RESEARCH IN UNIVERSITIES: INVESTING IN EXCELLENCE

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UK universities have built up a world-leading research base, with an exceptional record for the range and volume of significant new discoveries. This is due in equal measure to the efforts of our large group of excellent and highly committed researchers, and to the support given by our unique system for managing public research funding, in which HEFCE, the biggest single research funder, plays a key role.

Sustained public investment in research in universities and other higher education (HE) institutions has given the UK a national research system which is among the strongest and most productive in the world across a broad range of subjects, generating benefits to the national economy, to healthcare, and to national wellbeing and quality of life. In 2008 the UK, with some 1% of the world population, produced 8% of the published research papers in the world and accounted for 12% of citations including over 14% of the most highly cited papers in the top 1% globally.

Research-related income into universities from business and public services, which is a proxy for impact on the economy, was £1.7bn in 2009-10, and in addition 232 new businesses derived from university intellectual property were created.

In England, universities and other HE institutions generate research income totalling around £4.5 billion each year. Around a third of this is provided by the higher education funding council (HEFCE). A further third is government funding for projects and programmes through the UK Research Councils and the National Health Service. The rest comes from other sources, notably research charities and industry.

This mixed portfolio of public funding has played a crucial role in underpinning the past achievements of the national research base and in building the capacity for excellence in the future. The system emphasises excellence, by focusing funding where the capacity exists to produce world-leading research. At the same time it cherishes the principle that detailed decisions on what new fields of enquiry should be opened up, and how, are best taken by researchers and to the organisations in which they work building on their substantial engagement with research users. By providing parallel streams of funding with differing purposes this system ensures that support is available where it is needed throughout the research cycle.

HEFCE research grant, which totals around £1.5 billion per year, is not tied to stipulated purposes or activity. It is allocated selectively, in a way that provides a powerful challenge to achieve excellence: following assessments every few years, funding is allocated to those universities and departments that have demonstrated the capacity to produce research of internationally excellent and world-leading quality. Our future allocations will depend on the next assessment (the 2014 Research Excellence Framework), which will place increased emphasis on evidence that research outcomes have delivered benefits in the world outside. Universities are able to apply this funding wherever they see a need, and which is not met from other sources. Chief among these needs are maintaining a research environment and infrastructure conducive to excellence; making room for early stage, speculative enquiry into wholly new fields and lines of research; helping to support the training of young researchers and of PhD students; and more generally supporting and encouraging a culture in which researchers and universities take responsibility for ensuring that the full potential benefits of research are achieved in practice. Examples of HEFCE-funded projects are given in this article.

Our grant also gives universities the freedom to start enquiry into new fields. The most important discoveries all grow from the moment when a researcher (or a group of researchers) think of an entirely new question, or a new way of approaching an existing question, and devote time and effort to devising ways to answer it. Typically it is only at the stage when a question or field has been defined, and there is some agreement that a particular line of enquiry may help to take it further, that project funding can be obtained from other sources. In this way core research funding complements Research Council, Charity and Business funding, ensuring that the latter can be directed to the strongest performers with the highest probability of a successful outcome.

Excellent research is produced by excellent researchers, and requires continuing efforts to maintain a steady stream of new talent. For even the most gifted aspiring researchers, it is a major challenge to make the transition from completing their research training at postdoctoral level through to becoming recognised, years later, as a research leader taking forward their own programme of work. Support is available from a number of sources (for instance, funding for research fellowships from the Wellcome Trust), but for many the best immediate prospect is that their university

will provide them with a salary for a period while they find their feet. Universities are allowed and encouraged to fund such activities from HEFCE allocations.

An excellent and sustainable research base will make strong provision for the early stage of research training too. Students training for a PhD are important both as the first stage in growing new research talent: whether to work in universities or elsewhere; or as a significant contribution to a skilled, flexible and creative national workforce. Only a minority of those obtaining doctorates will go on to work in academic research, but all will have acquired valuable and transferrable skills and experience that they can apply to positive effect throughout their working life. PhD students draw financial support from a range of sources; but the HEFCE grant contributes to the cost of supervising all students, including those who have no other funding, and gives universities the flexibility to reduce or waive fees for promising students who have not been fortunate to secure significant support from an inevitably limited range of other sources.

Even world-leading research is of limited value if it is not shared, whether with other researchers or with those outside the academic sphere who could apply it to positive effect. Our funding and assessment arrangements support this sharing process in several ways. A major focus of our recent activity has been on identifying and celebrating the very broad range of ways in which the outputs of research can make a difference – to economic activity, to healthcare and quality of life, and to social wellbeing. The Research Excellence Framework now incorporates a significant component designed explicitly to give credit where universities have contributed to ensuring that their research has made a difference in any of these spheres. Our funding also supports a number of initiatives to help universities to harness the potential of the internet, such as supporting innovative provision for sharing and preserving research outputs and their underlying datasets.

WHAT NEXT?

The national research base is currently in very good shape, following sustained government investment through HEFCE and other bodies as well as the contribution of the research charities and business and industry. The announcement in December of funding allocations for science and research covering a four year period has provided a welcome and helpful element of stability, giving universities the ability to plan ahead with some confidence. Nevertheless, a number of significant challenges are emerging to which the research base must respond. Research at the highest level is increasingly a highly competitive globalised business with a limited available workforce, and a number of other countries are now investing heavily in building their national systems. At the same time, much of the most exciting research is undertaken as a group activity and running across established disciplinary boundaries, and much cutting edge science requires the provision and regular updating of increasingly complex and expensive equipment. HEFCE remains committed to working with other funders of research, and with our partners within higher education, to ensure that the UK research base is able to meet these challenges and to retain its position as a major source of world-leading and life-enhancing discoveries.

CASE STUDIES

Lancaster University - Targeting treatment for tropical disease

River blindness (onchocerciasis) is a major health problem in wet tropical regions. To tackle it, the African Programme for Onchocerciasis Control (APOC), co-ordinated by the World Health Organisation across 19 nations, has treated more than 30 million people with the drug Ivermectin. Ivermectin, however, can cause adverse reactions when given to people who also have the infection 'eye worm'. APOC therefore takes precautions before mass treatment with Ivermectin, and spatial statistical modelling at Lancaster University is helping treatment to be better targeted. Development of international partnerships such as this can take several years and therefore will depend on stable funding. The real-world impacts are clear: Lancaster's collaboration advances knowledge in tropical diseases and saves lives.

University of Birmingham - Systems Science for Health

Systems Science for Health (SSFH) is a new research initiative at the University of Birmingham. Launched in 2010, and underpinned by investment from HEFCE. It exploits state of the art technologies and high performance computing to unravel mechanisms of complex diseases, discover new diagnostic markers, and ultimately improve patient treatment and care. The initiative creates a new interface between three research communities at the University of Birmingham: 'omics' research (metabolomics in particular); bioinformatics & modelling; and biomedical & clinical research.

Omics technologies allow rapid analyses of thousands of biomolecules to discover diagnostic markers for disease or to measure the therapeutic responses of drugs on the body's tissues. Consequently the amount of data generated is vast, and high performance computers with mathematical modelling are required for the data analysis.

University of Sheffield - Magnomatics

For more than a decade the University of Sheffield has been exploring the possibilities of using high-energy permanent magnets for novel non-contact magnetic gearboxes. Following initial research, funding was awarded to drive the technology forward, and it can now be applied in sectors such as aerospace, hybrid-vehicles and the renewable energy sectors. A spin-out company, Magnomatics was established in 2006 to commercialise the research findings. This has gone from strength to strength, including contracts by the MOD and projects with European vehicle manufacturers. This commercial success has its genesis in the speculative research undertaken in 2000.