Technology Policy Research Unit (SPRU), engineering and physical sciences related sectors account for 30% of UK GDP, 40%



*Thousands of people learnt about the science of bridges, birdsong, volcanoes and many more topics at the University of Bristol's "Science Alive" event held in Bristol's Galleries shopping centre, sponsored as part of EPSRC's Public Engagement Programme.*

of all investment and 75% of all industrial R&D.<sup>1</sup> In addition, much of the rapid and exciting research progress in biology, medicine and environmental sciences has depended on earlier breakthroughs in the engineering and physical sciences (eg x-ray crystallography and synchrotron radiation, amino-acid sequencers and bioinformatics) and this trend continues.

However, in engineering and physical sciences a decline in undergraduate numbers over recent years has resulted in a reduction in researchers and centres of research activity in our universities. As a result there are serious concerns that some areas of engineering and physical sciences research in the UK no longer have the capacity to produce the well-trained people and research leaders of tomorrow. Given the importance of engineering and the physical sciences to both the UK economy and other areas of research, urgent action is required.

As a result we have decided to take action in a new way and in partnership with the Higher

Education Funding Council for England (HEFCE) and the Scottish Higher Education Funding Council (SHEFC) we are working to secure strategically important research areas that are missing or "at risk" in the UK. We have recently introduced Science and Innovation Awards on a pilot basis and by February 2005 plan to award 3 to 5 large, five year grants to enable academic staff to be appointed to establish research groups in strategically important areas. A crucial part of the scheme is a commitment from the host university to continue to support the academic posts and activities after the end of the special EPSRC funding to grow and sustain research capacity in these key areas. However, this can only serve as the beginning and to have a real effect in halting the decline in research capacity a continuing programme of these awards is needed.

This initiative must be coupled with longer term activities to engage with young people about the benefits of science and engineering and the opportunities for pursuing careers utilising these skills. A distinct feature of Research Councils in this arena is the access that we have to a large number of active researchers who have an important role to play in promoting and discussing the outcomes of their research with the public. We are currently working with other Research Councils to ensure our researchers have the training, resources and opportunities they need to undertake public engagement activities. This includes a major programme to link young scientist role models with schools to inspire interest in science.

These are just the first of many steps that will need to be taken to reverse the situation and EPSRC is one partner amongst several that have a role to play if we are to ensure the UK has the research capability it requires to drive the next generation of technological change.

<sup>1</sup> "Engineering and Physical Sciences in the UK", G Crespi and P Patel, Science and Technology Policy Research Unit [www.sussex.ac.uk/sprutest/documents/pateleps.doc](http://www.sussex.ac.uk/sprutest/documents/pateleps.doc)

Further information about the Engineering and Physical Sciences Research Council and its activities is available from our website at [www.epsrc.ac.uk](http://www.epsrc.ac.uk)