

## **RESEARCHERS: WHAT IS THE SITUATION?**

April 2006

### **AIM**

The Funders' Forum asked a small working group to look at the current situation regarding research staff in the UK and report back. This working group follows on from the work of the Research Careers Committee chaired by Sir Gareth Roberts. It has, therefore, kept in sight the work which was started by the Research Careers Committee, and which now forms various work-streams led by the RCUK Research Careers and Diversity Unit. It is recognised that this may intersect with the Health of Disciplines work-stream of Funders Forum if there are discipline specific issues.

Input into the analysis which follows has been sought from a range of sources, however we recognise that a Research Council perspective may still remain.

### **BACKGROUND**

The UK's ten year *Science and Innovation Investment Framework* (2004) makes clear that science, engineering and technology skills are essential for the future of the UK. There are several aspects to this, including enthusing school pupils to achieve in SET; increasing the participation in SET in HE; ensuring women and ethnic minority groups are fully represented; and being responsive to employers and skills needs of the economy.

Previously Roberts' report, *SET for Success* (2002), had addressed the supply of people with STEM skills, identifying a number of issues in schools, further and higher education, as well as in the labour market. *SET for Success* built on the work of the Research Careers Initiative, and its final report in 2002, which itself followed the agreement of the 1996 Concordat on career support for postdoctoral researchers. Significant changes have been made, and new initiatives introduced, since *SET for Success*, with an almost unprecedented level of interest in issues relating to healthy and sustainable flows of people into research careers. This report provides an opportunity to summarise a number of the current work-streams.

Changes which followed *SET for Success* (and funding in SR2002 and SR2004) include the introduction of RCUK Academic Fellowships, increased Research Council stipends (to £12K pa in Oct 2005), enhanced stipends for research students and enhanced salaries for postdoctoral researchers in priority areas, longer PhD training (to 3.5 years on average) and more focus on, and funding of, generic skills both for postgraduates and postdoctoral researchers.

The Research Careers Committee, chaired by Roberts, established two work streams. The first was aimed at improving information about research careers and the second is focused on reviewing the concordat for contract researchers in light of a number of changes including the Fixed-Term Working (FTW) Regulations, the requirement for HEIs to have HR strategies, and the publishing of the EU code of practice for researchers.

This work is continuing, led by the new RCUK Research Careers and Diversity Unit, but involving a number of stakeholders, and includes the following work-streams:

- (a) **Roberts Funding Impact** – a project to report on the impact of the various Research Council streams of funding introduced to support recommendations from the Roberts Report, including funding for generic skills training, and funding for enhanced PhD stipend and postdoctoral salaries. The project is also being undertaken by the RCUK Research Careers and Diversity Unit led by Dr Iain Cameron.
- (b) **Research Career Paths** – a project (previously started by the Research Careers Committee) to develop web-based careers material to enhance the visibility of research careers and their variety. It is important that the variety of different types of researchers is recognized and valued (eg research leaders *and* members of their teams). The project is being led by the RCUK Research Careers and Diversity Unit, and involves Wellcome Trust, the Royal Society and a range of other stakeholders. It is being supported by Kate Reading from the Unit. It is expected that Funders Forum will be updated on progress as required.
- (c) **Future of Concordat** – a project (previously started by the Research Careers Committee) to review the position of the Concordat in the light of developments such as the EU Charter for Researchers and new legislation on the use of fixed-term contract. The project is being led by Dr Iain Cameron, Head of the RCUK Research Careers and Diversity Unit. It is expected that Funders Forum will be updated on progress as required.
- (d) **Diversity** – The unit will work with individual Councils and OSI (DTI Office of Science and Innovation) to develop a co-ordinated set of planned activities and stakeholder interactions to encourage the pursuit of a research career from those groups with a traditionally poor uptake, especially the UK's ethnic minorities, and to encourage woman returners. RCUK will work with OSI to implement appropriate recommendations from the Greenfield report and work in partnership with the Women's Resource Centre.

## WHAT IS THE SITUATION?

We have prepared a bibliography of publications relevant to the research career pipeline which have been published since the Roberts Report (see attached **BIBLIOGRAPHY**). We have sub-divided these into those publications concerned with background and context, A level trends, Undergraduate student trends, PhD trends, HEI sector contract research trends, HEI sector research career progression and research careers beyond the HEI sector. The analysis which follows draws attention to some key issues and themes arising from the high number and wide variety of reports to date.

Our first impression is that there is a lot of monitoring and activity already underway, both around the current situation regarding the number of researchers and about the

supply side. There is less information about the demand side, but still we found a number reports, although mainly around basic level SET skills rather than higher level skills.

The data on research staff in the English HEI sector are available in a HEFCE report which was published in mid-2005, 'Staff Employed at HEFCE funded HEIs: Trends, profiles and projections' ([http://www.hefce.ac.uk/pubs/hefce/2005/05\\_23](http://www.hefce.ac.uk/pubs/hefce/2005/05_23)). The report draws on the most recently available HESA data (for 03/04), including data from the new individualised staff record. We have attached the most relevant section of this report as **ANNEX 1**.

Out of a total academic work force in English HEIs of 95,713 in 03/04, 37,205 were returned as lecturers (39%), 18,717 as senior lecturers (18%) and 11,673 as professors (12%). **22,093 individuals were returned as research assistants in 02/03, and 22,930 in 03/04 (representing 24% of the academic workforce);**

HEFCE's analysis of HESA data showed that 96% of research assistants were on fixed-term contracts; the percentage being similar for men and women, and slightly lower (95%) for part-time researchers. (Following normal usage, this group of staff are referred to as 'contract researchers' or 'contract research staff'.) The subject areas with the largest numbers of contract researchers are biological sciences (representing 30% of all contract research staff), engineering (11%), subjects allied to medicine (9%), chemistry (7%) and physics (7%) and social, economic and political studies (7%).

HESA data allows for limited tracking of individuals (only within the same institution), and shows that approximately 3% of the individuals returned as FTC researchers in 02/03 were returned by the same institution in 03/04 as now being on open-ended contracts; but the proportion varies with subject.

A report on academic research careers in Scotland in 2001 showed that one in three contract research staff in employment in 1998 had left contract research by 2000 and 22% of those on contracts in 1998 had entered a permanent post during 98-00. A further report on researchers in Scotland in 2005 reported an increase in numbers of research staff on permanent contracts rising from 3% (99/00) to 5.5% (02/03), but they also found the proportion of people in employment on fixed term contracts for ten or more years grew from 3.6 to 4.3%. The report welcomed the finding that an increase in total numbers of research staff (5,215 in 01/02 to 5,313 in 02/03) had not been achieved by institutions employing more on fixed-term contracts.

Data for Welsh and NI HEIs are not currently readily available – but could be derived from HESA data.

## SUPPLY SIDE

There is considerable information on the supply side in terms of those studying STEM subjects at school, at undergraduate and at postgraduate level. The following lists some of the headlines in the flow of people from A level to undergraduate applications, through to undergraduate degree numbers and PhD numbers.

**A level trends** were analysed in *SET for Success* which looked at trends across the period 91/92 to 99/00 and found **declines in A level awards** in maths (-8.5%), physics (-21.2%) and chemistry (-3.1%) and **increases** in biological sciences (+12.9%) and computer studies (+128.8%).

These were updated in HEFCE: *Strategically Important and Vulnerable Subjects* (2005/24) with examination of A level results from 99/00 to 03/04 showing further significant **declines** in total number of A level candidates in Maths (down 22%), chemistry (down 15%) and physics (down 11%).

**Applications to Higher Education** – HEFCE's report, however, also showed that UCAS applications for full time (FT) undergraduate places over the same period had **increased** in mathematics (up 36%) and chemistry (up 1%), but were **down** in physics (-8%) and biosciences (-7%). Although we have increasing numbers attending higher education over all, there are clear problem areas around some aspects of STEM (e.g. engineering and mathematics), whereas biosciences and IT are relatively buoyant, and chemistry is roughly stable. UCAS application figures for the 2005 entry show effectively no growth in numbers of accepted FT applicants for Mathematical and computer sciences, and for Engineering. In Biological Sciences, accepted applicant numbers increased by 10% compared to 2004, and Physical Sciences by 8% (reversing the decline in numbers seen in 2004).

**UCAS Applications for 2006:** FT undergraduate applications for 2006 (as reported in *THES* 17 Feb 06 as at the 15 January 2006 closing date) show a decline of 3.4% overall compared to the same point last year, but with a mixed picture at subject level. Application numbers have **increased** in Mathematics (11.5%), Physics (2.3%) and Chemistry (+5.8%), but are **down** in a range of other SET subjects: Biology (-6.3%), Computer Science (-10.3%), Mechanical Engineering (-7.3%), Electronic and Electrical Engineering (-18.6%).

**Undergraduate Numbers:** Undergraduate FTE numbers for UK-domiciled students between 99/00 – 02/03 showed a **decline** of 9% for mathematics and 11% for Physical Sciences; however, Engineering showed an **increase** of 6%. This needs to be understood in the context of 13% growth in the total undergraduate student population over this period.

**PhD Student Numbers:** HEFCE's report showed home domiciled PhD starters (97/98 to 01/02) to be static across the period, but there were **declines** in chemistry (-13%),

engineering (-13%) and languages (-14%). In terms of home domiciled qualifiers in the period 95/96 to 03/04, there was a 32% growth but subject variation with physics (-15%), vet science and agriculture (-12%) and creative arts (+198%) and education (+134%). The UK is ranked second behind Germany in G8 countries in terms of numbers of PhDs awarded per head of population.

**Academic Fellowships:** Following *SET for Success*, RCUK is now awarding 200 fellowships a year jointly with HEIs in the UK with the aim of providing career paths to permanent academic posts.

Applications for the *first round* of Academic Fellowships in 2004 were received from 93 UK HEIs, requesting nearly 1000 academic fellows and covering all fields of research activity in the sector. Over three quarters of the applications requested 6 or fewer fellows per year. Funding for nearly 400 fellows was allocated to 73 UK HEIs for Academic years 04/05-05/06. Both the request and the awards for fellows were fairly evenly spread across the research areas of the Research Councils as well as evenly distributed throughout the regions of the UK.

The average number of individuals applying against each post advertised by HEIs was 20 but there were some shortage areas and areas of exceptional demand. Two thirds of academic fellows recruited were at the same institution immediately prior to appointment. Statistics at present show percentages of women, ethnic minorities and disabled fellows in line with national averages.

Applications for the *second round* of Academic Fellowships have been received from 90 UK HEIs, requesting nearly 1000 fellowships.

## **DEMAND SIDE**

### *Academia*

**HEFCE** estimates of trends indicate that 6,000 recruits to permanent academic positions will be required each year from 04/05 to 10/11 to maintain 03/04 staffing levels. On top of this, a further between 7000 to 12000 recruits may be required to keep in line with DfES target student numbers for the period 04/05 to 10/11.

**UCEA** (Universities and Colleges Employers Association) recruitment and retention survey 2003 showed that problems were occurring in business areas as well as electrical and electronic engineering, medical and allied professions and sciences. The 2005 UCEA survey showed slight easing of both recruitment and retention problems for many groups but the situation worsening in younger academic staff and recruitment problems remaining in finance, business, IT, economics, electronics, law, health care and teacher education.

The **Academy of Medical Sciences** has published ‘The freedom to succeed: a review of non-clinical research fellowships in the biomedical sciences’ in 2005 and made recommendations for funders and employers to take more responsibility for fellowship holders’ careers.

**HEPI** (Higher Education Policy Institute) has published a report indicating that there is no significant brain drain and has not been for the past decade.

The **Bioscience Federation** has surveyed university bioscience departments and finds worries in connection with flow of people into the biosciences, including concern over salary levels and the challenges which institutions face in connection with implementation of the EU Fixed-Term Working (FTW) directive. This is in spite of the relatively large numbers of bioscience undergraduates, postgraduate and researchers.

Salaries in the UK are also identified by **CaSE** (Campaign for Science and Engineering) in 2004 as a potential problem in a world market for the top researchers.

### *Industry*

**ABPI** - *Sustaining The Skills Pipeline* (2005). The report outlines specific skills (including higher level research skills) which are required by the pharmaceutical industry, as well as core general and practical skills needs.

The report argues that further action is needed by all stakeholders to enhance the pipeline of skills that are a cornerstone of UK R&D competitiveness: skills at many different levels – from vocational, technical support to academic research skills. It argues that if the UK is to sustain its skills pipeline and respond to the increasing competitive pressures from emerging countries, action needs to be taken along the entire length of the skills pipeline. No single stakeholder, it argues, whether Government department, education funder or industry, can achieve significant change individually, and it is essential that stakeholders work together.

**LANGLANDS** in *Gateways to the Professions* (2005) draws on a wide variety of sources to look at recruitment issues facing a range of professions. Architecture and associated disciplines were found to have the highest skills shortages, with science, engineering and law also reporting above average recruitment difficulties. The report also draws attention to concerns for HEI employment in relation to a possible decline in the supply of PhD students if debt concerns deter graduates from continuing with their studies.

**LEITCH** *Review of Skills* (interim report 2005) reviews the UK skills needs for maximising economic prosperity and productivity and to improve social justice. It looks at the impact on productivity and employment of targeting support on improving low-level skills compared to focussing on high-level skills. In relation to the latter, the report emphasises the need for HE to work even more closely with employers in order to be able to respond to the skills needs of the economy.

**DTI Economics report No. 16, *Science, Engineering and Technology Skills in the UK*** (March 2006) looks at the supply and demand of people with high level SET qualifications. Using projections based on current trends in labour force data, it sees no serious cause for concern in the supply of SET professionals.

**OST PSA Target Metrics 2005 (Evidence Ltd, December 2005)**

The report confirms the UK's strong relative international performance in terms of achievement, productivity and efficiency. It does, however, highlight concerns in relation to the total UK spend on research as a proportion of its total economic activity (1.8% of GDP compared with an average of 2.25% in the 21 OSI comparator group nations), and in relation to the proportion of the total workforce classified as a researcher (0.59% compared to an average of 0.68% in the OSI comparator group).

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**DISCUSSION POINTS AND DRAFT RECOMMENDATIONS**

1. **Contract Researchers** – high-level data on the current situation in the HE sector regarding Research Assistants and Postdocs indicate that most are still on short-term contracts. However, we could look for a more integrated approach in the analysis of the HESA data, across the UK, focusing on the proportion of university staff designated as research assistants and whether they are on fixed term or permanent contracts. **We recommend that we monitor the trends over time, over discipline, and possibly for institutions, in the employment of contract researchers. Funders Forum should discuss whose responsibility this is.**

2. **In terms of data on the supply side we should bring together data on:**

- A level trends in SET subjects (from DfES / devolved administrations)
- Undergraduate application and acceptance data by subject (from UCAS)
- Trends in undergraduate student numbers (from HESA)
- Postgraduate research students numbers and trends by subject and domicile (from HESA)

**We recommend that we build on the Health of Disciplines work, which is looking, for example, at trends in staff and student numbers.**

3. **There is relative lack of data on the demand side especially for higher level skills** apart from the HE sector where HEFCE regularly reviews requirements of the university sector to maintain its staffing levels and meet current DfES targets. On the industry side, there are several work streams including that of the **UK Science Forum**, chaired by Sir Tom McKillop, which is seeking to address this issue by asking different R&D sectors for more work along the lines of ABPI. The **Sector Skills Councils** are

working to produce sector-specific 'Skills Agreements', but these focus primarily on lower level skills. The interim **Leitch** report 2005 also focuses on lower level skills, but is moving on to address the skills necessary to drive innovation. **Are these different workstreams likely to be sufficient?** Our report has focussed on researchers and research careers, but business R&D needs to ensure also, of course, a supply of SET professionals for product *development*. **Do we need to do more to ensure that different employment sectors address their individual higher level Research and Development skill needs?**

4. Even where we have both supply and demand data, we have no process for bringing them together, nor for integrating them over time (for example, to pick up early warning signs from emerging trends in schools). Also data are often not informed by our overarching R&D targets. How are we going to achieve this and report in a systematic way? **We recommend that consideration is given to developing a "traffic lights" system for indicating the relations between supply and demand (suitably lagged) across disciplines and that this should be part of the Health of Disciplines report to Funders' Forum** via Prof Diamond's working group. This needs to be linked up with the DSI/DfES working group on supply and demand for SET professions (the group which advised on the DTI Economics Report 16), drawing in Devolved Administrations as appropriate.

5. In many disciplines, we still have significant numbers of research staff still on short term contracts. The RCUK report on the impact of enhanced salaries and stipends (available shortly) highlights the complexity of employment culture in HEIs, and the difficulties of engaging PIs in broader human resource management issues. **We recommend that RCUK continues to review the status of researchers especially in light of the Fixed-Term Working Regulations and HEI's HR strategies and reports in 2008** as the FTW Regulations will have been in law for 6 years. (This is consistent with work stream (a) of the RCUK joint unit on careers and diversity).

While HEFCE is required by the Secretary of State to report annually on "workforce trends" and "progress on embedding HR strategies", there is no requirement to report specifically on the situation with regard to the use of fixed-term contracts by HEIs. Likewise there is no requirement from the Welsh Assembly to HEFCW. There is however precisely such a requirement from the Scottish Executive to SFC - which is why we have the very useful annual reports on the Scottish situation. **We should consider whether the funding councils should ask universities to report systematically on contract researchers.**

6. Given the number of research staff still on contracts, **we recommend that Funders' Forum support the review of the concordat for contract researchers** in light of the changes in legislation and the publishing of the EU code of practice for researchers, so that the UK continues to be at the forefront of good practice. The move to full economic costing by the Research Councils should also now help facilitate alternative more sustainable strategies for employing researchers. This is consistent with the work-stream of the RCUK Research Careers and Diversity Unit).

7. Given the importance of high level research skills to the economy, **we recommend that work continues to heighten the visibility of the career opportunities** open to researchers (Consistent with the work-stream (b) of RCUK Research Careers and Diversity Unit). With an eye to broadening supply at school level, consideration should be given as to how to play this work into the extensive activity that exists on widening participation in HE, especially activity aimed at encouraging well-qualified GCSE students to stay on.

8. We note that there is a lack of available data on researcher starting salaries and pay comparability with salaries of other (non-research) professions competing for the same skills. There is also a lack of data on pay structures given the new JNCHES pay framework. **We might wish, at some point, to ask UCEA to undertake a review of the pay structures used by universities, with the aim of trying to identify good practice.**

9. There is also a lack of data on inflow and outflow of researchers from the HEI sector. HESA has introduced a new staff survey (NISR - New Individualised Staff Record), which collects pay-levels, contract type, as well as previous employment (for those joining in the year in question) and destination (for those leaving HEI employment). **Unfortunately, the level of unknowns in the data-returns from universities make these data unusable.** The data would tell us, for example, how many postdoctoral researchers are retained by their employer on a further fixed-term contract when their current contract ends and will be key to understanding the impact of the fixed-term regulations. **How could we encourage HEIs to see the value to their own research strategies of taking more care over this survey (eg as part of an fEC-induced fresh look at HR strategies for sustainable research – see para. 10 below).** The Wellcome Trust are also hosting a meeting with HESA and other research funders in May 2006 to explore common issues regarding career tracking and how to improve the data.

10. A review commissioned by RCUK into the impact of funding for enhanced stipends and salaries will draw attention to **the complexity of employment culture in HEIs**, and obstacles to the introduction of market-led salaries for early-career researchers. This review, ‘Assessing the Impact of the Roberts’ Review Enhanced Stipends and Salaries on Postgraduate and Postdoctoral Positions’, by the *Centre for the Study of Law & Policy in Europe*, University of Leeds, will be published later in 2006. In particular the report finds that where such a policy is ‘imposed’ from above (eg HR managers) or from outside (eg enhanced salaries from RCs), it risks not engaging PIs, who act as the primary managers for the employment of researchers. The report will also draw attention to the way that RC grant funding inadvertently encourages **short-termism at all levels**: researchers themselves become focussed on the project at hand, rather than their long-term career development; PIs become driven purely by research outcomes, and less by long-term people-development issues; institutions predominantly offer short (fixed-)term contracts, even when there is every likelihood of further funding being secured. **How can we foster a debate regarding the culture of employment of**

**researchers in HEIs? What constitutes good practice in employment practice for a sector which needs to both offer professional career structures and be responsive to the needs of the economy?** Might the requirement, under fEC, for universities to think more strategically about sustainability of research provide a context for further work on HR issues surrounding researchers – e.g. encouraging universities to develop and apply best practice in order to be attractive to the best researchers?

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### **Working Group members**

Professor Julia Goodfellow (BBSRC)  
Professor Phil Gummett (HEFCW)  
Ric Parker (Rolls Royce)

Assisted by:

Dr Ian Lyne (BBSRC)  
Rosie Beales (RCUK)

### **and including discussion with**

Professor Sir Gareth Roberts (Wolfson College, Oxford) and  
Dr Sohalia Rastan (Wellcome Trust)

## ANNEX 1

### Extract from HEFCE report 2005

## Research assistants

### Overall

90. We now consider staff that are below lecturer grades, are involved in research but are not eligible for submission to the 2001 RAE, to whom we refer as ‘research assistants’. This group is of particular policy interest, both because of the contribution to research output, and because it is an important pathway from student to academic, that is academic at lecturer grade and above.

91. Table 36 shows that most assistant academics are research assistants (78 per cent). Those in the ‘Other’ category include a small number of research active staff who, though formally on a grade below lecturer, are principal investigators and are eligible for submission to the RAE. Most are staff only involved in teaching.

**Table 36 Research assistants (excluding low activity) and other assistant academics, 2002-03 and 2003-04**

	2002-03		2003-04	
	Number	FTE	Number	FTE
Research assistants	21,521	18,999	22,457	19,850
Other assistant academics	7,234	5,805	6,499	5,290
<b>All assistant academics</b>	<b>28,755</b>	<b>24,803</b>	<b>28,956</b>	<b>25,139</b>

Note: The FTE figures given are obtained by summing academic contracts over all staff included in this table.

92. In the population we consider in Table 36, we exclude a small number of low activity staff with all the attributes of research assistants, which form part of the low activity population in Table 5. The full population of research assistants is shown in Table 37.

**Table 37 All research assistants (including low activity), 2002-03 to 2003-04**

	2002-03		2003-04	
	Number	FTE	Number	FTE
Research assistants (normal activity levels)	21,521	18,999	22,457	19,850
Research assistants (low activity)	572	153	473	150
<b>All research assistants</b>	<b>22,093</b>	<b>19,152</b>	<b>22,930</b>	<b>20,000</b>

Note: The FTE figures given are obtained by summing academic contracts over all staff included in this table. Pop E

93. Table 38 shows that almost all (96 per cent) research assistants were on non-permanent contracts in 2002-03. We are particularly interested in whether this is affected by certain characteristics of the staff, and in whether any of these non-permanent assistants go on to permanent contracts in the following year.

**Table 38 Research assistants by contract, 2002-03**

<b>Contract</b>	<b>Total</b>	<b>%</b>
Permanent	829	4%
Non-permanent	21,264	96%
<b>Total</b>	<b>22,093</b>	<b>100%</b>

Notes: Pop E

**Characteristics of research assistants**

94. Table 39 shows that there is a comparatively small number of part-time research assistants, but that a slightly higher proportion (5 per cent compared with 4 per cent) of them are permanent compared with their full-time counterparts.

**Table 39 Research assistants by mode, 2002-03**

<b>Mode</b>	<b>Permanent</b>	<b>Non-permanent</b>	<b>Total</b>	<b>% Permanent</b>
Full-time	701	18,573	19,274	4%
Part-time	128	2,691	2,819	5%
<b>Total</b>	<b>829</b>	<b>21,264</b>	<b>22,093</b>	<b>4%</b>

Notes: Pop E

95. Males make up over half of the research assistants, as Table 40 demonstrates. The proportion on permanent contracts is the same for men and women.

**Table 40 Research assistants by sex, 2002-03**

<b>Sex</b>	<b>Permanent</b>	<b>Non-permanent</b>	<b>Total</b>	<b>% Permanent</b>
Male	469	11,557	12,026	4%
Female	360	9,707	10,067	4%
<b>Total</b>	<b>829</b>	<b>21,264</b>	<b>22,093</b>	<b>4%</b>

Notes: Pop E

96. Table 41 shows that Biological sciences has the largest numbers of assistant researchers, with over 6,500. There are less than 100 assistant researchers for Law, 10 of whom are on permanent contracts, making it the subject area with the highest proportion of permanent assistants. Medicine and dentistry has the smallest proportion (2 per cent) of permanent assistants.

**Table 41 Research assistants by subject, 2002-03**

<b>Subject</b>	<b>Permanent</b>	<b>Non-permanent</b>	<b>Total</b>	<b>% Permanent</b>
Medicine and dentistry	11	662	673	2%
Subjects allied to medicine	60	1,928	1,988	3%
Biological sciences	181	6,444	6,625	3%
Veterinary sciences/agriculture and related	9	219	228	4%
Chemistry	58	1,530	1,588	4%
Physics	54	1,505	1,559	3%
Other physical sciences	46	623	669	7%
Mathematical sciences	18	631	649	3%
Computer science/librarianship/info science	37	926	963	4%
Engineering/technology/building/architecture	96	2,292	2,388	4%
Social, economic & political studies	86	1,379	1,465	6%
Law	10	85	95	11%
Business and administrative studies	26	302	328	8%
Languages	12	313	325	4%
Humanities	22	541	563	4%
Creative arts and design	11	170	181	6%
Education	20	242	262	8%
Combined and unknown	72	1,472	1,544	5%
<b>Total</b>	<b>829</b>	<b>21,264</b>	<b>22,093</b>	<b>4%</b>

Notes: Pop E

**Progression of temporary research assistants**

97. We used individual staff identifiers to track<sup>1</sup> the activity over time of temporary staff members within institutions. Activity is defined in Annex A. Table 42 shows that 3 per cent of non-permanent research assistants from 2002-03 moved to permanent contracts within the same institution by 2003-04. The equivalent statistic for 2001-02 to 2002-03 is 2 per cent.

**Table 42 Progression of non-permanent research assistants, 2002-03**

<b>Contract in following year</b>	<b>Total</b>	<b>%</b>
Permanent	550	3%
Non-permanent	14,750	69%
None	5,964	28%
<b>Total</b>	<b>21,264</b>	<b>100%</b>

Note: This table refers to movement within institutions, not across the sector. Non-permanent, Pop E

98. Table 43 shows that the proportion moving onto permanent contracts is the same for both full-time and part-time staff.

<sup>1</sup> Tracking is only within institution and across institutional transfers are not accounted for.

**Table 43 Proportion moving to a permanent contract in the following year, by mode**

<b>Mode</b>	<b>Number</b>	<b>% Moving to permanent contract</b>
Full-time	18,573	3%
Part-time and other	2,691	3%
<b>Total</b>	<b>21,264</b>	<b>3%</b>

Note: This table refers to movement within institutions, not across the sector. Non-permanent, Pop E

99. Table 44 shows that a slightly lower proportion of female research assistants progress to a permanent contract than do their male counterparts (of whom 3 per cent progress).

**Table 44 Proportion moving to a permanent contract in the following year, by sex**

<b>Sex</b>	<b>Number</b>	<b>% Moving to permanent contract</b>
Male	11,557	3%
Female	9,707	2%
<b>Total</b>	<b>21,264</b>	<b>3%</b>

Note: This table refers to movement within institutions, not across the sector. Non-permanent, Pop E

100. Table 45 shows that the highest rate of progression to permanent contracts is in Education (7 per cent), with Business and administrative studies and Law also having a comparatively high rate at 6 per cent. Only 1 per cent of temporary research assistants in Medicine and dentistry move on to a permanent contract.

**Table 45 Proportion moving to a permanent contract in the following year, by subject**

<b>Subject</b>	<b>Number</b>	<b>% Moving to permanent contract</b>
Medicine and dentistry	662	1%
Subjects allied to medicine	1,928	2%
Biological sciences	6,444	2%
Veterinary sciences/agriculture and related	219	3%
Chemistry	1,530	2%
Physics	1,505	2%
Other physical sciences	623	4%
Mathematical sciences	631	3%
Computer science/librarianship/info science	926	4%
Engineering/technology/building/architecture	2,292	4%
Social, economic & political studies	1,379	5%
Law	85	6%
Business/administrative studies	302	6%
Languages	313	2%
Humanities	541	4%
Creative arts/design	170	5%
Education	242	7%
Unknown and combined subjects	1,472	3%
<b>Total</b>	<b>21,264</b>	<b>3%</b>

Note: This table refers to movement within institutions, not across the sector. Non-permanent, Pop E

## **BIBIOGRAPHY**

### SECTIONS:

- 1) Background and Context
- 2) A level Trends
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- 6) HEI Sector: Research Career Progression
- 7) Research Careers beyond the HE Sector
- 8) Discipline specific analyses
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## 1) Background and Context

- Roberts Review: SET for Success (2002)  
[http://www.hm-treasury.gov.uk/Documents/Enterprise\\_and\\_Productivity/Research\\_and\\_Enterprise/ent\\_research\\_roberts.cfm](http://www.hm-treasury.gov.uk/Documents/Enterprise_and_Productivity/Research_and_Enterprise/ent_research_roberts.cfm)
- Science & Innovation Investment Framework 2004-2014  
[http://www.hm-treasury.gov.uk/spending\\_review/spend\\_sr04/associated\\_documents/spending\\_sr04\\_science.cfm](http://www.hm-treasury.gov.uk/spending_review/spend_sr04/associated_documents/spending_sr04_science.cfm)
- Research Careers Initiative – Final Report 2002  
<http://www.universitiesuk.ac.uk/activities/rci.asp>
- House of Commons (2002) *Short-term Research Contracts in Science and Engineering*, Report of the House of Commons Select Committee on Science and Technology  
<http://www.publications.parliament.uk/pa/cm200102/cmselect/cmsctech/1046/104602.htm>
- DTI Economics Paper 16, *Science, Engineering and Technology Skills in the UK* (March 2006)  
<http://www.dti.gov.uk/economics/papers.html>

- The report analyses current trends with regard to the supply of people with SET qualifications (from A levels to doctorates), the stock of holders of qualifications in the population, and demand side indicators for SET qualified professionals. For example, the report finds a 40% increase in the number of people of working age holding doctorates between 1997 and 2004 (page 12); however, the sustainability of this trend needs to be considered in the light of the fact that absolute numbers passing A levels across a range of SET subjects has remained fairly static between 94/95 and 03/04.

- The report acknowledges that the analysis of the demand side does not factor in the R&D expenditure target of 2.5% GDP by 2014 announced in the Science and Innovation 10 year framework, and that further research may be needed (pages vii, 37).

- The report argues that any shortfalls in the supply of SET workers are likely to be corrected by market mechanisms; however, it also recognizes that institutional factors may affect the responsiveness of the market. For example, evidence is cited that academic wages in the UK are substantially behind those in the US: “This may reflect lower worker quality, but more likely is due to institutional differences between labour markets” (page 30). The report further acknowledges that “imperfections in the speed of this [market] adjustment process and other factors may create difficulties in the short to medium term” (page 35).

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## 2) A level Trends

*SET for Success* looked at trends across the period 91/92 – 99/00, and found declines in A level awards in Mathematics (-8.5%), Physics (-21.2%) and Chemistry (-3.1%). Particular increases were noted in Biological Sciences (+12.9%) and Computer Studies (+128.8%). (See *SET for Success* para 2.23). These trends have been updated in:

- HEFCE: Strategically Important and vulnerable subjects (2005/24):  
[http://www.hefce.ac.uk/pubs/hefce/2005/05\\_24/](http://www.hefce.ac.uk/pubs/hefce/2005/05_24/)

- A level results 99/00 to 03/04 show further significant declines in total number of A level candidates in mathematics (down 22%), chemistry (down 15%) and physics (down 11%), although the proportion of students gaining grades A-C has increased.

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- Physics in Schools and Colleges: Teacher Deployment and Student Outcomes (University of Buckingham, 2005)  
<http://www.buckingham.ac.uk/news/newsarchive2005/physics.html>

- The survey of 432 schools and colleges, shows that teachers' qualification in physics is the most important factor, after pupil ability, in explaining performance in both GCSE and A-level physics.

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## 3) Undergraduate Student Trends

- UCAS Applications  
<http://www.ucas.com/figures/ucasdata/subject/index.html>

- UCAS site allows for comparisons of applications 2002 – 2005; over this period, there has been an increase of 60,790 applications per year (a total of 522,155 applications in 2005), and an increase of 37,254 accepted applicants (an increase of 10%).

- However, applicants in Physical Sciences increased by only 749 (5%) in this period (though the 2005 figures reversed the decline in numbers seen in 2004); accepted applicants to Mathematical and Computer Science decreased by 5,947 (-19%).

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- HEFCE: Strategically Important and vulnerable subjects (2005/24):  
[http://www.hefce.ac.uk/pubs/hefce/2005/05\\_24/](http://www.hefce.ac.uk/pubs/hefce/2005/05_24/)

- In the period 99/00 to 03/04 undergraduate mathematics activity declined 9.3% (= 1800 FTEs); biosciences and physics show virtually no change over the period, and chemistry some decline. However, increases are seen in medically related subjects: pharmacy

(increase of 2100 FTEs), and medicine / dentistry / veterinary science (increase of 6400 FTEs).

- The report found few or no postgraduate research students in some of the minority languages.

- The report also analyses undergraduate application trends. It finds that UCAS applications have increased over the period 1999 to 2003 in mathematics (up 36% to 4533 applicants) and chemistry (up 1% to 2892 applicants), but have decreased in Physics (down 8%) and Biosciences (down 7%)

- Undergraduate FTE numbers for UK-domiciled students between 99/00 – 02/03 showed a decline of 9% for mathematics and 11% for Physical Sciences; however, Engineering showed an increase of 6% and Other Modern Languages (i.e. excluding French, Spanish and German) an increase of 16%.

- 
- SET Statistics Table 5.5 First degree and postgraduate qualifiers 94/95 – 02/03  
[http://www.ost.gov.uk/setstats/5/t5\\_5.htm](http://www.ost.gov.uk/setstats/5/t5_5.htm)

- Numbers of UK domiciled SET first degree graduates per year has grown from 41,153 to 65,310 in this period (increase of 59%); this compares with a increase of 26% across all subjects.

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- Higher Education in Scotland: A Baseline Report – second update (SFC 2005)  
[http://www.sfc.ac.uk/publications/pubs\\_other.htm](http://www.sfc.ac.uk/publications/pubs_other.htm)

- The report finds large increases in undergraduate numbers in Mathematical Sciences (+260, 12.1%), Social, Economic & Political Studies (+765, 6.4%), Creative Arts & Design (+375, 5.3%) and Law (+225, 5.1%). Numbers are down in three subject groups only: Business & Administrative Studies (-115, -0.6%), Languages (-100, -1.3%) and Librarianship & Information Science (-125, -4.4%).

- Postgraduate student numbers remain buoyant, especially at taught postgraduate level. Figure 11 shows that only two subject groups recorded falling numbers between 2002-03 and 2003-04: Business & Administrative Studies (-305, -3.3%) and Computer Science (-170, -5.7%).

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#### 4) PhD Trends

- SET Statistics Table 5.5 First degree and postgraduate qualifiers 94/95 – 02/03  
[http://www.ost.gov.uk/setstats/5/t5\\_5.htm](http://www.ost.gov.uk/setstats/5/t5_5.htm)

- Numbers of UK domiciled SET doctoral graduates per year has grown from 1486 to 3150 in this period (increase of 112%); this compares with a increase of 116% across all subjects.

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- OST PSA Target Metrics for the UK Research Base (Evidence Ltd, December 2005): [http://www.ost.gov.uk/research/funding/psa\\_metrics\\_report.pdf](http://www.ost.gov.uk/research/funding/psa_metrics_report.pdf)

- The report surveys UK R&D performance against international competitors using a range of metrics. On many indicators UK is second only to the USA, and has moved into first place this year on some indicators.

- The UK Gross Expenditure on R&D (GERD) at 1.8% of GDP has increased only marginally, and the UK is 17<sup>th</sup> of the 21 OST comparator group nations. Also only 0.6% of the UK workforce would be classified as a researcher, which is less than the OSI comparator group average.

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- Postgraduate Education in the United Kingdom (HEPI, November 2004): <http://www.hepi.ac.uk/pubdetail.asp?ID=164&DOC=Reports>

- % change in numbers of first year research postgraduates 96/97 -01/02: largest increase is in Creative Arts and Design (97% growth), lowest in Languages (8%), Veterinary Sciences (6%), Law (4%), and Physical Science (-2%).

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- Staff employed at HEFCE funded HEIs: Trends, profiles and projections (HEFCE 2005/23) [http://www.hefce.ac.uk/pubs/hefce/2005/05\\_23/](http://www.hefce.ac.uk/pubs/hefce/2005/05_23/)

- this report also provides an analysis of trends in home domiciled PhD starters (97/98 – 01/02) and found that total numbers were static across the period, but with declines in Chemistry (-13%), Engineering (-13%) and Languages (-14%)

- In terms of home domiciled qualifiers (in the period 95/96 – 03/04), a 32% growth in total numbers was found, but with considerable subject variation: Physics (-15%), Veterinary Science and Agriculture (-12%), Creative Arts (+198%) and Education (+134%).

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- What do PhDs Do? (Using HESA DLHE survey 02/03) [http://www.grad.ac.uk/cms/ShowPage/Home\\_page/Online\\_resources/What\\_Do\\_PhDs\\_Do/p!eXeccLa](http://www.grad.ac.uk/cms/ShowPage/Home_page/Online_resources/What_Do_PhDs_Do/p!eXeccLa)

- uses a standard coding of occupations which does not define postdoctoral research as a separate category. More detailed analysis of responses indicates that 48% of PhD

graduates went into 'education' as their first work destination, and 47% of these were identified as working as postdoctoral researchers in universities on fixed-term contracts (825 respondents).

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## 5) HEI Sector: Contract Researcher Trends

- Staff employed at HEFCE funded HEIs: Trends, profiles and projections (HEFCE 2005/23)

[http://www.hefce.ac.uk/pubs/hefce/2005/05\\_23/](http://www.hefce.ac.uk/pubs/hefce/2005/05_23/)

- this report shows that in 02-03, 96% of Research Assistants were on non-permanent contracts.

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- Report on the higher education workforce 2005 (Draft report based on the above – unpublished)

- The number of academic staff on short-term contracts has grown by a quarter since 95/96 to around 35,000 in 03/04, and has not significantly changed as a proportion of the total, at 36%, in 02/03.

- Only 3% of non-permanent research assistants from 02/03 moved to permanent contracts within the same institution by 03/04. The equivalent statistic from 01/02 to 02/03 is 2% (para. 97).

- Variation was found between subject areas: only 2% of RAs in Biological Sciences moved onto a permanent contract at the same institution, compared to 7% for Education and 6% for Law and Business studies.

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- Academic Research Careers in Scotland (SHEFC, 2001)

<http://www.sfc.ac.uk/library/11854fc203db2fbd000000ed49b85576/>

- this report found that one in three contract research staff in employment in 1998 had left contract research by 2000; 22% of contract research staff in 1998 had entered a permanent post during 98-00

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- Contract Research Staff in Scottish Higher Education Institutions Report 2004-05

[http://www.sfc.ac.uk/publications/pubs\\_other\\_shefcarchive.htm](http://www.sfc.ac.uk/publications/pubs_other_shefcarchive.htm)

- this reported an increase in the numbers of research staff on permanent contracts; the proportion rose from 3% (99/00) to 5.5 % (02/03)

- however, it also found that the proportion of people in employment on fixed-term contracts for 10 or more years grew from 3.6% to 4.3%

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- Staffing Issues in Academic Medicine and Dentistry: The Case of Non-clinical Researchers and Clinical Academics (Tom Sastry – Higher Education Policy Institute, 2005)

<http://www.hepi.ac.uk/pubdetail.asp?ID=184&DOC=reports>

- Para 14: “The predominance of non-clinical staff in researcher roles indicate that – as one would expect – the performance of UK biomedical research depends massively upon non-clinical staff: 95 per cent of staff on researcher grades are non-clinical and these non-clinical researchers represent 47 per cent of all FTE staff in clinical medicine”

- The report contends that the provision of career opportunities for non-clinical researchers, on which much of the success of the UK’s biomedical research depends, is arguably a higher priority than for clinical researchers.

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- Office of National Statistics Labour Force Surveys

[http://www.statistics.gov.uk/onlineproducts/lms\\_hqs.asp](http://www.statistics.gov.uk/onlineproducts/lms_hqs.asp)

- statistics at Summer 2005 show that out of 3,576,000 employees classified as Higher Managerial and Professional, 6.2% were on temporary contracts.

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- Contract Researchers Online Survey (CROS)

<http://www.cros.ac.uk>

- A summary report on data received from the HEIs participating in the CROS survey is available for 2002 (covering 17 institutions):

[http://www.cros.ac.uk/CROS\\_analysis\\_v2.pdf](http://www.cros.ac.uk/CROS_analysis_v2.pdf)

- Data from the 2005 survey now covers 24 different HEIs with responses from 3446 postdoctoral researchers. The survey provides a range of information on postdoctoral posts, training and development. A summary report is not available, but a brief analysis of the data show that for postdoctoral researchers with 5-6 years of experience, almost 30% had been employed at the same institution over the whole period. Around 20% of this group reported that they had been in post less than 1 year, indicating a recent change of location.

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- HESA Resources of Higher Education Institutions (2003-04)

<http://www.hesa.ac.uk/>

- HESA data provides information on researchers across the disciplines, and shows that 92.5% of employees at this level are employed on fixed-term contracts. Of the 27,590 full-time employees at this level returned in the 03-04 HESA staff returns, 87% (23,880) had been in employment at the same HEI in the previous year; 4,395 individuals left the employment of their HEI in that period. On the assumption that the majority of fixed-term contracts are 3-year in duration, one might expect around 8,500 contracts to end in any one year. This shows very approximately that around 50% of researchers at this level are retained in employment after the end of a fixed-term contract, and yet the majority will remain on a further fixed-term contract. See Tables 14a and 14b in the HESA publication.

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## 6) HEI Sector: Research Career Progression

- HESA Resources of Higher Education Institutions (2003-04)  
<http://www.hesa.ac.uk/>

- Out of a total academic workforce of 150,230, 45% of staff were on fixed-term contracts.

- 33,190 staff were returned as Researchers (22%), 54,045 as Lecturers (36%), 24,745 as Senior Lecturers (16%), and 13,525 as Professors (9%).

- Previous Employment / Destinations of staff flowing into / out of the HE sector are not known with any degree of accuracy, due to the high numbers of unknown values. HEFCE is working with HESA and the HE sector to improve return rates for this information in the New Individualised Staff Record (NISR).

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- Academic Staff: trends and projections (2002) (HEFCE 2002/43)  
[http://www.hefce.ac.uk/pubs/hefce/2002/02\\_43.htm](http://www.hefce.ac.uk/pubs/hefce/2002/02_43.htm)

- This report investigates how many academic staff will need to be recruited over the next 10 years in view of the continuing aging demographic profile of UK academic staff (para 52) (see *SET for Success* 5.37). It estimates overall leaving rates, and particularly whether there will be a significant increase in rates, because of staff retiring. Findings show that, overall, current recruitment rates are sufficient to maintain current staff numbers. However, this varies by subject. Further, if staff numbers are to increase, there will need to be a marked increase in recruitment.

- the total number of academic staff was found to have increased by 6.5% between 1995 and 2000, but with declines in a number of particular disciplines: Chemistry (-4.8%), Physics (-2.6%), Engineering (-9.6%) and Mathematics (-4.7%)

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- Staff employed at HEFCE funded HEIs: Trends, profiles and projections (HEFCE 2005/23):

[http://www.hefce.ac.uk/pubs/hefce/2005/05\\_23/](http://www.hefce.ac.uk/pubs/hefce/2005/05_23/)

- This report gives an overview of trends in academic staff at English higher education institutions (HEIs) from 1995-96 to 2003-04.

- a. Just over 6,000 recruits to permanent academic positions will be required each year from 2004-05 to 2010-11 to maintain 2003-04 levels.
- b. Between 7,000 and 12,000 recruits may be required to keep in line with DfES target student numbers for the period 2004-05 and 2010-11.

- this report updates the 2002 report above. It found that over the period 95/96 – 03/04 total academic staff numbers had increased by 16%, but again with declines in particular areas: Chemistry (-10%), Physics (-10%), Engineering (-14%) and Mathematics (-10%)

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- UCEA Recruitment and Retention Survey 2003

<http://www.ucea.ac.uk/index.aspx?ContentId=14&bc=Publications&p=Publications>

- An analysis of the subject areas associated with recruitment and retention problems revealed that the areas of concern were business areas and related subjects, as well as electrical and electronic engineering, medical and allied professions, and sciences.

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- UCEA Recruitment and Retention Survey 2005

<http://www.ucea.ac.uk/index.aspx?ContentId=14&bc=Publications&p=Publications>

- The survey (conducted in early 2005, relating to the 2004 calendar year) shows a slight easing of both recruitment and retention problems for many groups of staff, but a worsening of position with regard to the retention of younger academic staff, and recruitment problems remaining in finance, business, IT, economics, electronics, law, health care and teacher education.

- The survey found limited use of market supplements or ‘golden hellos’ to overcome recruitment difficulties. HR representatives reported that these tended to lead to imbalances within departments and unclear pay systems, with new staff being appointed on better salaries than existing staff.

- The analysis focuses primarily on permanent posts, and does not consider recruitment and retention issues specifically relating to the use of fixed-term contracts for researchers.

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- Radical Thinking, Creative Solutions: Career Issues in UK Academic Research (Wellcome Trust, 2001)

[http://www.wellcome.ac.uk/doc\\_WTD003195.html](http://www.wellcome.ac.uk/doc_WTD003195.html)

- A conference, 'Radical Thinking, Creative Solutions: Career issues in UK academic research', was held in July 2001 and gave delegates from academia, funding agencies, government and industry a unique opportunity to step away from their usual stances and think of radical ways to improve contemporary research life.

Recommendations included:

- that research principal investigators in universities be persuaded of their direct responsibility for management of research staff, and of the need for substantial change and improvement to current practices;
- that a working party urgently address the particular problem faced by senior fellows at the end of their research tenure, for whom university-funded positions are either unavailable or unattractive;
- that a four-year PhD be introduced as standard, with 'respectable exit points', for example after taught Master's or MRes, after additional research training for example to MPhil, and, for a smaller number of students, at completion of a PhD;
- that postdoctoral research training and experience be deemed a valued qualification for science teaching in schools, and that an appropriate, specific, entry pathway to school teaching be created.

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- The Freedom to Succeed: A Review of Non-Clinical Research Fellowships in the Biomedical Sciences (Academy of Medical Sciences, 2005)  
<http://www.acmedsci.ac.uk/p48prid31.html>

- The report looks in detail at UK fellowship schemes for non-clinical researchers and makes a number of recommendations, including the need for funders and employers to take more responsibility for fellowship holders, and for universities and funders to jointly share the financing of fellowships.

- 
- The Impact of International Mobility on UK Academic Research  
[http://www.hepi.ac.uk/downloads/19AcademicMobility\\_WSAReport.pdf](http://www.hepi.ac.uk/downloads/19AcademicMobility_WSAReport.pdf)

- The report reveals "a picture of international academic mobility that is in some respects contrary to the views that have informed past debate of the issue in the UK. Certainly it is clear that there is no 'brain drain' – and has not been for the past decade or more. The findings also provide a richer picture of mobility than was available hitherto, especially in its variation by career stage, origins and destinations, institutions and disciplines."

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- Building on Success (Biosciences Federation, 2005)  
<http://www.bsf.ac.uk/default.htm>

- The report surveys the impact of government policy on the health of the biosciences, and makes a number of recommendations in connection with the flow of people into biosciences, including continuing concern over salary levels, and the challenges which institutions face in connection with implements the fixed-term working regulations.

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- Attracting the Best (Report of a Save British Science symposium)

<http://www.sciencecampaign.org.uk/documents/2004/SBS0407.pdf>

- the report contains a number of recommendations relating to the 'market' for world-class researchers, and the salary levels and approach to salary-setting needed to ensure that UK research attracts and retains the best scientists.

- 
- Framework Agreement for the Modernisation of Pay Structures

<http://www.ucea.ac.uk/index.aspx?ContentId=20&bc=PayModernisation&p=PayModernisation>

- Only a small number of universities have fully implemented the pay agreement at this time. Information from the AUT website indicates, however, already a range of positions on starting salaries and progression for researchers. For example:

Bradford: Starting salaries for researchers on *point 27* (£23,457 from August 2005).

Liverpool: Starting salaries on *point 25* (£22,111) progress to point 31 after no more than 4 years.

Leeds: Starting salaries on *point 24* (£24,647) for researchers, with progression to point 30 in three years.

UCL: The starting salary for Researcher is point 22 (£20,235) from August 2005, but increasing to point 23 (£20,842) in August 2006 and point 24 (£21,467) in August 2007.

(Information taken from AUT website at:

<http://www.aut.org.uk/index.cfm?articleid=1292>)

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- Association of Graduate Recruiters – Graduate Recruitment Survey 2005

[http://www.agr.org.uk/publicationlibrary/view\\_survey\\_summary.html](http://www.agr.org.uk/publicationlibrary/view_survey_summary.html)

From press release: **Starting salaries**

The median starting salary for graduate level jobs across all sectors is £22,000, which represents a rise of 4.8 per cent on last year. Graduate starting salaries are highest in London (£26,500) and the South East (£22,000) and lowest in Wales (£18,800) and Northern Ireland (£18,500).

Investment banks remain the most generous with starting salaries of £35,000, followed by consulting firms (£28,500) and law firms (£28,000) although salaries in these areas have now remained unchanged for three years. The three sectors with the largest increases in starting salaries are Accountancy and professional services firms report (up 10% to £22,000), the public sector (up 7% to £22,000) and IT companies (up 5% to £22,000).

- 
- Brain Drain: Migration of Academic Staff to and from the UK, HEPI (2005)  
<http://www.hepi.ac.uk/pubdetail.asp?ID=180&DOC=reports>

- Among UK staff most mobility is among junior researchers, often before they have embarked on a research career, and that for the great majority these periods employed abroad should not be regarded so much as emigration as career development. For immigrants there is more mobility among established researchers, though young people still predominate.

- 
- Researchers in Higher Education Institutions: Scoping Study of Career Development and Human Resource Management (2005)  
[http://www.hefce.ac.uk/Pubs/rdreports/2005/rd16\\_05/](http://www.hefce.ac.uk/Pubs/rdreports/2005/rd16_05/)

- A study for HEFCE by Evidence UK. The report looks in detail at aspects of the culture of employment for researchers at HEIs; it covers issues such as the willingness of postdoctoral researchers to work without pay in certain circumstances, and the perception amongst PIs that funders are only interested in the research outputs from a grant and not the development of the researchers.

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- Evaluation of the HEFCE staff recruitment incentive scheme 'golden hellos' (Report to HEFCE by David Mason Consultancy, February 2006)  
[http://www.hefce.ac.uk/Pubs/rdreports/2006/rd04\\_06/](http://www.hefce.ac.uk/Pubs/rdreports/2006/rd04_06/)

- The report finds evidence that golden hellos have eased recruitment and retention difficulties, and that nearly three-quarters of all respondents considered that the scheme had some positive impact on easing recruitment difficulties.

- Some concern was found, however, regarding a specification of nationally-defined shortage areas, where these did not match local needs (para. 4.7).

- 
- Bridges to Independence: Fostering the Independence of New Investigators in Biomedical Research (2005)  
<http://www.nap.edu/catalog/11249.html>

- This report by the US National Research Council looks in detail at career progression issues in the context of the funding mechanisms used by the National Institutes of Health (NIH) grant system. It seeks to head-off the significant risk which it sees to its preeminence in biomedical science through inadequate support for research careers.

- It recommends a *5-year maximum period* for postdoctoral training before moving, where appropriate, to a staff scientist appointment (page 85, recommendation 4.1). The

report also recommends that the NIH's standard *grant application form be modified* to "include a description of how the postdoc will be prepared for an independent career (training)" (page 94, recommendation 4.5).

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## 7) Research Careers beyond the HE Sector

- OST PSA Target Metrics for the UK Research Base (Evidence Ltd, December 2005):  
[http://www.ost.gov.uk/research/funding/psa\\_metrics\\_report.pdf](http://www.ost.gov.uk/research/funding/psa_metrics_report.pdf)

- Researchers as % of total population – this rose again slightly in 2003, but remains below the OSI comparator group average and is less than most other members of the G8 (section 6.01).

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- Towards a European Research Area: Science, Technology and Innovation; Key Figures 2003-2004 (European Commission 2003)  
[http://europa.eu.int/comm/research/era/keyfigures\\_en.html](http://europa.eu.int/comm/research/era/keyfigures_en.html)

- A comprehensive report on R&D spend within the EU-15 and EU-25, and comparisons to US and Japan. It finds, for example, that BERD increased by 50% between 1995 – 2001 in the EU-15, but by 130% in America over the same period. The report finds that the difference lies not in the R&D investment of large companies, but in SMEs (page 30).

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- SET Statistics: Section 8 – Science and Engineering Personnel  
<http://164.36.38.104/setstats/8a.htm>

- Between 1992 and 2002, the number of researchers employed in the private sector increased from 80,000 to 105,000 (increase of 31%); the total number of non-HEI researchers increased from 98,000 to 119,000 (increase of 21%). However, the total numbers of personnel engaged on R&D increased in this period only from 196,000 to 197,000 – an increase of only 0.5%.

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- Dti R&D Scoreboard 2005  
[http://www.innovation.gov.uk/rd\\_scoreboard/](http://www.innovation.gov.uk/rd_scoreboard/)

Extract:

The UK shows continued strength in pharmaceuticals (4% increase) and aerospace & defence which together contribute over half of the UK 750's R&D. The total R&D for the 750 decreased by 0.5% over the previous year but this reflects a balance between foreign-owned UK companies that reduced R&D by 3% and UK listed companies that increased it by 1%. In addition, six companies

(2 foreign-owned) reduced R&D substantially; without these six, the UK increase would have been 2%.

The UK has much larger proportions of pharmaceuticals, aerospace, food producers and oil & gas R&D than the global average and much lower proportions of automotive, IT hardware and electronics R&D. Software is a growing sector in the UK with both the proportion and intensity of R&D growing over last year.

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- OECD Science, Technology and Industry Scoreboard 2005: Towards a Knowledge Based Economy  
<http://caliban.sourceoecd.org/v1=2045317/cl=61/nw=1/rpsv/scoreboard/index.htm>

Key findings:

Offshoring of research and development is on the rise, with more multinationals setting up research and development (R&D) laboratories abroad. In Hungary and Ireland, for example, foreign companies account for 70% of industrial R&D but the role played by foreign affiliates varies widely around the world. At over 40%, the share of R&D conducted by multinationals is also high in the Czech Republic, Portugal, Spain and Sweden, compared to less than 5% in Japan.

The importance of non-OECD-countries in driving global innovation is increasing fast. China has become the third largest R&D performer behind the United States and Japan, largely due to the rapid growth in researcher salaries that have encouraged talented Chinese scientists and engineers to remain in China.

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- The Gateways to the Professions Report (Sir Alan Langlands, July 2005)  
<http://www.dfes.gov.uk/hegateway/hereform/gateways-to-the-professions/index.cfm>

- The report draws on a wide variety of sources to look at recruitment issues facing a range of professions. Architecture and associated disciplines were found to have the highest skills shortages (in terms of skills shortage vacancies reported in the National Employer Skill Survey 2004), with science, engineering and law also reporting above-average recruitment difficulties (section 3.14-2.15).

- The report also draws attention to concerns for HEI employment in relation to a possible decline in the supply of PhD students, if debt concerns deter graduates from continuing their studies.

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- Leitch Review of Skills (Interim Report, December 2005)  
[http://www.hm-treasury.gov.uk/independent\\_reviews/leitch\\_review/review\\_leitch\\_index.cfm](http://www.hm-treasury.gov.uk/independent_reviews/leitch_review/review_leitch_index.cfm)

- This interim report reviews the UK skills needs for maximising economic prosperity and productivity, and to improve social justice. It looks at the impact on productivity and employment of targeting support on improving low-level skills compared to focussing on high-level skills. In relation to the latter, the report emphasises the need for Higher Education to work even more closely with employers in order to be able to respond to the skills needs of the economy.

- Looking forward to the next steps of the Review, the interim report refers to the ambitious challenges of moving towards “a high skill economy in 2020”, and the need to give further consideration “to whether people have the right incentives to gain skills that [...] support innovation” (para 6.7). The next phase of the Review will take a broader view of the type of skills required in the labour market, in particular “the skills necessary to drive innovation” (para 6.11).

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- Sector Skills Development Agency

<http://www.ssda.org.uk/>

- The Sector Skills Development Agency (SSDA) is responsible for funding, supporting and monitoring the network of Sector Skills Councils (SSCs).

- The SSCs are developing ‘Sector Skills Agreements’ - compacts between employers, their SSC and providers/funders of education and training, designed to ensure that its skills needs are understood and can be met. All SSCs will have Agreements in place within the next few years, but the requirement for research skills in each area will only have a minor place.

- Working to a timetable set by the SSDA, the first four "Pathfinder SSCs" (Skillset, e-skills, SEMTA and Construction Skills) have now completed their Agreements. A further six SSCs are currently working on their Agreements, and the SSDA website also includes the emerging draft documents from these (Lantra, Cogent, Skillfast, Skills for Health, Skills for Logistics, Skillsactive).

Sector Skills Agreements have five components:

Stage 1: Assessment of current and future skills needs

Stage 2: Assessment of current provision

Stage 3: Analysis of gaps and weaknesses

Stage 4: Assessment of the scope for collaborative action

Stage 5: Development of a costed action plan with key delivery partners

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- Sustaining the Skills Pipeline (Association of the British Pharmaceutical Industry, 2005)

<http://www.abpi.org.uk/Details.asp?ProductID=285>

- This report comprehensively documents the skills needs of a particular R&D sector, the pharmaceutical industry. It identifies the key research skills needed to ensure the continued success of the UK industry, as well as the broader issues which need to be addressed at lower levels to ensure a flow of people interested in working in the sector.

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- Higher Education: Meeting International Business Demand (Council for Industry and Higher Education 2005):

<http://www.cihe-uk.com/publications.php>

- A recent statement of the claim that in an increasingly service based economy, there are significant amounts of research being undertaken (esp. in financial and business consultancy sectors) which do not count as R&D under Frascati definitions, and is therefore not reported. The argument is, therefore, that the comparatively low levels of UK business R&D may be an under-reporting of the true situation.

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- Unweaving the Rainbow: Research, Innovation and Risk in a Creative Economy (AHRC 2005):

[http://www.ahrb.ac.uk/files/about\\_us\\_files/research\\_knowledge\\_transfer\\_task\\_group\\_-\\_unweaving\\_the\\_rainbow.asp](http://www.ahrb.ac.uk/files/about_us_files/research_knowledge_transfer_task_group_-_unweaving_the_rainbow.asp)

- A similar argument to that by the Council for Industry and Higher Education this time in connection to the creative industries.

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## 8) Discipline-specific Analyses

- Health of Disciplines: Annual Report 2006

<http://www.rcuk.ac.uk/documents/hod.asp>

- The report was considered at the January 2006 meeting of Funders' Forum. It draws particular attention to the following disciplines and research areas (paragraph 34):

- **economics**: figures show a comparatively high proportion of staff in the older age groups
- **engineering**: overall staff numbers are falling, as is the number of undergraduates;
- **physical sciences** (particularly physics and chemistry): these subjects have similar problems to engineering in terms of numbers, and the problem is acute as these disciplines underpin a number of others;
- **mathematics** (particularly where it underpins other research areas, e.g. mathematical biology; quantitative methods in the social sciences);

- **modern languages and linguistics:** as well as the messages apparent from the data, this area has been identified by HEFCE as strategically important and vulnerable;
- **socio-legal studies;**
- ***in vivo* mammalian physiology:** recruitment difficulties in this area have been apparent for some time, and it was identified as giving rise for concern in the recent ABPI report;
- **clinical and translational research:** numbers of students are increasing but there is still no overall improvement in this area;
- **public health research:** while there are some signs of recovery, overall numbers remain low;
- **social work:** figures show a very high proportion of staff in the older age groups;
- **veterinary sciences:** overall numbers are falling, and while a significant proportion of staff have retired in recent years, there is no corresponding increase in younger staff;
- **land-based research:** this area is important to a number of Government departments and has been identified by HEFCE as a strategically important and vulnerable subject.

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- A Fifteen year Longitudinal Career Path Study of PPARC PhD Students (PPARC, 2003)

<http://www.pparc.ac.uk/Pg/trnews.asp>

- This 2003 report is a follow-up to the 1995 survey of the careers of PPARC PhD students, following up on students 6-8 years after the completion of their PhD. The 2003 study found that 49% were employed in universities, 16% in other government and public organisations and 28% in the private sector. However, it found that 30% of those working in the university sector were still on fixed-term contracts, but this was much lower than in 1995 (66%).

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- The PhD and Careers in Astronomy in the UK (A report from the Royal Astronomical Society, 2005)

[http://www.ras.org.uk/images/stories/ras\\_pdfs/careers%20in%20astronomy.pdf](http://www.ras.org.uk/images/stories/ras_pdfs/careers%20in%20astronomy.pdf)

- The report considers the likely impact of the new Fixed-term Working regulations, and suggests that “universities may need to start functioning more like research companies and NASA institutes, with staff moving from one research field to another as funding for a particular initiative comes to an end and something else starts elsewhere.” (Page 34)

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- Institute of Physics Statistics Website

<http://policy.iop.org/Policy/Statistics/>

- The site provides comprehensive statistics on the recruitment to Physics education (and other SET areas) at all levels.

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- International Perceptions of UK Engineering Research (EPSRC and Royal Academy of Engineering, 2000)

<http://www.epsrc.ac.uk/AboutEPSRC/StrategyAndPlanning/InternationalReviews.htm>

- The report makes strong comments regarding personnel issues: “[Student stipends, RA salaries and lecture salaries] were so critically out of line with comparable careers in other forms of engineering that we were rather surprised that university research programmes continued at their current high level”. (Para 3.12)

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- Chemistry at the Centre: An International Assessment of University Research in Chemistry in the UK (EPSRC and RSC, 2002)

<http://www.epsrc.ac.uk/AboutEPSRC/StrategyAndPlanning/InternationalReviews.htm>

- The report supports a move to 4-year PhD programmes in Chemistry and recommends that a PhD be considered as “education” and not a “training”; “it is the preparation of a student to think and to create, not just to perform.” (page 41)

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## 9) Diversity

- UK Resource Centre for Women Statistics

<http://www.setwomenstats.org.uk/sections/index.php>

- a wealth of information here. In 2003, 42.3% of employees recorded as ‘science professionals’ were women; this compares to 38.3% in 2001.

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- SET FAIR – The Greenfield Report on Women in Science, Engineering and Technology

[http://extra.shu.ac.uk/nrc/section\\_2/publications/reports/R1182\\_SET\\_Fair\\_Report.pdf](http://extra.shu.ac.uk/nrc/section_2/publications/reports/R1182_SET_Fair_Report.pdf)

- The report considers UK activity along with overseas activities and identify priorities for more focused action. It focuses on what could be done to improve the recruitment and retention of women in science, engineering and technology (SET), to increase the number of women in policy making and to recognise women's achievement and contribution to SET.

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- A Strategy for Women in Science, Engineering and Technology (April 2003)

[http://extra.shu.ac.uk/nrc/section\\_2/publications/reports/R1428\\_Strategy\\_for\\_Women\\_in\\_SET.pdf?pubpdfload=03%2F862](http://extra.shu.ac.uk/nrc/section_2/publications/reports/R1428_Strategy_for_Women_in_SET.pdf?pubpdfload=03%2F862)

- The government's response to the Greenfield report - SET Fair - which was commissioned by Patricia Hewitt, on actions being taken to break down the remaining barriers to women studying and working in science, engineering and technology.

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- Maximising Returns to Science, Engineering and Technology careers (OST, January 2002)

[http://extra.shu.ac.uk/nrc/section\\_2/publications/reports/R1219\\_1\\_Executive\\_Summary.pdf](http://extra.shu.ac.uk/nrc/section_2/publications/reports/R1219_1_Executive_Summary.pdf)

- The report explores ways in which the UK can maximise the return of investment in female undergraduates in science, engineering and technology.

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- Who Applies for Research Funding? Key Factors Shaping Funding Application Behaviour Among Women and Men in British Higher Education Institutions (Wellcome Trust)

<http://www.wellcome.ac.uk/assets/wtd003210.pdf>

- Key factors shaping funding application behaviour among women and men in British higher education institutions.

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- AUT report - The Diverse Academy – The pay and employment of academic and professional staff in UK higher education by gender and ethnicity.

[http://www.aut.org.uk/media/pdf/5/r/diverseacademy\\_oct05.pdf](http://www.aut.org.uk/media/pdf/5/r/diverseacademy_oct05.pdf)

- The report reveals that women and non-white staff continue to be paid less and, worryingly, few UK black and minority ethnic (BME) staff choose to enter a career in higher education.

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- SET and the UK's ethnic minority population (Royal Society)

<http://www.royalsoc.ac.uk/downloaddoc.asp?id=1870>

- This report was commissioned by the Royal Society to provide a more detailed picture of the level of participation in science, engineering and technology (SET) education and employment by age, sex and race. The aim was to address gaps that had been evident in earlier reports and support a separate project looking more broadly at the use of SET role models to inspire young people, particularly girls and ethnic minority communities.

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- European Commission – Women and Science statistics and indicators - She Figures 2003

[http://europa.eu.int/comm/research/science-society/pdf/she\\_figures\\_2003.pdf](http://europa.eu.int/comm/research/science-society/pdf/she_figures_2003.pdf)

- The report is the result of two years of methodological and statistical work undertaken by the Commission in co-operation with the Statistical Correspondents of the Helsinki Group on Women and Science. This work has involved discussions on the harmonisation of data, two data collection exercises and the development of a coherent system of statistical indicators. The intention is for it to serve as a solid benchmarking tool for scientists, researchers, policy makers and human resource managers concerned by women and science. By presenting the results from these indicators, this publication describes some of the common trends in the employment of European women and men scientists and researchers.

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- Equalities Review - Interim Consultation Report

[http://www.theequalitiesreview.org.uk/documents/pdf/interim\\_report.pdf](http://www.theequalitiesreview.org.uk/documents/pdf/interim_report.pdf)

- The report surveys what inequalities still persist after decades of action to promote equality in society, suggests some novel ways to measure them, and focuses on what is needed to make people more equal.

- The Report argues that we are moving in the right direction, but inequality still persists. For example, women with children are by far the least able to get a job when compared to men with children or to single men and women. It shows where we need to focus our efforts to ensure that all of those who are disadvantaged in some way are given the opportunity to reach their full potential and contribute to a vibrant and successful UK economy.