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Impact of quality-related (QR) funding for research in English higher education institutions

Report to HEFCE by SQW Ltd

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Executive summary

1. In 2005-06 the Higher Education Funding Council for England (HEFCE) distributed around £1.48 billion of public funding for research to English higher education institutions (HEIs). Most of the money is allocated by a formula based on the quality and amount of research undertaken. This quality-related (QR) research funding totalled £1.2 billion in 2005-06. It is allocated as a block grant which HEIs are free to spend according to their own priorities. For some HEIs, QR is the most important source of discretionary income.
2. HEFCE commissioned SQW Ltd to review the impact of QR funding. The review was based on a series of case studies to illustrate how QR funding has been used, and to explore the impacts and results of that funding. As such, it is not an evaluation of the rationale and policies of QR funding.
3. A pilot phase of the review involved consultations with senior HEI managers to explore key issues surrounding the use of QR. This was followed by more detailed discussions with senior managers and researchers in other HEIs. In total, fifteen HEIs were consulted and this report presents case study material from 11 of these. The sample was selected to encompass: large research intensive institutions; post-92 universities which were undertaking a significant volume of research; research in the arts and humanities as well as science and engineering; and small specialist HEIs. In many cases it was not possible to track QR expenditure: academic units often receive a single income stream from the HEI which is based on revenue from many sources, so activities specifically associated with QR cannot be identified. For this reason, the case studies focused on research activities supported by funds which are spent at the discretion of the HEIs.
4. QR is widely perceived as very important within the HE sector. It meets approximately half the difference between income for specific research projects and the full economic cost of those projects, so the current level of project activity would not be sustainable without QR. However, HEIs perceive advantages to QR funding beyond contributions to the 'funding gap' and almost all consulted would not wish QR to be replaced by funding projects at full economic cost.
5. The main attractions of QR are its relative predictability and stability, at least between the periodic Research Assessment Exercises (RAEs) to assess quality, and the discretion HEIs have over expenditure. The latter means that their internal allocations of QR funds can be aligned with institutional priorities and can contribute to developing and sustaining research capabilities. This could not be achieved through a system of 100% project funding.
6. HEIs must use QR, and other income streams, to meet the difference between project income and full economic costs, but all those we visited are making explicit choices on where to invest QR. The activities supported can be grouped under four broad categories, although there are important overlaps. The categories are:

- *Maintaining research competitiveness.* This encompasses cases where the HEI has invested in areas of strength – through buildings, equipment, staff time and new staff – in order to maintain leadership and reputation in the field. The results include
 - components of the research infrastructure which would be difficult to fund through a system of project grants
 - the development of ideas to the point where project funding becomes feasible
 - support for research teams between projects
 - attracting and retaining leading researchers.
- *Developing research staff* which includes
 - establishing new posts
 - reductions in teaching and administrative loads, including conventional research leave
 - a range of support measures, often targeted at younger staff, including mentoring and small research grants as well as reduced teaching and administration loads.
- *Restructuring* or investing in underperforming subject areas. These activities tend to be similar to ‘maintaining competitiveness’ and have resulted in quite dramatic enhancements to research strengths, reflected in the most recent RAE grades.
- *Developing new research areas.* QR has supported the establishment of teams, and research centres, in advance of project funders’ requirements. We have not identified radical departures from mainstream research, but there are examples of interdisciplinary teams being brought together with central support from the HEI. These enable HEIs to position themselves to respond to emerging demands.

7. The conclusion we draw from the case studies is that these activities are materially enhancing HEIs’ capacities to respond to project funders’ requirements, including developing capabilities ahead of those requirements. This, with the role of QR funds in meeting the shortfall between funding for projects and their full economic costs, means that QR is ‘fit for purpose’.

1: Introduction

The review

- 1.1 The Higher Education Funding Council for England (HEFCE) commissioned SQW Limited to review the impacts of quality-related (QR) research funding on English higher education institutions (HEIs). The purpose was to inform HEFCE of the impacts of QR funding and, more specifically, the research outputs that are generated from that funding, as an input into HEFCE's submission to the Comprehensive Spending Review. Previously, HEFCE had commissioned a review of the literature of QR impacts¹. The current review is based on a series of case studies in 11 HEIs.
- 1.2 The case studies are intended to illustrate the ways in which HEIs use their QR allocations, explore the impacts of QR, and identify the type of research outputs these give rise to. The review is not an evaluation of QR *per se*. Such an evaluation would require an assessment of the rationale and policies, notably selectivity and concentration, for allocating QR and also the mechanisms through which it is allocated. This review has only considered outputs that QR has generated, mainly within HEIs which have received relatively large amounts of QR funds in recent years. It has not considered the impacts on HEIs which receive little² or no QR, nor the relationships between research and other HEI activities.

QR funding

- 1.3 Total QR funding in 2005-06 was around £1.2bn. HEIs receive QR as part of the block grant and they have discretion over how it is spent. In particular, there is no requirement to pass on QR allocations to the units of assessment which generate it. The allocation to institutions is determined by: the Research Assessment Exercise³ (RAE) ratings; a number of volume indicators (of which the most important is the number of staff submitted to the RAE); and the amounts available for each unit of assessment. A formula is applied to these factors and selectivity is introduced by the relative weights given to different RAE grades. Since the 2001 RAE, units of assessment graded less than a 4 received no mainstream QR funding. Over time the allocation has become increasingly concentrated. In 2005-06, QR was allocated to 109 HEIs but 26 HEIs received 80% of the total and almost 52% went to the top 10 recipients.⁴

¹ 'Impact of selective funding of research in England, and the specific outcomes of HEFCE research funding' Evidence Ltd, 2005, www.hefce.ac.uk under Publications/R&D reports

² Apart from some small specialist institutions.

³ A consultation on future allocation mechanisms was launched by the Department for Education and Skills in June 2006, and closed in October 2006, <http://www.dfes.gov.uk/consultations/conResults.cfm?consultationId=1404>

⁴ Research Council grants are slightly more concentrated. In 2003-04, 26 HEIs received 85% of all grants and the top 10, 55%.

Approach

- 1.4 The first phase of the review involved pilot studies within three HEIs, to identify key issues, and these informed the design of the rest of the study. Consultations were also held with key stakeholder organisations at this stage. The review is based on discussions with fifteen HEIs in total. An initial round of consultations was held with senior managers to explore issues surrounding the use, and impacts, of QR and to identify potential case studies. These were followed by detailed discussions with academic managers and researchers and case studies from 11 of the 15 HEIs are presented in this report.

Case study HEIs

- 1.5 Fifteen HEIs were approached during the review. The sample was biased towards research intensive institutions but the aim was to ensure coverage of a range of experiences. In particular, HEFCE wished the sample to include:

- large research intensive organisations
- post-92 universities which were undertaking a significant volume of research
- research in the arts and humanities and social sciences as well as science and engineering
- small specialist HEIs.

- 1.6 The case studies in this report are taken from 11 HEIs. Their most recent income, research grants and QR allocations are shown in Table 1-1. There are significant differences between the HEIs, especially in relation to QR as a proportion of total income, but also as a proportion of research grants and contracts. These differences partly reflect research intensity, but also subject mix given the higher cost of research in the science, technology, engineering and medicine (STEM) subjects. The QR allocation to Wimbledon School of Art (while still a separate institution), for example, was several times greater than its project funding, reflecting the relative low equipment and consumable costs of research in the arts, limited availability of project funding and the institution's performance in the 2001 RAE. The high proportion for Royal Holloway reflects strengths in STEM subjects together with active research in the arts and humanities. In total these 11 institutions account for 20% of all QR funds awarded to the 109 HEIs in 2005-06.

Table 1-1: Case study institutions

Institution	QR 2004-05 (£m)	QR as % of total income	QR as % of total research grants and contracts
Cranfield University	£4.3	3%	11%
Royal Holloway University of London	£11	14%	119%
University of Bath	£13.4	10%	57%
University of Essex	£8.5	10%	57%
University of Hertfordshire	£1.6	1%	40%

Institution	QR 2004-05 (£m)	QR as % of total income	QR as % of total research grants and contracts
University of Leicester	£13.6	8%	39%
University of Newcastle upon Tyne	£27.5	10%	50%
University of Oxford	£79.7	15%	44%
University of Warwick	£22.6	8%	39%
University of York	£17.6	12%	48%
Wimbledon School of Art ⁵	£0.6	8%	638%

Source: HEI reports and HEFCE

1.7 We adopted a three stage process to the case studies:

- an initial discussion with a nominated individual in each HEI in order to understand background issues such as how QR is allocated internally and to explore how the case studies might be conducted
- further discussions with senior management with research responsibilities and, in most cases, staff with financial and planning responsibilities. The purpose was to identify in more detail how QR has been used, including plans for the future, and to obtain views on the distinctive characteristics and value of QR funds. We also identified specific areas of research to follow up
- discussions with heads of department/research groups and individual researchers who have benefited from QR funding to identify specific activities and outputs.

1.8 The case study material covers a wide range of activities. It includes substantial investments in specific subject areas, sometimes over a lengthy period, but also comparatively low-cost programmes which release staff from teaching and administration enabling them to focus on research. We have, in total, discussed around 40 activities with the selected HEIs.

Methodological issues

1.9 The main conceptual difficulty encountered during the study is the association of QR income with specific research activities and this, in part, arises because of the way QR is allocated internally. In most HEIs in the study is not possible to trace QR income through to activities because of the nature of the 'resource allocation models'. Broadly speaking there are two types of model:

- 'formula driven' where departments/schools are allocated income according to what they generate, with top slicing to cover central costs and to provide for strategic investments

⁵ 2003-04. Wimbledon School of Art is now a constituent college of the University for the Arts London as Wimbledon College of Art.

- ‘managerially’ driven where allocation decisions are made by a committee. Income generation, actual and potential, and institution-wide priorities are invariably key considerations.
- 1.10 This distinction is not meant to imply that one model is necessarily associated with a more strategic approach. Formula driven allocations can be associated with large strategic investment funds which are allocated centrally. Managerially driven allocations can simply adjust departmental funds in line with the overall changes in an institution’s income.
- 1.11 There are further differences according to whether budgets cover all expenditure made by the school/department or, as is more common, only relate to non-pay costs. In many cases, schools/departments only have control over non-staff budgets. Salary costs are met centrally, and QR is one component of central income; schools/departments are required to make the case for additional staff and the replacement of current posts as they become vacant. In practice, however, the two approaches are not radically different in the current context. In both cases the academic units which receive funds have discretion over an income stream which is made up of QR and other sources of income, and the direct link between QR and research activities is broken. In some cases, where the research allocation model only covers non-pay costs, the volume of QR over which schools/departments have discretion can be low; less than 6% of QR in one HEI we consulted.
- 1.12 Most of the HEIs consulted have ‘strategic funds’ of some description although these are sometimes small, for example less than £300,000 in one medium sized HEI. QR is typically a component of these, through central top-slicing in line with other income sources, and the funds are often used for investment in research capabilities. However, QR is seldom the only component, and in some cases it represents a relatively small contribution to the fund. It is therefore difficult to associate QR with research activities via this route.
- 1.13 We would, however, note some important exceptions to the above:
- there are cases where QR accounts for all, or a substantial proportion, of a strategic fund and it makes sense to follow the uses to which the fund has been put
 - for some institutions, in some subjects, QR is the only significant source of non-project research support and it is therefore meaningful to associate some activities with QR. These tend to be post-92 institutions and arts and humanities subjects
 - a small number of HEIs have allocated all QR funds to selected departments, including funds generated by other departments.
- 1.14 In these cases it is possible to associate QR with research activities and we have tried to follow these up. In other cases we have adopted a pragmatic approach and sought to identify research activities in which the HEI has invested discretionary resources, however these resources might have been generated. There is not necessarily a direct link with QR, but we believe it provides a credible illustration of what QR can enable. We would emphasise that QR is a substantial proportion of discretionary income. In 2003-04, total QR for the sector was just over £1bn which represented 7% of total income for the sector and 46% of total research grants and contracts. There are no data on the total volume of discretionary income

but it is interesting to note that QR was over five times the volume of endowment and investment income for the sector.

Report format

- 1.15 The next chapter discusses the characteristics of QR funding as perceived by the HEIs. Key findings from the case studies and extracts from selected case studies are presented in Chapter 3 and conclusions in Chapter 4. A fuller write up of all case studies is in Annex A.

2: Key characteristics of QR

Introduction

- 2.1 In our visits to HEIs, we discussed strategic and other characteristics of QR with senior managers. There was a strong consensus of opinion which, in broad terms, reflects the purposes for which QR is provided:

“Quality-related funding ... provides a foundation allowing university leaders to take strategic decisions about the research activities of their own institutions. It funds the basic research infrastructure – including the salary costs of permanent academic researchers, support staff, equipment and libraries – that gives institutions the base from which to undertake research commissioned by other funding sources; the flexibility to react quickly to emerging priorities and new fields of enquiry; and the capacity to undertake ‘blue skies’ research”⁶.

- 2.2 Key characteristics of QR are discussed below.

Additional resources

- 2.3 Project funders do not generally pay the full economic cost of their projects, and one of the key roles of QR is to provide the infrastructure to enable projects to be undertaken where a consequential public benefit is anticipated. Many of those we consulted drew attention to the findings from the Transparent Approach to Costing (TRAC), which imply that the total costs of research are greater than total related income to HEIs. Table 2-1 shows an analysis undertaken by HEFCE which suggests that, across England, the full economic cost of all the work that QR underpins (at least in part) on the basis of anticipated public benefit exceeds the relevant income, including QR, by around £1.1bn. QR represents 26% of the full economic cost of this research and without QR the total shortfall would double. It is thus essential in enabling HEIs to undertake work commissioned by other sources at a price below full cost.

Table 2-1: 2003-04 research income and full economic cost (£000s)

Income source	Income	Full economic cost of work to be done	HEI contribution
Research Councils	689	1,077	388
HEIs' priorities		940	940
UK government	398	622	224
Charities	575	1,045	470
EU	146	247	101
Total	1,808	3,931	2,123
QR grant			1,019
Shortfall			1,104

Source: HEFCE

- 2.4 In practical terms, the funding is manifested in equipment, but also higher staff-student ratios than would be sustainable on the basis of teaching and other funding sources alone. There is

⁶ ‘Science & innovation investment framework 2004-2014’ HM Treasury, http://www.hm-treasury.gov.uk/media/066/A0/spend04_sciencedoc_2-3_090704.pdf

a question as to why a similar outcome could not be achieved by project funders paying 100% of full economic costs. However, the majority of those we consulted see real advantages in the current system; specifically:

- the perception is that project funders will tend to maximise the volume of research projects they support. This is seen as inevitably bringing pressure to reduce the costs of research below sustainable levels
- institutions engage in supporting activities such as staff and post doctoral development which contribute to the long-term health and viability of the research effort, but also add to total costs. There are many specific examples of such activity in the case studies. Project funders are less able to support such activities which are not project specific
- project grants are paid after the research team is assembled and the infrastructure is in place. Other sources of investment are therefore required to cover set-up costs and to maintain continuity of research teams. While some research groups can exist on a series of project grants, this requires careful management and is not a feasible option for groups which are smaller and which may not receive grants continuously. QR can be used to meet this specific gap in funding. Again, the case studies provide illustrations of such activities.

2.5 Several of those consulted also made the point that QR was, in volume terms, relatively more important to those subjects for which project funding was limited⁷. Arts and humanities were mentioned in particular, but there appears to be a hierarchy in this respect with (in decreasing order of disadvantage): social sciences, engineering, natural sciences, and medicine.

Discretionary spend

2.6 HEIs have discretion over how they spend QR. This is widely seen as one of its strengths and all those we visited exploit this discretion to some degree. In particular, all have identified priority subject areas, and QR funding is redistributed from academic units which generate it to these priority areas. The discretionary nature of QR spend is also, clearly, one of the reasons why the potential benefits compared with 100% project funding can be exploited.

2.7 There are examples in the case studies of HEIs investing ahead of the requirement of project funders, and thereby developing new (and often interdisciplinary) areas of research and capabilities within their institutions. Individual members of staff have also benefited from the time and other resources which QR supports, and undertaken blue-skies research which is unlikely to have attracted project funding, at least initially. An interesting example of this is Cranfield University: industry is the major source of its research funding, but QR is considered essential to develop research capacities which industry will need in the future but which it would be unwilling to support at present. However, we did not identify examples of QR supporting research which has led to fundamental breakthroughs or radical changes in research areas. This reflects a number of related issues:

⁷ The distinctive characteristics of QR discussed in this chapter are important to all subject areas.

- breakthroughs are by definition rare, and the current study would be unlikely to encounter them, or identify them as such, in the time frames available to it
- the financial sustainability of research is a key issue for all the HEIs visited and the potential to generate project funding in the future is a major condition for investment. Institutional investments cannot, therefore, be too far in advance of funders' requirements. However, HEIs have successfully developed the capacity to respond to the shorter term requirements of funders. This has been one of the positive outcomes of QR funding and one which would be difficult to secure through 100% project funding
- related to the last point, the ability to generate QR in the future is an important consideration, with the result that most HEIs continue to support units that score highly in the RAE rather than undertaking substantial redistributions of QR.

Stability

2.8 Finally, QR is considered to be a relatively stable source of funding which enables HEIs to plan and invest with some degree of certainty. The stability arises from the formulaic allocation of QR and the relatively long period between RAEs. Given RAE grades, well informed projections of the financial settlements of public funding for HE, and information from HEFCE, most HEIs are able to make good projections some time in advance. However, there is uncertainty in relation to future RAEs since institutions need to project both grades and the financial allocation they will lead to. Almost all those we consulted face uncertainty as to future RAE outcomes and therefore QR allocations⁸, but the larger multi-faculty institutions have some opportunity to balance gains and losses which is not available to smaller HEIs, especially those focusing on a narrow range of subjects.

⁸ The changes to be introduced in the 2008 RAE are expected to reduce the impacts on funding of changes in 'gradings' but there is still significant uncertainty over financial outcomes.

3: Case study findings

Introduction

- 3.1 This chapter draws together findings from the case studies with the activities classified under one of the following headings:
- maintaining research competitiveness
 - developing research staff
 - restructuring
 - developing new research areas.
- 3.2 These headings are clearly not mutually exclusive activities: we have encountered several examples of elements of each being taken forward simultaneously in the same academic unit. The relative number of case studies given for each category roughly reflects our findings at the institutions visited and, we suspect, would be replicated in a larger sample.

Maintaining research competitiveness

- 3.3 All the HEIs consulted have at least one research area of very high quality, as indicated by RAE grades, and have invested resources in maintaining excellence, sometimes over a fairly lengthy period. The motive is, in part, to maintain leadership and thereby generate income in the future; but in many cases it is important to the institution to be perceived as leading in some areas in order to enhance or maintain its reputation. Investments have taken a number of forms but have tended to focus on staff, both volume and seniority of posts, and equipment and sometimes buildings. However, the Science Research Investment Fund (SRIF) has become an increasingly important source of capital funds, and QR less so, over recent years. It is interesting to note that SRIF and QR share some characteristics in that both are allocated to institutions on the basis of performance indicators (RAE grades and research income in the case of SRIF), and the institution has discretion over internal allocations.
- 3.4 These cases also illustrate the special role of QR in relation to project funding as discussed in chapter 2. Many of those we interviewed claimed that project funders tend to be risk averse, and there is a danger of research proceeding along familiar lines rather than breaking new ground. For the reasons given, there is little evidence of completely new areas of research developing with QR support, but it does enable researchers to follow their own interests and open up promising areas. A related point was made by Cranfield University. Cranfield receives a low proportion of research income via QR and a high proportion from industry, but QR is considered to be of disproportionate importance because it enables staff to explore new areas which industry would not fund but which nevertheless underpins their work with industry.
- 3.5 The University of Leicester has made long-term investments in one of its main areas of strength (see Box 1).

Box 1 University of Leicester: Department of Genetics

The objectives of the department have been to further its excellence in teaching and research. Illustrations of this include the development of sophisticated processes for genetic fingerprinting and profiling, the award of the Queen's Anniversary prize in 2002, and the award of a 5* rating in the 2001 RAE.

Funding has been generated from a wide range of sources but the continued support and commitment from the university to the department through its discretionary funding, including QR, has been a key factor.

Key investments include:

- building refurbishment
- equipment
- establishment of a bio-incubator (Biobater)
- additional lectureships.

The number of papers produced by the department has roughly tripled over a five year period from 40-50 to 130. An important factor has also been the increase in quality of papers as measured by publication in high impact journals and in citations.

The department is planning to seek external funding to develop a major research centre in human genetics. This would facilitate further developments including large scale screening, development of new techniques for studying genetic variations and their medical and pharmaceutical implications, and collaboration with medical colleagues in areas such as cardio-vascular research. This would be supported by the university's discretionary funding through a commitment to fund the running costs of 4.5 full-time equivalent posts at post-doctoral level at an annual cost of some £200,000.

3.6 Genetics at Leicester represents an example of a high profile department which has benefited from substantial investment over a long period. At the University of Oxford, institutional investments have combined with substantial project funding (see Box 2).

Box 2 University of Oxford: Wellcome Trust Centre for Human Genetics

The Wellcome Trust Centre for Human Genetics was founded in 1994 to undertake research into the genetic basis of common diseases, including asthma, psychiatric disorders, infectious disease, heart disease and diabetes. Its goal is to define the underlying biological processes in such diseases, and how genetic factors and the external environment interact to determine occurrence and severity. It has 400 staff and students and an income of some £16m. There are no established posts, with all personnel funded by external grants.

The Centre therefore brings together researchers from different disciplines and departments into a collaborative environment which would not otherwise be possible. It has been extremely successful achieving a 5* RAE grading, and is now the largest unit comprising externally funded research fellows in the UK.

The Centre is primarily funded by UK and overseas charities but is reliant on funding from the university for infrastructure and operating costs such as heat, light and power. QR contributes to these costs and is essential to provide:

- for maintenance of the infrastructure and operating costs
- bridging funds for research fellows where their specific external funding has come to an end and they need funding until their next grant application is approved
- pump priming funds to demonstrate capability or need to project funders
- funding for new junior researchers to buy equipment, fund a technician, obtain specific training, or fund a research assistant
- funding for an existing (funded) research group to acquire a different technology platform to that supported by project grants. A project sponsor is unlikely to fund two (related) platforms for the same project but the opportunity to explore different approaches may be valuable to the research team
- funding for the purchase of a piece of equipment where one group does not have sufficient demand to utilise the equipment full time, but believes that there would be a good possibility of other groups joining in to share costs.

- 3.7 Cranfield University's research is focused on collaboration with industry, but industrial sponsors are typically only interested in supporting research with fairly immediate pay backs. QR enables the university to develop capabilities to meet future needs of businesses (see Box 3).

Box 3 Cranfield University: Power & Propulsion Group, School of Engineering

The main research focus of the Power and Propulsion Group (PPG) is gas turbines. The UK gas turbine industry generates around £30 billion a year; half in aerospace and half surface based. As for all parts of Cranfield University, PPG's strategy is to work closely with industry. There are 25 PhD students in the group, and the majority of these are funded by industry.

PPG generates around £1m per year in research funding. Approximately 50% comes from industry and the remainder from the Research Councils and QR. However, QR funds only represent around 5% of total research income.

All QR funding is returned by the university to the schools which have generated it and, within the School of Engineering, the funds are distributed to the groups who have generated the QR. The head of PPG allocates these funds within the group.

PPG has links with major businesses such as BAe Systems and Rolls Royce. The latter has established a University Technology Centre in Performance Engineering to undertake long-term research in the broad field of performance engineering. In addition to major names, a significant proportion of the group's research is carried out for small and medium-sized enterprises who could not afford to do this work themselves and rely on the synergies within the group to do research for them cost effectively.

QR only accounts for a small proportion of research income but is crucial to the PPG's work with industry. As one of our respondents said: "If you starve an HEI of such funds it is like starving a plant of water, it will eventually wither". For Cranfield this withering process would be in a few years. Industry collaborations would sustain the group for the short term but it would be very difficult to invest in the cutting edge research which ensures its future. In order to explore novelty and innovation several ideas need to be tried of which only one may work, and to secure funding for this from other streams such as the Research Councils is extremely difficult.

- 3.8 At the University of Hertfordshire, limited QR resources are being used to extend research capabilities in an area of real strength (see Box 4).

Box 4 University of Hertfordshire: history research group

In the 1996 RAE, the history research group at the University of Hertfordshire received a grade 2. Following an aggressive policy of targeting external research funding and creating large projects, the group of 6 full-time equivalent staff was awarded a grade 5 in the 2001 RAE. At the same time, the university implemented a new strategy of investing all QR into only those units of assessment with the potential to be internationally excellent. Six units were identified for funding following external and peer assessment, of which history was one. As a result, the group effectively received a completely new funding stream of approximately £180,000 per annum from 2001.

The group has used the funding to develop areas of strength, and to allow lone researchers to push forward their research agendas. The money received through the QR funding stream ensures that all research-active staff in the group have the same platform to work from. This has generated a change in culture; there is now the expectation that all members of staff should be research active at the highest level. Specifically, QR funding has been used for the following:

- two new appointments at the research professor level, which has led to an increase in the number of graduate students within the group
- appointment of a postgraduate research assistant to do the groundwork for research funding applications, including pulling together archive material; this has freed up research-active staff time from administration
- support for a number of large-scale projects, including 'Old Bailey Online', a digitisation of 18th century criminal records undertaken in conjunction with the University of Sheffield
- to buy out internal teaching time and to fund staff sabbaticals of one term in seven within the group for all academic staff
- to support the production of research outputs, including books and microfilms. 10-15 books have been produced since the 2001 RAE where QR funding has played a

significant part in their production.

- 3.9 All the cases above reflect investment in specific subject areas , but QR can also be used to support the research infrastructure across subject areas, for example through libraries (see Box 5).

Box 5 The University of Oxford: central libraries

The central libraries comprise 33 managerially integrated sites including the Bodleian Library. The overall cost is some £27m of which some £16m is derived from QR funds.

The Bodleian Library is a library of legal deposit, which means that all publishers in the UK and the Republic of Ireland must deposit a copy of their publications with the library if requested. In addition, it receives documentary archives including important collections of personal papers. As a consequence, the library has amassed major collections that are unique.

The core purpose of the central libraries is to preserve and make accessible these important collections as an essential resource for researchers. Oxford University Library Services (OULS) also provides a central resource for faculties and departments and spends a growing proportion of its budget purchasing scientific and other databases, datasets, electronic journals, digital maps and reference materials. However, the publishers frequently sell these electronic journals as a bundle of titles and the integrated library system enables negotiations to achieve substantial discounts.

OULS employs specialist curators who understand the historical background and relevance of documents and who can work with academic researchers to provide specialist contextual information. Overall, OULS employs some 564 full-time equivalent staff of whom 142 are staff in professional, subject specialist and curatorial posts.

Output indicators include:

- some 53,000 current registered users
- around 50% of readers are from outside the university
- citations of manuscripts held in the Oxford central libraries and the Dictionary of the National Biography indicate that the Oxford Libraries are second in the number of citations
- finally, the Research Support Libraries Programme survey of UK academics indicated that the Bodleian was by a large margin the most heavily used resource.

The role of QR has been essential in contributing towards the cost of providing the physical and curatorial resources necessary to support a key national and international research resource.

Developing research staff

- 3.10 One of the practical implications of QR funding is that staff-student ratios are higher than would otherwise be the case, since QR represents an additional source of funding for staff. This, critically, frees up staff time to undertake research. Several of the case study institutions have also used discretionary funding to:

- make new appointments in priority subject areas
- allow and support the development of research capabilities. In some cases these schemes are restricted to priority subject areas but often all staff have the opportunity to take periods of research leave.

- 3.11 The establishment of new posts is often associated with ‘maintaining competitiveness’ activities as illustrated by an ambitious scheme at the University of Leicester (Box 6).

Box 6 Leicester University: the 'New Blood' programme

Leicester submitted to 32 units of assessment in the 2001 RAE. Twelve received a 5 rating and one 5* (Genetics). However a large number of departments received 4 ratings which resulted in relatively little QR funding for the university and a few units were rated 3a or 3b, resulting in no QR income. The influence of a new Vice Chancellor led to the development of a more explicit research-led strategy, with all departments expected to engage in research of high quality. As a result of reducing staff costs and increasing overall income, the university finances were in a much stronger position by 2005, and consideration was given to how good performance in research and teaching might be further rewarded and encouraged. It was decided to establish new academic posts in departments that had excelled in the RAE.

The main objectives of the proposed 'New Blood' programme were to:

- encourage and motivate staff in departments that had performed well in the 2001 RAE
- build up departmental research strengths and ability to win research grants
- position the university to do well in the 2008 RAE and to maximise its potential QR funding.

The university decided to support 20 new lecturers/researchers. Each post would provide:

- guaranteed 'study leave', free from teaching in the first year
- low teaching loads in the three subsequent years
- funding for research travel for four years.

Posts were provided only to departments or units which had received 5 or 5* ratings in the 2001 RAE. One post was distributed to each of 18 departments which had been graded 5 in the 2001 RAE and two posts were provided in Genetics (the only 5* department). The main criterion for new appointments was that applicants should have already achieved international recognition for their research, with a significant publications record in high impact journals.

The university received over 1000 applicants with a very high quality profile. All the new appointments have now been made

- 3.12 Royal Holloway University of London (see Box 7) has used QR funding to support new appointments in subject areas where it is already strong and in which it wishes to enhance capabilities. The number of new posts is even larger than at Leicester but appointments were focused on more established researchers; new appointments have an average teaching and management load (although they are still expected to lead research).

Box 7 Royal Holloway: new appointments

Royal Holloway University of London performed strongly in the 2001 RAE with all submissions achieving at least a 4; 15% of staff submitted were in units of assessment graded 5* and 59% in units graded 5, with the science faculty one of a very small number nationally that were rated 5 and 5* throughout. Royal Holloway's aim is to consolidate and improve its position as a research-intensive institution of international distinction. By 2008, it aims to at least to maintain individual departments' performance, and to increase the proportion of staff submitted.

After the 1996 RAE the university strengthened a number of measures supportive of this strategy, including a pump-priming fund for research grants and support to established and younger researchers. These were in part supported by QR funds but the strong performance in the 2001 RAE was attributed to a policy of appointing outstanding researchers. This has continued to be Royal Holloway's policy, and £4m from QR was made available for new appointments.

These posts were allocated centrally and the key selection criteria were potential to contribute to achieving RAE targets, strengthening the institution's position in leading-edge subjects, and strengthening the generation of research and contract income. Departments were also required to demonstrate financial sustainability over the medium term.

Twenty-eight additional posts, of which 13 were chairs, were awarded. This represented around a 7% addition to the academic staff complement. The allocations were selective: 16

departments made successful bids and were allocated between one and three additional posts. Around 20% of departments did not receive any additional funding.

The quality and quantity of applications was considered very high and appointments were made in 2004 and 2005. It is still early to identify tangible outcomes but Royal Holloway considers its investment to have been very worthwhile. Research grants have already started to increase; those from the Research Councils increased by 21% between 2002-03 and 2004-05 and have continued to grow over the last year. There has also been an expansion into new research areas including new areas of interdisciplinary research.

- 3.13 The University of Essex has funded a research leave scheme which gives academic staff the opportunity to develop their research and establish contacts with other researchers, unrestricted by teaching and administration responsibilities (see Box 8). The scheme is not targeted on specific subject areas but Essex's strategy is to raise all areas to at least a 5 equivalent in the next RAE.

Box 8 University of Essex: research leave

The University of Essex wishes to become one of the leading research universities in the UK, and to embed a strong culture of research across all departments and in all staff. It is aiming to achieve a minimum of grade 5 equivalent in all departments in RAE 2008. Every member of academic staff has equal entitlement to the research leave scheme. Leave periods are managed at the departmental level so they can be fitted around teaching commitments. Academics primarily use the leave period to undertake research activities, particularly those that do not sit easily with a heavy teaching load:

- to finish a book based on earlier research and undertake extensive archive research to underpin a new research direction
- fieldwork overseas, in a related area to their current research. This has led to research moving in a new direction
- time spent overseas undertaking fieldwork, and extensive periods of research and writing in the UK.

Interviewees reported that time away from university teaching duties has led to the following outputs and impacts:

- published works, books, articles, papers, conference proceedings, editorials. These would have been produced more slowly or not at all without study leave; many will be used as submissions in RAE 2008
- rejuvenation and renewal of research including attendance at conferences and seminars and time to follow up thoughts and ideas that would 'fall by the wayside otherwise'. These activities were reported to be impossible to combine with a teaching load. They have stimulated new research areas and directions, and in one case at least, have given the research in question a wider relevance. Time spend undertaking fieldwork in new geographic areas has increased the scope of various research projects
- changed research directions: study leave has enabled academics to bring together parallel streams of research in new ways, and has provided time to re-orientate research
- new collaborations, linkages and partnerships
- raised research profile through production and editorship of major publications, and attendance at a wider range of conferences than would otherwise be the case
- impacts on teaching: new knowledge has led to updated courses and more recent case studies and examples.

- 3.14 Developing research capabilities is especially important in less research intensive institutions. The aim in some cases, both pre- and post-92 universities, has been to change research culture as well as skills and capabilities. This is especially true of arts and humanities. The research tradition in these subjects has been one of relatively small grants and the single researcher. The Arts and Humanities Research Council (AHRC) provides opportunities for larger and

longer projects, with collaboration between researchers and postgraduate involvement analogous to the typical STEM research project.

- 3.15 Activities have been people-focused with accompanying infrastructure often funded through SRIF and other sources. Discretionary funds have also been used to develop research support services to identify funding opportunities and to assist with, and quality control, proposals for funding.
- 3.16 There are some interesting initiatives which essentially involve new posts, restricted to established and promising researchers and with integral support for research, but also activities concerned with developing existing staff. Younger researchers appear to be a particular target, but not exclusively so. These include:
- time for research, managed through workload planning
 - mentoring of younger staff by experienced researchers
 - sabbaticals, in some cases for up to a year
 - small grants to develop ideas. These are not intended to generate new research areas but to develop research ideas to the point where high quality proposals can be submitted to project funders
 - delivering practice-based PhD supervision in the arts.
- 3.17 Wimbledon College of Art illustrates the use of QR by a small specialist institution to develop researchers (see Box 9).

Box 9 Wimbledon College of Art: developing researchers

Within the context of a college of art, research has a somewhat broader connotation than the more tightly defined concepts of research in the sciences. 'Practice-based research' is used to describe this approach. Research within the college is considered vital to enable new subject matter to be explored, new approaches to be developed and to ensure that teaching and learning are refreshed by experience at the leading edge of practice. This accords with its belief that teaching should be undertaken by practising artists rather than as a theoretical subject. QR funding provides a vital resource to enable the college to pursue its activities. The current use of QR funding involves a number of different activities, one of which provides funding for staff such as the 'fellows' programme, whilst others have enabled researchers to undertake practice-based research, to do research abroad and also to reinforce collaboration with other colleges including the University of the Arts London (of which Wimbledon is now part).

Some of the activities undertaken by different researchers using QR based funding have included:

- research to explore some of the ways in which scientific outputs and images have been presented and their relationship to the current cultural precepts
- research into the experiences of transsexual people by examining how sight, sound, scent and touch relate to the development of gender identities and gender projections in the social domain
- practice-based research involving the development of design in performance contexts, particularly in the sphere of ensemble and integrated performances in African music and theatre.

Outputs and outcomes can be classified as:

- tangible outputs such as books, articles, exhibitions and paintings
- the ability to develop collaborative funding applications, for example to the AHRC

- development of a research culture, specifically through artists/researchers with a history of successful applications to Research Councils and private foundations providing mentoring to other staff on how to develop grant applications
- development of a practice-led research culture. Where artists might previously have expected to present proposals in which they had little idea about the research questions, outputs etc, they are now better able to formulate proposals
- providing materials gained through the programme that will inform the teaching of undergraduates in the theory of contextual studies.

Restructuring

- 3.18 All the HEIs consulted have explicit plans and strategies for the subject areas they provide and, with the increasing concentration of research funding, they have adopted more strategic approaches to managing research. For some the goal is excellence in all areas and the requirement is to upgrade underperforming departments. Others are adopting a more targeted approach, but also aim to enhance quality in selected areas. Activities are similar to those described for maintaining competitiveness (paragraphs 3.3-3.9 above), but there is generally a more explicit requirement to generate income quite quickly from external sources in order to return the investment made by the institution. Indeed, the potential for income generation is often one of the key criteria in deciding where to invest.
- 3.19 One example is the chemistry department at the University of Warwick, which was experiencing some difficulties in the early part of the 1990s, but is now performing at an international level (see Box 10).

Box 10 University of Warwick: Department of Chemistry

The Department of Chemistry achieved a 3a grade in the 1996 RAE but was rated as 5 in 2001 and submitted almost the same number of staff to both exercises. Of the 34 HEIs which made submissions in chemistry to both exercises, only four achieved increases of two grades and only three were awarded a 5 or 5* in 2001. This represents a substantial enhancement of research capabilities.

The process of change in fact began in 1992. The initial changes were on a fairly minor scale but included some restructuring of management within the department. The university did, however, provide funds to refurbish the undergraduate laboratories and for two additional posts. These changes came too late to impact on the 1996 RAE which the department believes was 18 months too soon for it to benefit.

Following the 1996 RAE results, the university set up a panel of external experts to review chemistry, and other subjects which had performed relatively poorly. Closure of the department was an option but the panel recommended that it should continue, based on a belief that chemistry could become viable and attain a high level of research performance.

Since 1996 the university has provided funding to the department in a number of ways including:

- additional staff posts
- 50% of the costs of refurbishing the research laboratories
- guaranteeing the long-term salaries of Royal Society Fellows.

The department has focused on its strengths and emerging areas of chemistry, for example, mass spectrometry which is a distinct group within the department with 30 members. An important component of the department's strategy has been to move into interdisciplinary areas of research, often with direct support from the university.

The department has continued to develop since the last RAE and the number of research staff has increased by around 40%. This is reflected in published outputs, with all members of staff now actively engaged in research. The reputation of the department is now firmly established amongst schools and potential students. The department admitted 85 undergraduates in 2005-06; and 120, with higher A-level scores, in 2006-07.

3.20 Biological sciences at the University of Essex (see Box 11) shares some of these characteristics.

Box 11 University of Essex: biological sciences

QR funding received by the University of Essex is pooled with other institutional income before allocation to departments and centrally decided investments. Only about 6% of QR generated is returned directly to the departments that generated it.

The Department of Biological Sciences at Essex University was formed in 1997 as a result of the merger of the departments of biology and chemistry, and is currently the largest science department in the university. Following the 2001 RAE, the department received a 4 rating leading to a substantial fall in QR funding. Following this, the university made the strategic decision to improve performance across the department, and central funds were allocated for the following:

- consolidation of the environmental, biochemical and sports science components of the department onto one site in order to promote cross-disciplinary research and improve the research infrastructure. This was funded by the university at a cost of £1m
- creation of a Research Executive to establish policy and implement strategy within the department. The executive also oversaw reorganisation into four research groups and five interdisciplinary research units
- investment of £2m for new equipment and laboratory refurbishment
- a new research strategy which includes a key role for the department in three cross-departmental research centres
- new lectureship and chairs.

The main outputs so far have been:

- increased quantity and quality of published papers
- growth in research income from approximately £55k per researcher to more than £100k
- an increase in competitively-funded research fellows (number per Category A academic staff has risen from 1 per 25 to 1 per 4.5)
- improvements in esteem measures across the department, and a much better ability to compete for research funds
- improved student recruitment.

Developing new research areas

3.21 As already mentioned, those consulted have drawn attention to the inherent conservatism of project funding and the potential for QR to support the emergence of new approaches and ideas. This is because QR:

- buys time, and sometimes also project resources, for researchers to develop ideas
- supports travel and conference attendance, and thus valuable exposure to other researchers
- provides investment for new research ‘centres’ to exploit the potential arising from emerging areas. These are often interdisciplinary.

3.22 These are potentially important QR impacts and reflect one of the original rationales for the dual support system for distributing public funds for research. However, it is worth noting that wherever HEIs have made major investments in new areas it is on the basis that the resulting capacity will generate additional income, sometimes within two years or so of establishment. The Research Councils and charities are often a key income source, and senior

academics are in close contact with these funders so are well informed of developments as well as helping to shape those developments. They are also, of course, well informed about global developments in their specialist areas. Therefore investment decisions are typically based on sound information and projections of project funders' requirements. These investments may not be developing genuinely new research areas, but they are helping to provide the research infrastructure for the future and are therefore crucial.

- 3.23 At Cranfield University, an early development of nanotechnology was, in part, supported by QR funding (see Box 12).

Box 12 Cranfield University: nanotechnology manufacturing science

In 1993 the head of the School of Industrial Manufacturing Science (now the School of Applied Science) proposed to the senior management team that the school should invest in a new research activity in nanotechnology. This was agreed and the initial activity was to appoint a professor to head the activity. A case was made to the Royal Academy of Engineering who supported the appointment at 50% for five years, the balance being funded by the school. Today, all QR funding at Cranfield accrues to the school that has generated it, and QR would now contribute to a similar investment.

A professor was appointed in October 1994 and immediately planned the laboratory and equipment requirements. Money for this came from the school (£750,000), and a grant from the Wolfson Foundation, and provided specialist laboratory facilities.

Nanotechnology started as a research activity, with no teaching initially, recruiting staff and research students as it grew. Funds were generated from research grants although one staff member was funded from the McKeown endowment. Two notable milestones were the setting up of a formal research relationship with a commercial company, TDK, where staff from Japan were seconded to Cranfield; and the award of a platform grant from the Engineering and Physical Sciences Research Council (EPSRC) in 2002 in recognition of the work of the centre.

In 2001 the group launched a masters course in microsystems and nanotechnology part funded by an EPSRC grant. The increase in size of the activity meant that further investment was required. In 2002 the school put in another £180,000 to enable a second professor to be appointed. Currently the centre turns over £1.6m and employs eight academics, four researchers and three support staff, and has 23 research students.

The centre's research activities range from the development of new functional materials through to prototyping micro-electromechanical system devices. The work conducted is truly multidisciplinary and encompasses micro-engineering, nanotechnology, biology, materials science, physics and chemistry. Excellent in-house facilities are available, including over 100 square metres of clean room space, extensive equipment for analysis, synthesis, electrical and device characterisation. The Nanotechnology Centre enjoys close collaboration with industrial sponsors, ensuring that the research carried out in the labs continues to maintain its relevance to the latest industrial devices and material requirements.

- 3.24 The University of Warwick has invested substantial resources in staff and infrastructure with the expectation of generating project funding from the Research Councils and other bodies (see Box 13).

Box 13 University of Warwick: Systems Biology Centre

The University of Warwick has recently created a centre for systems biology. This will build on the university's existing strengths in the area and has meant a substantial investment in staff, infrastructure and accommodation. Systems biology involves developing the understanding of a biological system through mathematical and computational modelling of the interactions of components of the system, leading to the expression of this understanding in qualitative and quantitative terms.

This will build on the university's current strengths in the area and involves a substantial investment that includes 12 new posts (five at professorial level), a number of secondments, sizeable infrastructure and dedicated accommodation. These investments are being provided by the university. The decision to invest was taken in the light of expectations regarding future Research Council funding, and represents an attempt by the university to position itself to exploit this potential.

The centre is led by the Department of Biological Sciences, the Mathematics Institute, the Medical School and Warwick HRI, which is dedicated to horticultural research and development.

The centre builds on a thriving programme at the interface between the life sciences and the mathematical and physical sciences which has been led by:

- the Interdisciplinary Programme for Cellular Regulation⁹
- the Molecular Organisation & Assembly in Cells Doctoral Training Centre¹⁰ which is funded by the Life Sciences Programme of the EPSRC.

The Warwick Systems Biology Centre will also host a new doctoral training centre in systems biology. This has been funded by a £3.4m grant from the EPSRC and the BBSRC, with significant investment from the university.

⁹ This multidisciplinary programme is funded primarily by the EPSRC and the Biotechnology and Biological Sciences Research Council. It brings together mathematicians, physicists, statisticians, biologists and medics to understand the regulation and co-ordination of cellular systems using mathematical and statistical analysis, modelling and computation.

¹⁰ A multidisciplinary centre operating at the interface between mathematics, chemistry, biology, physics and computing. It offers a range of MSc programmes, and a four year degree programme (MSc & PhD). The aim is to equip students with the skills necessary to become effective life scientists of the future.

4: Conclusions

- 4.1 QR is widely perceived as very important within the HE sector. In the institutions we visited, QR varied between 1% and 15% of total income, reflecting research intensity and subject mix, but all considered it an important income source. In part this is because of the substantial contribution QR makes to meeting the costs of projects funded by the Research Councils and others. HEFCE has estimated that the gap between the income generated by these projects and their full economic cost, and the cost to HEIs of undertaking research not commissioned by a third party including 'blue skies' research, together come to some £2.1 billion. So HEIs are in effect spending double their QR grant to achieve its two main aims. We would not claim that our sample of interviews was representative, but opinion was almost unanimously against QR being replaced by higher levels of funding for project grants. Interestingly, this was true of some HEIs which might gain financially from such a system.
- 4.2 For the reasons given in chapter 1, it is sometimes difficult to track the impacts generated by QR funding. However, we have been able to explore activities supported from discretionary funds more generally. There is limited data on discretionary funds available to the sector but, at around £1bn, QR will be a significant component of such funds. It is, for example, over five times larger than endowment and investment income. For HEIs that do not have endowments or significant surpluses from income-generating activities, such as short courses and contract research, QR will be the only source of discretionary income. Many of the impacts generated through discretionary spend can therefore be attributed to QR. Even where this is not the case they illustrate what QR can achieve. There are two main characteristics of QR which make it attractive to the sector.
- 4.3 First, HEIs have discretion over how it is spent and, despite the need to meet the shortfall arising from project funding, all those we visited exercised this discretion. Discretionary spending has a number of benefits:
- expenditure can be aligned with institutional priorities and plans
 - it makes a key contribution to developing and sustaining research capabilities within institutions. The ways in which this happens are summarised below; they could not be achieved through a system of 100% project funding.
- 4.4 Second, QR funding, because it is allocated formulaically, is relatively stable and predictable between RAEs. This means that HEIs can invest with a greater degree of certainty than is associated with other income streams, notably competitive project grants.
- 4.5 We have grouped the case study material into four, not mutually exclusive, categories to illustrate how HEIs have utilised QR: maintaining research competitiveness; developing research staff; restructuring; and development of new research areas. Each is summarised in turn below.

4.6 *Maintaining research competitiveness.* This encompasses cases where the HEI has invested in areas of strength – through buildings, equipment, staff time and new staff – in order to maintain its leadership and reputation in the field. The investment may represent a significant diversion of resources from other areas. The main impacts, in comparison with full economic costing of research projects are:

- support for elements of infrastructure which would be difficult to fund through project grants. The central libraries at Oxford University are a good example from our case studies. The libraries employ specialist curators to provide an effective service to researchers, and the physical costs of housing the collections are also substantial. A significant proportion of these costs are met from QR. The Wellcome Trust Centre for Human Genetics, also at Oxford, is another example where QR supports running costs. The centre has no established staff and all researchers are funded through projects. The building provides an ideal environment for collaborative and interdisciplinary research
- resources, time and sometimes also equipment and consumables, to develop ideas to the extent where project funding becomes feasible. Cranfield University also emphasised the importance of supporting longer-term research, which was vital to underpin industry contracts in the future, but would not itself attract industry sponsorship
- support for research teams between project grants. Large groups can sometimes be sustained by a series of project grants but this requires careful management and, in some subject areas, continuous grant funding is not typical. Continued support from QR means that HEIs can respond quickly to new calls from project funders
- attracting and retaining leading researchers.

4.7 *Developing research staff.* As mentioned above, this is an important component of maintaining competitiveness through the establishment of additional posts in key areas of strength. There are also schemes which are accessible to a wider cross-section of researchers, although in all cases the aim is to enhance research outputs. These include:

- conventional research leave arrangements where QR is used to buy out teaching and administration time to enable staff to concentrate on research for a limited period
- a range of support measures, often targeted at younger staff, including mentoring and small grants as well as reduced teaching and administration loads.

4.8 *Restructuring.* Some of the HEIs consulted have invested in underperforming subject areas and restructuring. We encountered relatively few examples of this but there have been some quite dramatic enhancements to research strengths, reflected in the 2001 RAE grades. The activities supported tended to be similar to those described under ‘maintaining competitiveness’. Our impression is that the potential to generate income, from both teaching and research activities, for financial sustainability was an especially important consideration, and delivery against this was closely monitored.

- 4.9 *Development of new research areas.* QR has facilitated the establishment of teams, and research centres, in advance of project funders' requirements. While we have not identified any examples of radical departures from mainstream research, there are several examples of interdisciplinary teams being brought together with support from the university. There is, invariably, an expectation that the teams will generate project funding and become financially sustainable, but these examples represent HEIs positioning themselves to respond to emerging demands.
- 4.10 The overall conclusion we draw from the case studies is that these activities are materially enhancing HEIs' capacities to respond to project funders' requirements, including developing capabilities ahead of those requirements. This, together with QR's role in meeting the shortfall in project funding compared with the full economic cost of projects, means that QR is 'fit for purpose'.

Annex A: Case studies

University of Bath: Department of Mechanical Engineering

- A.1 The university was in deficit until two years ago, which restricted the scope for strategic investment, but budgets are now increasing, creating more room for manoeuvre. As the university came out of the red it decided to establish a central strategic fund so that departments which generated QR funding would receive a significant slice of this new money to support their research. The Department of Mechanical Engineering was one beneficiary.
- A.2 Using the strategic funds the department was able to:
- retain two eminent professors, who were coming up to retirement, employed for two days a week.
 - recruit two highly rated researchers into the posts formerly filled by the retiring professors by offering golden handshakes. These researchers are specialising in new areas for the department enabling it to grow and develop. They have been provided with funds to set up a new research infrastructure. The department was awarded funds as an EPSRC Innovative Manufacturing Research Centre in 2001 and funding has just been renewed to 2011. The two new researchers work with this centre
 - appoint a new lecturer in composite engineering (the department has a growing collaboration in composites with Airbus)
 - appointed two research fellows who are funded by the university rather than the department. The purpose of these appointments was to add to research but also succession planning as permanent posts will become vacant in five years' time.
- A.3 One of the department's thrusts is to provide excellent teaching efficiently, as this releases staff to do research, and it had wanted to explore the use of teaching assistants. With strategic funds it decided to appoint a postgraduate on a five year term – a blend of two years of teaching with three years of research. The potential benefit is that academics are released to do quality research and they provide tutoring of the postgraduate to enable them to undertake teaching effectively. In practice it has proved difficult to find suitable postgraduates but an appointment is about to be made.

- A.4 In the past the number of postgraduates per academic did not compare well with other 5* mechanical engineering departments across the UK. The department therefore decided to provide bursaries from its own operating income. This proved successful and the university rolled out the scheme across all departments. The funding required is top sliced by the university before the departments receive their operating budget and the university then allocates studentships to departments in relation to their QR income. Mechanical engineering is awarded seven or eight university studentships which are independent of Research Council grants. The money is ring fenced for bursaries but can be awarded to overseas students as well as home and EU students (unlike Research Council grants). Without QR funding, it is unlikely that the university would be able to top slice departmental revenues for this purpose.

Cranfield University: Power & Propulsion Group (School of Engineering)

- A.5 The focus of the School of Engineering is on wealth generation and the main research focus of the Power and Propulsion Group is gas turbines. The gas turbine industry is worth £30bn a year (this includes machinery, services etc) with half of the business in aerospace and the other surface based. The emphasis of the Power and Propulsion Group is on links with industry, research, postgraduate courses and consultancy work.
- A.6 Total activity in the Power and Propulsion Group generates some £2.5m of which approximately 40% is from teaching and the rest is research money. Approximately 50% of the research money is from industry and the remaining £0.5m is from the Research Councils such as EPSRC. QR funds account for only around 5% of the total activity.
- A.7 Cranfield has links with major businesses such as BAe Systems and Rolls Royce. For example the Rolls Royce University Technology Centre in Performance Engineering at Cranfield University undertakes long-term research. In addition to major names, a significant proportion of the Power and Propulsion Group's research is carried out for small and medium-sized enterprises who could not afford to do this work themselves and rely on the synergies within the group to do research for them cost effectively. The majority of PhD students are also funded by industry.
- A.8 Within the School of Engineering, QR funds are allocated to the groups that have generated them. The head of the Power and Propulsion Group is responsible for the allocation of discretionary funding within the group. Group members work closely in teams and so funding is allocated to teams and specific projects rather than to individuals. The money is allocated strategically to projects so that the group can 'be prepared for tomorrow' although it may actually fund an individual's research work. The funding helps them look to the future in a timeframe which industry would not consider. Discretionary funding is seen very much as investing in the future of the group.
- A.9 There are three major streams of work. The first and the key skill of the group is the ability to produce mathematical models of engines and their behaviour. Part of any

discretionary funding goes into strengthening this activity so that they continue to have a product which industry will wish to use. The second area of activity is research into novel engine cycles for power generation in aerospace and surface turbines. This area of work is very much looking to the long term and is not one which would currently be funded by industry. The third stream is investigating how the mathematical models can be used to help improve the way in which gas turbines are used, for example, to understand the degradation process of turbines.

- A.10 Discretionary funding has been used for basic research which would not be funded by industry but in some years time may well be of interest and use to industry. The funding partly frees up time for staff to carry out this basic research, and has also allowed the Power and Propulsion Group to fund one or two PhD students to work on such projects.
- A.11 The work using mathematical models to improve the use of gas turbines was originally developed out of research funds. This strand of the group's work is now generating contracts with industry.
- A.12 QR funding allows the Power and Propulsion Group to invest for the future. One comment from the group was that 'if you starve an HEI of such funds it is like starving a plant of water, it will eventually wither'. For Cranfield this withering process would be in a few years. Their collaborations with industry would sustain them for the short term but without the discretionary funding it would be very difficult to invest in the cutting edge research which ensures their future. In order to explore novelty and innovation, several ideas need to be tried of which only one may work. To secure this funding through other streams such as the Research Councils is extremely difficult.

Cranfield University: Development of nanotechnology

- A.13 Each school at Cranfield University has its own profit and loss accounts and balance sheet. The schools 'trade' academically in research, education and industry and each generates income which goes direct to the school. Block grants from the funding council are allocated by the university to the schools with very little top slicing. All money flows through to the schools and is then recovered by the university for central costs. Schools are, therefore, allocated all the QR they generate. QR is therefore one component of 'surplus' funds which they use to reinvest in research infrastructure and new research areas.
- A.14 In 1993 the head of the School of Industrial Manufacturing Science (now the School of Applied Science) proposed to the senior management team that the school should invest in a new research activity in nanotechnology. This was agreed and the initial activity was to appoint a professor to head the activity. A case was made to the Royal Academy of Engineering who supported the appointment at 50% for five years, the balance being funded by the school. If a similar initiative was undertaken today, at least part of the school's contribution would come from QR.

- A.15 A professor was appointed in October 1994 and immediately planned the laboratory and equipment requirements. Grants for this came from the school (£750,000), and from the Wolfson Foundation, and provided equipped clean room facilities.
- A.16 The nanotechnology activity started as a research activity, initially without students, recruiting staff and research students as it grew. Funds were generated from research grants although one staff member was funded from the McKeown endowment. Two notable milestones were the setting up of a formal research relationship with TDK, where staff from Japan were seconded to Cranfield, and the award of an EPSRC platform grant in 2002 in recognition of the work of the centre. In 2001 the group launched a masters course in microsystems and nanotechnology part funded by an EPSRC grant. The increase in size of the activity meant that further investment was required. In 2002 the school put in another £180,000 to enable a second professor to be appointed. Currently the centre turns over £1.6m and employs eight academics four researchers and three support staff and has 23 research students.
- A.17 The centre's research activities span from the development of new functional materials through to prototyping of micro-electromechanical system devices. The work conducted is truly multidisciplinary and encompasses micro-engineering, nanotechnology, biology, materials science, physics and chemistry. Excellent in-house facilities are available, including over 100 square metres of clean room space, extensive analysis, synthesis, electrical and device characterisation equipment. The Nanotechnology Centre enjoys close collaboration with industrial sponsors ensuring that the research carried out in the labs continues to maintain its relevance to the latest industrial devices and material requirements.

University of Essex: Department of Biological Sciences

- A.18 Essex uses a notional income expenditure model when allocating funds to departments. This takes into account the total income generated by a department (teaching, tuition fees, QR, project grants, short courses, consultancy etc), and calculates notional income after costs are removed (mainly staff salaries, the departmental grant allocation and a 40% tax for central services). Total QR funding is pooled with the other funding that comes into the institution. About 6% of QR generated is given back to departments in this way and departments have free rein over how they spend this money.
- A.19 The Department of Biological Sciences at Essex University was consolidated into a single department in 1997 as a result of the merger of the Department of Biology and the Department of Chemistry, and is currently the largest science department in the university. Following the 2001 RAE, the department received a 4 rating when the university had been hoping for a 5, leading to a substantial fall in QR funding. The university decided that it needed to achieve a substantial improvement in performance across the whole department. It allocated central funding for new staff appointments and other strategic investment to improve performance, which included funding for reorganisation, laboratory refurbishments and new physical equipment.

A.20 During 2003, the department received major support from the university central funds for a programme of activities which included:

- the physical merging of the environmental, biochemical and sports science components of the department onto one site in order to promote cross-disciplinary research and improve the research infrastructure. This was funded by the university at a cost of £1m
- the creation of a Research Executive chaired by the department's research director, with members drawn from both senior and junior staff. Its purpose was to establish research policy and implement strategy within the department, and oversee the reorganisation of the department into four research groups and five interdisciplinary research units
- the development of a new research strategy which includes the establishment of a competitive departmental research fund to fund internal RAE-related research activity
- investment of £2m of the university's central funds for new equipment and laboratory refurbishment which included the consolidation of staff into one building and a rolling programme of refurbishment of laboratories
- new staff including a chair, senior lecturer and lectureships in bioinformatics, environmental microbiology, marine science, protein science and proteomics.

A.21 The main outputs have been:

- increased quantity and quality of peer-reviewed papers published, with a growth in papers published in top journals
- a growth in research income from approximately £55k per Category A staff in RAE 2001 to more than £100k per Category A staff to date in this RAE period
- an increase in competitively-funded research fellows (the number per Category A academic staff has risen from 1 per 25 to 1 per 4.5)
- improvements in esteem measures across the department, and a much better ability to compete and obtain a good score in the next RAE.

A.22 The funding provided by QR has played a vital role in enabling the university to provide the funds to enable its largest scientific department to improve its effectiveness and competitiveness. The reorganisation and investment has already produced positive outputs in terms of research income, and the number and quality of publications. These are likely to persist in the long-term, and have already had cross-benefits in terms of student recruitment. In addition, the outlook for the future is now thought to be very good, with the department being well placed to obtain a good rating in the next RAE.

University of Essex: Research leave scheme

- A.23 The University of Essex is striving to become one of the leading research universities in the UK, and to embed a strong culture of research across all departments and in all staff. It is aiming to achieve a minimum of grade 5 equivalent in all departments in RAE 2008.
- A.24 To help achieve this, discretionary funding has been allocated to specific research areas (e.g. biological sciences, which has received funding for salaries and equipment, and English literature), and to more generic initiatives such as a research leave scheme. This buys out teaching time for one term in seven, and entitlement is accrued through length of service. This time can be ‘banked’ to take up to a year’s leave at a time, depending on the nature of the research involved. Staff are also encouraged to apply for matched leave periods from other schemes such as the AHRC and ESRC research leave schemes. Staff submit research plans for the proposed leave period to the pro vice chancellor (research) for approval; these plans include an indication of expected outputs. A written report is submitted on return to the university. In this way, the centre retains a strong overview of current and developing research areas across all departments.
- A.25 Every member of academic staff, regardless of position, has more or less equal entitlement to the scheme. Staff reported that the scheme has served to build a common research culture, particularly because everyone is able to access the same benefits. It is managed efficiently and in a light-touch manner, so staff feel the whole application process is very straightforward. It is also very transparent given the accessibility of the scheme. One interviewee remarked that it ‘helps ambitious and successful people become more successful’, which will be central to building the research ambitions of the university.
- A.26 Leave periods are managed at the departmental level so they can be fitted around teaching commitments. Academics primarily use the leave period to undertake research activities, particularly those that do not sit easily with a heavy teaching load (such as fieldwork away from the university, writing books and other major publications). We interviewed three academics in different departments in the School of Social Sciences, most of whose current research is carried out on their university salary. As a result, dedicated funding to facilitate time away from the university for research is seen as highly valuable, and something that is otherwise only available from a limited number of sources.
- A.27 Specific examples of activities undertaken by the three recent recipients of the scheme that we spoke to are as follows:
- two ten-week periods of leave. The first period was used to finish a book based on earlier research, and the second was used for extensive archive research away from the university, to underpin a new research direction
 - one ten-week period of leave, to carry out fieldwork overseas, in a related area to their then-current research. This has led to their research moving in a new direction

- a one-year period of leave. This included time spent overseas undertaking fieldwork, and extensive periods of research and writing in the UK.
- A.28 Interviewees reported that time away from university teaching duties has led to the following outputs and impacts:
- *published works*: books, articles, papers, conference proceedings, editorials. These would have been produced more slowly or not at all without study leave; many will be used as submissions in RAE 2008
 - *rejuvenation and renewal of research*: including attendance at conferences and seminars where the academics in question were not presenting, and time to follow up thoughts and ideas that would ‘fall by the wayside otherwise’. These activities were reported to be impossible to combine with a teaching load. They have stimulated new research areas and directions and, in one case at least, have given the research in question a wider relevance. Time spent undertaking fieldwork in new geographic areas has increased the scope of various research projects
 - *changed research directions*: study leave has enabled academics to bring together parallel streams of research in new ways, and has provided time to re-orientate research, or think through the wider applicability of certain pieces of work
 - *new collaborations, linkages and partnerships*: these have developed through taking sabbatical positions, meeting people at conferences that would not otherwise have been attended
 - *raised research profile*: through production and editorship of major publications, and attendance at a wider range of conferences than would otherwise be the case.
- A.29 Those interviewed had finished their periods of study leave relatively recently. As a result, no increased success in funding applications was reported; however, increased success is expected in the short to medium term. Two of the three interviewees reported that the ability to take time out of teaching had facilitated successful funding applications to support extended periods of overseas fieldwork; this facilitation enabled the research to take place, even though the scheme itself did not cover the costs of the research.
- A.30 QR funding currently represents around 10% of university turnover. The study leave scheme could not continue without this support, as discretionary funding is the key source of funding. Without the scheme, staff would have to apply for funding from elsewhere, and applications for similar schemes are reported to be time consuming and with no guarantee of success. This deters people from applying. Overseas fieldwork would have relied on the academics in question taking unpaid leave, which they thought was unlikely to happen. Certain pieces of research would not have been undertaken at all. Publications arising from the leave period would have taken much longer to complete.

University of Hertfordshire: Astronomy

- A.31 The University of Hertfordshire has adopted a highly selective strategy to build research excellence. Following RAE 2001, the university put together a working party to examine where QR funds could be best spent to achieve international excellence. After submission of research strategies, units were externally peer assessed and six were chosen to receive strategic support. All QR funding received following RAE 2001 is allocated to one of these six areas; other QR-generating departments receive no funds from QR.
- A.32 The School of Physics, Astronomy and Mathematics submitted a single research strategy for the school. However, only astronomy was identified as having sufficient current potential to achieve international excellence. As a result, QR funding has been specifically allocated to that research group. The funding comes straight to the group from the centre with no top slicing, bypassing the research institute and school management levels. As a result, the group (along with the others that received funding), is accountable for delivering quantifiable results against this additional investment. QR funding for the group is of the order of £350k per annum. The group head has discretion over how the additional money is allocated within the group.
- A.33 The astronomy research group is one of the oldest research groups at the university, going back over 20 years. All its research work is curiosity-driven mainstream astronomy. The group is seeking to strengthen existing research areas, and to develop new ones, including interdisciplinary research. The potential to generate external funding and, more specifically, fit with the strategy of the Particle Physics and Astronomy Research Council (PPARC), are key considerations when deciding on new developments. A conscious effort is made to avoid spreading the group too thinly across too many different research areas.
- A.34 Staff numbers had increased significantly over the years, but a small but significant staffing dip occurred following RAE 2001 when a number of permanent staff left for various reasons. The injection of QR funding into the group has primarily been used to boost the critical mass of staff. There are now 14 permanent research active staff and four research fellows (funded by PPARC and the Royal Society). Historical staff levels were about 50% of this.
- A.35 Staff recruitment was at a senior level, with the appointment of two new chairs and a number of other staff using QR funding. A small amount of QR funding was also spent on several PhD studentships and on a university research fellow position. The additional staff are now in a position to bring in their own research grants and their own studentships, further adding to research quality and volume.
- A.36 Whilst the group has had extensive networks for collaboration in the past, new recruits have added to this significantly, both with UK and overseas contacts. The number of new high quality staff has also raised the profile of the group. The ability to place a number of job adverts on relevant web-sites also had a surprisingly positive

effect on raising the profile of the group. The increased size and quality of the group has led to a larger volume of high quality publications.

University of Hertfordshire: History

- A.37 In RAE 1996, the history research group at the University of Hertfordshire received a grade 2 and therefore no QR funding. Following an aggressive policy of targeting external research funding and creating large projects, the group was awarded a grade 5 in RAE 2001. The university's strategy was to invest all QR earned in only six units of assessment without any central top-slice, one of which was history. . Thus the group effectively received a completely new funding stream of approximately £180,000 per annum after the 2001 RAE.
- A.38 This new funding has been used to support the broader policy of transforming research in the group. The group has chosen areas where it has real strengths to build on, including the 18th century, and 20th century film and propaganda; this fits with the university's broader strategy of concentrating on areas of strength. It has also enabled various members of staff working alone to push their research forward. In terms of the types of research supported, the group is working to the assumption that over the next 10-20 years the relative importance of competitive programmes for research funding will increase and the relative importance of the block grant for research will decrease, so research groups will need to be more outward facing and be able to identify areas where charitable and Research Council funding will be available. QR funding is helping the group position current research activities to be able to respond to these changing external factors.
- A.39 With the QR funding, two new senior appointments were made at the research professor level (these have both been in post for two years now), taking the number of permanent staff to 12. Money has also been used to buy out internal teaching time, to fund staff sabbaticals (one term in seven on an internal rota, available to all staff, including those that are non-returnable under the RAE), and to support the production of research outputs such as books and microfilms, and their presentation at conferences and other events. One of the most effective uses of the funding has been in employing a postgraduate research assistant to do the groundwork to underpin research funding applications, such as pulling together archive material.
- A.40 There was a strong steer from the university centrally that any new appointments should be at a senior level, which fitted with the preferences of the group. All other decisions on funding allocations were made by the group.
- A.41 The new appointments have allowed the group to increase the number of students that undertake projects with staff members. Research projects that have been at least in part supported by QR have significantly raised the profile of the group, and as a result led to higher quality candidates applying for studentships. The group is keen to increase the number of post-doctoral researchers and the numbers and quality of postgraduates and undergraduates working with it, and funding has enabled it do this without using the money for extra studentships and post-doctorate salaries.

- A.42 One significant project is 'Old Bailey Online', a digitisation of 18th century criminal records, undertaken in conjunction with the University of Sheffield and with major funding support from the AHRC and the New Opportunities Fund.
- A.43 Since investments have been made using QR funding, the group has received on average £1m per annum of external research income.
- A.44 Historical research projects do not generally require large amounts of project-specific funding, so no discretionary funding has been used to support specific pieces of research or develop new research areas. Rather, QR has ensured that all research-active staff within the group have the same platform to work from; the strongest researchers primarily support themselves from external funding.
- A.45 There is no doubt from within the group that QR funding has created the 'space' that has allowed all members of staff to be research active at the highest level. It has also put in place the expectation that this should be the case, which is a significant shift in culture; its 'transformative effect' was cited. This cultural change has been at least as important as the direct financial impact; staff and students in the group now see research as a possible career path, which was not the case previously. Specifically there have been 10-15 books produced by the group since RAE 2001 where QR has played a significant part in their production; a further five are due to be published in 2007. It has helped support the Old Bailey Online project, which generates up to 15,000 visitors a day and has had major international impact. Senior staff whose salaries are covered by QR funding have brought major research grants into the group with associated studentships, publications, and higher research profile.
- A.46 Whilst alternative funding sources may have been available for some of the activities supported by QR (the AHRC research leave scheme for study leave, university funds for production and presentation of research outputs), there would have been no alternative source to fund the two additional senior appointments and the support for research grant applications.

University of Leicester: Department of Chemistry

- A.47 The department achieved a grade 4 in the 2001 RAE. This was as expected but the resulting income was lower than projected. This, and other factors, meant its financial position deteriorated in subsequent years and the department's contribution to university finances declined substantially. On average, the university expects a department's income to exceed costs by some 34 % in order to make a contribution to the university's overheads. However, during this period, the contribution fell to minus 12% of costs, with the university having to support the department from its other resources including QR. At the same time, the overall position of the university's finances had deteriorated as a consequence of too many departments rated 4, leading to a substantial annual deficit.
- A.48 This led to a major re-evaluation of the role of the chemistry department and consideration of drastic options for stemming these financial losses. They included the possibility of closure, gradual decline or merger with departments in other

universities. The decision to support the chemistry department through the central allocation of university funds led to a major restructuring of the department, significant capital investment in buildings and equipment and a more focused research strategy.

- A.49 The restructuring involved a range of activities to reduce staff costs and overheads and to increase efficiencies. As a consequence of the savings achieved, the department was then in a position to recruit two new younger staff at a lower cost and to reposition the department to face the future.
- A.50 A large part of this repositioning related to the refurbishment of the building, which was undertaken one floor at a time, and the installation of new equipment providing research and teaching facilities that are now fit for purpose. As a result, it has been possible to bring research groups together more effectively and to recover under-used space. The downsizing operation and the reduction in overall staff would not have been possible without the investment in buildings and equipment. In total, some £2.5m, from the first round of SRIF, was invested by the university in the refurbishment. In addition, investments have been made through subsequent allocations of SRIF and teaching and learning capital funds.
- A.51 As a consequence of this reorganisation and investment, the department has moved into overall financial surplus and is making a contribution of 14.5% (2004-05) to overheads in place of minus 12% in 2002-03. This is still not sufficient to meet the university's target contribution of 34%, but the department's financial, teaching and research strategies are moving forward, with expectations of reaching the target contribution in the medium term.
- A.52 However, the department is now relatively small and this can have serious consequences due to the need provide core teaching and administrative duties, such as admissions tutors, examination tutors and financial management.
- A.53 In terms of research activity, the restructuring has been accompanied by a strategic change of emphasis which recognises that a relatively small department cannot compete internationally in all areas. The research strategy is, therefore, to focus on three key fields; it includes collaboration with other RAE 5 rated university departments such as engineering, physics and biological sciences. As an example, some 50% of grants from the BBSRC, Wellcome Trust, Leverhulme Trust and Cancer Research UK are joint grants to the chemistry and biological sciences departments.
- A.54 The research output per staff has increased and the department is now achieving success in publications and collaborations in its three areas of focus. For example, there has recently been publicity for the air fingerprinting undertaken by the department in collaboration with the Leicester Royal Infirmary, the Home Office, ICI Paints and the Forensic Science Service, to identify and measure specific chemicals related to childhood disease.

- A.55 The university has made a conscious decision of the university to invest strongly in the department using discretionary funds such as QR, to support it through difficult decisions and to provide the basis for future growth. The main benefits from this period of support from the university include capital investment in the department, a more focused research strategy, the recruitment of new research staff and an enhanced ability to collaborate with other leading research groups in specialist areas. The outcomes are expected to be seen in the 2008 RAE with an upgrading of the department's RAE status and a consequent increase in QR related funds and a better contribution from the department to university overheads.

University of Leicester: Department of Economics

- A.56 Economics is a subject where it is possible to undertake research in some areas without large scale project funding, although other areas that require manipulation of large datasets need considerable computing power. In 2001, the department entered 16.5 staff into the RAE and obtained a 5 grade. This produced some £300,000 of QR income for the university. Overall research project income in the department in 2003-04 was slightly in excess of £100,000.
- A.57 Over a number of years, the university has supported the department in strengthening its staff by increasing non-pay budgets and providing refurbished buildings.
- A.58 The departmental objective in 2002 was to expand staff to 30 full-time equivalents (FTEs) and to enhance the department's reputation through high impact publications. This was largely achieved, and more recent objectives include achievement of a 5* equivalent rating in the 2008 RAE and improving the staff-student ratio to a level more consistent with the department's major competitors by increasing staff numbers to a level of possibly 43 FTEs. This strategy would also require a change in the financing of the department by the university since these developments would result in a reduction in the large existing contribution made by the department to university overheads.
- A.59 The main route to expansion of the number of posts is a bidding process by departments to the university as a whole. However, the university was also operating an incentive scheme during this period which involved an additional lectureship for every 12 additional overseas students. As a result of recent staff increases, the student-staff ratio has fallen from 27 to 21 although this is not considered to be competitive with other economics departments with a similar research rating.
- A.60 More recently, the department has appointed one new lectureship under the 'New Blood' scheme as a result of the university's decision to award a post to departments achieving 5 in the RAE.
- A.61 The department has been provided with a new building of its own which was recently refurbished; previously, it shared space with management studies. The new building provides additional space including offices for part-time staff and for expansion.

A.62 The department has developed a very good reputation in its subject as measured by research ratings, the growth of the postgraduate programmes, the ability to recruit high quality staff and recruitment of high quality students. Since the build up of the department, the volume of papers has also gone up. In 2001 some 80% of staff were submitted for assessment in the RAE, whereas today virtually all staff produce papers and are likely to be entered in the next RAE. There has been a conscious strategy of seeking publication in high impact journals. The department research committee undertakes its own assessment of research: it asks staff to submit their best four papers during the past year and assesses the quality or impact of individual journals in which papers are published. The current assessment is that the department is operating close to 5* under the 2001 RAE measures or 3* and 4* under the 2008 measures. Overall, the growth and development of the department has led to it becoming one of the largest economics departments in the country in terms of student numbers, and a strong contender to become one of the top five departments in the 2008 RAE.

University of Leicester: Department of Genetics

A.63 The Department of Genetics is one of four departments in the School of Biological Sciences. The department became operational in 1964-05 and has grown substantially since then and received major investment through a variety of programmes and sources. It also engages in a wide range of inter-disciplinary and collaborative research and teaching. To facilitate this, an Institute of Genetics was created in 2002. This acts as a virtual institution which facilitates joint appointments and interaction with other departments within the faculty and outside it, for example the law school. As a result, the institute has been very successful in developing new areas of research. The objectives of the department are to further its excellence in teaching and research. Some illustrations of this include the development of sophisticated processes for genetic fingerprinting and profiling, the award of the Queen's Anniversary prize in 2002, and the award of a 5* rating in the 2001 RAE.

A.64 Whilst funding has been achieved from a wide range of sources, the continued support and commitment from the university to the department through its discretionary funding including QR has been a key factor. The university has been keen to support the department's plans not only because of its internal success, but also because of its active programme of collaboration with other departments and its support for joint appointments and interactions. One example was the location of parts of the medical school into building which houses genetics to facilitate collaboration with genetic epidemiologists and medical statisticians.

A.65 Over a period of several years, the department has received continuing support from the university to enable it to expand and enhance its research status. This has included:

- the recent award of two 'New Blood' posts to genetics where other departments received a maximum of one post

- the department has recently received approval for a £6m scheme to refurbish its facilities. Part of this funding (£1.4m) is being derived from the capital element of a new Centre for Excellence in Teaching and Learning award, but £4.6m has been committed by the university itself
- a new investment is being undertaken to create a bio-incubator (Biobater) which will be jointly funded by the East Midlands Development Agency and the university. This will include three new members of staff in the genetics department to enhance linkages with research
- the department is planning to seek external funding to develop a major research centre in human genetics. This bid has been supported by the university's discretionary funding through a commitment to fund the running costs of 4.5 FTE posts at post-doctoral level at an annual cost of some £200,000.

A.66 Indicators of output include:

- the number of papers produced by the department has tripled over a five year period to 130 in the most recent year. An important factor has also been the increase in quality of papers as measured by publication in high impact journals and in citations
- the number of PhD students is currently 38, a substantial increase from about 20 five years previously.

University of Leicester: 'New Blood' programme

A.67 During 2001-02, in an attempt to generate annual surpluses for reinvestment, the university had undertaken a restructuring programme involving voluntary redundancies. This included specific targets for departments that were thought to be contributing less than the norm to university overheads. In particular, targets were set for chemistry, geology and sociology. As a consequence, the university reduced its staffing costs significantly.

A.68 The results of the 2001 RAE were that, out of 32 submissions, 12 received a 5 rating and one 5* (genetics). However a large number of departments received 4 ratings which resulted in relatively little QR funding for the university, and a few units were rated 3a or 3b, resulting in no QR income.

A.69 The influence of a new vice chancellor led to the development of a more explicit research-led strategy, with all departments expected to engage in research of high quality. As a result of reducing staff costs and increasing overall income, the university finances were in a much stronger position by 2005 and consideration was then given to how good performance in research and teaching might be further rewarded and encouraged. After considerable discussion, proposals were made to fund new academic posts in departments that had excelled in the RAE.

A.70 The main objectives of the proposed 'New Blood' programme were to:

- encourage and motivate staff in departments that had performed well in the 2001 RAE
 - build up departmental research strengths and ability to win research grants
 - position the university to do well in the 2008 RAE and to maximise its potential QR funding
- A.71 Discussion in the relevant university committees centred on whether it would be better to provide support for some 10 new chairs or to support 20 new lecturer posts. The conclusion was that the university should support 20 new lecturer/ researchers. These would be additional posts above departments' existing staff complements and would be designed to be particularly attractive to young post-doctoral researchers. Each post would be supported to provide:
- a guaranteed 'study leave' free of teaching commitments during the first year
 - a relatively low teaching load in each of the three subsequent years to allow appointees additional time for research
 - funding for research travel over four years.
- A.72 Posts were expected to provide additional research strength in the departments in which they were funded. In particular:
- posts were provided only to departments which had received 5 or 5* ratings in the 2001 RAE
 - one post was distributed to each of 18 departments which had been graded 5 in the 2001 RAE and two posts were provided in genetics (the only 5* department)
 - the main criterion for new appointments was that applicants should have already achieved international recognition for their research with a significant publications record in high impact journals.
- A.73 The university announced the creation of the 20 new posts in the form of an advertisement featuring a signed letter from the vice chancellor setting out the benefits and criteria for application. The departments which had been awarded posts were specified. One of the main publications featuring the advertisement was the Times Higher Educational Supplement.
- A.74 The university received over 1000 applicants with a very high quality profile. Candidates were interviewed in the relevant department by a panel chaired by one of the university's four pro-vice chancellors. At the time of writing, all the new appointments have been made.

University of Newcastle upon Tyne: School of English Literature, Language & Linguistics

- A.75 The school has two large research groups – linguistics and English literature. There are 35 academics in the school and some 100 PhD students. Most of the school's funding comes from teaching. QR income is £600,000 per annum and this is between a quarter and one-third of the school's total income.
- A.76 In the 2001 RAE the school was awarded a 5; a substantial improvement on the 1996 grade (3). There was a significant increase in QR income associated with this. The most important requirement for research in these areas is time and the school has a generous leave scheme which is supported by discretionary funds. The head of school holds the funds and academics apply for research leave. Typically an academic in the school will have a period of leave (a semester) once every 6-8 semesters.
- A.77 There is a small committee within the school which assesses the bids. The research leave is planned at least a year in advance and bids are about to be assessed for 2007-08 leave. This allows academics to plan their research, such as applications for fellowships or to use libraries. In addition, the AHRC leave scheme depends on a period of external leave before a researcher can apply to it. The School of English Literature, Language & Linguistics has had considerable success in applying to the AHRC and, combined with the school's own leave period, it means that researchers can achieve an entire year's sabbatical.
- A.78 When considering the applications for leave the committee takes into account the following:
- is the project realistic for the timescale
 - period of time since the applicant last had leave
 - whether the applicant has had major administrative responsibilities
 - how important the study leave work is in supporting other research grant applications.
- A.79 The assessment, to a certain extent, favours junior colleagues as it is often easier for senior more established researchers to find research income from other sources.
- A.80 Since the last RAE the profile of the school has also changed, with children's literature and creative writing established as major strengths. The school is also responding to opportunities, for example, working with cultural industries, in order to generate research grant income. The study leave scheme is seeking to support and develop the research of the school. Applicants to the scheme are expecting to use the research time either to finish off specific projects or to get new ones going. At the moment the 2008 RAE has come to dominate research planning and so the priority amongst the academics is to finish projects and generate publications. This emphasis will change once the RAE has been completed.

- A.81 The study leave scheme is one way in which the School of English Literature, Language & Linguistics supports staff in the early stages of their career and to help get them established. There has been a culture change over the last few years. In the past there was very much the sense that senior colleagues with a track record were the ones to get the support. There is now awareness that the whole school has to achieve and that (perhaps as a result of the RAE) there is no point in having an elite band of achievers.
- A.82 The head of school considers that every output of the academics depends on people having a period of study leave. On the literature side the leave provides the opportunity to produce long sustained pieces of writing such as monographs. It is possible to write papers while teaching but it is much more difficult to write longer pieces which require considerable thought and uninterrupted time. The leave is intrinsic to getting work done whose outputs then feed into RAE submissions. The leave also allows researchers to be less insular, as visits to libraries in the UK and overseas, fellowships etc allow academics to meet other scholars in their field.
- A.83 The way in which the AHRC leave scheme is currently set up means it would not be possible for researchers to apply for this scheme without the school's own study leave scheme. Large research grants do not come with study leave and even if they covered the full economic costs of the project there would not be sufficient funds to buy out the time of principal investigators.
- A.84 Without the discretionary funding the school would struggle. Being dependent upon research grants would drive research in a certain direction. For example, working with a research assistant is fine for producing editorials but for monographs individual time is the key.
- A.85 Without QR, the school would need to rethink how to establish the conditions it currently has to produce research and ultimately this might mean a move from monographs to papers. However, this seems inconceivable as it is extremely difficult to produce on a small scale what would usually be produced on a large scale.

The University of Oxford: Ancient scripts and information engineering

- A.86 This case study concerns the development of an inter-disciplinary project involving the Centre for the Study of Ancient Documents within the classics faculty, and specialist information engineering expertise within the engineering science department. The University of Oxford has access to a huge collection of ancient documents including ancient Greek papyri and inscribed Roman stylus tablets. The Centre for the Study of Ancient Documents is a research unit which seeks to exploit the wealth of information in these collections by developing new approaches to reading ancient inscriptions and undertaking studies of these texts.
- A.87 The initial project impetus came from a research requirement of a professor in the centre to be able to read Roman tablets (each of which is about the size of a postcard).

These were inscribed by scratching onto a wax covering on a wooden tablet using a metal stylus. Over the centuries, the beeswax covering had disappeared leaving only the faint remaining scratches on the wooden substrate. This made it difficult to distinguish between the script and the other marks and the wood grain. Whilst it is possible to use computer based techniques with multi-spectral imaging to read the images of other ancient texts based on carbon inks, these techniques were not suitable to read the indistinct scratches. The professor presented the problem to a variety of scientific specialists, but none were able to find a solution.

- A.88 In 1995-96, the centre had only recently been set up with modest staff and premises. At about this time, the professor met another Oxford academic whose speciality is information engineering and medical image processing who understood the problem and developed a new conceptual approach to its solution.
- A.89 The key objective was to develop a new approach that would enable the meaning of the remaining scratches on the surfaces of the tablets to be interpreted. The initial resources used in the collaboration were intended to develop an approach which would enable the team to apply for much larger sums of research funding from Research Councils and charitable foundations. At this stage, however, there was no project funding and the work was undertaken using QR funding provided by the university, to set up the Centre and funds its assistant director post.
- A.90 The key outputs included:
- publications in journals about the processes involved
 - a successful application for £20,000 for a one year research project from the Leverhulme Foundation
 - a subsequent application to the Mellon Foundation
 - the development of a successful application to EPSRC for £180,000 for a three year project to develop further applications of the imaging technology and to increase the number of tablets that can be deciphered
 - as a result of the subsequent work, there has been a series of publications, in particular about the content of the texts, some of which were concerned with the costs of transport
 - the work has also been the subject of joint meetings of the Royal Society and the British Academy bringing together leading researchers in ancient history, archaeology, optics engineering, computer science and 3D modelling, and leading to stimulating inter-disciplinary discussions.
- A.91 Many existing sources of funding are mainly responsive and short term. There is very little funding for 'blue skies' research that requires a flexibility that the Research Councils do not provide. In particular, the ability to fund an inter-disciplinary research project was a key benefit of QR. The initial availability of QR funding

through the university is considered to have been essential for the development of this project.

The University of Oxford: central libraries

- A.92 The university provides a number of important resources centrally. One of these is the Oxford University Library Service (OULS), which currently comprises 33 managerially integrated library sites including the Bodleian Library. Funding derived from the university QR income is a critical element in the OULS budget. In addition, individual colleges have their own libraries funded from their own resources. The OULS provides a central resource which is used by researchers and students from the university and by a large number of people from elsewhere in the UK and abroad.
- A.93 The overall cost of the central libraries is some £27m annually, of which about £16m is derived from QR funds. The remainder is provided by trust funds, Research Councils such as the AHRC, the NHS, which shares the costs of health related collections, and the Joint Information Systems Committee. In addition, the OULS receives some specific project funding from Research Councils and other bodies to catalogue and archive new collections that have been left to the library.
- A.94 The Bodleian Library dates from 1602 and is a library of legal deposit, which means that all publishers in the UK and the Republic of Ireland must deposit a copy of their publications with it if requested. In practice, the library has been receiving such publications since 1610. In addition, it receives documentary archives, including important collections of personal papers. (The personal archives of six British prime ministers are housed in the Bodleian.) As a consequence, the library has amassed major collections of both ancient and modern texts that are unique in the world and comprise some 7.6m physical items as well as other material such as databases, datasets and electronic journals. (OULS as a whole holds 9.5m items.)
- A.95 The core purpose of the central libraries is to preserve and make accessible these important collections as an essential resource for researchers. OULS also provides a central resource for the faculties and departments and spends a growing proportion of its budget on purchasing scientific and other databases, datasets, electronic journals, digital maps and reference materials. Journals are increasingly required by researchers in electronic form and an individual copy of a key journal may be used by researchers from several departments. However, the publishers of such journals frequently sell these electronic journals as a bundle of titles and the existence of an integrated central library system does enable negotiations to achieve substantial discounts.
- A.96 The provision of a central research resource is important not only for Oxford University academics and students but also for national and international researchers. OULS employs specialist curators who understand the historical background and relevance of documents and who can work with academic researchers to provide specialist contextual information. Library staff add value to the collections and provide project management expertise for researchers seeking to exploit the scholarly

potential of the collections. Overall, OULS employs some 564 FTE staff of whom 142 FTEs are staff in professional, subject specialist and curatorial posts.

A.97 Output indicators include:

- some 53,000 current registered users
- around 50% of readers are from outside the university
- citations of manuscripts held in the Oxford Central Libraries and the Dictionary of National Biography indicate that the Oxford libraries are second in the number of citations
- finally, the Research Support Libraries Programme which is funded by the four higher education funding bodies undertook a survey of UK academics which asked them which libraries they used most, other than their own university library. The Bodleian was by a large margin the most heavily used resource.

A.98 The role of QR has been essential in contributing towards the cost of providing the physical and curatorial resources necessary to support a key national and international research resource. Funding provided by the University of Oxford from its QR income stream has been a vital part of this. Without this funding stream, the central libraries at Oxford could not continue to function. The Bodleian and its subsidiary departments (including the Radcliffe Science Library) are important for all disciplines, but the holdings of the Bodleian are particularly significant in areas such as the humanities, where its unique historical collections provide a vital research resource.

University of Oxford – Wellcome Trust Centre for Human Genetics

A.99 The Wellcome Trust Centre for Human Genetics was founded in 1994 to undertake research into the genetic basis of common diseases. Many common diseases such as asthma, psychiatric disorders, infectious diseases, heart disease and diabetes have both a genetic and an environmental cause. The goal of the centre is to identify the underlying biological processes and how genetic factors interact with the environment to cause disease. To achieve this, it has brought together scientists with expertise in genetics, populations, gene function and protein structure so that discoveries can be brought through to better diagnosis and treatment as quickly as possible. The centre was 5* rated in the most recent RAE.

A.100 The centre is a part of the Nuffield Department of Clinical Medicine, which forms a part of the Oxford University Medical Sciences Division. It has about 400 staff and students and an income of some £15.7m in the financial year ending July 2005. The centre is primarily funded by UK and overseas charities which contribute 81% of income (with the Wellcome Trust providing the major part of this – 56%). Other income derives from the European Commission, UK Research Councils and overseas government agencies. The major part of that income is spent on research activities

(£13.3m) with £2.4m spent on other activities. However, charities rarely pay the Full economic costs of research projects, and the centre is reliant on funding from the University of Oxford to pay for infrastructure and operating costs such as heat, light and power.

A.101 Of the total income of £15.7m, some £2.4m is defined as ‘other activity’ which consists of funding from:

- the overhead allocations of Research Council grants
- QR allocated by the university through the Medical Sciences Division and Nuffield Department of Clinical Medicine.

A.102 Beyond this, it is not possible to track QR funding within the centre since these figures are not kept separately.

A.103 Because of the nature of the research undertaken at the centre which runs as a 24/7 operation utilising sophisticated analytical equipment, the operating costs such as electricity and other utilities are extremely high (some £20,000 a month). These and other costs are met from the university’s central resources which derive from QR.

A.104 A unique feature of the centre is that there are no established posts, with all personnel funded by external grants. The availability of QR through the university (Medical Sciences Division) therefore enables the centre to bring together researchers from different disciplines into a collaborative environment who would normally be located in different clinical departments such as psychiatry.

A.105 The main activities are undertaken through a number of specific research groups such as neurogenetics and psychiatric genetics, immunity and inflammation, cardiovascular medicine, and diabetes. In total, there are some 30-40 research groups which are supported by a range of technologies and equipment, most of which is used intensively because of the nature of the research. Research groups are built up in areas where there are thought to be important opportunities for research breakthroughs.

A.106 Since most funding is obtained from charities and these bodies are unwilling to provide full economic costs, there is a very important role for QR, in particular to:

- maintain and enhance the fabric of the building and other infrastructure
- provide a stream of revenue to meet operating costs such as heat, light and power
- provide bridging funds for research fellows where their specific external funding has come to an end and they need funding for salaries and consumables until their next grant application is approved
- provide pump priming funds; for example where an existing research group is seeking to obtain funding but needs to demonstrate a certain level of capability or that there is a real issue that needs researching

- provide funding for new junior researchers who have been funded by external sources such as Royal Society Fellowships, but where there is a need for additional funding of between £10,000 and £20,000 to enable them to buy equipment, fund a technician, obtain specific training, or fund a research assistant
- fund an existing research group which has been funded by a charity to acquire a particular technology platform, but where the research group wished to invest in a different technology with different parameters. For example, a research group had been funded by the Wellcome Trust for particular equipment to study genotypes, but now has two or three different platforms to choose from, each of which has different (volume) characteristics. In this case, it was highly unlikely that Wellcome would be willing to fund a second piece of equipment, and QR funding of some £30,000 to £100,000 was used to purchase the alternative platforms
- QR can also be used to provide the funding for the purchase of equipment needed by researchers where one group does not have sufficient demand to utilise the equipment full time, but believes that there would be a good possibility of other groups joining in to share costs at a later stage. Here, QR funding has been used to meet the shortfall in utilisation in the short term
- pay for the personal and professional training of research staff.
- provide funding to enable the centre to engage with local advocacy groups and the wider community on, for example, the public engagement of science
- provide matching or partnership funding for research fellows. Currently there is a trend for external bodies to provide 50% fellowships, or fellowships funded for a limited duration on the understanding that the university then takes over the funding for a further period
- finally, QR funding enables the types of networking to take place within the centre that would not be possible in a traditional structure, where specialists such as psychiatrists and paediatricians would normally be in separate clinical departments reflecting their areas of expertise, and separate from other researchers.

A.107 In terms of outcomes, the centre has been extremely successful achieving a 5* grading and is now the largest unit of externally funded research fellows in the UK.

A.108 The range of papers, conferences, added value collaborations, and public engagement in science activities is extensive – however, it is not possible to relate such outcomes specifically to the use of QR (although few would have been possible without such core funding).

A.109 QR has been essential to the operation of the centre not only in providing the resources to maintain the buildings and facilities and to provide for running costs such as heat, light and power, but also to provide the flexibility to fund the activities listed above. Because of the policies of the main charitable funding bodies, it is extremely unlikely that these QR funds could be replaced by other sources.

Consequently, without QR the infrastructure and activities of the centre would gradually decay.

Royal Holloway University of London: New appointments

- A.110 Royal Holloway, University of London (RHUL) performed strongly in the 2001 RAE with all 21 submissions achieving at least a 4; 15% of staff submitted were in units of assessment graded 5* and 59% in units graded 5, with the science faculty one of a very small number nationally that were rated 5 and 5* throughout. RHUL's most recent research strategy covers the period 2002 to 2008. It aims to consolidate and improve its position as a small research-intensive institution of international distinction. More specifically, that strategy aimed to improve individual departments' performance, expressed in terms of RAE 2001 grades, and to increase the proportion of staff submitted from the 89% submitted in 2001.
- A.111 After the 1996 RAE the university strengthened a number of measures supportive of this strategy:
- *the Research Strategy Fund* which supports new research initiatives. It provides up to £5,000 for projects which may, in due course, attract funding from external sources and to stimulate the germination of new ideas within the institution which hold promise and are likely to grow and develop in the widest sense. Applicants must demonstrate that funding will lead to proposals for external funding
 - *sabbatical leave*. Although long-established, the research-focus of sabbatical leave was strengthened and it is also used to support the recruitment and retention of staff. Funding to support sabbatical leave was increased by £100,000 per year
 - *support for new staff*. RHUL's policy was that new staff should be given lighter teaching and administrative loads to allow them to develop research capabilities and that they should also receive guidance on the development of their research.
- A.112 All these activities were, in part, supported from the QR allocation to RHUL. However, the strong performance in the 2001 RAE was attributed to a policy of appointing outstanding researchers in leading-edge areas of research, and providing a supportive environment in which they can work. This was the institution's policy over the five year period of the research strategy and it earmarked £4m over four years for appointing new staff. RHUL does not consider it would have been able to do so in the absence of QR funds. The overall aim of the appointments was to increase research strength and depth by recruiting established researchers capable of leading and developing younger staff. A number of these appointments were made as research professorships. In addition, a significant number of the academic staff were expected to retire or reach 65 by 2007 and the new appointments offered an opportunity to ensure that research strengths were distributed over the career range.

- A.113 These posts were allocated in the annual planning round. Decisions were taken by the Academic Development Committee which assesses, each year, cases for academic appointments. The key selection criteria were potential to:
- contribute to achieving RAE targets
 - strengthen the institution's position in leading-edge subjects
 - strengthen the generation of research and contract income.
- A.114 RHUL was committed to funding the posts after the four year period, and a condition of funding was that recruits would be expected to generate additional grants and contracts so that the posts would be financially sustainable.
- A.115 It allocated 28 additional posts, of which 13 were chairs. This represented around a 7% addition to the academic staff complement. The allocations were selective; 16 departments made successful bids and were allocated between one and three additional posts. Around 20% of departments did not receive any additional funding. The result was a transfer of resources from declining areas of research to those of increasing importance.
- A.116 The quality and quantity of applications for these positions was considered to be very high; for example, 240 applications were received for one bioscience post, and three Fellowships by Assessment were appointed under this scheme. Appointments were made in 2004 and 2005. It is still early to identify tangible outcomes but RHUL considers its investment to have been very worthwhile. Research grants have already started to increase: those from the Research Councils increased by 21% between 2002-03 and 2004-05 and have continued to expand over the last year. There has also been an expansion into new research areas including interdisciplinary research, for example between archaeology and geography.

University of Warwick: Department of Chemistry

- A.117 The Department of Chemistry achieved a 3a grade in the 1996 RAE but was rated as 5 in 2001 and submitted almost the same number of staff to both exercises. Of the 34 universities which made submissions in chemistry to both exercises, only four achieved increases of two grades and only three a 5 or 5* in 2001. This represents a substantial enhancement of research capabilities.
- A.118 The process of change in fact began in 1992, before the 1996 RAE. The department was facing twin problems of insufficient research outputs and insufficient demand for undergraduate places. The latter was an important consideration. The university considers chemistry to be an expensive subject and a critical mass is required for financial sustainability. The initial changes were on a fairly minor scale but included some restructuring within the department. The university did, however, provide funds to refurbish the undergraduate laboratories in an effort to make Warwick more attractive to chemistry undergraduates and also provided funding for two additional

posts. These changes came too late to impact on the 1996 RAE which the department believes was 18 months too soon for it to benefit.

A.119 Following the 1996 RAE results, the university set up a panel of external experts to review chemistry, and other subjects which had performed relatively poorly. Closure of the department was an option but the panel recommended that it should continue and the university accepted this recommendation. The decision reflected a belief that chemistry could become viable and attain the high level of research performance that Warwick expects of all subjects, rather than a view that chemistry is an integral component of any university with serious science and engineering aspirations.

A.120 Since 1996 the university has provided funding to the department in a number of ways including:

- additional staff posts
- 50% of the costs of refurbishing the research laboratories
- guaranteeing the long-term salaries of Royal Society Fellows.

A.121 The department has focused on its strengths and emerging areas of chemistry, such as mass spectrometry which is a distinct group within the department with 30 members. An important component of the department's strategy has been to move into interdisciplinary areas of research, often with direct support from the university. These include:

- the Interfaces and Materials Group of the chemistry department works with the Centre for Advanced Materials, based in the physics department. The central theme of research is controlled polymerisation to give macromolecules of designed, desired and targeted structure
- the Molecular Organisation and Assembly in Cells Doctoral Training Centre is a multidisciplinary centre operating at the interface between mathematics, chemistry, biology, physics and computing. It is mainly funded by the EPSRC but university support was an important element in securing this grant. It offers a range of MSc programmes, and a four year degree programme (MSc & PhD). The aim is to equip students with the skills necessary to become effective life scientists of the future
- the Centre for Scientific Computing was established in 2001 and involves the departments of mathematics, computer science, statistics, engineering, biology, chemistry and physics
- chemistry is also involved with the new Warwick Systems Biology Centre which is described elsewhere in this report.

A.122 The department has continued to develop since the last RAE and the number of research staff has increased by around 40%. This is reflected in published outputs, with all members of staff now actively engaged in research. The reputation of the department is now firmly established amongst schools and potential students. The

department admitted 85 undergraduates in 2005-06. The intake increased to 120 in 2006-07 with higher A-level grades than in previous years.

University of Warwick: Centre for the Study of Globalisation and Regionalisation

- A.123 Politics at Warwick was awarded a 5 in the 2001 RAE, a significant improvement over the 1996 grade of 3a. In 1992 the department had been awarded a 4 and there was an internal review of the department to identify remedial actions. The department felt that the 3a grade did not reflect accurately its underlying strength but nevertheless embarked on a rebuilding process. The University agreed to fund a number of additional posts in order to facilitate this.
- A.124 The department undertook some internal restructuring, including hiring a permanent administrator to reduce the burden on academics, and establishing a research committee to improve the success rate with grant applications. However, a key factor in its improved rating was the establishment of the Centre for the Study of Globalisation and Regionalisation. This was set up in 1997 and is the largest academic centre in Europe dealing with this subject area. The ESRC has provided core funding of £4.5m in two five-year phases (1997-2002, 2002-2007). However, the additional posts funded by the university were instrumental in enabling the department to bid successfully.
- A.125 The centre has a core staff of 13 and draws on academic staff from anthropology, economics, law, sociology and politics. Its work highlights issues of the definition, measurement, impacts, and policy implications of globalisation and regionalisation. More specifically, much of the centre's research concentrates on questions such as comparative regionalisms, the political economy of global and regional finance and trade, civil society in globalisation and regionalisation, and security issues in globalisation and regionalisation. The research spans all regions of the world, as well as relations between them.

University of Warwick: Systems Biology Centre

- A.126 The University of Warwick has recently created a centre for systems biology. This will build on the university's existing strengths in the area and involves a substantial investment in staff, infrastructure and accommodation.
- A.127 Systems biology involves developing the understanding of a biological system through mathematical and computational modelling of interactions between its components, so that this understanding can be expressed in qualitative and quantitative terms. A key feature that distinguishes the modern approach to systems biology is the aim of linking modelling with the huge volume and diversity of cellular and molecular data, such as that from high-throughput, genome-wide and imaging technologies. Understanding complex biological processes will allow us to tackle many important problems and areas such as disease mechanisms, pharmaceutical drug discovery, drug target validation, and horticulture and agriculture.

- A.128 Investments provided by the university include 12 new posts, a number of secondments, sizeable infrastructure and dedicated accommodation. The decision to invest was taken in the light of expectations regarding future Research Council funding, and represents an attempt by the university to position itself to exploit this potential.
- A.129 The centre is led by the Department of Biological Sciences, the Mathematics Institute, the Medical School and Warwick-HRI, a team dedicated to horticultural research and development.
- A.130 The centre builds on a thriving programme at the interface between the life sciences and the mathematical and physical sciences. This has been led by:
- the Interdisciplinary Programme for Cellular Regulation, funded primarily by the EPSRC and BBSRC. It is a multidisciplinary programme bringing together mathematicians, physicists, statisticians, biologists and medics to understand the regulation and co-ordination of cellular systems using mathematical and statistical analysis, modelling and computation
 - the multidisciplinary Molecular Organisation & Assembly in Cells Doctoral Training Centre, which operates at the interface between mathematics, chemistry, biology, physics and computing. It is mainly funded by the EPSRC but university support was an important element in securing this grant. It offers a range of MSc programmes, and a four year degree programme (MSc & PhD). The aim is to equip students with the skills necessary to become effective life scientists of the future. Over an eight-year period it will produce a minimum of 50 PhD postgraduate students with a broad interdisciplinary training in biology, chemistry, mathematics and computing.
- A.131 The Warwick Systems Biology Centre will also host a new doctoral training centre in systems biology. The centre has been funded by a £3.4m grant from the EPSRC and the BBSRC, and significant investment by the university. The centre is an independent unit within Warwick University providing training in the multi-disciplinary skills required for research into biological systems. Students undertake a dedicated taught MSc course in the first year followed by a PhD in systems biology during years 2-4. It has been set up in completely refurbished premises and will be managed by senior academic staff from a mix of life sciences and physical sciences departments.

Wimbledon College of Art: Research support

- A.132 When the fieldwork for this report was carried out, Wimbledon College of Art was a specialist institution (as Wimbledon School of Art) providing courses at FE, undergraduate HE, Masters and PhD levels. During the period around 2000, the college had QR income of some £1.2m based on a 5 rating in the 1996 RAE. However in 2001, it achieved a 4 rating resulting in a major loss of income to around £600,000 in recent years. Some of the outcomes of this reduction in funding included an increase in student-staff ratio, an increase in FE numbers and a reduction in senior staff numbers. QR funding still, however, provides a vital resource to enable the

college to pursue its activities. In particular, QR provides a major part of the resources for its research programme.

A.133 Within the context of a college of art, research has a broader connotation than the more tightly defined concepts of research in the sciences. Where a scientific research project might be defined in terms of subject matter, key research questions, activities, resources and outputs; this is not as clearly defined in the art context where 'practice-based research' is used to describe the approach. In general, academics in the arts pursue lines of enquiry, or the development of opportunities through a more continuous practice-based approach. Research within the college is considered vital to enable new subject matter to be explored, new approaches to be developed and to ensure that teaching and learning are refreshed by experience at the leading edge of practice. This accords with the college's belief that teaching should be undertaken by practising artists.

A.134 The current use of QR funding involves a number of different activities, one of which provides funding for research fellows, whilst others have enabled researchers to undertake practice-based research, to do research abroad and to reinforce collaboration with other colleges including the University of the Arts London (which Wimbledon has recently joined as noted above).

A.135 Some of the activities undertaken by different researchers using QR based funding include:

- research to explore some of the ways in which scientific outputs and images have been presented and their relationship to the current cultural precepts. In particular, practice-based research has involved painting a series of works on the subject of natural history collections, working with entomologists at Oxford University, a range of collections such as displays of birds at the Natural History Museum, and paintings of rainforest species
- research into the experiences of transsexual people by examining how sight, sound, scent and touch relate to the development of gender identities and gender projections in the social domain. The outputs are intended to enable a wide audience to appreciate the difficulties and life experiences of the six participants. Specific activities include research into the significance of touch, smell, sound and image
- practice-based research involving the development of design in performance contexts, particularly in the sphere of ensemble/integrated performances in African music and theatre.

A.136 Outputs and outcomes can be classified into six main areas:

- paintings, books, exhibitions etc
- the ability to develop collaborative applications for funding, for example a successful application to the AHRC for £210,000 for a project to investigate archaeological sites

- development of a research culture, specifically through artists/researchers with a successful history of applications to Research Councils and private foundations providing mentoring to other staff on how to develop grant applications
- working with students to train them how to get their proposals into shape. In the past most supervisors would have come from a theoretical perspective, but with the new readership positions (funded partially through QR) there is now a greater emphasis on the potential for practice-led research proposals. The language and conceptual approach being used by students to present research proposals is developing

A.137 QR funding has enabled the college to undertake activities and programmes that would be very unlikely to be funded from other sources. In particular:

- the appointment of five research fellows which has been vital to the resurgence of the college in terms of research rating, project funding and research culture
- the provision of resources to enable staff within the college to reduce their teaching load and gain in terms of research activities, training in research methods and experience of working alongside experienced researchers
- an important role both in research and research culture through facilitating links between different institutions
- supporting internal collaboration within the college as well as international collaboration
- developing the role of the college is one where teaching is informed by research practice rather than by theoretical concepts or knowledge received at second hand.

University of York: Department of Biology

A.138 The Department of Biology has over 400 staff, of which 60 are research staff, and around 130 post-doctorates. It was graded 5 in the 2001 RAE, and QR funds generated amount to £1.8m. This RAE grade, in part, reflects past investments by the university. In 1992 the university invited strategic bids from departments, and biology submitted a bid for extra investment in plant sciences. The investment was effective and York would claim it is probably now the foremost department in the country for plant sciences.

A.139 The department seeks to work at inter-disciplinary interfaces. It has, for example, recently invested in immunology and infection (helped by Hull-York Medical School). In furthering the inter-disciplinary aim, the department has made new strategic appointments with other departments: two with mathematics and one with chemistry. It has also just recruited two research fellows, partly funded by the Research Councils. There has been a QR contribution to these joint appointments with a continuing QR contribution also assumed post 2008. The bid for these appointments was based on a business case which partly relied on QR funding.

A.140 The vast majority of research is supported through project funds, and the normal expectation within the department is that once staff have become established they will generate project funding. Discretionary funding does however support:

- the research infrastructure and deficits on some research projects as the university moves to full economic costing
- pump priming for research proposals. Research Councils, we understand, now demand proof of principle before funding proposals so the department provides up to £20,000 for this purpose. Pump priming bids require a two page application, fully costed, which goes to the departmental research committee. Funds can be used for consumables, technicians and so on. A larger share of the funding is given to new people and those in a more junior research role, or with less experience
- graduate student training which accounts for approximately £300k per year
- new staff are given large sums of ‘start-up’ funding – as much as £200k for new chairs and around £70k for others. This attracts people to York, certainly at lecturer level, and is more than is given by other universities.

A.141 York was able to provide specific examples of how QR has been used. One of these concerns a geneticist who through attending a colleague’s undergraduate lectures in the Department of Genetics became inspired to work in a new area. The two colleagues jointly received QR at university level. An extremely successful collaboration ensued, including publications in *Nature*. The collaboration began in 1985, moved into a funded project and was very productive for around 10 years.

List of abbreviations

AHRC	Arts and Humanities Research Council
BBSRC	Biotechnology and Biological Sciences Research Council
EPSRC	Engineering and Physical Sciences Research Council
FTE	Full-time equivalent
HEFCE	Higher Education Funding Council for England
HEI	Higher education institution
OULS	Oxford University Library Services
PPARC	Particle Physics and Astronomy Research Council
QR	Quality-related research funding
RAE	Research Assessment Exercise
RHUL	Royal Holloway, University of London
SRIF	Science Research Investment Fund
STEM	Science, technology, engineering and mathematics
TRAC	Transparent Approach to Costing

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