The Russell Group of Universities

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SUBMISSION OF EVIDENCE FOR THE HOUSE OF COMMONS SCIENCE AND TECHNOLOGY SELECT COMMITTEE INQUIRY: THE IMPACT OF GOVERNMENT SPENDING CUTS ON SCIENCE AND SCIENTIFIC RESEARCH

Introduction

The Russell Group is an association of 20 major UK research-intensive universities. Collectively Russell Group universities represent 12% of the higher education sector by number and account for a significant proportion of the UK's research base, employing 40% of academic staff and educating 56% of PhD students. Russell Group universities are successful in winning the majority of the competitively available funding for research from a wide range of sources. Approximately two thirds of research funding going into the university sector is won by Russell Group institutions including 63% of research grants and contracts from UK industry and commerce.[1]

The UK's leading universities are one of the country's success stories. The UK is second only to the US in terms of research productivity and punches well above its weight although the UK public and private expenditure on R&D still lags behind many other G7 nations. Leading research-intensive universities provide a concentration of talent, state-of-the-art facilities teaching and research, and offer a stimulating, competitive and progressive environment to enable them to:

- Generate a significant volume of excellent research
- Provide first-class research-informed teaching at undergraduate level
- Deliver high-quality postgraduate training, enabling PhD students to work together alongside researchers of an internationally defined calibre
- Act as a focal point for clusters of knowledge intensive business activity
- Stimulate inward investment
- Offer international leadership and access to international research networks
- Promote and facilitate international research

Russell Group universities are international institutions, whose research and teaching has a major impact on the UK economy. Russell Group universities[2]:

- Have an estimated total economic output of £25.3billion per annum
- Are responsible for supporting 237,000 jobs UK-wide
- Are a successful UK export industry, with overseas earnings of £3billion per annum

Maintaining an environment within the UK which is conducive to science, research and innovation is essential not only for the success of the economy but also to enabling the UK's world-class universities to compete for academic talent, the brightest students and R&D investment from the private sector, charitable and other sources. This is recognised in Government's framework for higher education, "*Higher Ambitions*" which states "A key asset in attracting researchers and maintaining the critical mass of our research activity is our clear

[1] 2007-08 HESA data show that 68% of Research Council funding going into the HE sector was won by Russell Group universities, with Russell Group universities also securing 62% of Funding Council investment.
[2] Data derived from the Universities UK report "The Economic Impact of HEIs"

public commitment to science and research. Stable government funding and support provides an essential foundation for science and research base to plan and grow".

The Russell Group agrees, and welcomes the Government's commitment in "*Higher Ambitions*" to the dual support system for research and to the public funding of teaching via independent Funding Councils. These are fundamental components of the UK HE funding framework and are necessary to enable universities (and other funders and collaborators) to plan, invest, and develop sustainable partnerships over appropriate timescales. They are also critical to maintaining UK and international stakeholder confidence in the HE sector.

Whilst this inquiry focuses on the impact of government spending cuts to science, engineering and technology, the Russell Group would like to emphasise that the cuts announced by the government to universities, science and research budgets will inevitably have a significant impact on teaching and research across the academic spectrum. The points raised below about the impact of these funding cuts and the importance of concentrating limited public funds on the very best UK research and teaching in order to maintain the UK's world-class research base are as applicable to the arts, humanities and social sciences as they are to STEM subjects.

1. The process for deciding where to make cuts in SET spending

1.1 We recognise that the Government has made major increases in investment in higher education and research since 1997. This increased provision has included substantial uplifts to the STEM-focused Research Councils, preferential weighting of STEM subjects in the Research Assessment Exercise (RAE), and an additional £75M in funding from HEFCE over the years 2007-08 to 2009-10 to support the provision of very high cost laboratory subjects (chemistry, physics, chemical engineering and mineral, metallurgy and materials engineering). This additional funding has helped Russell Group universities to maintain high quality research and research-led teaching in these critically important subjects.

1.2 The cuts in public spending for HE and research announced in October 2008, in the 2009 budget, and in the pre-budget report, and the annual grant letter to HEFCE in December 2009 amount to some £915M. In December the STFC also announced cuts of around £28M per annum to its programmes in order to balance its books. These cuts, which follow cuts to some departmental R&D budgets and other reductions such as the loss of funding for the Overseas Research Students Awards Scheme in England and Wales, are cumulatively eroding the sustainability of the UK's leading universities. This is damaging their ability to compete for resources and talent on the world stage and will in time undermine UK competitiveness. Public finances are likely to be squeezed substantially after the general election and the outlook for universities is grim.

1.3 It is worth emphasising that whilst the UK is cutting its public investment in universities, many competitor countries are substantially increasing public investment in HE and research and concentrating this funding on centres of excellence. Countries such as the US and France are investing in higher education as a means to prompt a swift, but sustainable, recovery from recession, recognising that research underpins innovation and long-term economic growth. Other countries, such as China, Korea, Taiwan, Canada, Denmark, and Germany, are investing selectively to create or strengthen world-class universities with the aim of challenging the existing world leaders for academic talent, students and resources, ultimately boosting their nation's economic productivity.

1.4 In this climate, where resources are under pressure and international competition is intensifying, public investment must be prioritised on strengthening research centres with world-class capability. "*Higher Ambitions*" states that this approach is necessary to protect the UK's international reputation for research excellence and to enable the UK to compete successfully to attract the world's best researchers, brightest students,

and inward R&D investment. The framework emphasises the need to support and protect the UK's "strongest, world-leading centres of research" and that this should mean more concentration of research and resources.

1.5 The Russell Group supports this view and believes that it is important that SET policy and funding models reflect this approach. This includes the REF assessment methodology, as well as in the methods subsequently used to allocate QR funding in England, Scotland, Wales and Northern Ireland.

1.6 We believe that discussions about strategic priorities for public investment in higher education, science and research should continue to be based on solid evidence and analysis, and discussed in partnership between government, research funders, business, and universities via Funding Council boards, Research Councils' governing bodies, and national entities such as the Funders Forum and the Council for Science and Technology. This model has, on the whole, worked well over the last 10 years. If further cuts in HE and research budgets cannot be avoided, robust strategic thinking and re-prioritisation must be applied across the UK research base. Early dialogue and debate will help universities and other stakeholders to manage the risks more effectively and to assess impacts, revise strategies, and re-prioritise objectives.

2. Evidence on the feasibility or effectiveness of estimating the economic impact of research both from a historical perspective (for QR funding) and looking to the future (for Research Councils grants)

2.1 Government support for basic research is an essential part of the UK innovation system. Public investment in research generates a huge range of beneficial outputs and impacts which underpin and contribute to the UK's long-term economic growth, well-being and quality of life. Government also has a vital role in creating a policy and regulatory environment and providing signals and incentives to enable excellent research and innovation to flourish. The introduction of measures to evaluate economic impact more systematically and to use this information to inform the distribution of public funding is a significant policy development in this context.

2.2 As successful competitors for a substantial volume of public funding, Russell Group universities share a commitment to ensuring that the outputs from their research are disseminated widely across the academic sector and beyond, and that efforts are made to ensure that this research ultimately has an impact – whether this be on teaching, society, culture or the economy. Further information about these impacts is available in our forthcoming publication "*The economic impact of research conducted in Russell Group universities*."

2.3 Whilst it is appropriate that future public investment in research recognises and rewards these efforts, the quality of research must remain the paramount criterion used to determine how funding is distributed if the UK is to maintain its world-class research base. It is essential that both sides of the dual support system continue to stimulate, incentivise, and fund excellent, novel, high-risk fundamental research. It is important that the introduction of impact assessment does not result in a shift in funding to more conservative or more applied research or give this perception. This matters because evidence suggests that the highest quality research, particularly basic research, is likely to have the most significant social and economic impact over time. For example, from the Russell Group's recent analysis of a number of commercialisation case studies, it is clear that the majority of highly successful licences and spin-out companies from Russell Group institutions have emerged from long-term curiosity-driven research.

Impact assessment in the REF

2.4 The only realistic way to evaluate the impacts of research is post-hoc, after the research has been completed; outputs have been peer reviewed and disseminated;

and intermediaries or potential users have utilised, transformed, or integrated the knowledge arising from the research into product or policy development or some other kind of development activity. The timescale and nature of this process is unpredictable, lengthy and often convoluted.

2.5 A variety of methods for evaluating the impacts of research have been developed including econometric or statistical analysis, bibliometric and citation analysis, use of indicators, expert review, network analysis and/or case studies. In selecting a method it is important to consider when impact should be evaluated (how long after the research was conducted) and at what level of aggregation (e.g. at the level of a programme, research organisation or subject area). The answers to these questions will depend on the purpose of the impact evaluation, for example the need to demonstrate the overall benefits of public investment in research; to review the effectiveness of an area of research, programme or institute; and/or to inform future investment decisions.

2.6 In the US, assessment of the wider economic and societal benefits of research is a common feature of post-programme or periodic subject reviews undertaken by federal research funding agencies or learned societies. Such reviews nearly always use a case study approach to track and estimate the economic impacts of technologies or areas of research over time and are primarily used for STEM research e.g.

- National Institutes of Health economic studies program (http://ospp.od.nih.gov/ecostudies/)
- American Council for Chemical Research study "*Measuring Up: R&D Counts for the Chemical Industry"* (http://www.ccrhq.org/publications)
- Department of Energy study of the economic impact of fossil fuel and energy efficiency R&D (http://www.nap.edu/catalog.php?record_id=10165)
- National Institute of Standards and Technology "*Toolkit for Evaluating Public R&D Investment*" (http://www.atp.nist.gov/eao/gcr03-857/contents.htm)

2.7 In the UK similar approaches are utilised by the Research Councils, learned societies and universities to evaluate and demonstrate the economic impacts of programmes, institutes and areas of research e.g.

- Wellcome, AMRC, MRC study "*Medical Research: What's it worth*?" (http://www.wellcome.ac.uk/About-us/Publications/Reports/Biomedical-science/WTX052113.htm)
- University of Cambridge study "*A tale of two innovations – making an impact*" (http://www.research-horizons.cam.ac.uk/researchnews/-p-a-tale-of-two-innovations--p-.aspx)
- NERC study "*The economic benefits of environmental science*" (http://www.nerc.ac.uk/publications/corporate/economic.asp)
- AHRC study "*Leading the world – the economic impact of UK arts and humanities research*" http://www.ahrc.ac.uk/About/Policy/Documents/leadingtheworld.pdf

2.8 These kinds of studies are primarily a means to demonstrate the long-term benefits of public investment in broad areas of research, although the methodologies employed can also be used to evaluate the long-term impacts of an institution or a large research programme. These approaches are not well suited to use in the REF because they tend to be tailored specifically to the research being evaluated; are time consuming and expensive to undertake, requiring the development of in-depth case studies and the application of specialist economic or statistical analysis; and tend not to be concerned about the attribution of research impacts to university research groups – a key requirement of REF impact assessment.

2.9 The Russell Group response to the Funding Councils consultation on the REF, states that "it is important that the REF encourages researchers to consider and pursue effective means for exploiting their research whilst avoiding perverse incentives which could discourage novel, unorthodox, or high-risk research" – including the establishment of new research groups or collaborations. We support the inclusion of

an element of impact assessment in the REF in principle, provided that a robust methodology can be developed, which commands the confidence of the HE sector, research users and other stakeholders. The Russell Group has specific concerns about:

- **Defining "impact":** the Funding Councils need to define what constitutes "impact" and how this differs from the assessment of "significance" under the research outputs component of the REF. Based on the experience of the impact pilot projects, the Funding Councils should develop and issue clear advice to the sector about the definition of "impact" and give a range of examples

- **Linking impacts to excellent research**: because the purpose of the REF is to evaluate research excellence and facilitate the allocation of QR (rather than to evaluate and fund knowledge transfer or public engagement) it is essential that impact assessment is explicitly linked to research activity and research excellence. The impact pilot projects need to explore ways to enable the panels to verify that the impact statements and case studies submitted are based on excellent research

- **Attribution of impacts**: the exploitation of research is non-linear, often happens over a long period of time, and involves multiple organisations and individuals, many of whom are beyond the influence of the original researchers or their institutions. The Russell Group believes that it is essential that impacts are rooted in the research portfolio of the submitting unit i.e. it is not acceptable for a third-party institution to able to take someone else's excellent research, carry out non-research activity to exploit this (e.g. collation of research findings) and then be able to claim the impact as part of its REF submission. The Funding Councils will need to address this issue and that of attributing impacts from collaborative research and consortia as part of the impact pilot projects

- **Assessment period**: a number of studies (such as the Wellcome, AMRC and MRC study) show that the period from research to impact is often in excess of 20 years. As such we believe that the period of 10-15 years proposed in the consultation is too short and would prefer each panel to be given the flexibility to determine what is appropriate in each discipline, subject to guidance about minimum timescales. If a standard period is to be set then this should extend to 20 years after the original research was conducted

- **The burden of impact assessment**: The Russell Group has concerns about the volume of work likely to be involved in the development and assessment of impact submissions. For example, if HEIs provide one case study for every five FTE submitted this would equate to around 890 impact statements and case studies in the engineering unit of assessment (UoA). Given that impact assessment is being introduced for the first time it will be important to evaluate the bulk of the evidence submitted, and to demonstrate that a sufficiently broad group of expert users have been consulted to enable realistic judgements to be formed about the reach and significance of the impacts.

2.10 11 Russell Group universities are participating in the REF impact pilot projects and are working with the Funding Councils to address these challenges and develop a credible and practical impact assessment methodology. Although these pilots should go a considerable way to exploring and addressing the theoretical and practical challenges of developing and using impact assessment, these cover only 5 UoAs and outputs from this exercise are by no means certain. Since impact assessment is a new and untested component of the REF with no pre-existing methodology we believe that we believe that impact should be introduced at a maximum level of no more than 15% in the first REF. This should be accompanied by a commitment to review the relative weighting of impact in subsequent REF exercises in the light of practical experience. This will help to manage the risks associated with introducing a new and potentially destabilising element into the REF and to help build the

community's confidence in impact assessment. More detail is provided in the Russell Group's response to the Funding Councils on the development of the REF at: http://www.russellgroup.ac.uk/russell-groups-policies/

Research Councils' impact assessment

2.11 Funding research and postgraduate training, and promoting and supporting the exploitation of research outcomes to contribute to the economic competitiveness of the UK are core parts of Research Councils' missions. As such it is both reasonable and necessary that the Research Councils should seek to evaluate the economic impact of their investments at a suitable point in time after the research has been completed, reviewed and disseminated. However, as indicated above, we do not believe that it is always possible to predict the future impacts of basic research before that research has been undertaken – if this were the case the proposed research would fail to meet the peer review criteria for excellent, innovative research.

2.12 Research Councils UK has published a statement entitled "*Expectations for Societal and Economic Impact*" which states that Research Councils expect award holders to "identify potential benefits and beneficiaries from the outset, and through the full life cycle of the project(s)". In April 2009, Research Councils introduced a new peer review requirement asking applicants for funding to predict who is likely to benefit from the proposed research, how they might benefit, and the kinds of steps which might be taken to increase the likelihood of the benefits being realised. Applicants are also required to produce an impact plan describing how the potential impacts of research will be realised. Writing in THE, Professor Alan Thorpe, the chair of RCUK, said that "Impact plans are not designed to ask peer reviewers or applicants to predict future benefits; they are intended to ensure that applicants consider potential pathways to impact."

2.13 Whilst the Russell Group agrees with the RCUK chair that it is vital that the sector and funders work together "to make a strong and persuasive case for continued investment in research by the taxpayer", it is evident that the only reliable and effective way to demonstrate the economic impact of research investments is to evaluate this after that research has taken place. It is reasonable to encourage recipients of Research Council funding to consider who the eventual beneficiaries of their research might be, and where appropriate, to take steps to engage potential users and beneficiaries during the lifetime of the research. However, given the long-term and unpredictable pathways of research exploitation and substantial differences in exploitation patterns in different subject areas, predicting who these beneficiaries might be will not be feasible in every case and applicants should not be encouraged to provide spurious information.

2.14 The Russell Group is continuing to follow closely the changes introduced by the Research Councils. We are reassured that the guidance issued by Research Councils to applicants and reviewers makes it clear that research excellence remains the primary criterion for the peer review of proposals. We are also reassured that some Research Councils (e.g. ESRC) have given clear statements that excellent research proposals with no obvious or immediate societal or economic impact will not be disadvantaged in the peer review process and would like to see this message reinforced by all of the Research Councils. We would like to see greater clarity and consistency from Research Councils in their communications about impact and expect them to monitor closely and report how the introduction of impact statements affects both applications submitted and peer review decision making to ensure that it does not stifle funding for novel, unorthodox or highly innovative research.

3. The differential effect of cuts on demand-led and research institutions

3.1 Many of the funding cuts summarised in paragraph 1.2 are very recent and their full impact on individual universities and programmes may not be known for some time.

For example, it remains to be seen how HEFCE will choose to operationalise the cuts announced in the December grant letter, and the impacts of this will not be clear to individual English universities until they receive their annual grant letters in March. However, HEFCE has already announced that it will achieve some of the necessary savings through the withdrawal of targeted allocations within its teaching funding. This funding currently provides additional support for the costs of old and historic buildings and some postgraduate taught courses. Russell Group institutions stand to lose to £30M per year from the withdrawal of these allocations.

3.2 Research-intensive Russell Group universities already have diversified income streams and continue to perform extremely well in the international sphere despite the disparity in resources compared to competitor institutions in the US and elsewhere. The potential impacts of the announced cuts in public funding will fall across all elements of university activity and individual universities will choose how best to manage these impacts in light of their mission objectives. In the current climate it will be increasingly difficult to secure additional funding from private or charitable sources and cuts could potentially impact on ability of Russell Group universities to compete internationally for researchers, students and resources at a time when international competition is increasing as a result of very substantial increases in investment in research and postgraduate funding across the US, Europe and in Asia. Potential impacts are summarised below:

Impact on research and collaboration

3.3 It is too soon to determine what the impact of £915M of funding cuts to HE and research might have on Russell Group universities. Although the Secretary of State's letter to HEFCE indicated a desire to protect research funding, HEFCE has already agreed a reduction of £16M in QR in 2010-11. This could impact on charity support or business research (both of which have a strong STEM focus). Cuts to the HEFCE capital investment programme for research are likely to mean that some Russell Group universities will have to reschedule infrastructure renewal and development unless alternative funding can be accessed e.g. the planned new biological and life sciences building for the University of Bristol.

3.4 Russell Group universities use their competitively won public funding to lever substantial income from commercial, charitable and other funders for collaborative research and for teaching. As well as the obvious impact of being able to support less research and invest less in research infrastructure, reductions in the public funding available for research creates uncertainty amongst researchers and their collaborators, making it more difficult to build the trust and relationships on which successful collaboration and co-funding is based. Ultimately this could deter companies, charities and others investing in research in the UK. Uncertainties about future levels of funding and potential cuts also influence the mobility choices of researchers, increasing the likelihood that the best researchers currently in the UK may look to move elsewhere. It will also be more difficult for research-intensive universities to recruit and retain new talent from the UK and overseas. Attracting and retaining these individuals is crucial to the international competitiveness of research-intensive universities, and their continuing ability to win income for research from a diverse range of organisations.

Impact on recruiting postgraduates

3.5 The ability to attract the brightest postgraduate research students from the UK and across the world is important for Russell Group universities because it adds to an institution's research productivity, brings in new perspectives, builds foundations for future collaboration, and contributes towards creating an international environment which benefits all students. Overseas students also generate significant benefits in terms of fees income. Russell Group universities are competing for postgraduate talent in a global market place. Their competitiveness is based upon offering high

quality programmes which demonstrate high levels of student satisfaction and lead to students acquiring knowledge, competences and skills which they and employers value. Competition is fierce and many other countries are offering an education in English and financial incentives to attract talented postgraduates. The anticipated loss of £16M from QR funding could result in less funding for postgraduate support, and the cuts to capital funding for research will curtail investments in modernising laboratory facilities and equipment. This will compound the losses already being sustained by universities on some laboratory-based doctoral programmes and the loss of the Overseas Research Students Awards Scheme in England and Wales.

Impact on teaching

3.6 At the present time the major cost pressure on universities is the funding for teaching and student support. Research-intensive universities face specific cost pressures on teaching. Russell Group universities seek to provide research-informed teaching delivered by leading academics, providing access to top quality equipment and resources whilst maintaining a low student:staff ratio. This kind of educational experience is costly, particularly for laboratory-based subjects. The case study at section 9 gives an indication of the funding gaps involved. The additional funding from HEFCE to support high cost science subjects outside the mainstream teaching grant is currently due to end in 2009-10. The withdrawal of this funding will have very serious consequences for Russell Group universities, because in many cases the mainstream teaching funding fails to adequately recognise the full cost incurred in teaching laboratory-based science subjects.

3.7 Whilst BIS has sought to minimise the reduction in teaching grant funding, the reductions in the capital budget for teaching will impact on universities' abilities to renew and upgrade laboratory facilities and equipment, libraries, collections, and other teaching and learning facilities which underpin high-quality undergraduate provision. Capital projects are likely to be scaled back or postponed. This is likely to disproportionately impact upon STEM subjects which are more dependent upon access to expensive laboratory facilities and equipment.

3.8 Russell Group universities have a strong track record in increasing cost effectiveness and are focused on pursing new and innovative ways in which to deliver greater cost efficiency and higher levels of productivity. For example, by leading or participating in a number of HEFCE's feasibility studies to investigate innovative uses of shared services and resources. Russell Group universities recognise that their administrations will need to continue to respond flexibility to these challenging and changing circumstances, with a renewed emphasis on sustainability and drive for efficiencies across all parts of their business. As noted by Price Waterhouse Coopers in their report "*Weathering the Storm: Coping with financial challenge in the HE sector*", many of the "easy" savings have already been realised. The extent to which further efficiency savings can be made without a negative impact on the teaching quality or the international research competitiveness of the UK's leading universities is questionable. The continued drive for improved efficiency has the potential to be counter-productive, if, for example, it results in the loss of ability to attract and retain leading academic staff and the brightest students.

4. The implications and effects of the announced STFC budget cuts

4.1 Russell Group universities competitively win around 70% of STFC's annual research grant funding to the university sector (£96M in 2007-08) and host many of the UK's leading particle physics and astronomy research groups (66% of research active physicists in UK universities are at Russell Group institutions). Russell Group universities are also major players in the provision of postgraduate education in the areas supported by STFC e.g. 11 out of the 19 UK HEIs offering postgraduate provision in astronomy and space science are Russell Group institutions, as are 5 out of 6 UK HEIs offering postgraduate nuclear physics, and 9 out of the 16 HEIs offering

particle physics at masters or doctoral level. 69% of postgraduate research students studying physics or astronomy are at Russell Group universities.

4.2. We commend the efforts of STFC to consult widely with the academic community as part of its latest prioritisation exercise and welcome the clear statement given by the Council about its future priorities. The budget cuts however are substantial and the loss of excellent research that would have been supported is regrettable. These cuts and the continuing uncertainty about the future funding of the particle physics and astronomy research in the UK have a number of implications for Russell Group universities.

Impact on research, collaboration and the UK's reputation as a partner in international particle physics and astronomy projects

4.3 The withdrawal of funding from a number of international projects will have a major impact on the UK research groups working on these projects (e.g. researchers at the Universities of Glasgow and Edinburgh contributing to the anti-Proton ANnihilation at DArmstadt (PANDA) project, and the researchers at the University of Birmingham who are the only UK group involved in Accelerators and Lasers Combined Experiments ALICE, one of the major experiments at the Large Hadron Collider). Withdrawal from these projects hampers the ability of UK research groups to lever new funds for collaboration and also raises questions about the reliability of the UK as an international partner, which will inevitably colour negotiations for future international research projects.

Ability to attract and retain leading physicists and astronomer

4.4 The Russell Group was critical of STFC's decision to cut 25% of its funding for postgraduate students and fellowships from 2010-11 because of the adverse impact on students and early career researchers. The decision by STFC's Education, Training and Careers Committee to preserve as far as possible funding for PhD students and funding for advanced fellowships (for outstanding researchers) is welcome. However, this comes at the expense of support for early career researchers, with no postdoctoral fellowships being awarded in 2010, a move which could well drive UK talent abroad. Researchers in the particle physics and astronomy fields are highly mobile and a high proportion of those working in the UK are foreign nationals (the Institute of Physics estimates between 32%-40% of physics researchers in UK and Ireland are from the EU and 16%-20% are other overseas nationals). As the University of Leeds has indicated in its evidence, some astronomers and solar system physicists may leave the UK to pursue their research in countries where funding is more secure and where they will be able to work in research groups which continue to participate in international projects. Attracting high calibre replacements will be challenging in the current climate and some institutions may choose to withdraw from areas of research if the excellence cannot be maintained.

Ability to attract the brightest postdoctoral students

4.5 Paragraph 3.5 above outlines the importance of attracting overseas postgraduate students to Russell Group universities. Whilst STFC's recent decision to limit the reduction in PhD studentships from 25% to 15% goes some way to alleviating immediate concerns, sustainable, long-term investment in research, university infrastructure, and postgraduate education remains fundamental to maintaining the UK's reputation and market position.

Ability to attract students to study physics and astronomy at undergraduate level

4.6 Loss of researchers and expertise could curtail the breadth of undergraduate physics degrees in Russell Group universities, which are dependent upon research-informed

teaching. The funding cuts and their coverage may also deter students from pursuing courses in these areas. Russell Group universities report comments from parents and potential students about whether it is "worth studying physics or astronomy".

5. The scope of the STFC review announced on 16 December and currently underway

5.1 The Russell Group welcomed the announcement by the Science Minister of a review of the STFC. Academics from Russell Group universities are actively participating in the on-going debate. We would like the review to explore how best to determine the UK's strategic priorities for participation in major international research programmes and facilities and to look at alternative ways of funding UK participation to tension these priorities more effectively against support for the UK's research base. As indicated above, a solution needs to be found which enables priorities to be tensioned against each other strategically and does not simply result in the brunt of any currency fluctuations or cost overruns falling on university research funding simply because making cuts to university budgets is the simplest short-term solution for funding agencies.

6. The operation and definition of the science budget ring-fence, and consideration of whether there should be a similar ring-fence for the HEFCE research budget and departmental research budgets

6.1 The science budget is a unique, UK-wide source of public funding for fundamental, curiosity-driven research. Via competitive peer review it provides the UK's very best researchers with the funding, postgraduate research students, equipment and facilities to pursue cutting-edge research across the full range of academic disciplines. The public investment in the science budget is also a powerful lever helping to attract £1,540M of research investment into the UK HEI sector each year from business, charities, the EU and other overseas funders. The research undertaken with this funding generates new ideas and knowledge that will ultimately drive forward human understanding, deliver new products, goods and services, and inform public policy contributing to economic prosperity, quality of life and well-being. International comparisons show that UK universities are highly efficient centres of research, with the UK generating more citations per unit of R&D spend and more citations per researcher than any other G8 country. Maintaining investment in the science budget at a time when the private sector is scaling back investment in R&D and charitable funders are slowing or deferring research funding is essential to maintain the international competitiveness of research-intensive universities and their contribution to productivity and growth.

6.2 Research of this kind is by its very nature a long-term and incremental investment, which operates on a timescale beyond an annual budgeting cycle, a three year spending review or five year Parliament. The ring-fence around the Science Budget (and that around the single health research fund) provides a clear commitment of the Government's strategic intent to invest in basic research and enables Ministers, Government and academia to work together to define and commit to long-term overarching research priorities. This national commitment and broad predictability of funding (protected from short-term political pressures) gives academics, universities and potential research funding partners and collaborators from the UK and overseas a high-degree of confidence in the stability of the UK research environment. For private sector, charitable and overseas funders and collaborators in particular, stable, long-term public funding for research and research infrastructure lowers the risks associated with collaboration and is a critical factor in their selection of the UK as a partner of choice.

6.3 Universities are facing the challenge of operating in an environment where public funding will be tightened. Greatest pressure is likely to be around student support (see question 9) and maintaining the unit of resource for teaching funding. Enabling

research-intensive universities to continue to compete for and deliver excellent, basic research in this difficult environment is critical to achieving the Government's ambitions for maintaining the international competitiveness of the UK's research base. The ring-fence around the science budget provides a continuing guarantee not only to the universities, but also to funding agencies and potential collaborators of the long-term stability and security of public investment in the UK's research intensive universities.

6.4 Research funded by Government Departments is primarily commissioned for specific policy purposes and funded on a contractual basis. Whilst Departments and Research Councils collaborate to co-fund basic research in key policy areas, it is important to continue to maintain departmental R&D budgets to avoid further erosion of Science Budget funding for basic research. The Russell Group would like to encourage greater visibility of the funding available for research and greater transparency about the research priorities likely to be supported – particularly in relation to research which is subject to open competition or tender. Publication of information about the volume of funding available for research from individual departments and their agencies would be highly valuable, and would also help to encourage effective cross-government collaboration between departments, Research Councils and the TSB.

7. Whether the government is achieving the objectives it set out in the "Science and Innovation Framework 2004-2014: Next Steps" including, for example, making progress on the supply of high-quality STEM graduates to achieve its overall ambitions for UK science and innovation

Maintaining the UK's world-class university system

7.1 The RAE has been integral to enhancing the quality of the UK research base. The Next Steps document included recommendations to develop a metrics-based RAE to "maintain the UK's world-class university system".

7.2 The results of the 2008 RAE demonstrated that Russell Group universities continue to excel both in terms of the consistently high quality of researchers and also in the sheer volume of excellent research. Twice as much of the research conducted within Russell Group universities was rated as 4*, compared with the rest of the sector. However, the new methodology introduced in the 2008 RAE and subsequent allocation of QR funding in England and Wales saw a much wider dispersal of research funding across the HE sector than in previous years. A number of Russell Group universities saw a decrease of QR funding in cash terms of between 1% and 13%. In real terms, in 2009-10 half of the Russell Group of universities saw either a flat or reduced allocation of QR research funding compared to 2008-09. This means that despite a 5.6% increase in QR funding, only half of the Russell Group universities received any benefit from this increase despite the fact that most improved their performance, in some cases significantly e.g. LSE and the University of Manchester.

7.3 "*Higher Ambitions*" is clear that now more than ever the UK's research-led institutions have a crucial role to play in helping the country to recover from the economic downturn. It sets out the Government's commitment to supporting and protecting the UK's "strongest, world-leading centres of research", and recognises that in a climate of scarce resources public investment must be prioritised on strengthening research centres with world-class capability and that this should mean more concentration of research and resources. This is necessary to protect the UK's international reputation for research excellence and to enable the UK to compete successfully to attract the world's best researchers, brightest students, and inward R&D investment. The Russell Group believes that it is important that the REF reflects this agenda in its assessment methodology and in the methods used subsequently to allocate QR funding. The REF should recognise and reward the very highest levels of excellence in research, and should avoid driving a growth in volume of lower quality research.

7.4 Higher concentrations of research excellence help to maximise the impact of research and provide a rich environment for training and developing post-graduate researchers. Critical mass within an institution is also the foundation for innovative, interdisciplinary research collaborations that are key to solving global challenges. The REF needs to recognise and reward such concentrations of excellence, particularly where this involves interdisciplinary collaboration. More information is provided in the Russell Group's response to the Funding Councils on the development of the REF, as referenced at paragraph 2.10.

Improving STEM skills and the supply of scientists

7.6 Highly skilled STEM graduates are essential to the future prosperity of the UK. Recent government consultations,[3] as well as the wage premium which STEM graduates continue to command in the marketplace[4], show that demand for STEM qualified graduates remains high amongst UK business and industry. Employers continue to report difficulties in recruiting sufficient numbers of STEM graduates[5]. The Russell Group response to Sir Mark Walport's review of science and learning for DCSF sets out the concerns of our institutions about the supply of qualified applicants to STEM degree courses and provides evidence of the work that universities are doing with schools and colleges to try and address these issues[6].

7.7 The supply of STEM qualified graduates depends on the supply of students choosing to study STEM subjects at A-level or equivalent. Although the commitments made by the government in the Next Steps document were a welcome move towards boosting STEM skills, concerns remain about the continued long-term decline in the numbers of students studying core STEM subjects such as physics, chemistry and maths, at A-level. Over the period 1989 to 2008 entries have fallen by 22% in maths, 36% in physics and 13% in chemistry despite total A-level entries soaring.[7] Take up of A-level STEM subjects is showing some improvement with maths, further maths, physics and chemistry A-levels all seeing an increase in 2009 in both total number of candidates and those achieving grade A (Source: JCQ Results 2009). However, as a proportion of total A-level candidates, science candidates have remained largely static (*Source: Cambridge Assessment, A valid overview of entries in schools and colleges, 2009*). It is important that growth in numbers of A-level STEM entrants is maintained through reinforcing policy commitments, increasing the number of specialist STEM teachers and increasing the numbers students at state schools taking triple science at GCSE and then progressing to A-level STEM subjects:

- Despite small increases in the uptake of STEM subjects at A-level, this increase is skewed towards independent and grammar school pupils, where the number of students studying at least one STEM subject at A-level far outweighs the numbers at comprehensive schools.[8] This makes it challenging for Russell Group universities to recruit larger numbers of state school pupils into STEM courses where there is high demand and stiff competition for places. This remains a significant barrier to widening participation at Russell Group universities.

- Taking separate sciences at GCSE is an important stepping stone to progression and success in A-level sciences. However, there are inequalities of opportunity in this respect, with less than a third of non-selective maintained schools having pupils

[3] *The Demand for STEM Graduates,* DIUS, CIHE, ETB and IER, January 2009
[4] See, for example: (1)1994 Group (2008). *Graduate Employment and Earnings: are universities meeting student expectations?* London: 1994 Group; (2)PricewaterhouseCoopers (2005). "The economic benefits of higher education qualifications". Rates of return in comparison with those that left school with only two 'A' levels.
[5] Emerging stronger, CBI/Nord Anglia education and skills survey 2009; ABPI (2008) "Skills needs for Biomedical Research": http://www.abpi.org.uk/publications/pdfs/2008STEM_Skills_Report.pdf
[6] Russell Group response to DCSF consultation on science and learning, Sept 09
[7] JCQ entry trends - A, AS, AEA Tables
[8] Less than 1 in 10 students take 1+ science A-level in mainstream and science specialised schools compared with 1 in 3 at grammar and independent (Source: House of Lords Science and Technology Committee, 10th report of session, 2005/06, Science Teaching in Schools, Evidence from DfES .

taking separate or 'triple' science at GCSE[9]. The Government's commitment that all able[10] state school pupils will be afforded the opportunity of studying separate sciences at GCSE is welcome and needs to be reinforced to ensure that this opportunity is more widely available and take-up encouraged.

- High quality teaching in schools is also a pre-requisite to more able students going on to study STEM subjects at university. The Government's commitment to recruit more chemistry, physics and maths specialists into teaching is welcome. Equally important is that good teachers are retained in the profession. Progress in these areas is essential if all students are to have equal opportunity to learn science and maths from well-qualified, specialist teachers. The differences between schools can be significant. For example, physics teachers in comprehensive schools are far less likely to have a degree in physics than their peers in the independent sector. If disparities of this kind remain it will continue to be challenging for universities to recruit larger numbers of state school pupils to STEM degrees.

8. Whether the extra student support, which the Government announced on 20 July 2009 for 10,000 higher education places, delivered students in STEM courses

8.1 The Russell Group supports the Government's longstanding aim that more students should have the opportunity to benefit from going to university. However, to maintain the confidence of students, parents, employers and others in the value of a university education it is important that the high quality of the teaching and learning experience is maintained. Sustainable public investment coupled with prudent financial management in universities is needed to ensure that the quality of provision is maintained in the longer term.

8.2 STEM subjects such as chemistry and engineering are particularly expensive to teach because of the need to provide hands-on access to modern laboratory facilities and equipment. Many Russell Group universities are teaching these subjects at a loss (see case study below). Most English Russell Group universities decided not to take up the offer of extra student places for STEM subjects in 2009-10 because of the lack of additional government funding for teaching and concerns about the impact that this could have on maintaining teaching quality. Whilst this has delivered some limited growth in recruitment to STEM degrees, in the absence of corresponding funding from HEFCE for the teaching of these students, there remain serious concerns about the lack of sustainable funding for these places.

9. The effect of HEFCE cuts on the "unit of funding" for STEM students

9.1 The Secretary of State's Grant letter to HEFCE on 22 December 2009 outlined a further £135M of cuts on the overall funding council support for universities in England, on top of previous cuts of £180M which were announced for 2009/10. The combined effect of these cuts is a reduction in the HEFCE funded grant for teaching of £215M. According to the figures quoted in the grant letter, this will result in a reduction of the planned unit of resource from £4,140 to £3,950.

9.2 As indicated at paragraph 3.6 research-intensive universities face specific cost pressures on teaching. The case study below provides an example of the income gap which one Russell Group university has experienced in teaching chemistry.

[9] Coyne M, Goodfellow J,M *Report to the Secretary of State, DIUS, on universities' links with schools in STEM subjects* (September 2008).
[10] The commitment applies to all pupils achieving level 6 or above in science at key stage 2 (age 14)

Case study: the cost of teaching undergraduate chemistry student X at an English Russell Group university in 2007-08. The student:staff ratio for chemistry at this institution is just over 13:1

- Cost of teaching (per undergraduate FTE): £14,190 per annum

- Income received per student:
  - Funding Council grant: £7,500[11]
  - Tuition fee: £3,070
  - Total = £10,570 per annum

- Loss = £3,620 per undergraduate FTE per annum

(1) Based on HEFCE standard resource for chemistry in 2008-09 plus additional targeted allocations/weightings

9.3 The reduction in the overall unit of resource will only exacerbate this situation. Since STEM subjects receive funding within the HEFCE T-funding model based on a weighting of the 'standard resource' an overall reduction in the unit of resource could have a proportionately greater impact on these subjects. However, as indicated above, HEFCE has not yet indicated how it will make the savings that it has been asked to make in the teaching grant for 2010-11. Therefore, it is too early to comment on what the impact of those cuts will be on STEM education in particular. Moreover, individual institutions will make their own decisions concerning the budgets of individual science and other departments, based on the overall financial position of the university.

January 2010

[11] The Rt Hon Lord Mandelson, Secretary of State for Business, Innovation & Skills; Grant letter to HEFCE, 22 December 2009 (http://www.hefce.ac.uk/news/HEFCE/2009/grant1011/letter.htm)