

COUNCIL FOR
SCIENCE AND
TECHNOLOGY

Orchard 3
Second Floor
1 Victoria Street
London SW1H 0ET

Tel: +44 (0)207 215 1092
cstinfo@dius.gsi.gov.uk
www.cst.gov.uk

Professor Adrian Smith
Director General Science and Research
Department for Business, Innovation and Skills

1 July 2010

Dear Adrian

FUTURE SCIENCE SPENDING REVIEW

We welcome the opportunity for CST to input into the Science Spending Review. There are two major factors which we believe will govern the next Review.

The first is that the public expenditure environment is and will continue to be extremely challenging over the coming years and therefore the importance of making optimal choices will be even more important. The link between economic growth and the strength and quality of a nation's research base is well-documented¹. Greater focus will be needed to ensure that the most pressing priorities are addressed, the best researchers are supported, and that the benefits from earlier investments are fully realised. The second is that the UK's strong position in research will be significantly under threat in the next decade because of increasing competition from the rest of the world particularly North America, India and China. If our global research position declines it will impact on the UK's economic and social growth.

It is therefore important that discussions on the Science Budget should not reflect a purely UK perspective, but should take into account what our global competitors are doing to support their science bases. Our recent report *A vision for UK research* set out the economic stimuli packages for R&D announced by some of the UK's major competitors². World-class research and high quality teaching are crucial to enable the UK to compete successfully in global markets; if the UK's research position slips we will jeopardise the economic and social benefits arising from a world-class research base,

¹ CST report: *A vision for UK research*, March 2010 (available at www.cst.gov.uk); *The scientific century: securing our future prosperity*, Royal Society, March 2010; *Ingenious Britain: making the UK the leading high tech exporter in Europe*; a report by James Dyson

² For example \$21bn in the US and \$6bn in Canada for R&D, \$860m in China for R&D investment in companies - CST report: *A vision for UK research* page 15 (available from www.cst.gov.uk)

and the UK will be less of a magnet for overseas investment. Nor should discussions on the Science Base ignore the potential leverage that public sector funding for research has in attracting investment from other sectors.

We make two fundamental points:

- we welcome recent statements that spending on research will be protected. It will be important to have a long-term (10-year) commitment to the Science Budget, and while we recognise the current severe financial constraints we believe the UK's investment in research must be maintained and rise as our economic circumstances improve if we are not to undermine our international competitive position
- Government must put in place an overall Strategy to guide investment in our research endeavour, and help leverage in private and charitable sector investment

The Strategy must define a set of measures to ensure our research endeavour continues to be world-class, and provide a clear set of objectives to guide what will be difficult future funding decisions. It should not be a prescriptive attempt to micro-manage our research base. The components of such a strategy are in Annex 1. More details on these and the other points below are in Annex 2.

Making optimal choices in difficult financial circumstances means focusing on the best research and the best people across the whole research landscape. In this context the balance of funding across the different Research Councils and the Technology Strategy Board needs to be looked at urgently, in particular to ensure that priority areas of research and the capacity to realise the benefits of that research are supported. The opportunities for using public sector funding to leverage in charitable and private sector funding, and the balance between different areas of research - such as medicine, engineering and the physical sciences, and social sciences - should also be considered.

Governance of the Research Council system, robust in many respects, needs to be improved in two specific ways:

- in determining allocations between Research Councils both at the outset of the spending review and, more particularly, at later stages to enable any rebalancing of resources between Councils to be effected more quickly and easily
- by developing a common methodology on how Research Councils administer and fund grant applications, to ensure that they can more easily fund multi-disciplinary research and cross-Council programmes

New models for research collaboration are needed, in particular:

- developing cross-Council programmes which address the big challenges facing the UK and adopt a multi-disciplinary and interdisciplinary approach. Progress on cross-Council programmes has been good but it remains an area for further development, and one that needs to be protected. In particular we welcome the

involvement of government departments in some of the programmes and believe this should continue

- to ensure that access to existing large-scale research facilities are maximised and that any major new research equipment and resources are made available to the broadest research communities
- new and larger-scale research collaborations which are competitive at an international level, and which may need to involve structured inter-institutional collaboration between universities, other higher education institutes and research institutes to develop their full potential
- encouraging business to make a stronger pull on the outputs of research, and for the UK to increase its absorptive capacity by better exploiting research opportunities arising from outside the UK

Government needs to provide the challenge to universities, and to other higher education and research institutes, to collaborate better worldwide at an institutional level, and in ways that do not blunt their competitive edges. UK embassies and university and Research Council offices abroad have important facilitating roles here.

Universities need to position themselves to address this challenge. They need to ensure they have the right strategies and the highest quality people to initiate and take forward these new models of collaboration with their equivalents in the US, China, India and other emerging economies. There needs to be a rebalancing between teaching and research - research has tended to take precedence over teaching in universities and we believe both are important and that a better balance needs to be struck.

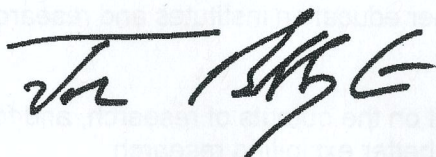
We have some further specific issues for the Spending Review:

- it is essential to continue the dual support system and maintain the separation between Quality Research (QR) and Research Council (RC) funding
- the distribution of upstream research funds (both QR and RC) should be done on the basis of excellence wherever it is found, as assessed by peer review
- excellence should be measured through both research achievement and the training given to researchers by their supervisors, and should focus on recent achievements not those from (say) 20 or more years ago
- there should be a focus on supporting well the very best researchers at all stages of their careers
- capability must be maintained as far as possible across all disciplines in the research base
- maintaining this capability will require a better understanding of the health of the disciplines and taking strategic decisions on whether particular weaknesses should be strengthened

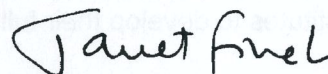
-
- *in extremis*, it may not be possible to support all disciplines to a high international level. Choices would then need to be made, driven by the Strategy

We are copying this letter to the Prime Minister, Vince Cable, David Willetts and Simon Fraser; and to Jeremy Clayton.

Yours sincerely,



Professor Sir John Beddington
Co-Chair CST



Professor Dame Janet Finch
co-Chair CST

A UK Strategy for research endeavour

This will need to articulate:

- longer term, stable objectives for the UK research base, and for its contribution to the economy and society
- the need to ensure a stronger UK research performance in the face of significantly enhanced global competition
- the need to invest in both upstream and downstream research
- incentives for attracting private sector and charitable investment
- the delivery of an appropriate regulatory and governance framework which allows research to flourish whilst maintaining public confidence
- how the UK can best realise the benefits of recent national investment in research infrastructure, including access to cutting-edge research infrastructure
- a commitment to attract and retain a significant number of the world's best researchers to undertake research in the UK, alongside the best home grown talent
- the relative emphases on *people* and *projects* in awarding grants
- the importance of supporting internationally competitive collaborations
- how to balance bottom-up research projects and top-down thematic programmes
- how to achieve balance between supporting research in specific disciplines and encouraging multi-disciplinary and inter-disciplinary research
- how to maximise economic and social impact of research

In order to implement this strategy it is vital that we have a diverse and sustainable university research base which can deliver:

- world-class research, across all disciplines, which can compete with the best in the world and which act as magnets for international business
- world-class capability across the spectrum of knowledge exchange and translational activities
- broader based and high quality collaborations within and between institutions, individuals and across disciplinary boundaries

-
- the capacity to support higher level skills development for the new industries and other developments stimulated by research
 - research leaders of the highest quality and capability

The Detail

The UK's international position in research

The starting point for the CST report *A vision for UK research* was the recognition that, whilst the UK currently holds a strong position in research internationally, this will be significantly under threat in the next decade because of increasing competition from the very big economies, especially India and China, which are investing heavily in research, as well as from the US which looks set to make further investments in the face of this new competition.

It is therefore important that discussions on the Science Budget should not reflect a purely UK perspective, but should take into account what our global competitors are doing to support their science bases. Our recent report *A vision for UK research* set out the economic stimuli packages for R&D announced by some of the UK's major competitors³. World-class research and high quality teaching are crucial to enable the UK to compete successfully in global markets; if the UK's research position slips we will jeopardise the economic and social benefits arising from a world-class research base, and the UK will be less of a magnet for overseas investment. The vitality of the UK research endeavour means attracting the best people. We argue that the UK must take this new global competition seriously and act in anticipation of it. It is important that the forthcoming Spending Review should recognise this and begin to address it.

This will entail Government, and its agencies, planning to spend public funds in a focussed way in order to address the future competitive environment. But it also will entail Government producing a sustainable vision which will lever out higher levels of private sector investment in research and development, as well as attracting high value global businesses to invest in the UK.

If this approach is taken, then the Spending Review also offers a real opportunity to signal to universities where particular emphases are being placed, to enable them to respond accordingly. One important message is that universities need to be more strategic in devising, winning and delivering large-scale cross-sector and multi-disciplinary projects, which will mean more collaboration within and between institutions, and more and deeper international collaborations.

Public investment in UK research: level and distribution

The CST position recognises that the public expenditure environment is and will continue to be extremely challenging over the coming years. We welcome recent statements that spending on research will be protected. It will be important to have long-term (10-year) commitment to the Science Budget, and while we recognise the current severe financial constraints we believe the UK's investment in research must be maintained and rise as our economic circumstances improve if we are not to undermine our international competitive position.

³ For example \$21bn in the US and \$6bn in Canada for R&D, \$860m in China for R&D investment in companies - CST report: *A vision for UK research* page 15 (available from www.cst.gov.uk)

We believe that it is of fundamental importance that the UK should develop a robust Strategy for research. This should then provide the framework for taking decisions about investments in the forthcoming, and subsequent, Spending reviews. The CST's recommended strategy would have the following features.

A UK Strategy

In difficult fiscal times, where hard choices will need to be made, it is particularly important that the UK's research endeavour is set within an overall Strategy. This should not be interpreted as a prescriptive attempt to micro-manage our research base and hence risk destroying serendipity. Rather, it should be used to define a set of measures to help ensure that our research endeavour continues to be world-class or world-leading, to help leverage in private and charitable sector investment, and to ensure we have a clear set of objectives to guide what may be difficult future funding decisions.

For further details on the Strategy and the university base see Annex 1 above.

Balance between Quality Research and Research Council funding

The dual support system is one of the UK's real strengths, and it is essential to continue to maintain the separation between Quality Research (QR) and Research Council (RC) funding. QR is vital to enable universities to be strategic and develop capability. RC funding is vital to support both researcher-led projects and research of national strategic importance. Equally it is important to ensure we do not freeze the current structures; we must maintain flexibility within the system so that they can respond to different sets of priorities over time.

Fund excellence

CST believes that the distribution of all up-stream research funds (both QR and RC) should be made purely on the basis of excellence wherever it is found, as assessed by peer review. Concentration may flow as a consequence of this but the openness of the system needs to be maintained. We firmly believe that any attempt to prior-select a group of institutions for research funding would be dangerous and lead to sub-optimal outcomes.

Excellence should therefore be the over-riding criterion as to whether or not a particular Research Council funds a particular research project or individual researcher. Identifying excellence will inevitably involve retrospective consideration, but the key will be to focus on recent history as a predictor of the future, and not be mesmerized by the achievements of (say) 20 or more years ago. Excellence should be measured through both research achievement and the training given to researchers by their supervisors.

There should be a focus on supporting well the very best researchers at all stages of their careers.

Allocation of funding between different Research Councils

CST recognises that the present distribution of funding between the different Research Councils has developed over many years for a variety of reasons and cannot

automatically be regarded as optimal for all time. In considering the appropriate distribution it is appropriate to take a number of factors into account.

Maintaining capability across the research base

It is essential that the UK maintains capability broadly across the research base, in order to ensure our global position as a leading producer of top quality research.

Such an outcome may not always be guaranteed if funding flows to projects and researchers purely on the basis of excellence. Therefore it is a proper role for government, through its agencies, to have a good understanding of the health of disciplines. However, this does not mean supporting second rate research in subject areas where UK research capability is weak. Rather it means taking strategic decisions about whether particular areas of weakness should be strengthened – and if so, enabling the training of researchers in outstanding research environments, which may be in other countries, in order to build capacity and capability.

Pattern of investments from a range of Funders

Making optimal choices in difficult financial circumstances means focusing on the best research and the best people across the whole research landscape. In this context the balance of funding across the different Research Councils and the Technology Strategy Board needs to be looked at urgently, in particular to ensure that priority areas of research and the capacity to realise the benefits of that research are supported.

It is also important to maximise possible interactions and synergies between the Research Councils, TSB and research, development and procurement budgets from other Government Departments. In health, the National Institute for Health Research (NIHR) is an important component of health research funding. The Office of Strategic Co-ordination of Health Research provides a governance mechanism that bridges and co-ordinates health research across the MRC, Department of Health and Devolved Administrations. When finances are tight, there is no excuse for not achieving the maximum value for money and synergy between the different sources of Government funding devoted to research, development and procurement. This is an area that needs reviewing.

Some disciplines have a variety of funding sources available, whilst others are dependent much more exclusively on public funding. Medical research has grown significantly and become more costly over the last ten years, and for obvious reasons. But successful outcomes in medical research often depend on high quality research from the engineering, physical and social sciences base. We know that the UK's international position in physical sciences is facing real competition⁴. The opportunities for using public sector funding to leverage in charitable and private sector funding, and the balance between different areas of research - such as medicine, engineering and the physical sciences, and social sciences - should be considered.

We recommend the Spending Review addresses these questions.

⁴ Evidence Ltd (2009) *International comparative performance of the UK research base*

Improve governance

If this kind of rebalancing is to take place, then the Research Councils collectively need to have the capacity to undertake it. It follows there must be a clear governance process in place to enable the Director General of the Research Councils (or equivalent) to make decisions on resources each Research Council will receive, both at the outset and during the Spending Review period if reallocations are needed. CST is not persuaded that present governance structures are optimal.

We recommend that this issue should be addressed.

Common allocation methodology

We also sense that over time the Research Councils have become rather disparate in how they each operate their funding regimes. For example, it appears that different Research Councils operate different methodologies for determining funding, making it very difficult, for example, to coordinate applications for funding which address bids to two or more Councils for cross-disciplinary work. We do not believe this is a sustainable approach, not least as it risks severely limiting the ability to move resources between different Research Councils.

There is therefore an urgent need to develop a common agreed methodology to ensure that Research Councils can easily fund research that overlaps the boundaries of two or more Councils. We have no firm views about the best approach. However this methodology will need to be designed to enable a greater amount of multi-disciplinary and interdisciplinary research to take place, as well as facilitating resource transfer between Research Councils to ensure the continued excellence of our research endeavour.

Large facilities

We know that expenditure per researcher inevitably varies enormously between different research areas, and that investment in a large facility will normally attract extra funding for projects using that facility to ensure maximum utilization of what is an expensive capital facility.

Investments in large research facilities present particular challenges. We must ensure that access to existing large-scale research facilities are maximised and that any major new research equipment and resources are made available to the broadest research communities. It will be particularly important to ensure that funding of the research projects - necessary to ensure the UK gets maximum return and benefits from such facilities - is not compromised either by the costs to maintain such facilities or, in the case of international facilities, the subscription costs. But equally, it makes no sense to construct and develop major facilities and then starve them of the revenue that is essential for them to deliver the maximum potential output.

Research disciplines vs multi-disciplinary research vs thematic challenges

It is vital to ensure a variety of funding approaches as between (i) research expenditure directed at specific disciplines (ii) multi-disciplinary research and (iii) research directed at big, cross-cutting themes. Each is important and it is not possible to set an arbitrary balance - we cannot know whether the 14% of Research Councils' expenditure which was allocated to multi-disciplinary research in the last allocations round was the right percentage. But given that the major issues facing the UK and the world range across many disciplines that figure does seem low.

More multi-disciplinary and cross-Council programmes

We are clear that Research Councils do need to address strategic challenges and to do that they need clear, joined-up strategies and mechanisms for multi-disciplinary, interdisciplinary and downstream research. We also recognise that they need to build and sustain the quality of key disciplines.

The research funding system retains a strong bias towards single discipline proposals because that is where most researchers are located - particularly in the medical and physical sciences (but arguably less so in the social sciences).

CST recognises that the Research Councils have made major strides in developing cross-Council programmes with multi-disciplinary and interdisciplinary agendas. However it seems evident that this needs to go further to address the big challenges which the UK faces, in the face of fierce global competition. We would advocate more cross-Council programmes and promoting new and better collaborations - to address major global challenges not least climate change, food security, healthcare and an ageing population. Such initiatives would also have the advantage of being able to leverage in significant external investment. Government therefore needs to extend, support and protect long-term funding mechanisms for multi-year cross-Council research programmes, and involve Departments when appropriate - we welcome the involvement of government Departments in some of the programmes and believe this should continue.

It is important to emphasise that multi-disciplinary research proposals and cross-Council initiatives are compatible with 'curiosity-driven' research; this continues to thrive and be supported and the challenge for the Research Councils is to ensure that these programmes and initiatives maintain space for upstream speculative research.

Enhancing the UK's competitive position through greater collaboration

The developing research environment globally demands that the UK has the capacity to compete with the new research-based economies emerging in India in China, as well as with the US. The sheer scale of these competitors will, over the next decade, require that the UK's leading research groups collaborate with each other, and with international partners, if there is to be any chance of matching them. These new collaborative models need to be developed, and need to be reconciled with the continuing fierce competition between those seeking Research Council and other funding.

There is a need to unpack the different types of collaboration that are possible; different types of collaboration are needed for different kinds of research:

- *large facilities collaboration*: where factors such as cost preclude one organisation or country from creating and operating large scientific facilities, for example the Large Hadron Collider
- *large-scale international collaboration*: where the sheer scale of effort needed can best be delivered through collaboration, or where collaboration at an international level can deliver both breadth and economies of scale not possible for each

participant alone, for example the collection and sharing of data in astrophysics, or trans-national research on climate change, or under the EU Framework programmes

- *to ensure pan-UK coverage:* where there is a need to create a UK-wide co-ordinated network, for example on clinical trials
- *collaboration at the university/department level:* for example pooling resources and expertise

Role of Government

Government and its agencies need to incentivise active and productive research connections, through funding mechanisms. We believe that, in a new environment which encourages collaboration amongst leading research groups, there is a place for each of the models described above, depending on the objectives of a particular collaboration.

Government has an equally important role in facilitating and encouraging universities to find new ways of collaborating at the highest levels of international excellence (see below) but to do it in a way which does not blunt the competitive edge that individual universities have developed through years of bidding against each other for Research Council funding.

Our embassies abroad need to continue to prioritise science and research. We welcome the RCUK's presence in emerging economies such as India, China; as well as their offices in the US and the UK Research Office in Brussels. We also welcome the EU Presidency's decision to appoint a Chief Scientific Advisor to the European Commission.

It is vital that the UK continues to maximise the value it obtains from both the EU Framework Programme and the EU Research Council, and that needs the UK to continue to play a leadership role in Europe. Researchers need to be incentivised to secure money from the EU research programmes.

Role of Universities and Research Institutions

It will be up to Universities themselves to decide how best to address the challenges. In difficult fiscal times they will need to double their efforts to ensure they have the right strategies for their University, and the highest quality people, so they are best-placed to initiate new models of collaboration between their Universities and individuals, and new models for promoting the translation of research outputs to economic and social benefit.

We should like to see universities and research institutions themselves taking a more strategic approach by collaborating with other Universities and institutions (and their leading researchers) in the UK, US, EU, China, India and other emerging economies. Collaboration at the level of the research group, or on broad themes, with different configurations of institutions on different topics, may be where the most promise lies.

Such collaborations will need to be at a much more strategic level than they already are, not least in terms of there being fewer, but at a deeper level, and at the departmental or institutional level rather than simply between researchers themselves. We do not underestimate the challenges - where competition rather than collaboration has historically been the watchword - and mechanisms will be needed to facilitate the

processes, if they are to be meaningful rather than empty. We believe that through the Spending Review could make a start could be made on developing new mechanisms to incentive collaborations between leading research groups in the UK and internationally.

Making choices

In times of financial austerity, the importance of making optimal choices in difficult circumstance will be even more of an imperative, and these choices will need to be made by looking right across the landscape, not simply on a Research Council-by-Research Council basis. There will need to be a focus on funding the best research and the best people, but within the framework of a Strategy as we have advocated. By looking across the landscape, and within this framework, it should be possible to maximise the benefit and to give optimal value for the public money invested.

In extremis there might need to be choices which acknowledge that it is not possible to support all disciplines to a high international level. We would regard this as both regrettable and potentially dangerous but, were it to happen, it should be done explicitly having considered all the consequences.