

CONTINUING TO DEVELOP THE EXCELLENCE OF UK UNIVERSITY RESEARCH

The Royal Society's Submission to the House of Commons Science and Technology Committee Inquiry into the Research Assessment Exercise

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1. A healthy research base in our universities is crucial to the future of the UK, most obviously in providing new ideas for exploitation by our companies and by the health and other public services. However, it is in the maintenance of a dynamic knowledge system across all major areas that is arguably more important as it is impossible to know what areas of expertise will be required in future. Most recently the importance of university expertise was exemplified by the need to call on experts in depleted uranium, bioterrorism and on Afghanistan, Middle East and Islamic studies. The Royal Society believes that the overall international standing of UK research is higher than it has been for many years, but that this position can easily and all too quickly be lost if steps are not taken to put the present funding arrangements on a sustainable basis. Once lost, it would be difficult and expensive to regain the present position.
2. In considering the health of university research it is important to recognise and take account of its unique structure involving the symbiosis of researchers and their home university, with each side having their own aspirations and long and short term objectives:
 - the researcher's main aim is to take forward the frontiers of knowledge and to be recognised by their peers. In pursuit of this, the researchers often receive only modest financial rewards, especially considering the amount of time that they devote to their research, but the best of them will look for an institution that can provide them with appropriate facilities in terms of physical and human infrastructure and an intellectually challenging environment. Researchers will seek access to a pool of bright postgraduate students and increasingly they have also been seeking opportunities for exploiting their research, which can also require suitable infrastructure within the institution.
 - The universities wish to retain the services of researchers in appropriate disciplines, if possible ones with an international reputation, in order to maintain the institution's standing as a centre of learning, to teach undergraduates and post-graduate students, and of increasing importance, to provide appropriate expertise for delivering in-house and distance-learning based continuing professional development.
3. This relationship between researcher and institution can be traced back to the formation of medieval universities and it can be questioned whether it is still appropriate at the start of the twenty first century, especially when in many areas where there is a requirement for very expensive technology and the involvement of larger research teams than hitherto. Furthermore, the massive increase in participation in higher education, coupled with the necessary decrease in the cost per student that has occurred over the past 20 years, has also impacted on the structure of universities and on the balance of time that academic staff can spend on various activities including research. Nevertheless, the Royal Society believes that none of these changes has diminished need for the structure of universities to take account of the special position of university researchers.

THE DUAL SUPPORT SYSTEM

4. A balanced pluralistic funding system is necessary both to provide stability for long-term developments and to recognise needs of the various components of the system. The dual support system for public funding of university research in the UK – many features of which are unique to the UK - seeks to recognise the requirements and needs both of universities as institutions and of researchers as individuals.

5. As far as the university is concerned, the funding arrangements need to provide flexibility to local management to develop their institution's strengths, with a clear understanding of how success or failure will impact on the institution's future funding. The block funding from the Funding Councils allows an institution to develop its research capabilities within the context of its overall mission by providing the resources for it to develop the key basic facilities and the "pump priming" funding packages required to attract and retain world class researchers. It is a great strength of the system that the funds provided are both unhypothecated and transparent in the way that they have been calculated by the Funding Councils.
6. In the UK funding arrangements, it is important for the support through the two arms of the dual support system to be balanced. During the 1980s and early 1990s the proportion of funds distributed through the Funding Councils decreased and this led amongst other things to the run-down of research facilities. The additional capital funding provided through the last spending review, including a significant contribution from the Wellcome Trust, has redressed the situation to some extent, but there remains some way to go.
7. Research Councils provide researchers with the necessary grants and access to national and international facilities to enable them to develop their research and in appropriate cases build up teams of postdoctoral researchers and postgraduate research students.

FUNDING COUNCIL FUNDING AND THE RESEARCH ASSESSMENT EXERCISE

8. It is important that both Research Council and Funding Council grants be distributed competitively to support the best quality research and to provide both institutional and personal incentives to strive for the best. This inevitably means that there will be a high degree of selectivity in the system, but this should result from the system of funding, not imposed top-down. A rigid institutionalised system of selectivity runs a severe danger of fossilising the system at a particular point in time, whereas it is essential for our university system to be dynamic and to enable new centres of expertise to develop, possibly at the expense of more established ones that have lost their edge.
9. It is also important not to take too simplistic a view of selectivity when for example comparing the UK universities with those in other countries, where differences in the type of institution and their size can result in a distorted picture. There have in the past been wild claims of the US being much more selective than the UK, whereas a more sophisticated analysis indicates that the two systems were much more comparable with respect to selectivity.
10. The Research Assessment Exercise (RAE) has been a successful way of determining by peer review the quality of university research departments, and there can be little doubt that this, coupled with the related funding formula, has been a major factor in the increased standing of UK university research.

THE RESEARCH ASSESSMENT EXERCISE

11. The RAE assesses university research on the basis of 69 units of assessment (UoA), and university departments or major research units have to map themselves onto one or more of these UoA. In 2001 the Funding Councils took note of previous criticisms levelled at the assessment exercise and in particular paid particular attention to the following:
 - wider representation on the assessment panels including people from outside the university research;
 - the use of international referees to confirm or otherwise the 5 and 5* ratings decisions;
 - particular attention to possible problems with inter-disciplinary and multidisciplinary research;

- a wider definition of research output to include many other outputs beyond peer reviewed articles;
 - taking into account movement of staff between universities.
12. Under the RAE, a university specifies those academic staff that it wishes to be considered as part of the assessment exercise. This has led to criticisms that certain universities have been game-playing, and manipulating their returns to gain higher ratings by excluding some staff from the exercise. However, it is right to recognise that some academic staff within departments may no longer wish or be able to continue at the cutting edge of research, but yet more than earn their salary through concentrating on teaching, including the preparation of course material, undergraduate text books or distance learning material, and/or take on a significant administration load including the annual recruitment of students. The cost of such staff should not be borne from research funds, and should be excluded both from the RAE and from any volume measure used for determining the research block grant. Nevertheless, there are some worrying trends in the submissions from some universities to the 2001 RAE, where some research-intensive universities offered less than 80% of their academic staff for assessment. This needs further study and consideration as to whether there should be a minimum percentage of staff who should be included to achieve a 5 or 5* rating.
13. On a related issue, the Society believes that it is important for the RAE to remain strictly an assessment of research quality across the spectrum from applied to blue sky research. It should not try and include recognition of other desirable, but non-research activities. The Society supports the Funding Councils' and OST's policy of supporting other activities through different streams of funding, such as those made available to support exploitation and contact with the user communities. However, it has to be recognised that with severe pressure on resources some other activities that are not so easy to accommodate may be squeezed. For example, there have been claims that pressures on academic staff time have resulted in a reluctance to become engaged in peer review activities such as serving on grant and other committees, and acting as referees for grant proposals or for publications.
14. Perhaps the major practical problem with the RAE is its cost, not only to the Higher Education Funding Councils and the peer review panels, but also the work required of each individual member of staff, heads of department and the administrative staff of the institution. Set against this the exercise is only undertaken once every five years and thus probably represents a significantly smaller overhead than that for the research councils' peer review system. Nevertheless, the combination of administrative work associated with the RAE, preparation of grant proposals, coupled with demands of the QAA, are a significant and growing burden on academic staff. The Society therefore believes that the Funding and Research Councils should consider over the next 12 months how they could reduce these burdens while retaining robust systems for determining quality.
15. The results of the 2001 RAE has shown a greater increase in the rated quality of departments compared to the outcome from 1996 than between any previous adjacent pairs of assessments. The number of departments with at least a 4 rating (research of national or international standing) increased from 43% to 65% and, because of the generally larger size of the higher rated departments, the number of researchers in these departments has gone up from 59% to 80%. It is important to check that this is a real increase in quality of the UK's overall research standing and not due to "grade drift". Evidence for a real increase in quality comes from the international referees, by a study of some of the departments that have increased their rating where significant efforts have been made to recharge their research complement, or where the rating can be compared with other departments in the same UoA that have not increased their standing, and by a study of the relative citations received by the UK. An initial analysis is set out in the next section.

THE STANDING OF UNIVERSITY RESEARCH

16. Over the history of the RAE there has been a general improvement in the research ratings as universities have strived to improve the standing of their key departments, and it is important to recognise that there has been some major restructuring within the system.
17. As funding contributions for departments rated 1, and then 2, were withdrawn, universities were faced with the choice of investing to improve the standing of the department or taking more radical action, such as closing the department, merging with one or more other departments within the university or rationalisation with a neighbouring university. This has resulted in the reduction in the number of lower rated departments and some spectacular rises in rating, some from very modest beginnings.
18. There have also been cases over the past decade where some previously high standing departments at major research universities have lost the cutting edge, and this has been reflected in reduced RAE ratings. In most cases, the universities concerned have taken action to replace poor research performing staff with new blood, often starting at the top, and the departments have recovered their previously high RAE rating.
19. Evidence for the overall improvements in the peer reviewed assessments of university research departments comes from an examination of the citations received by UK researchers relative to the average citations received by researchers throughout the world. An analysis undertaken by Evidence Ltd of the detailed Institute for Scientific Information (ISI) data has shown that not only have the relative citations of papers in science and social sciences produced by departments rated 5 and 5* in the 1996 RAE increased significantly between 1991 and 2000, this is also true of the citations of papers produced by departments rated 3b, 3a and 4¹. Furthermore, an added indication of the genuine improvement in quality at these levels, is that the papers from 1996 3b to 4 rated departments took an increased share of the UK total.
20. Finally, it is important to recognise that research excellence stretches well beyond the powerhouses of Cambridge, Oxford, University College London, Imperial College and Edinburgh. There are 76 universities (ie excluding specialist institutes and free standing medical schools) with one or more 5 rated departments and 53 with one or more 5* departments. Further evidence can be found from a consideration of the top 10 institutions for citations in the various disciplines. An initial study, of 8 groups of science and social science UoAs (Clinical Research, Biological Sciences, Environment, Mathematics, Physical Sciences, Engineering, Social Sciences, and Business and Economics) includes 37 universities. This confirmed an earlier study of 21 subject areas where only considering the top three UK universities within each area resulted in a total of 26 universities being included in the list (ISI Science Watch 1997 January/February 1-2). A similarly wide range of institutions is obtained from a consideration of the top ten institutions in terms of total grant income from each of the six Research Councils. Of course this demonstrates the heterogeneity of quality within universities; but this is healthy. All this argues for continuing to treat the university system as a continuum, allowing for the growth of research excellence where it is best established within the system, with possible contraction elsewhere, rather than trying to determine the structure top down. It is essential to allow for the development of both significant research universities, like Warwick, and for individual high quality centres of expertise throughout the system wherever they develop.

¹ As an illustration of the increase in impact as indicated by relative citation analysis, the citation impact relative to the world average for papers in the science and social sciences from departments rated 3b, 3a, 4 and 5/5* in the 1996 RAE over the period 1991-92 to 2000 is shown at annex A. This information was commissioned by the HEFCE from Evidence Ltd, and further information can be provided.

FUNDING COUNCIL BLOCK GRANTS

21. The increased number of higher rated departments in RAE 2002 clearly causes funding problems. In its submissions to the three funding Councils on their 2000/2001 consultations over university funding policy, the Society expressed the view that it was important to continue to provide some recognition for 3b and 3a rated departments, as this allowed entry routes for up and coming departments and also research capability in some subjects across the country. While the latter will be of lesser importance with the smaller number of 3-rated departments, the Society believes that flexibility is still a compelling reason for continuing to recognise these departments, albeit possibly at a lower level of funding.
22. Without increased total funding, but taking into account the new ratings, distribution of the funds in 2002 on the same basis as those for 2001, would result in significant reductions in the block funding for research at the top four English institutions Cambridge, Oxford, University College and Imperial College, possibly amounting to £40 million.
23. The Society would urge the DfEE and the Scottish, Welsh and Northern Ireland authorities to establish increased support for university research in the current spending review. It cautions against the optimistic view, which has been expressed by some, that the universities have been able to raise their performance within the existing resources and so should be able to maintain them within current resources. Satisfactory performance under the current funding level is not sustainable and it is essential to put university research and other activities on a realistic long-term basis. International comparisons confirm that UK funding of university research is still lower than our major competitors, despite the high private sector component.
24. The efforts of the OST, the Funding Councils and the universities to take forward a major improvement in university accounting procedures should ensure that universities are better able to organise their investments in capital facilities and human resources.
25. The Society notes that over the last two spending reviews significant resources have been made available to renew university facilities. As the Cabinet Minister for Science and Lord Sainsbury both said in their oral evidence to the Committee on 19 December, there is some distance to go to make up the shortfall of the previous decade or so of under-funding of university research. The Society hopes that the total increased expenditure on university research, including this capital element can be consolidated and indeed increased in the forthcoming Spending Review, in order to ensure that we can maintain and indeed continue to enhance the standing of our research base.
26. There remains a problem for the forthcoming year, but provided that some additional funds can be made available, a combination of this and some transitional arrangements should provide a way forward so long as the longer term funding is secured.

THE FUTURE DEVELOPMENT OF UNIVERSITY RESEARCH

27. Building on the basic underpinning support provided by the HE Funding Councils, the Research Councils, including the Arts and Humanities Research Board, have an important role in signalling the way that research should develop into the future. However, it is important for them not to lose sight of the importance of some unfashionable but underpinning fields, exemplified by systematic and whole animal biology. Furthermore, a danger of project based funding systems is that under financial pressure they can become risk averse. One other issue is whether the 3-year basis of many grants is such that it results in projects being artificially constrained by unnatural timetables and also to hinder the planning of longer-term projects.
28. Our major charities, largely in the biomedical field, have a significant role to play in the development of research capability. This is also true of our innovative firms and public service authorities, which should seek out the most appropriate university research

partners, both for the support of longer term underpinning projects of mutual interest and also, where appropriate, more directed research contracts.

29. The Society also believes that there is an important continuing role for the National Academies in selecting and supporting high quality researchers, irrespective of their area of work. The Royal Society, for example, makes use of its grant-in-aid from the Science Budget, supplemented with £6.1 million from its own funds and a range of other sources, to support the highest quality researchers across the career range. It also uses these schemes to encourage and develop excellent women researchers with outstanding potential, and it takes particular care to ensure that its schemes include flexible family-friendly best practice.

30. The main schemes are:

- 17 Royal Society Professorships, of which 2 are held by women (33% of the last round or awards): allowing distinguished researchers to concentrate on their research.
- 20 Research Merit Awards, jointly funded with the Wolfson Foundation: to date to enable UK universities to attract and retain the best scientists through paying enhanced salaries and research expenses; So far, these awards have enabled UK universities to attract five top scientists from overseas universities.
- 320 University Research Fellowships, of which 77 (24%) are held by women: these fellowships allow promising senior postdoctoral fellows to concentrate on their research for up to 10 years rather than having to undertake extensive teaching loads, although many do contribute to the teaching of their home institution.
- 55 Dorothy Hodgkin Fellowships, of which 52 (95%) are held by women, specifically directed at promising young scientists, particularly women, at the early stages of their research careers. These research fellows receive high levels of support including a mentor to offer individual career and research advice.
- 19 Industry Fellowships promoting innovation, collaboration and knowledge transfer between academic scientists and industrialists.
- Up to 20 Laboratory Refurbishment grants per year of up to £250,000, funded through support from the Wolfson Foundation, to enable departments to renew their research facilities in key areas such as informatics and nanotechnology.
- A research grants scheme supporting the research programmes of around 300 UK based scientists each year through awards of up to £10,000 for equipment, consumables and field work costs.
- 3 Mercer Innovation Awards each year to enable scientists to develop their inventions through the commercialisation stage.
- A conference grant scheme enabling up to 1250 UK based scientists each year to present their work at international events.
- A range of post-doctoral exchange schemes.

31. The Society believes that, in particular, the research chairs, research merit awards and fellowships have made a significant contribution towards attracting outstanding researchers from abroad and retaining our best researchers in the UK.

Royal Society
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APPENDIX: SOME WIDER THOUGHTS

1. The Committee will no doubt receive evidence suggesting possible long-term changes to the RAE and Funding Council support for research that could be examined further including:
 - Whether the time between assessments could be increased and whether all subjects need to be examined at the same time.
 - Whether the significant discontinuities in funding if a department goes up or down one rating point resulting from the fact that there are five funded rating categories but two-digit accuracy in the volume measure, could be improved. A possible way forward may be to have three "5" quality ratings with the highest one having a higher threshold for the proportion of internationally excellent work.
 - Whether, in view of the larger number of 5 and 5* departments, the current system of criteria referencing should be replaced by norm referencing, by grading to a curve, as used to guard against grade inflation in many US universities.
 - Whether, the Funding Councils should see what could be done to make standards more uniform across UoAs. While there is no operational need to have strict comparability between UoAs, since the RAE is designed to allocate funding within a UoA, there is some evidence suggesting differences in the way that standards have been applied (which can cause problems if they are used for purposes for which they were not intended).
 - Whether the overall burdens of the RAE could be reduced by making use of the success of staff in gaining research grants – for example by providing the "dual support" element of the funding by means of fixed percentage addition to individual grant applications, with the money going to the university as a whole to use as it thinks fit, as is the case with the existing Funding Council block grant (and with such funding arrangements in the US).
2. These changes could have significant implications for the future development of the UK university research system, and many of them were extensively explored in the reviews conducted by the Funding Councils a year or so ago. Nevertheless, some of them could usefully be revisited in the light of the outcome of the 2001 RAE. The Society is intending independently to examine the RAE outcome in relevant disciplines, but the results of this study will not be available until after the Committee concludes its own review.