IOP Institute of Physics

RSC | Advancing the Chemical Sciences

Mapping the Future: Survey of Chemistry and Physics Postdoctoral Researchers' Experiences and Career Intentions

Final Report

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For Institute of Physics
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Contents

Executive summary

The Institute of Physics (IOP), its Women in Physics Group (WiPG) and the Royal Society of Chemistry jointly initiated a project, part-funded by the UKRC's Innovative and Collaborative Grants Scheme (IGCS), to investigate the experiences of male and female postdoctoral researchers (PDRs) working in university physics and chemistry departments, whether their experiences were different and how this affected their long-term career intentions.

A questionnaire was designed to collect information on the personal characteristics and circumstances, plans, career-development activities, and views on the culture of the departments in which the physics and chemistry PDRs worked. The questionnaire was made available in electronic form and a total of 776 responses from individual PDRs were received.

For the most part, the subsequent analysis concentrated on the differences between chemists and physicists and between males and females. Occasionally other factors, such as whether respondents were on their first or second/subsequent contracts, were considered. Respondents were also asked to provide general comments in the final section of the questionnaire and many did so; these responses have not been analysed in depth, although qualitative responses to some of the other questions have.

The route to becoming a postdoctoral researcher

Respondents were questioned on issues such as how long they had spent as a PDR, the number of contracts that they had taken on, their motivations for and overall opinions on undertaking postdoctoral research.

Overall, female respondents had spent less time undertaking postdoctoral research than male respondents. Male physicists had spent the most time undertaking research and were more than twice as likely as female chemists to have been a PDR for seven years or more and almost three times as likely as female chemists to have been a PDR for more than 10 years.

The most popular reason for undertaking postdoctoral research, chosen by all groups of respondents, was “Out of interest and enthusiasm for science” (74%) although physicists were more likely to select this than chemists. The second most popular reason selected was “To gain a permanent academic post” (49%), which males (53%) were more likely to select than females (40%). The most common “downside” of postdoctoral research was “No job security” (78%).

Next steps

Respondents were asked about their career plans. Those who had not already accepted a job offer were asked whether they intended to stay in a role requiring a scientific background and what effect doing postdoctoral research had had on their career intentions.

Overall, 40% of respondents reported that undertaking postdoctoral research had made them more intent on continuing in a career as a research scientist and 36% reported that they now had doubts about this. There was a significant difference between the likelihood of male (32%) and female (46%) chemists to report that they now had doubts about a career in research science. When this was broken down by those respondents undertaking their first or their second/subsequent contracts, it was found that similar proportions of females and males on their first contract reported that undertaking postdoctoral research had made them more intent on a career in research science (47% compared with 43%, respectively) and had given them

doubts (30% compared with 26%, respectively). On second/subsequent contracts, the proportion of males stayed the same but the proportion of females reporting that they were more intent on a career in research science fell to 21% and the proportion that now had doubts about this rose to 61%. A similar picture, although not so dramatic, arose in physics. The proportion of females who said that they were more intent on a career in research science fell between first and subsequent contracts (50% to 38%, respectively) and the proportion of males stayed about the same (39% and 41%, respectively).

Long-term career plans

Respondents were asked what they thought they would be doing in the longer term (i.e. in 6-10 years) and 63% of all respondents selected “Academic on a permanent contract”. This was followed by “Scientist: Industry or commerce (32%)” and then “Continuing postdoctoral research” (15%).

When results were analysed to compare those on a first contract and those on subsequent contracts, the patterns between male and female chemists and male and female physicists were again different. Similar proportions of male and female chemists on first contracts selected “Academic on a permanent contract” (65% female; 69% male) but significantly fewer female chemists on second and subsequent contracts selected this compared with males (44% female; 66% males). The pattern for physics was different. Similar proportions of male and female physicists on a first contract saw themselves as an academic in the longer term (57% female; 65% male), but for those on second or subsequent contracts, the proportions of females stayed the same and the proportion of males actually rose (55% female; 76% males).

Career development

Respondents were questioned about the careers advice that they had sought before undertaking postdoctoral research and during their current contract, and their experiences within their departments of appraisal, mentoring and the development of transferable skills.

38% of researchers had taken careers advice before undertaking their first contract and a slightly higher proportion of respondents had received careers advice during their current postdoctoral contract (45%). 54% of respondents rated their awareness of career options within academia as good or very good, but only 23% gave a similar rating for career opportunities outside academia. One-third of chemists and more than half of physicists described their knowledge of the latter as poor or very poor.

56% of respondents had never been appraised during their postdoctoral research careers. 67% of respondents who had not been appraised said that they would like to be.

64% of respondents reported that they were encouraged to undertake activities to develop their transferable skills and physicists were more likely than chemists to undertake activities that may be seen to be supporting academic careers (external presentations, teaching, attending conferences, etc).

Less than 5% of PDRs had participated in a mentoring scheme in their current HEI.

Culture of departments

Respondents were asked various questions relating to overall departmental culture, including whether they had received an induction and how they felt that research staff were generally regarded. There was no significant difference between physicists or chemists or between males or females in how they described their relationship with their supervisors, with 83% of respondents reporting that it was excellent or good.

50% of all PDRs reported having an induction when joining their current department and, of these, 66% found it useful although there were differences between those who stayed in the same group as their PhD and those who moved groups.

51% of all PDRs reported feeling more like staff members than students although physicists (59%) were significantly more likely to report this than chemists (43%), and female chemists (38%) were the least likely to report that they felt more like staff members than students.

40% of PDRs felt that they were respected and well regarded in their department. There was a significant difference between physicists (45%) and chemists (34%), and female chemists (29%) were the group least likely to feel respected and well regarded in their departments.

56% of respondents said that they were expected to supervise students and a further 25% reported that they did so even though they were not expected to. 82% of researchers in physics and 63% of chemists reported having the opportunity to teach.

Conclusions and recommendations

Overall more differences between chemists and physicists than between the genders were found, confirming important cultural differences between the disciplines. Where gender differences were found, they were generally greater between male and female chemists than between male and female physicists. However, the gender differences were less than those found in previous RSC studies of PhD chemists.

The data still raise concerns about the effect of undertaking postdoctoral research, in particular on female chemists' ambitions to remain within the academic environment. The data suggest that undertaking postdoctoral research for a shorter period of time has little effect on long-term career ambitions but that undertaking postdoctoral research for more than one contract causes women chemists in particular to become disinclined towards an academic career. It may be that females are simply more realistic about their chances of achieving a permanent academic post because men are statistically significantly more likely to see themselves as an academic in the longer term in both chemistry and physics.

Nevertheless, the data highlight some worrying issues for postdoctoral researchers in both chemistry and physics and for both males and females. Appraisal, induction and mentoring were still not common-place in many departments and less than half of postdoctoral researchers actually felt valued within their department. It is clear that more needs to be done to improve the experience of PDRs in physics and chemistry, regardless of gender or discipline.

A number of recommendations have been developed and each recommendation is followed by the name of the key stakeholder(s) considered to be the most appropriate to take it forward.

1. Consideration should be given to how schemes such as Juno and Athena SWAN can enable and encourage the implementation of good practice for postdoctoral researchers. Best practice should be shared among HEIs in the training, treatment and management of postdoctoral researchers. Vitae are already taking the lead in this, and the Institute of Physics should continue to promote and use Project Juno as a tool for enabling best practice to be shared among physics departments.

   ►*ECU, UKRC, Institute of Physics, Concordat Strategy Group and Vitae*

The postdoctoral researchers' knowledge of the careers available outside academia was generally reported as poor or very poor.

2. Making impartial careers advice available for all PDRs is essential in ensuring that individuals have a realistic view of their likelihood of, and suitability for, gaining a permanent position. Mechanisms need to be explored to ensure that PDRs have access to independent, alternative sources of advice on careers outside academia, and the uptake of this should be monitored by gender.

   ►*HEIs, professional bodies, Vitae and Concordat Strategy Group*

Better and more consistent application of policies and practices, together with individual research units or groups paying more attention to their overarching cultures with regard to postdoctoral researchers, may improve the experience for those researchers.

3. While many institutions are implementing the Concordat to Support the Career Development of Researchers principles at senior levels, implementation must also be monitored at the departmental level to ensure that institutional and departmental policies and practices for postdoctoral researchers, both formal and informal, are communicated and applied consistently.

   ►*Vitae, HEIs and Concordat Strategy Group*

4. Mechanisms should be implemented to allow PDRs to be consulted on departmental issues and they should, as a matter of course, be represented on relevant departmental committees. As part of this, appropriate and effective departmental mechanisms need to be in place to communicate directly with all postdoctoral researchers.

   ►*HEIs, heads of departments and Concordat Strategy Group*

5. All postdoctoral researchers, whether they are new to a department or not, should have a targeted induction covering their role and responsibilities as a member of staff, the appraisal system, flexible working, training opportunities, careers advice, the institution's expectations of them and other relevant departmental/institution staff policies and procedures. PDRs who are new to a department should also have an appropriate departmental induction covering general issues of how they should carry out their research role (e.g. access to services, etc).

   ►*HEIs, departments and Concordat Strategy Group*

6. PDRs should have regular, timely, independent appraisals covering their personal development. During appraisals, clear and impartial feedback on career options (including

suitability for an academic career) should be provided. The person carrying out the appraisal should have the appropriate training to run appraisals for research staff.

►*HEIs, departments, research funders and Concordat Strategy Group*

7. Resources should be made available to make mentoring schemes more widely available for postdoctoral researchers. Universities UK should consider the role that it can play in national mentoring initiatives for postdoctoral researchers. The benefits and impact of mentoring schemes should be actively promoted and it should be recognised as a valid activity through the dissemination of guidance, communication and awareness-raising.

   ►*Universities UK, HEIs, ECU and Concordat Strategy Group*

8. Opportunities should be provided for PDRs to gain experience of teaching, where they wish to and it is deemed appropriate, and appropriate training should be provided for this. PDRs should not be able to teach without this training.

   ►*HEIs, departments, Staff Development Units, Vitae and Concordat Strategy Group*

9. Where it is expected that PDRs will play a significant role in the supervision of PhD students, that activity should be formally recognised as part of their role and appropriate training, including diversity awareness, should be provided.

   ►*HEIs, departments, Staff Development Units, Vitae*

Acknowledgements

I would like to thank all of the individuals who gave up their time to respond to the Survey of Postdoctoral Researchers' Experiences and Career Intentions, to those individuals who acted as contacts in participating chemistry and physics departments and to those who helped pilot the questionnaire.

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Sean McWhinnie

1. Background

Female retention in science, engineering and technology (SET) is an important issue, with economic and social justice implications. The overall retention rate of female SET graduates is far lower than that of males at 25% compared with 40%.[1] The situation, which contributes to the relative lack of women in senior positions in SET professions, is sometimes described as “the leaky pipeline”. Scientists flow along the science career pipeline, a notional path representing training and advancement, and they "leak out" along the way and are lost to science.[2]

Figure 1 illustrates that the proportion of female undergraduates in chemistry is around 44% and compares well with the proportion of women who take A-level chemistry (48%). However, there is a gradual leakage of women in moving from A-level to undergraduate and then postgraduate level. Thereafter there is a more significant leakage in moving from postgraduate to researcher level in chemistry, which has been the subject of much research. In comparison with the relatively high proportion of female chemistry undergraduates, chemistry currently has a relatively low proportion of female professors. Overall, chemistry does relatively well at recruiting women into higher education but is less successful at retaining women through to the highest levels.

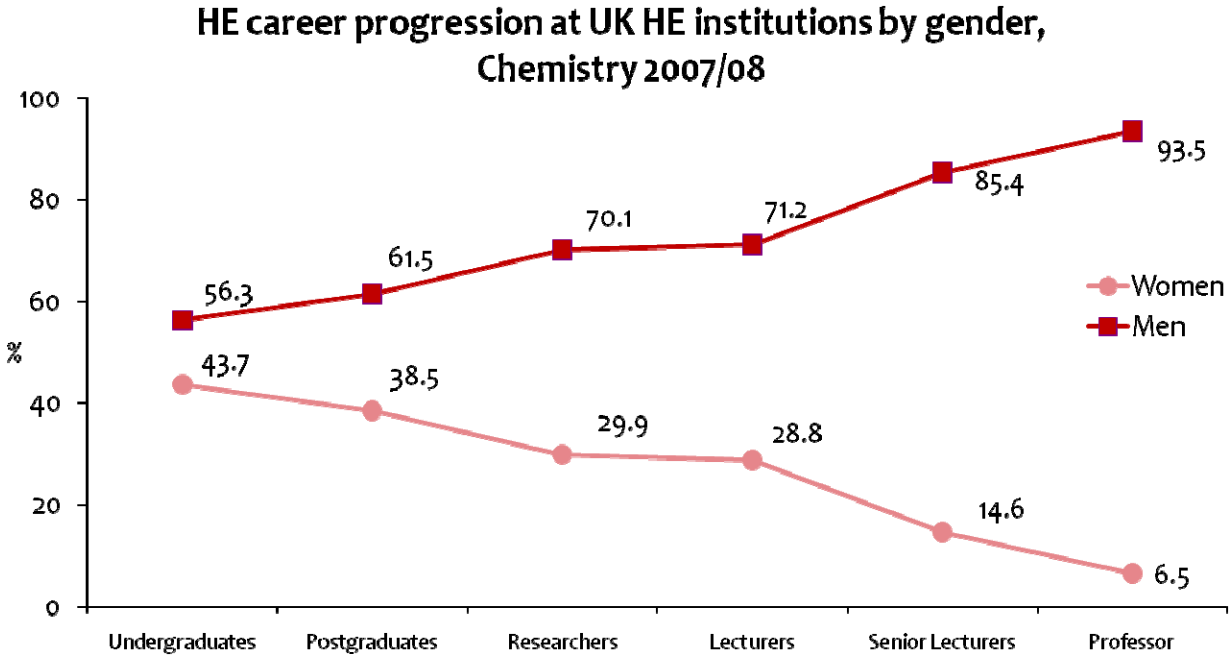

Figure 1: The chemistry higher-education pipeline (HESA, 2008).

In contrast to chemistry, physics has half the proportion of female undergraduates (21.6%), although this does compare well with the proportion of women taking A-level physics (22%). Figure 2 illustrates that women are retained in physics through to postgraduate level but there is a drop at researcher level; thereafter women are retained in physics better than in chemistry because both subjects have similar proportions of women at professorial level.

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1 Report for the Office of Science and Technology and the Department of Trade and Industry, *Maximising Returns to Science, Engineering and Technology Careers,* London: DTI, 2002.

2 N. Angier, Women Swell Ranks of Science, But Remain Invisible at the Top, New York Times, May 21, 1991.

Physics, in contrast to chemistry, is therefore better at retaining women in higher education but has difficulty in recruiting them in the first place.

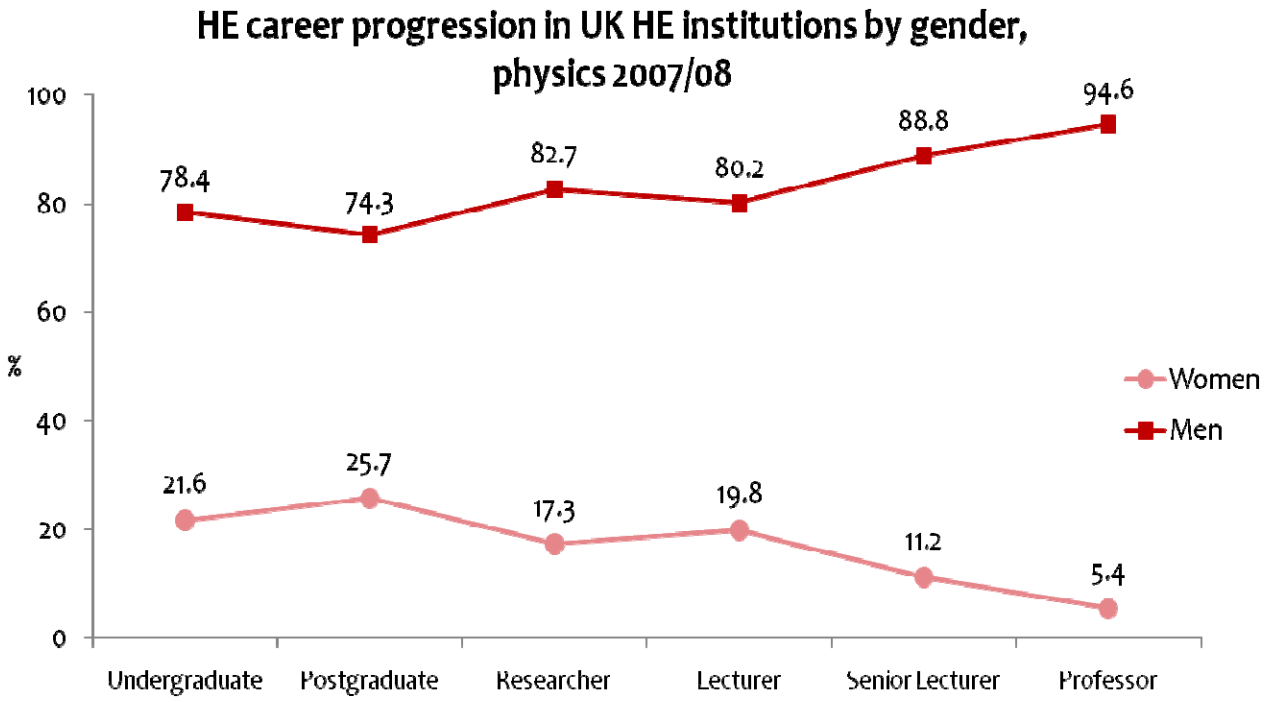

Figure 2: The physics higher-education pipeline (HESA, 2008).

The Royal Society of Chemistry (RSC) originally became interested in "the leaky pipeline" when their analysis of Higher Education Statistics Agency (HESA) data showed that female attrition was notably higher in chemistry compared with other sciences.[3] While similar proportions of men and women progressed from undergraduate to doctoral chemistry programmes, a significantly smaller proportion of women then moved from PhDs to postdoctoral positions. The RSC commissioned a study to examine why female chemists were less likely than male chemists to stay in academia after completing their PhDs[4].

The RSC then ran a survey of current PhD students to provide further insights into female attrition from chemistry.[5] The survey focused on the career intentions of PhD students and it revealed that many female chemists were put off further chemistry research during the course of their PhD studies and, of those students intending to stay in research, fewer female than male chemists wanted an academic career (figure 3). 72% of first-year but only 37% of third-year female chemistry PhD students indicated that they wanted to continue research after their PhDs. This suggested that female chemistry PhD students rethought their intention to pursue a research career after their initial experience of doctoral study. The same pattern was not found among males.

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3 Factors affecting the career choices of graduate chemists, Royal Society of Chemistry, London, 1999

4 Ibid

5 Change of Heart - Career intentions and the chemistry PhD, Royal Society of Chemistry, 2008, London (http://www.rsc.org/images/ChangeofHeart_tcm18-139211.pdf)

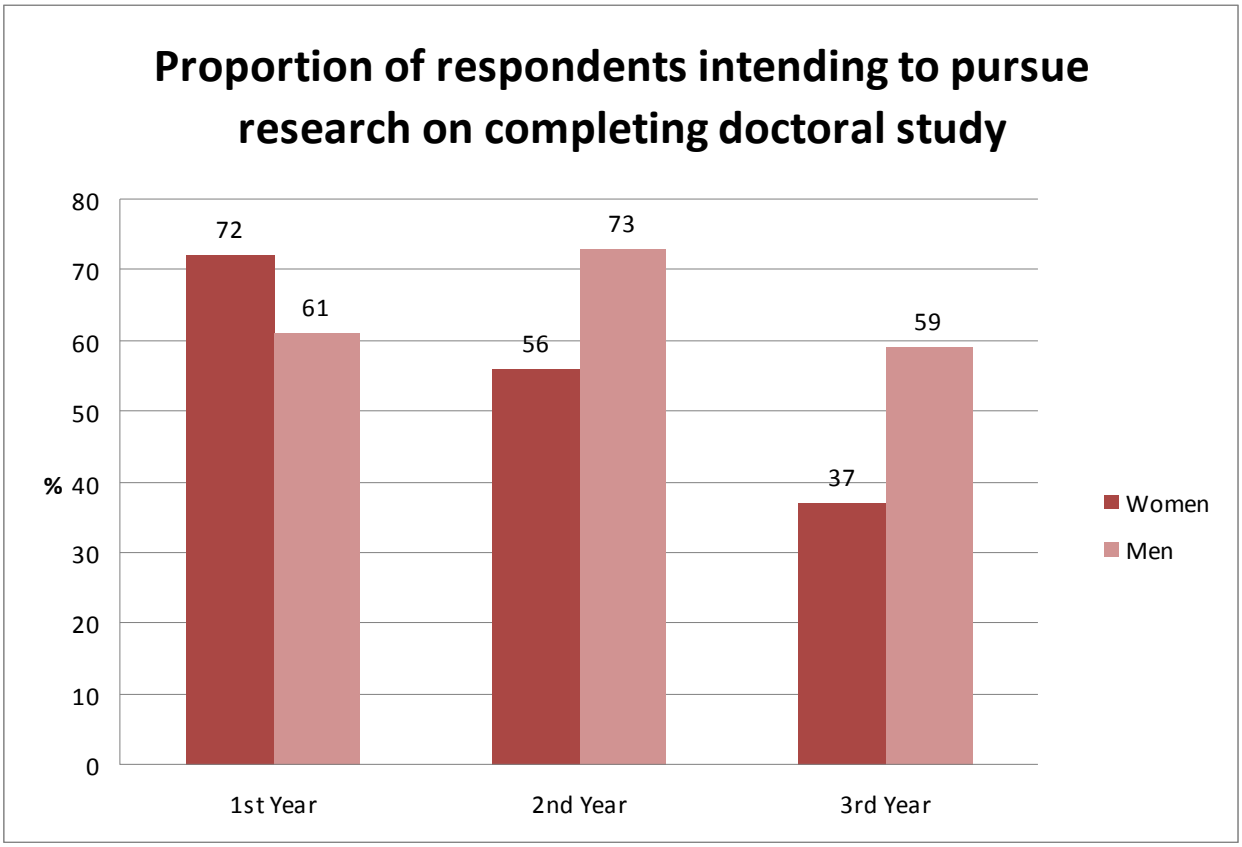

Figure 3: Research career intentions of PhD chemists, by gender and stage.

Considering only the respondents who were intending to pursue a research career, female chemistry PhD students were less likely than male students to want to stay in academia (as opposed to moving to an industrial or public-sector setting). 44% of men and 37% of women saw academia as a career option for them. As shown in figure 4, the survey highlighted that there was a significant change in the attitude of female respondents between the first and second years: 53% of second-year male respondents but only 29% of second-year female respondents indicated that they planned to continue in research in academia on completion of their PhD, even though a greater proportion of female respondents (51%) than male respondents (44%) began their doctoral studies planning to stay in academia. An interesting point to note is that among men, the proportion of respondents planning to stay in academia decreased substantially to 36% from 53% between the second and third years. Overall 12% of third-year female PhD students and 21% of third-year male PhD students intend to pursue research careers in academia.

Qualitative responses to the open-ended questions in the 2006 survey hinted that women were put off academia by what they described as the "all-consuming" nature of academic research, by the isolation that it entails, and by a perceived or real incongruity between an academic science/ chemistry career and motherhood. There was some indication that female respondents thought that there were drawbacks to certain aspects of research work (e.g. repetition, stress and solitude) whereas male respondents were concerned by the realities of the research-based labour market (e.g. pay levels and progression opportunities).

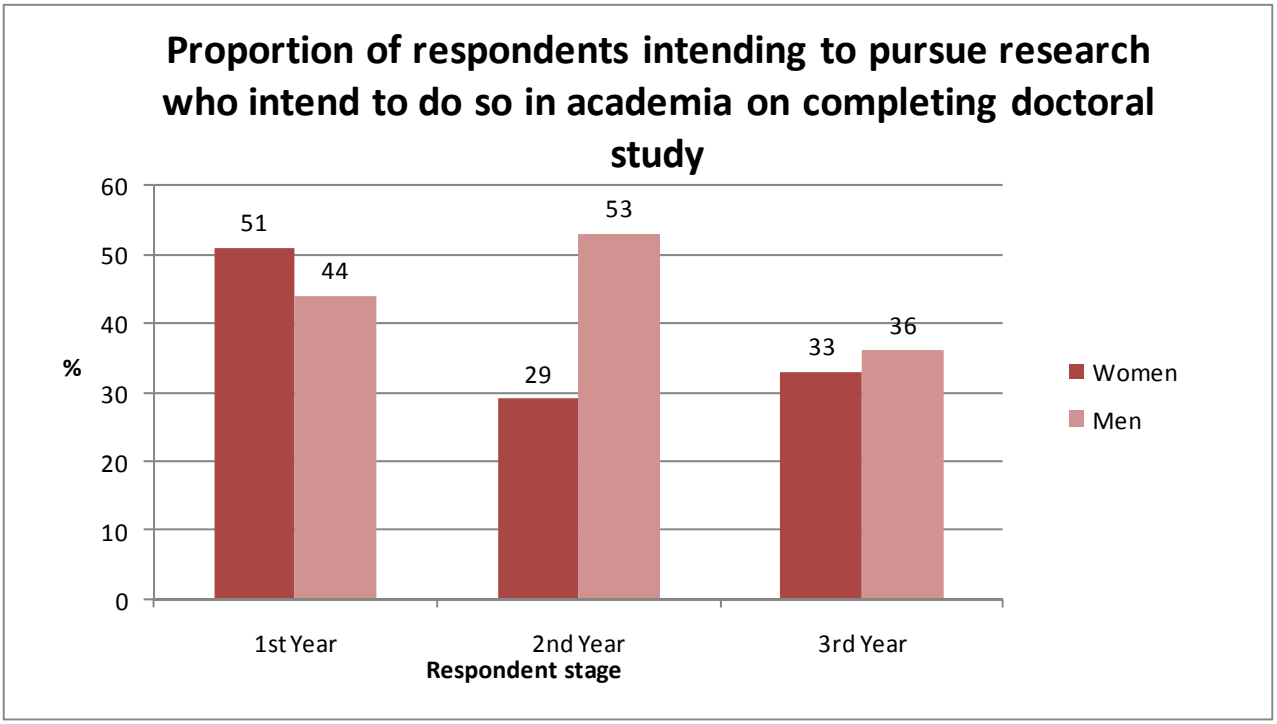

Figure 4: Proportion of respondents intending to pursue a research career who plan to do this in academia, by gender and stage.

Follow up work carried out in 2008[6] comprised a number of focus groups and individual interviews. That research identified that a number of factors deterred a larger proportion of women than men from remaining in research beyond their PhD. These factors included: having been more affected by what might be termed "standard supervision issues" (e.g. enjoying little pastoral care and having to cope with a supervisor who lacked interpersonal/ management skills); encountering significant supervision issues, which they felt powerless to resolve; a lack of integration with their research group, isolation and exclusion (and more rarely, bullying) partly caused by the culture of their research group, especially where this was particularly "macho"; and developing concerns about perceived, rather than actual, poor experimental success rates.

The research suggested that where women did not wish to pursue an academic career, this was because they perceived the rewards on offer insufficient to overcome the challenge and compromise entailed. It was found that female participants were more likely to view academic careers as too all-consuming, too solitary and not sufficiently collaborative and that the short-term contract aspect of undertaking postdoctoral research meant that it could not be reconciled with other aspects of their life. They also reported that they felt that the competition for a permanent academic post was too fierce for them to compete successfully and they would need to make sacrifices (about femininity and motherhood) in order to succeed in academia.

In contrast to the results for chemistry PhD students, a survey of molecular bioscience PhD students[7] found that there was no evidence that a significant proportion of women were deterred during their PhD from entering a research career in the molecular biosciences. Rather, many

[6] The Chemistry PhD: the impact on women's retention, Royal Society of Chemistry, London, 2009 (http://www.rsc.org/ScienceAndTechnology/Policy/Documents/WomenRetention.asp)

[7] The Molecular Bioscience PhD and Women's Retention: A Survey and Comparison with Chemistry, Biochemical Society, London, 2009 (http://www.rsc.org/ScienceAndTechnology/Policy/Documents/MolecularBiosciencereport.asp)

female molecular bioscience respondents had never intended to remain in research. Of those molecular bioscience PhD students planning to continue in research after completing their PhD, 90% of both sexes indicated that they were likely to remain in academia. However, only 47% of female respondents compared with 62% of male respondents believed that they would have a long-term academic career.

The findings of the surveys of chemists and molecular bioscientists showed that there were gender differences in both subject areas, but that they operated to different degrees. Women in both subjects were affected more than men by a number of factors. However, a greater proportion of women chemists change their minds about research careers than women in molecular biosciences. The reason for the differences is not clear but the results from the two subject areas underline that different subject areas have developed different cultures and that those cultures affect men and women to different degrees. Despite the findings of the survey, the data in figure 5 show that there is still a drop in the proportion of women proceeding from PhD to researcher level in biological sciences.

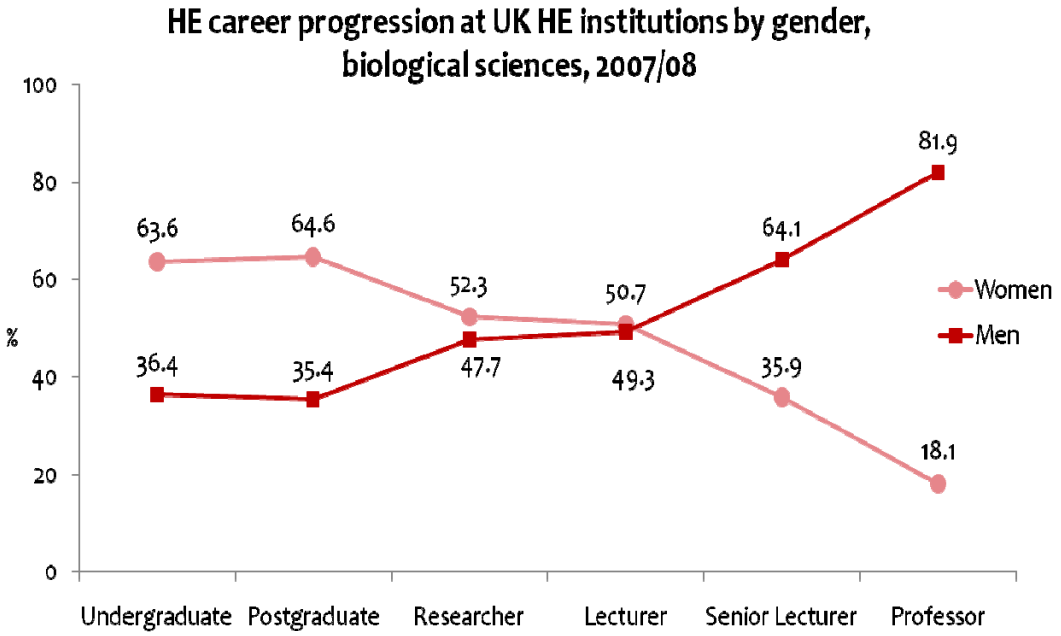

Figure 5: The biological sciences higher-education pipeline (HESA, 2008).

While not directly comparable, the Science and Technology Facilities Council (STFC) run a survey of their PhD students each year.[8] They have found that female STFC students are at least as likely as male students to want to pursue a career in academia at the end of their PhDs and that this intention has increased for both women and men over time but more so for women. Responses to the STFC career path survey indicate that women and men were equally likely to be working in academia six to nine years after finishing their PhDs.[9] The findings outlined above prompted a number of issues about how the experiences of postdoctoral researchers affected their long-term career intentions.

This study was designed to try to answer address some of these issues.

[8] http://www.stfc.ac.uk/Funding%20and%20Grants/674.aspx
[9] http://www.stfc.ac.uk/Funding%20and%20Grants/18313.aspx

2. Methodology

A web-based questionnaire was developed, aimed at postdoctoral researchers in chemistry and physics. This was based on the questionnaire used in the 2006 study of chemistry PhD students and in the 2008 study of molecular-bioscience students. The questionnaire was designed to collect information on the characteristics and personal circumstances of the respondents, information on where they had studied, how long they had been undertaking postdoctoral research, their plans for the future, what opportunities they had had for career development and information on their views of the culture of the department in which they worked.

A meeting was held with representatives of Vitae who had supported the Careers in Research Online Survey (CROS)[10] carried out in early 2009 to discuss how the questionnaire for chemistry and physics postdoctoral researchers might best support work across the whole sector.

Heads of physics and chemistry departments in the UK were contacted to ask whether they would be willing to make the link to the survey available to the postdoctoral researchers in their departments. It was suggested that the heads might nominate a member of staff to help. Heads were also told that the expectation was that it would be necessary to send out one or two reminders and were asked to provide demographic data on the number and gender of the postdoctoral researchers to whom the link was sent. 30 physics departments and 29 chemistry departments agreed to participate (see Appendix A). The majority of heads did nominate a member of staff in their departments to act as a contact.

The link to the survey was distributed to physics departments from 11 March 2010 onwards and to chemistry departments from 22 March 2010 onwards in an e-mail that the contacts were asked to forward to postdoctoral researchers. It was also suggested that contacts could add some words at the beginning of the e-mail encouraging postdoctoral researchers to participate: a few contacts did so.

The survey gave those who participated the opportunity to take part in a prize draw with Amazon vouchers offered as prizes. Participants were also invited to provide contact details in case any follow up was needed.

Responses from departments were monitored and a reminder was sent to contacts on 13 April 2010 to be distributed to postdoctoral researchers. In the case of the larger departments participating, a second reminder was distributed on 26 April 2010. The survey closed on 30 April 2010. In total 776 responses were received.

Departmental contacts were also asked to provide the demographic data referred to above. At the time of writing 21 physics and 20 chemistry departments have provided those data.

The raw data were copied to an Excel worksheet and were coded using Access. Processed data were analysed in Excel, for the most part using Pivot Tables.

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[10] Careers in Research Online Survey (CROS) 2009, CRAC, Cambridge, 2009 (http://vitae.ac.uk/policy-practice/1393-142891/Careers-in-Research-Online-Survey-CROS-2009.html)

3. The sample demographics and results

The following chapters describe the results of the Survey of Chemistry and Physics Postdoctoral Researchers' Experiences and Career Intentions. For the most part the analysis has concentrated on the differences between chemists and physicists, and between men and women. Occasionally other factors have been examined, such as the domicile of respondents, or whether or not they are on their first contract as a postdoctoral researcher.

Respondents were invited to make general comments in the last section of the questionnaire. Many did so, but the analysis of those qualitative data is not presented in this report. Qualitative responses to other questions have been analysed and are presented in the report.

One other important issue to consider is that the size of the postdoctoral researcher population varies greatly from one institution to another. A breakdown of the respondents by institution is provided in Appendix B. A large number of respondents have come from a relatively small number of departments. Consequently the views of postdoctoral researchers in the larger departments may well dominate the responses. In order to check this effect responses have been analysed by institution to see whether there are institutional patterns. Nonetheless the views presented in this report are those of the UK postdoctoral researcher community and departments with smaller numbers of postdoctoral researchers may wish to use the data presented to benchmark their own policies and practices.

A fuller description of the sample demographics is provided in Appendix A.

Respondents were asked to specify the department that they worked in; most specified chemistry (376) or physics (370) but some indicated other departments (30). Women are over-represented in the respondent populations for both disciplines in comparison with the HESA data presented in Figure 1 and Figure 2: 33.5% of the chemists and 25.1% of the physicists were female. HESA data indicate that women make up 30% of chemistry researchers and 17% of physics researchers. The numbers of female chemists and physicists mean that comparisons can be made between the genders in both disciplines.

Most of the analysis is confined to those who stated their gender and declared that they worked in chemistry or physics departments. The overall figures for chemistry and physics, however, include those respondents who preferred not to state their gender and the overall totals for the whole population include all respondents, including those who stated that they worked in departments other than chemistry or physics.

Among chemists, 45.2% of the sample were British and, among physicists 55.7%. The chemistry sample is representative of the proportions of British and non-British postdoctoral researchers, and British postdoctoral researchers are slightly over-represented in the physics population.

Around 85% of the British chemists and physicists reported their ethnicity as White British. That the percentages of White British are similar for physicists and chemists is surprising because data suggest that there is a higher proportion of White British physicists than chemists.[11] The numbers of those individuals who classified themselves as belonging to other ethnic groups

[11] P. Elias, P. Jones and S McWhinnie, Representation of Ethnic Groups in Chemistry and Physics, Institute of Physics, London, 2006 (http://www.iop.org/publications/iop/2006/file_38241.pdf)

were too low to come to any firm conclusions. However, it is noteworthy that there are no British postdoctoral researchers in the sample who reported being Black or Black British.

Male and female chemists were equally likely to be in a relationship as each other (73.0% and 76.0%, respectively), but female physicists were significantly less likely ($p < 0.01$) than males physicists to be in a relationship (60.2% and 76.0%, respectively). In both chemistry and physics, males were more likely to be married/in a civil partnership than females; conversely in chemistry females were more likely to be cohabiting than males, but in physics males were more likely to be cohabiting than females.

Physicists and chemists were equally likely to have children (19.7%), and men (20.5%) were more likely than women (16.5%), although the difference was not significant. It suggests that around one-fifth of respondents had childcare responsibilities and may require a degree of flexibility at work.

Given that female researchers were less likely to be married and less likely to have children than male researchers, this might be an area worth looking at in more detail in the future.

Less than 1% of the sample disclosed that they had a disability. This figure is broadly in line with that for academic staff in physical sciences, which itself is low compared with academic staff in HEIs generally.

Overall, 97% of respondents worked full-time. Women were more likely to work part-time than men: around 1 in 20 female chemists and around 1 in 10 female physicists worked part-time.

Overall, the sample is broadly representative of the population of researchers in chemistry and physics drawn from the 2007/08 HESA data. Women are slightly over-represented and the sample is younger than the actual population. The proportions of British and non-British postdoctoral researchers in the sample are representative of the proportions in the HESA population.

4. The postdoctoral research experience

4.1 Educational background

67% of the chemistry respondents had first degrees in chemistry (or degrees that specialised in chemistry) and 8% had first degrees in a subject combining chemistry with another subject. A further 8% had first degrees in biological sciences. Similarly, 62% of physics respondents had first degrees in physics (or degrees that specialised in physics). A further 16% had degrees in astronomy/astrophysics or a combination of physics with a related discipline. A much smaller proportion of physics than chemistry respondents had a background in the biological sciences.

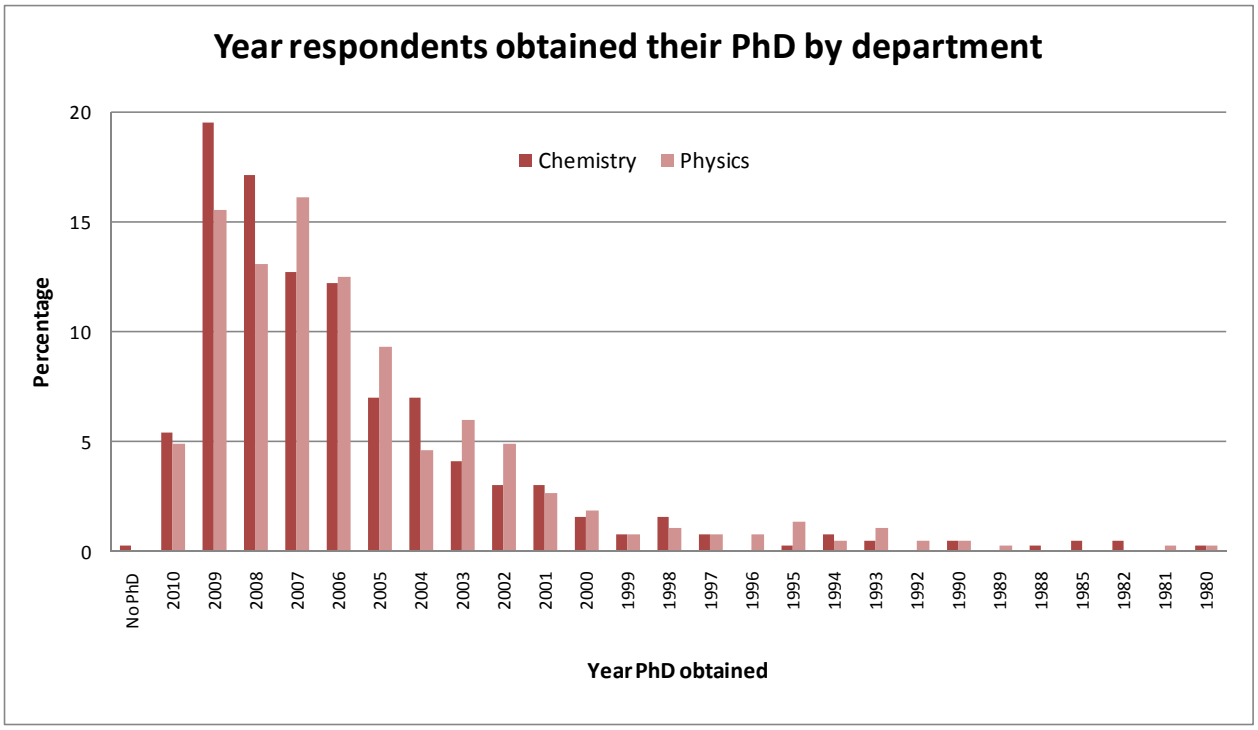

Figure 6: Year PhD obtained, by department of respondents (chemistry N = 369; physics N = 367).

Figure 6 shows the year that respondents gained their PhDs by department and Figure 7 shows the same information by gender. The figures suggest that among the respondents, chemists had spent less time undertaking postdoctoral research than physicists, and women had spent less time undertaking postdoctoral research than men. Data in these figures are independent of age and so are a better indication of the time that different groups have spent undertaking postdoctoral research.

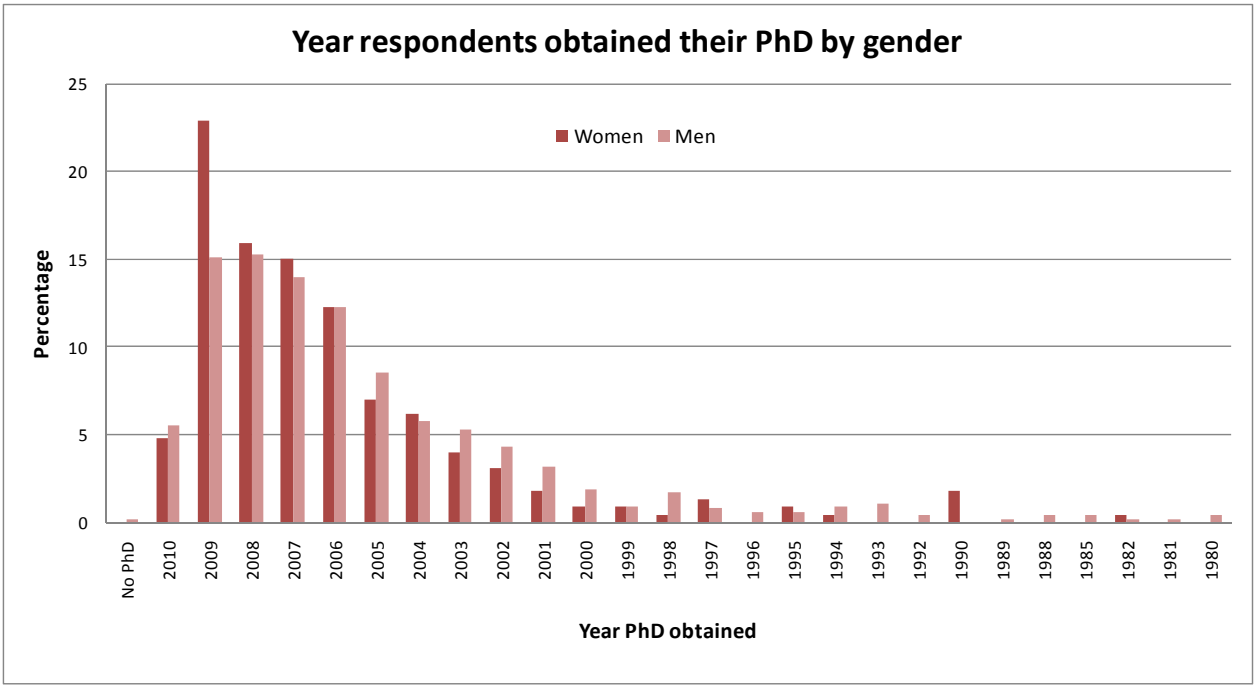

Figure 7: Year PhD obtained, by gender of respondents (women N = 227; men N = 530).

4.2 Length of time spent undertaking postdoctoral research

The data in Table 1 examine the relationship between respondents' first and subsequent postdoctoral contracts/positions, the group that those contracts were carried out in and their nationality. Around 44% of British respondents on their first postdoctoral researcher contract, and around one-third of those on subsequent contracts, were working in the same groups as they carried out their PhD research. In contrast, and unsurprisingly, only 12% of non-British respondents on their first postdoctoral researcher (Table 1) contract were in the same group as their PhD.

Table 1: Relationship between first and subsequent postdoctoral researcher contracts, the group those postdoctoral researcher roles are carried out in and the nationality of respondents.

Group	First PDR contract					
	British			non-British		
	First PDR contract	Subsequent PDR contracts	Overall	First PDR contract	Subsequent PDR contracts	Overall
Same group as PhD	44.2%	32.5%	37.6%	12.4%	6.7%	9.5%
Different group to PhD	55.8%	67.4%	62.2%	87.6%	93.3%	90.5%
Sample size	163	212	375	169	180	349

Table 2 shows that British male respondents were more likely to undertake their first postdoctoral researcher role in the same group that they carried out their PhD research in than British female respondents, but were less likely than women to undertake subsequent postdoctoral research in the same group. Neither of the differences were statistically significant.

Table 2: Relationship between first and subsequent postdoctoral researcher contracts, the group those postdoctoral researcher roles are carried out in and the gender of British respondents.

Group	First PDR contract					
	British female			British male		
	First PDR contract	Subsequent PDR contracts	Overall	First PDR contract	Subsequent PDR contracts	Overall
Same group as PhD	40.7%	36.7%	38.9%	45.6%	31.3%	36.9%
Different group to PhD	59.3%	63.3%	61.1%	54.4%	68.7%	63.1%
Sample sizes	59	49	108	103	160	263

Table 3 shows that, considering only those on their first postdoctoral research contract, British physicists were significantly more likely than British chemists to be working in the same group as they carried out their PhD research ($p < 0.01$). Subsequently British physicists moved on to work in other groups, while there was little difference between the proportions of British chemists on their first or subsequent postdoctoral researcher contracts working in their PhD group.

Table 3: Relationship between first and subsequent postdoctoral researchers, the group those postdoctoral researchers are carried out in and the department of British respondents.

Group	First PDR contract					
	British chemists			British physicists		
	First PDR contract	Subsequent PDR contracts	Overall	First PDR contract	Subsequent PDR contracts	Overall
Same group as PhD	32.4%	30.5%	31.4%	53.9%	34.2%	42.7%
Different group to PhD	67.6%	69.5%	68.6%	46.1%	65.8%	57.3%
Sample sizes	74	95	169	89	117	206

Table 4 presents information on the length of time that respondents had spent undertaking postdoctoral research and how many contracts they had had. 45.5% of respondents were on their first contract. The medium length of time spent undertaking postdoctoral research was between three and four years, with 27.9% of respondents in their third year of postdoctoral research. Taking into account the number of contracts and length of time undertaking postdoctoral research, the largest proportion of respondents (20.2%) had been undertaking postdoctoral research less than a year and were on their first contract. The data in table 4 show that women were more likely than men to be on their first postdoctoral research contract and table 5 highlights that women had spent less time undertaking postdoctoral research. There was also a small number of respondents who seemed to have had a number of short contracts, rather than the more normal two- or three-year research council contracts.

29% of respondents (31% of men and 26% of women) had worked on three or more contracts. It would be interesting to know their motivations: were they determined to obtain a permanent academic post or were they committed to a full-time career as a university researcher?

Data on the length of time spent undertaking postdoctoral research are presented broken down by department and gender. The median time spent undertaking postdoctoral research was three years for female chemists, four years for male chemists, two years for female physicists and four years for male physicists. Having noted that, examination of the data presented in Figure 8 suggests that male chemists and female physicists had similar profiles, a smaller proportion of female chemists undertook postdoctoral research for a long time and a higher proportion of male physicists did likewise.

Table 4: Number of postdoctoral researcher contracts and length of time spent on postdoctoral research.

Number of PDR contracts	Gender	Length of time spent undertaking postdoctoral research (years)*						
		<1	1 to 2	3 to 4	5 to 6	7 to 10	10+	Overall
1	Male	19.1%	15.5%	7.0%	0.9%	0.8%	0.2%	43.4%
	Female	23.7%	20.5%	6.8%	0.0%	0.5%	0.0%	51.6%
	Overall	20.2%	16.8%	7.0%	0.7%	0.7%	0.1%	45.5%
2	Male	0.4%	6.2%	13.0%	4.2%	1.9%	0.4%	26.0%
	Female	0.5%	5.0%	13.2%	2.7%	0.5%	0.0%	21.9%
	Overall	0.4%	6.1%	13.2%	3.7%	1.5%	0.3%	25.1%
3	Male	0.0%	1.1%	6.2%	5.7%	1.9%	0.2%	15.1%
	Female	0.0%	1.8%	5.9%	5.5%	2.7%	0.0%	16.0%
	Overall	0.0%	1.3%	6.1%	5.6%	2.1%	0.1%	15.2%
4	Male	0.0%	0.0%	1.5%	1.7%	2.6%	0.6%	6.4%
	Female	0.0%	0.0%	0.9%	2.3%	1.8%	0.0%	5.0%
	Overall	0.0%	0.0%	1.3%	1.9%	2.4%	0.4%	6.0%
5+	Male	0.0%	0.0%	0.4%	1.3%	2.6%	4.7%	9.1%
	Female	0.0%	0.0%	0.0%	0.5%	1.8%	3.2%	5.5%
	Overall	0.0%	0.0%	0.3%	1.1%	2.6%	4.2%	8.2%
Overall	Male	19.4%	22.8%	28.1%	13.8%	9.8%	6.0%	100.0%
	Female	24.2%	27.4%	26.9%	11.0%	7.3%	3.2%	100.0%
	Overall	20.6%	24.2%	27.9%	12.8%	9.3%	5.2%	100.0%
Sample sizes	Male	103	32	121	149	73	52	530
	Female	53	7	60	59	24	16	219
	Overall	156	183	211	97	70	39	756

* The value in each cell is the percentage of male/female/all respondents from the total population of male/female/all respondents.

Table 5: Length of time spent undertaking postdoctoral research, gender and department of respondents.

Department	Gender	Length of time spent undertaking postdoctoral research (years)						Total count
		<1	1 to 2	3 to 4	5 to 6	7 to 10	10+	
Chemistry	Female	24.4%	27.7%	27.7%	11.8%	5.9%	2.5%	119
	Male	24.6%	24.6%	27.0%	11.9%	7.4%	4.5%	244
	All	24.3%	25.3%	27.8%	11.7%	7.1%	3.8%	367
Physics	Female	23.6%	28.1%	25.8%	10.1%	7.9%	4.5%	89
	Male	14.9%	20.8%	29.4%	16.0%	11.9%	7.1%	269
	All	17.0%	22.6%	28.4%	14.5%	11.1%	6.4%	359
All	Female	24.2%	27.3%	26.9%	11.0%	7.3%	3.2 %	219
	Male	19.4%	22.8%	28.1%	13.8%	9.8%	6.0%	530
	All	20.6%	24.2%	27.9%	12.8%	9.3%	5.2%	756

Overall, chemistry respondents had spent less time undertaking postdoctoral research than physics respondents and this may be related to the long-term nature of some projects in physics. Furthermore, there may be more scope to remain as a postdoctoral researcher if working in areas such as instrumentation/facility development projects.

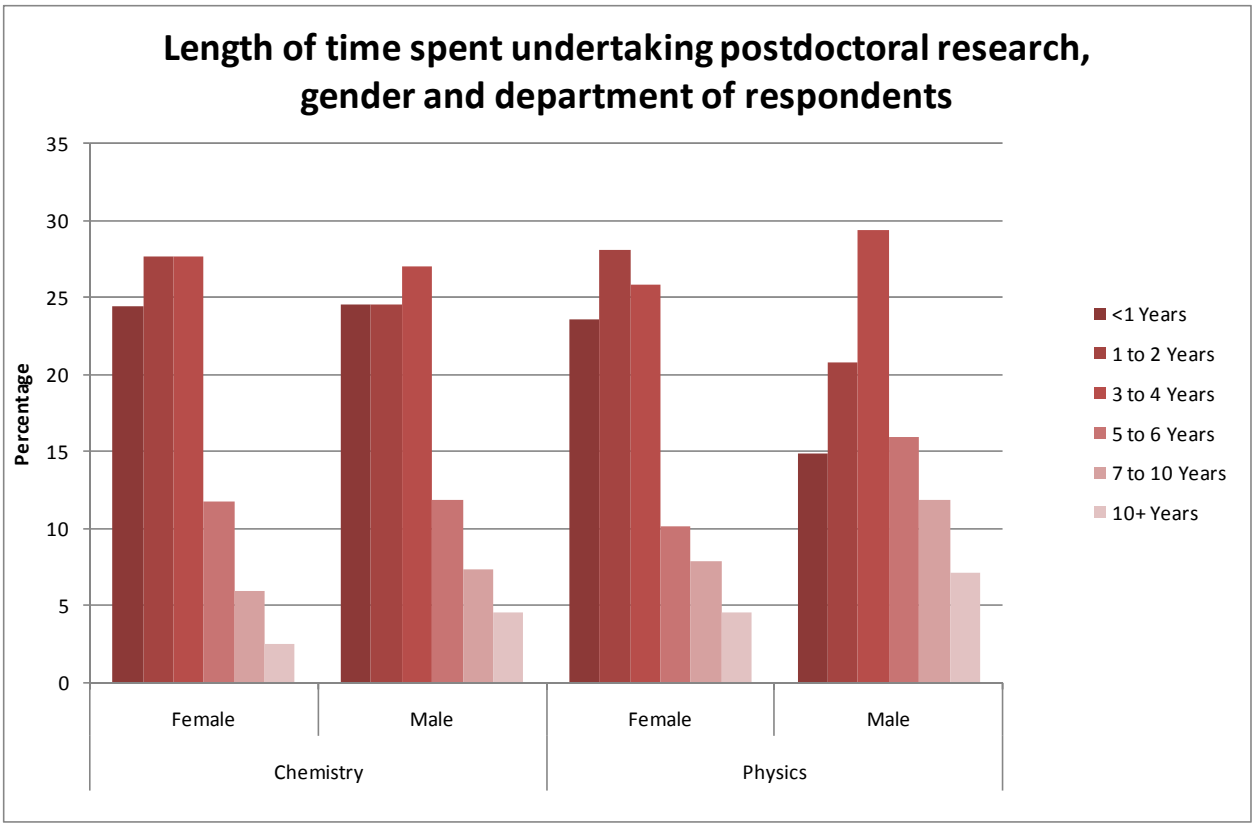

Figure 8: Length of time spent undertaking postdoctoral research, gender and department of respondents.

4.3 Funding for current postdoctoral research contract

Table 6 shows the sources of funding for respondents. There were no significant changes in the pattern of funding with length of time spent undertaking postdoctoral research. Analysis by gender suggested that there was relatively little difference between the source of funding for men and women.

Table 6: Source for funding and length of time spent undertaking postdoctoral research.

Source of funding	Length of time spent undertaking postdoctoral research (years)						Total Count
	<1	1 to 2	3 to 4	5 to 6	7 to 10	10+	
Research council	46.7%	48.9%	61.3%	55.8%	54.5%	48.6%	387
University	21.3%	20.7%	16.2%	18.9%	18.2%	16.2%	137
Other	16.7%	19.5%	13.2%	14.7%	12.1%	16.2%	114
Industry	6.7%	5.2%	4.4%	5.3%	6.1%	16.2%	43
Charity	6.7%	4.6%	4.4%	4.2%	6.1%	2.7%	36
Royal Society	2.0%	1.1%	0.5%	1.1%	3.0%	0%	9
Sample size	150	174	204	95	66	37	726

4.4 Motivations for undertaking postdoctoral research

Respondents were asked to mark up to two main reasons why they were undertaking postdoctoral research. The results are shown in table 7.

The most popular reason for undertaking postdoctoral research for all groups of respondents was "Out of interest and enthusiasm for science"; however, there was a significant difference between chemists and physicists in the sample. 80% of physics respondents and 67% of chemistry respondents listed this reason. This finding is in line with other work on the motivations of chemists.[12] The STFC studentship questionnaire[13] findings are also in line: more than 95% of both female and male STFC students cite enthusiasm for their subject. The second most popular reason was "To gain a permanent academic post". There were differences between the proportions of men and women giving this reason. Men (53%) were statistically significantly ($p < 0.01$) more likely than women (42%) to say that they were undertaking postdoctoral research to gain a permanent academic position. This is in line with the earlier RSC research on chemistry PhD students, which showed that overall women were less likely than men to want to stay in academia. There were no noticeable patterns when it came to selecting the other reasons although women were more likely than men to select "To be near my partner's place of work/study".

[12] K. Purcell, G. Atfield, C Ball and P. Elias, An Investigation of the Factors Affecting the Post-University Employment of Chemical Science Graduates in the UK, RSC, London, 2008 (http://www.rsc.org/images/IERFullReport_tcm18-159366.pdf)

[13] http://www.stfc.ac.uk/Funding%20and%20Grants/674.aspx

Table 7: Main reasons for undertaking postdoctoral research, by department and gender (respondents could indicate up to two reasons).

Main reason(s) for deciding to undertake postdoctoral research	Chemistry			Physics			Overall
	Female	Male	Overall	Female	Male	Overall	
Out of interest and enthusiasm for science	67.2%	67.6%	67.5%	78.7%	81.0 %	80.4%	73.8%
To gain a permanent academic position	37.8%	54.9%	49.3%	43.7%	51.3 %	49.4%	49.4%
To enable me to travel abroad	9.27%	6.1%	7.2%	11.2%	5.9%	7.3%	7.2%
To be near my partner's place of work/study	13.4%	4.9%	7.7%	11.2%	3.7%	5.6%	6.6%
For financial reasons	2.5%	8.6%	6.6%	3.4%	3.0%	3.1%	4.8%
To enhance my earning potential	9.2%	7.0%	7.7%	2.2%	1.5%	1.7%	4.7%
I was inspired/encouraged by a supervisor	4.2%	4.1%	4.1%	3.4%	3.3%	3.4%	3.9%
Other reasons	3.4%	4.5%	4.1%	1.2%	4.1%	3.4%	3.7%
To publish PhD research	0.8%	2.5%	1.9%	4.5%	1.9%	2.5%	2.2%
Don't know	0.0%	0.0%	0.0%	0.0%	0.7%	0.6%	0.3%
Sample size	119	244	363	89	269	358	726

Respondents were also asked if they were pleased that they had decided to undertake postdoctoral research. 79% of respondents replied that they were pleased, although 11% replied that they did regret the decision. There was little difference between chemistry and physics, or between men and women. Higher proportions of those who had undertaken postdoctoral research for longer regretted their decision: 10% of those who had undertaken postdoctoral research for up to three years regretted their decision compared with 22% of those who had undertaken postdoctoral research for seven years or more.

Table 8: Whether or not respondents are pleased that they decided to undertake postdoctoral research, by department and gender.

Are you pleased you decided to undertake postdoctoral research?	Chemistry			Physics		
	Female	Male	Overall	Female	Male	Overall
Yes	81.5%	79.9%	80.4%	83.1%	76.2%	78.0%
No, I somewhat regret my decision	9.2%	11.9%	10.9%	9.0%	12.3%	11.4%
Don't know	9.2%	8.2%	8.7%	7.9%	11.5%	10.6%
Sample size	119	244	367	89	269	359

Those respondents who said that they were pleased with their decision to undertake postdoctoral research were invited to indicate what the main reason for this was (table 9). The most popular reasons were "I enjoy researching my topics" and "I enjoy the challenge of advancing knowledge". The next most popular reasons selected were "I enjoy the academic environment" and "I am gaining/have gained the experience I the careers I want". Women were more likely than men to give the former and chemists were more likely than physicists to give the latter, although female chemists were less likely to say this than male chemists.

Examining the data in terms of the length of time that respondents had spent as a postdoctoral researcher showed that "I enjoy the challenge of advancing knowledge" gained in popularity at the cost of "I am gaining/have gained the experience I need for the career I want". Enjoyment reasons were selected by 95% of those who had spent seven years or more as a postdoctoral researcher.

Table 9: The main reasons why respondents were pleased with their decision to undertake postdoctoral research, by department and gender (respondents were asked to mark only one reason).

Main reason why respondents are pleased with their decision to undertake postdoctoral research	Chemistry			Physics			Overall
	Female	Male	Total	Female	Male	Total	
I enjoy researching my topic	27.8%	23.6%	25.1%	33.8%	38.7%	37.6%	31.2%
I enjoy the challenge of advancing knowledge	29.9%	29.2%	29.8%	25.7%	27.9%	27.2%	28.6%
I enjoy the academic environment	24.7%	17.9%	20.0%	25.7%	18.6%	20.4%	20.2%
I am gaining/have gained the experience I need for the career I want	16.5%	25.1%	22.0%	8.1%	10.8%	10.0%	16.2%
I have a better idea about my long-term career plans	1.0%	4.1%	3.1%	5.4%	2.5%	3.2%	3.1%
Other	0.0%	0.0%	0.0%	1.4%	1.0%	1.1%	0.5%
Don't know	0.0%	0.0%	0.0%	0.0%	0.5%	0.4%	0.2%
Sample size	97	195	295	74	204	279	574

The respondents who somewhat regretted undertaking postdoctoral research were asked to give their main reason for this. The responses are set out in Table 10, but no particular reason stands out and the numbers were too small to allow comparisons to be made.

Table 10: Main reason why respondents regretted their decision to undertake postdoctoral research (respondents were asked to mark only one reason).

Main reason why respondents regretted decision to undertake postdoctoral research	Total
Financial worries	17
My academic research isn't going well	13
I've felt isolated	12
I no longer want to work in science	10
Supervision issues	7
Administrative issues	1
Other	21
Total	81

All respondents were asked to select from lists the main "upsides" and "downsides" of undertaking postdoctoral research. Respondents were asked to mark all factors that applied. The "upsides" that respondents selected are shown in Table 11 broken down by department and gender.

Four "upsides" were selected by more than half the respondents: "Flexible working hours"; "Exciting and interesting projects"; "Collaboration potential"; and "Travel and networking opportunities". Physicists were significantly more likely than chemists ($p < 0.01$) to select "Flexible working hours", and chemists were significantly more likely than physicists to select "Gaining transferable skills" ($p < 0.01$).

There were some gender differences in the "upsides" selected by chemists compared with physicists although the only significant difference that stands out among the most popular reasons is that female chemists were more likely than male chemists to have selected "Travel and networking opportunities". In addition, there was a significant difference in the likelihood of female physicists selecting "Working environment" compared with female chemists ($p < 0.05$).

Table 11: Main "upsides" of undertaking postdoctoral research listed, by respondents by gender and department (respondents could select all that applied).

Main upsides of undertaking postdoctoral research	Chemistry			Physics			Overall
	Female	Male	Overall	Female	Male	Overall	
Exciting and interesting projects	73.9%	75.8%	75.2%	74.2%	78.4%	77.4%	76.3%
Flexible working hours	69.7%	63.5%	65.4%	85.4%	79.9%	81.3%	73.3%
Independence and freedom	61.3%	59.0%	59.9%	65.2%	63.2%	63.8%	61.8%
Travel and networking opportunities	59.7%	48.4%	51.8%	62.9%	58.4%	59.6%	55.6%
Collaboration potential	58.8%	50.8%	53.4%	49.4%	43.1%	44.8%	49.2%
Working environment	36.1%	43.4%	41.1%	51.7%	41.6%	44.3%	42.7%
Gaining transferable skills	47.1%	41.4%	43.1%	24.7%	28.3%	27.6%	35.4%
Location	31.1%	25.8%	27.8%	28.1%	19.7%	21.7%	24.8%
Salary	21.0%	14.8%	16.9%	12.4%	10.0%	10.6%	13.8%
Other reasons	0.0%	1.2%	0.8%	2.2%	1.9%	1.9%	1.4%
No upsides	0.8%	0.0%	0.3%	0.0%	0.7%	0.6%	0.4%
Sample size	119	244	367	89	269	359	726

Table 12 shows the "downsides" selected by respondents. By far the most popular "downside" selected was "No job security". Overall 78% of respondents selected this, although physicists were significantly more likely to do so than chemists ($p < 0.01$). Physicists were also significantly more likely to select "Research funding issues" than chemists ($p < 0.01$).

The biggest difference was that female physicists were significantly more likely to select "Working long and irregular hours" and "Isolation" than male physicists ($p < 0.05$). Female physicists were also significantly more likely to report “Isolation” than female chemists. Perhaps this reflects the smaller proportion of women in physics compared with chemistry. There were no significant differences between the responses of female and male chemists. It is also interesting to note that female chemists were more likely than female physicists to list "Few role models"

even though there are more women working in chemistry than in physics. However, the numbers were too small to measure whether this is significant or not.

Table 12: Main "downsides" of undertaking postdoctoral research listed, by respondents by gender and department (respondents could mark all that applied).

Main downsides of undertaking postdoctoral research	Chemistry			Physics			Overall
	Female	Male	Overall	Female	Male	Overall	
No job security	72.3%	72.5%	72.8%	84.3%	83.3%	83.6%	78.1%
Research funding issues	40.3%	36.9%	38.7%	52.8%	56.1%	55.4%	47.0%
Length of contracts	47.1%	39.3%	42.5%	44.9%	49.1%	48.2%	45.3%
Working long and irregular hours	29.4%	25.8%	27.0%	38.2%	25.3%	28.4%	27.7%
Repetitive and/or frustrating	29.4%	23.0%	25.1%	25.8%	17.1%	19.2%	22.2%
Salary	15.1%	22.5%	20.4%	19.1%	20.8%	20.3%	20.4%
Isolation	13.4%	13.9%	14.2%	31.5%	20.4%	23.1%	18.6%
Supervision/management problems	13.4%	11.5%	12.5%	12.4%	13.0%	12.8%	12.7%
Working environment	10.9%	9.4%	10.1%	9.0%	11.2%	10.6%	10.3%
Few role models	16.0%	5.3%	8.7%	6.7%	7.1%	7.0%	7.9%
Other reasons	3.4%	4.9%	4.4%	3.4%	4.8%	4.5%	4.4%
No downsides	2.5%	3.3%	3.0%	1.1%	1.5%	1.4%	2.2%
Sample size	119	244	367	89	269	359	726

4.5 Summary

- Overall, female respondents had spent less time undertaking postdoctoral research than male respondents.
- Male physicists had spent the most time undertaking research and were more than twice as likely as female chemists to have been a PDR for seven years or more and almost three times as likely as female chemists to have been a PDR for more than 10 years.
- Taking into account the number of contracts and length of time undertaking postdoctoral research, the largest proportion of respondents had been undertaking postdoctoral research for less than a year and were on their first contract.
- The most popular reason for undertaking postdoctoral research, chosen by all groups of respondents, was “Out of interest and enthusiasm for science” (74%), although physicists were more likely to select this than chemists.
- The second most popular reason selected was “To gain a permanent academic post” (49%), which males (53%) were more likely to select than females (40%). The most common “downside” of postdoctoral research was “No job security” (78%).
- 79% of respondents were pleased that they had decided to undertake postdoctoral research and 11% regretted the decision. There was little difference between chemistry and physics, or between men and women.

5. Next steps

5.1 Career plans

Respondents were questioned about their career plans.

Table 13 presents data on how much respondents had planned their next career step. 59% of respondents stated that they had planned the next career steps a little, 22% fully and 20% not at all. There were relatively few differences between groups.

Table 13: The degree to which respondents report that they have planned their next career steps, by gender and department.

Degree to which next career step has been planned	Chemistry			Physics			Overall
	Female	Male	Overall	Female	Male	Overall	
Fully	20.6%	25.6%	23.7%	17.2%	20.4%	19.5%	21.6%
A little	59.5%	55.3%	56.9%	62.4%	60.0%	60.8%	58.8%
Not at all	19.8%	19.1%	19.4%	20.4%	19.6%	19.7%	19.6%
Sample size	126	246	376	93	275	370	746

5.2 Job offers

Respondents were also asked whether or not they had accepted a job offer. As shown in table 4 around 13% of respondents had already accepted a job offer.

Table 14: Respondents who have already accepted a job offer, by gender and department (N = 746).

Accepted a job offer	Chemistry			Physics			Overall
	Female	Male	Overall	Female	Male	Overall	
Accepted an offer	10.1%	12.7%	11.7%	11.2%	14.1%	13.4%	12.5%
Not accepted an offer	89.9%	87.3%	88.3%	88.8%	85.9%	86.6%	87.5%
Sample size	119	244	367	89	269	359	726

Those who indicated that they had already accepted a job offer were asked to indicate something about the nature of the role that they had accepted. The details given by the 91 respondents who had accepted a job offer are shown in Table 15. 80% of the 91 respondents had accepted roles in universities, the majority of them taking another postdoctoral researcher position. Only three respondents were not continuing as scientists.

Table 15: Nature of roles accepted by respondents, by department

Nature of role	Chemistry	Physics	Overall
Academic: postdoctoral researcher	22	22	44
Academic: fellowship	9	8	17
Academic: lecturer	5	7	12
Scientist: industry/commerce	4	5	9
Scientist: public sector	2	4	6
Teacher training	1	1	2
Consultant		1	1
Sample size	43	48	91

5.3 The effect of postdoctoral research work on career intentions

The respondents who indicated that they had not yet accepted another job offer were asked about their intentions in more detail. The responses to questions about the effect of respondents' experiences on their intentions to remain in research are shown in table 16.

Overall there was no significant difference between chemists and physicists in terms of the effect that undertaking postdoctoral research had had on their intentions to stay in research science: 40% of respondents were more intent on continuing and 36% less intent.

Table 16: The effect of respondents' experiences of undertaking postdoctoral research on their intention to pursue a career as a research scientist, by gender and department.

My experience as a postdoctoral researcher...	Chemistry			Physics			Overall
	Female	Male	Overall	Female	Male	Overall	
…made me more intent on pursuing a career as a research scientist	34.2%	42.1%	39.5%	44.6%	40.3%	41.4%	40.4%
…has given me doubts about pursuing a career as a research scientist	45.6%	31.8%	36.7%	32.5%	36.9%	35.5%	36.1%
…at present had no influence on my career intentions	20.2%	26.2%	23.8%	22.9%	22.9%	23.1%	23.4%
Sample size	114	214	332	83	236	321	653

There was a significant difference between the responses of male and female chemists ($p < 0.05$), with around 46% of female chemists compared with 32% of male chemists reporting that they were now less intent on a research-science career. This is in line with findings from the RSC survey of chemistry PhD students. In contrast, the distributions of responses for male and female physicists were similar. To investigate this further the data in Table 16 were broken down by whether or not respondents were on their first postdoctoral research contract. Table 17 and Table 18 show this breakdown for chemists and physicists, respectively.

Table 17: The effect of chemistry-based respondents' experiences of undertaking postdoctoral research on their intention to pursue a career as a research scientist, by gender, whether or not this is their first postdoctoral position and department.

My experience as a postdoctoral researcher...	First postdoctoral position			Subsequent postdoctoral position			Overall
	Female	Male	Overall	Female	Male	Overall	
…made me more intent on pursuing a career as a research scientist	47.4%	42.6%	44.0%	21.1%	41.6%	35.3%	39.5%
…has given me doubts about pursuing a career as a research scientist	29.8%	25.7%	27.7%	61.4%	37.2%	45.1%	36.7%
…at present had no influence on my career intentions	22.8%	31.7%	28.3%	17.5%	21.2%	19.7%	23.8%
Sample size	57	101	159	57	113	173	332

For chemists, the distributions of responses for those on their first and for those on their second or later postdoctoral research contracts were significantly different ($p < 0.01$), with chemists

becoming less enthusiastic about research careers after their first contract. This difference is particularly striking for women; 30% of women chemists on their first contract and 61% of those on their second or later postdoctoral research contracts were less inclined towards pursuing careers as research scientists. Furthermore, responses for women and men on their first postdoctoral research contract were similar, but the responses for those on their second or later postdoctoral research contracts were significantly different ($p < 0.01$).

In contrast to the chemists, there was relatively little difference in the distributions of female and male physicists on their first or subsequent postdoctoral research contracts, although again those on their second or subsequent postdoctoral contracts were less enthusiastic towards research careers than those on their first contract, and the difference was greater for women than men.

Table 18: The effect of physics-based respondents' experiences of undertaking postdoctoral research on their intention to pursue a career as a research scientist, by gender, whether or not this is their first postdoctoral position, and department.

My experience as a postdoctoral researcher...	First postdoctoral position			Subsequent postdoctoral position			Overall
	Female	Male	Overall	Female	Male	Overall	
…made me more intent on pursuing a career as a research scientist	50.0%	38.9%	43.0%	37.8%	41.1%	40.2%	41.4%
…has given me doubts about pursuing a career as a research scientist	30.4%	35.8%	33.8%	35.1%	37.6%	36.9%	35.5%
…at present had no influence on my career intentions	19.6%	25.3%	23.2%	27.0%	21.3%	22.9%	23.1%
Sample size	46	95	142	37	141	177	321

Respondents who had not already accepted a job were asked whether they intended to seek, or were seeking employment in a role that required a scientific background. Table 19 shows the results.

Table 19: Respondents' intention to seek a role that requires a scientific background, by department and gender.

Seeking employment in a role that requires a scientific background	Chemistry			Physics			Overall
	Female	Male	Overall	Female	Male	Overall	
Yes	90.4%	91.1%	91.0%	88.0%	86.9%	87.2%	89.1%
No	0.9%	1.4%	1.2%	2.4%	3.0%	2.8%	2.0%
Not sure	8.8%	7.5%	7.8%	9.6%	10.2%	10.0%	8.9%
Sample size	114	214	332	83	236	321	653

Only 2% of respondents were not intending to seek employment that required a scientific background. There were no significant differences between chemists and physicists, or men and women.

5.4 Research employment options

Table 20 shows that the majority of respondents were likely to seek an academic fellowship, a position in a research institute, a lectureship or undertake another postdoctoral research

contract. A smaller proportion would seek a role in industry. There were no significant differences between the choices of chemists and physicists, or men and women. Data also show that there were no significant differences between the choices of those on their first or subsequent postdoctoral research contracts.

Table 20: Areas of work sought by respondents who intend to seek employment that requires a scientific background, by whether or not this is their first postdoctoral research contract, gender and department (select all that applied).

Department	Area of work sought	First PDR contract			Subsequent PDR contract			Overall
		Female	Male	Overall	Female	Male	Overall	
Chemistry	An academic fellowship	51.9%	61.5%	57.6%	54.9%	57.7%	57.0%	57.3%
	A position in a research institute	59.6%	61.5%	61.1%	58.8%	61.5%	60.8%	60.9%
	A lectureship	46.2%	54.9%	52.1%	52.9%	56.7%	55.1%	53.6%
	Another postdoctoral researcher position	48.1%	60.4%	56.3%	51.0%	46.2%	48.1%	52.0%
	Employment as a research scientist in industry	38.5%	35.2%	36.1%	47.1%	45.2%	45.6%	41.1%
	Sample sizes	52	91	144	51	104	158	302
Physics	An academic fellowship	53.8%	66.7%	62.7%	52.9%	69.3%	65.4%	64.3%
	A position in a research institute	53.8%	59.0%	57.6%	58.8%	59.1%	58.6%	58.2%
	A lectureship	51.3%	51.3%	51.7%	50.0%	59.8%	57.4%	55.0%
	Another postdoctoral researcher position	53.8%	59.0%	57.6%	47.1%	54.3%	53.1%	55.0%
	Employment as a research scientist in industry	46.2%	41.0%	42.4%	41.2%	49.6%	48.1%	45.7%
	Sample size	39	78	118	34	127	162	280

Table 21 presents data on the areas of work sought by respondents by length of time spent as a postdoctoral researcher. There was no significant pattern but the longest-serving respondents were slightly less likely to apply for academic posts.

Table 21: Areas of work sought by respondents who intend to seek employment that requires a scientific background, by length of time spent as a postdoctoral researcher (select all that applied).

Area of work sought	Length of time spent undertaking postdoctoral research (years)					
	<1	1 to 2	3 to 4	5 to 6	7 to 10	10+
An academic fellowship	64.8%	59.3%	59.0%	64.2%	54.1%	53.6%
A position in a research institute	63.1%	56.6%	60.2%	66.7%	49.2%	50.0%
A lectureship	53.3%	50.3%	59.0%	51.9%	54.1%	39.3%
Another postdoctoral research position	64.8%	53.8%	51.2%	44.4%	50.8%	60.7%
Employment as a research scientist in industry	39.3%	35.2%	44.6%	58.0%	44.3%	42.9%
Sample size	122	145	166	81	61	28

5.5 Sectors in which employment is sought

Respondents who intended to seek employment that required a scientific background were also asked whether they intended to seek, or were seeking, employment as a research scientist in a number of different sectors. The results are shown in Table 22 and table 23.

Table 22: Sectors in which employment is sought as a research scientist by chemistry-based respondents, by whether or not this is their first postdoctoral research contract, and gender (select all that applied).

Sectors employment sought in as a research scientist	First PDR contract			Subsequent PDR contract			Overall
	Female	Male	Overall	Female	Male	Overall	
University (not as a PDR/lecturer)	30.8%	34.1%	32.6%	21.6%	18.3%	19.6%	25.8%
University (as a PDR/lecturer)	71.2%	78.0%	75.7%	70.6%	77.9%	75.9%	75.8%
Pharmaceutical industry	21.2%	14.3%	16.7%	19.6%	20.2%	19.6%	18.2%
Chemical industry	21.2%	17.6%	18.8%	25.5%	21.2%	22.8%	20.9%
Food and drink industry	11.5%	4.4%	6.9%	5.9%	2.9%	3.8%	5.3%
Defence	5.8%	12.1%	9.7%	5.9%	6.7%	6.3%	7.9%
Water, electricity, oil, gas	3.8%	4.4%	4.2%	5.9%	4.8%	5.1%	4.6%
Medical service	1.9%	4.4%	3.5%	5.9%	1.9%	3.2%	3.3%
University spin-off R&D	11.5%	14.3%	13.9%	19.6%	10.6%	13.3%	13.6%
Commercial research	7.7%	5.5%	6.3%	13.7%	5.8%	8.9%	7.6%
Cosmetics industry	3.8%	3.3%	3.5%	7.8%	1.0%	3.2%	3.3%
Public sector	5.8%	5.5%	5.6%	9.8%	3.8%	5.7%	5.6%
Research institute	23.1%	18.7%	20.8%	15.7%	18.3%	18.4%	19.5%
Don't know	3.8%	1.1%	2.1%	9.8%	1.9%	4.4%	3.3%
Other	3.8%	2.2%	2.8%	2.0%	3.8%	3.8%	3.3%
Sample size	52	91	144	51	104	158	302

Chemistry postdoctoral researchers were significantly more likely to seek employment in university as a lecturer or postdoctoral researcher than any other sector listed. 76% of chemistry-based respondents would seek employment in university as a lecturer or postdoctoral researcher; the next most popular choice selected was work in a university but not as a lecturer

or postdoctoral researcher. Following that choice 20% of postdoctoral researchers selected working in the chemical sector.

Table 23: Sectors in which employment is sought as a research scientist by physics-based respondents by whether or not this is their first postdoctoral research contract, and gender (respondents were asked to select all that applied).

Employment sought as a research scientist	First PDR contract			Subsequent PDR contract			Overall
	Female	Male	Overall	Female	Male	Total	
University (not as a PDR/lecturer)	25.6%	29.5%	28.8%	35.3%	27.6%	29.0%	28.9%
University (as a PDR/lecturer)	74.4%	76.9%	76.3%	67.6%	83.5%	80.2%	78.6%
Pharmaceutical industry	17.9%	16.7%	16.9%	8.8%	11.0%	10.5%	13.2%
Chemical industry	20.5%	20.5%	20.3%	11.8%	16.5%	15.4%	17.5%
Food and drink industry	5.1%	5.1%	5.1%	2.9%	0.8%	1.2%	2.9%
Defence	12.8%	7.7%	9.3%	11.8%	11.8%	11.7%	10.7%
Water, electricity, oil, gas	10.3%	7.7%	8.5%	5.9%	6.3%	6.2%	7.1%
Medical service	5.1%	5.1%	5.1%	2.9%	3.1%	3.1%	3.9%
University spin-off R&D	12.8%	11.5%	11.9%	14.7%	14.2%	14.2%	13.2%
Commercial research	12.8%	6.4%	8.5%	5.9%	8.7%	8.0%	8.2%
Cosmetics industry	2.6%	5.1%	4.2%	0.0%	0.0%	0.0%	1.8%
Public sector	7.7%	7.7%	7.6%	14.7%	5.5%	7.4%	7.5%
Research institute	20.5%	15.4%	17.8%	20.6%	21.3%	21.0%	19.6%
Don't know	2.6%	3.8%	3.4%	8.8%	0.0%	1.9%	2.5%
Other	5.1%	2.6%	3.4%	2.9%	1.6%	1.9%	2.5%
Sample size	39	78	118	34	127	162	280

Table 23 shows data for physicists and whether they were seeking or intended to seek employment as a research scientist by whether or not this is their first postdoctoral research contract, and gender.

A very similar pattern was observed for physicists as for chemists. 79% of physics-based respondents would seek employment in a university as a lecturer or postdoctoral researcher; again the next most popular choice selected was work in a university but not as a lecturer or postdoctoral researcher. Following that choice, 20% of physics postdoctoral researchers selected working in a research institute.

Overall, the majority of both chemists and physicists were focused on continuing to work in the university sector. In fact, only 23 respondents in total did not indicate that they intended to seek, or were seeking, employment in universities.

Respondents were asked what appealed to them about working in the sector(s) that they specified. Of those who commented, the majority commented on the attractions of the university/academic environment rather than on any other options indicated. Considering the comments of those who had selected working in an academic environment alone, Table summarises the most commonly occurring phrases/reasons given for wanting to work in academia. Only aspects that were mentioned by four or more respondents are included in the table.

By far the most common aspect was an interest in science. Following this, but significantly less common, were an enjoyment of the academic environment, liking aspects of teaching, freedom, independence and flexibility. There were no noticeable differences between the responses of the different groups of respondents.

It appears that among respondents the major driver for seeking employment was an interest in science, coupled with a need for independence, flexibility and freedom. For the majority of respondents this meant staying in academia if possible and, presumably, this is why many of them sought employment as a postdoctoral researcher in the first place. Nonetheless, a number of respondents were attracted by the challenges of research and science outside academia.

Table 24: Frequency with which aspects of university-based roles that appealed to respondents were mentioned by those who would consider such roles exclusively (N = 148).

Aspect of university role	Total count
Carrying out exciting research/cutting-edge research; fascinated in/love science; want to continue in science/discover something new; want to contribute to society; like the pure research environment; enjoy pursuing knowledge for knowledge's sake; enjoy advancing science	68
Enjoy the independence; autonomy	25
Like teaching/inspiring students/training new researchers	22
Freedom	21
Enjoy the flexibility, including the flexible working hours	19
Enjoy the academic environment; feel there is a good working environment	18
Like the opportunities for collaboration/networking	6
No other real choice given the research area	7
Appreciate the travel opportunities	5
Like the job security (of a permanent academic job)	4
Like the salary	4
Enjoy acquiring new knowledge; gaining wisdom; enjoy the academic stimulation	4

5.6 Non-research careers

The 71 respondents who indicated that they did not want or did not know whether they wanted a career as a research scientist were asked whether they had begun their current postdoctoral research contract thinking that they would continue their career as a research scientist. The responses are shown in Table broken down by department and gender.

Although the numbers are too small to draw any conclusions about differences between chemists and physicists, or men and women, the majority did begin their current postdoctoral research contract thinking that they would continue as a research scientist.

Respondents who had changed their minds were asked to indicate why. A variety of reasons were given including the feeling that there was a lack of opportunities and that the hours required to do science were too long. A couple of respondents stated that they felt that careers as research scientists were incompatible with bringing up young families. Overall, respondents did not say that they were no longer interested in science, rather that there were aspects of science careers that they did not like.

Table 25: Whether respondents who did not want, or were not sure if they wanted, a career as a research scientist began their current postdoctoral research contract thinking that they would continue as a research scientist, by department and gender.

Whether respondents began their PDR contract planning to continue as a research scientist	Chemistry			Physics			Overall
	Female	Male	Overall	Female	Male	Overall	
Yes	4	7	11	7	20	27	38
No	3	2	5	1	3	4	9
Don't know	4	10	14	2	8	10	24
Sample size	11	19	30	10	31	41	71

The respondents were also asked to indicate which options, from a list of 18, they intended to pursue on completion of their postdoctoral research contract. The responses are shown in Table. The numbers of respondents were too few to allow a breakdown by gender.

Interestingly, a number of respondents did indicate that they would consider employment as a scientist: the vast majority of these (31 out of 32 and 20 out of 21, respectively) were respondents who indicated that they were not sure whether they wanted to continue as a research scientist. The numbers in the table are too small to come to any definite conclusions about the destinations of this group of respondents.

Table 26: Respondents who did not want, or were not sure if they wanted, a career as a research scientist, possible options after completion of their postdoctoral research contract, by department (respondents were asked to select all that applied).

Nature of role	Chemistry	Physics	Overall
Scientist: public sector	60.0%	34.1%	45.1%
Scientist: industry/commerce	33.3%	26.8%	29.6%
Manager/consultant	13.3%	19.5%	16.9%
Scientific publishing	20.0%	12.2%	15.5%
IT professional or technician	13.3%	7.3%	9.9%
Further study: non-scientific	6.7%	7.3%	7.0%
Patent work	10.0%	4.9%	7.0%
Writer/journalist/broadcaster	13.3%	2.4%	7.0%
Science policy	6.7%	2.4%	4.2%
Career break	6.7%	2.4%	4.2%
Teacher training	0.0%	7.3%	4.2%
Financial professional	3.3%	2.4%	2.8%
Travel	3.3%	2.4%	2.8%
Voluntary work	3.3%	2.4%	2.8%
Human resources/recruitment		2.4%	1.4%
Other	20.0%	34.1%	28.2%
Sample size	30	41	71

5.7 Summary

Overall, the data suggest that there were relatively few differences in the careers that male and female chemists and physicists who were on their first or subsequent postdoctoral research contracts would consider. The data also show that the majority of both physics and chemistry postdoctoral researchers are intending to seek or are seeking a role in the university sector, even though it is inevitable that the majority will not secure a permanent position.

- 59% of respondents stated that they had planned the next career steps a little, 22% fully and 20% not at all, and 13% of respondents had already accepted a job offer.
- 40% of respondents reported that undertaking postdoctoral research had made them more intent on continuing in a career as a research scientist, and 36% reported that they now had doubts about this. There was a significant difference between the likelihood of male (32%) and female (46%) chemists to report that they now had doubts about a career in research science.
- Similar proportions of female and male chemists on their first contract reported that undertaking postdoctoral research had made them more intent on a career in research science (47% compared with 43%, respectively) and had given them doubts (30% compared with 26%, respectively). On second/subsequent contracts, the proportion of male chemists stayed the same but the proportion of female chemists reported that they were more intent on a career in research science fell to 21% and the proportion that now had doubts about this rose to 61%.
- The proportion of female physicists who said that they were more intent on a career in research science fell between first and subsequent contracts (50% to 38%, respectively) and the proportion of male physicists stayed about the same (39% and 41%, respectively).
- The majority of respondents were likely to seek an academic fellowship, a position in a research institute, a lectureship or undertake another postdoctoral research contract. A smaller proportion would seek a role in industry. There were no significant differences between the choices of chemists and physicists, or men and women.
- 76% of chemistry-based respondents would seek employment in university as a lecturer or postdoctoral researcher: the next most popular choice selected was work in a university but not as a lecturer or postdoctoral researcher.
- 79% of physics-based respondents would seek employment in a university as a lecturer or postdoctoral researcher: again the next most popular choice selected was work in a university but not as a lecturer or postdoctoral researcher. Following that choice, 20% of postdoctoral researchers selected working in a research institute.
- The overall population of postdoctoral researchers was split between those whose experience as a postdoctoral researcher had made them more, less or similarly intent on pursuing a career in scientific research after their first contracts. However, chemists in general, and female chemists in particular, were significantly more likely to report that their experiences as a postdoctoral researcher had made them less likely to pursue a research career. The length of time spent as postdoctoral researchers has far less effect on the intentions of physicists to pursue a research career.

6. Long-term career plans

6.1 Long-term roles

Respondents were asked to indicate what they thought they were most likely to be doing in the longer-term future (i.e. in 6-10 years time). The results for chemistry postdoctoral researchers are shown in Table .

Table 27: Longer-term career plans of chemistry postdoctoral researchers, by whether or not this is their first postdoctoral research contract, and gender (respondents were asked to mark no more than two choices).

Jobs that postdoctoral researchers are most likely to be doing in 6-10 years time*	First PDR contract			Subsequent PDR contract			Overall
	Female	Male	Overall	Female	Male	Overall	
Academic on a permanent contract	64.5%	69.2%	67.7%	43.8%	66.4%	58.3%	63.2%
Scientist: industry/commerce	21.0%	30.0%	27.1%	40.6%	33.6%	36.1%	31.5%
Continue postdoctoral research	17.7%	18.5%	18.2%	12.5%	11.2%	11.7%	15.1%
Scientist: public sector	9.7%	13.8%	12.5%	10.9%	18.1%	15.6%	14.0%
Financial professional	11.3%	5.4%	7.3%	12.5%	4.3%	7.2%	7.3%
Scientific publishing	9.7%	0.8%	3.6%	1.6%	3.4%	2.8%	3.2%
Management consultant	3.2%	2.3%	2.6%	4.7%	1.7%	2.8%	2.7%
Patent work	1.6%	0.8%	1.0%	4.7%	3.4%	3.9%	2.4%
IT professional/technician	0.0%	3.8%	2.6%	0.0%	1.7%	1.1%	1.9%
Science policy	1.6%	3.1%	2.6%	1.6%	2.6%	2.2%	2.4%
Government/civil service	1.6%	0.8%	1.0%	0.0%	2.6%	1.7%	1.3%
Teacher	1.6%	0.8%	1.0%	1.6%	0.9%	1.1%	1.1%
Writer/journalist/broadcaster	1.6%	1.5%	1.6%	0.0%	0.0%	0.0%	0.8%
Human resources	0.0%	0.0%	0.0%	0.0%	0.9%	0.6%	0.3%
Sales (inc. technical)	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Marketing/PR officer	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Voluntary work	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Other	1.6%	3.1%	2.6%	1.6%	2.6%	2.2%	2.4%
Don't know	11.3%	5.4%	7.3%	12.5%	4.3%	7.2%	7.3%
Sample size	62	130	192	64	116	180	372

Similar data for physicists are shown in table 28.

Table 28: Longer-term career plans of physics postdoctoral researchers, by whether or not this is their first postdoctoral research contract, and gender (respondents were asked to mark no more than two choices).

Jobs that postdoctoral researchers are most likely to be doing in 6-10 years time*	First PDR contract			Subsequent PDR contract			Overall
	Female	Male	Overall	Female	Male	Overall	
Academic on a permanent contract	56.5%	65.2%	63.3%	55.3%	75.7%	69.6%	66.0%
Scientist: industry/ commerce	21.7%	26.8%	25.7%	12.8%	29.7%	24.7%	25.3%
Continue postdoctoral research	17.4%	17.7%	17.6%	29.8%	24.3%	25.9%	21.2%
Scientist: public sector	19.6%	15.2%	16.2%	10.6%	16.2%	14.6%	15.5%
Financial professional	13.0%	10.4%	11.0%	10.6%	4.5%	6.3%	9.0%
Scientific publishing	6.5%	2.4%	3.3%	4.3%	1.8%	2.5%	3.0%
Management consultant	0.0%	0.6%	0.5%	6.4%	1.8%	3.2%	1.6%
Patent work	0.0%	1.2%	1.0%	2.1%	0.9%	1.3%	1.1%
IT professional/technician	2.2%	4.9%	4.3%	4.3%	6.3%	5.7%	4.9%
Science policy	0.0%	0.6%	0.5%	4.3%	1.8%	2.5%	1.4%
Government/civil service	2.2%	1.8%	1.9%	0.0%	0.0%	0.0%	1.1%
Teacher	2.2%	1.8%	1.9%	2.1%	1.8%	1.9%	1.9%
Writer/journalist/broadcaster	2.2%	0.6%	1.0%	2.1%	0.0%	0.6%	0.8%
Human resources	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Sales (inc. technical)	0.0%	0.6%	0.5%	0.0%	0.0%	0.0%	0.3%
Marketing/PR officer	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%
Voluntary work	2.2%	0.0%	0.5%	0.0%	0.9%	0.6%	0.5%
Other	0.0%	0.6%	0.5%	4.3%	1.8%	2.5%	1.4%
Don't know	13.0%	10.4%	11.0%	10.6%	4.5%	6.3%	9.0%
Sample size	46	164	210	47	111	158	368

Overall, 63% of chemists and 66% of physicists believed that they would most likely be on a permanent academic contract in 6-10 years' time. Significantly smaller proportions of both physicists and chemists indicated that they might be a scientist in industry or commerce, or a scientist in the public sector, or still be undertaking postdoctoral research.

Considering just those who indicated that they believed that they would be an academic on a permanent contract does reveal some gender differences. Among chemists undertaking their first contract, 65% of women and 69% of men selected this option. However, the respective proportions of women and men on second or subsequent postdoctoral research contracts were 44% and 66%, a statistically significant difference ($p < 0.01$). The data also suggest that women chemists on their second or subsequent contracts were more likely to see themselves working in industry as a scientist.

The pattern for physics was different. 57% and 65% of female and male physicists, respectively, on their first contract indicated that they saw themselves on a permanent academic contract in

6-10 years' time. The figures for those on subsequent contracts were 55% and 76%, respectively, a statistically significant difference ($p < 0.01$). The proportion of women remains essentially the same and the gender difference increased as men on subsequent contracts were more likely to see themselves on permanent academic contracts. Male physicists therefore seem to become more focused on getting a permanent academic contract. This observation may well correlate with the earlier finding that male physicists have undertaken postdoctoral research longer than females, and that there was a significant tail of long-term male physics postdoctoral researchers. It is likely that male physicists who did not want a permanent academic position, or did not believe that they would get one, move on leaving the others behind.

So in both chemistry and physics, there were statistically significant differences in whether or not women and men saw themselves as an academic on a permanent academic contract in 6-10 years' time once they move on from their first postdoctoral research contract.

6.2 Factors that influence career choices

Respondents were asked how important it was for them to a have a career that involved a number of factors. Respondents were asked to rate the factors as very important, important, somewhat important or not important. The results are shown in Table 29.

Table 29: Distribution of respondents' ratings of the importance of different aspects in their career, by gender (N = 768).

Factor	Female				Male			
	V. Imp.	Imp	S. Imp	N. Imp	V. Imp.	Imp	S. Imp	N. Imp
Job security	43.2	49.3	6.2	1.3	42.1	44.5	12.7	0.7
Lots of variety in the work	34.2	52.9	11.6	1.3	35.1	48.5	14.4	2.1
Living in a pleasant area	31.1	55.4	11.7	1.8	30.1	53.3	15.6	0.9
Making a positive difference	39.1	45.8	13.8	1.3	39.0	44.0	14.8	2.2
Autonomy at work	29.3	46.2	20.4	4.0	34.1	48.4	15.8	1.7
Access to state-of-the-art equipment/resources	25.9	48.2	21.4	4.5	32.9	46.0	16.8	4.3
Good professional development	35.6	52.3	10.4	1.8	24.3	52.8	19.8	3.2
Opportunities to publish	33.9	37.1	21.4	7.6	38.5	36.8	18.1	6.5
Safe working environment	39.8	48.7	9.3	2.2	30.0	42.5	21.5	6.0
Flexible working options	36.1	44.1	17.2	2.6	26.3	44.3	25.7	3.7
Be near my partner's place of work/study	42.9	31.9	13.3	11.9	33.1	36.1	17.0	13.7
Prospects for a leadership role	22.2	43.6	25.8	8.4	23.1	41.0	26.5	9.3
Holding a respected position	19.1	49.8	24.4	6.7	14.2	48.3	29.8	7.7
Prospects for receiving a high salary	16.1	45.3	30.5	8.1	15.1	46.7	31.1	7.2
Benefits package	20.2	39.5	30.9	9.4	17.3	41.5	31.2	10.0
Opportunities to travel	13.4	39.3	35.7	11.6	11.6	37.2	38.3	12.9

Table 30 presents a ranking of the factors derived by calculating a score based on summed products of the percentage of respondents indicating each level of importance and the level weighting, such that very important was weighted as four and not important was weighted as one. For example, if 100% of respondents indicated that a factor was important, the score would be 300. Tables 30, 31 and 32 highlight in yellow those factors where the rankings were different for men and women by four or more. Women ranked a "Safe working environment" (second and ninth, respectively), "Good professional development opportunities" (fourth and eighth, respectively), "Flexible working options" (seventh and tenth, respectively) and "Be near my partner's place of work/study" (eighth and eleventh, respectively) higher than men. Women also ranked "Opportunities to publish" (tenth and seventh, respectively) and "Access to state-of-the-art equipment/resources" (eleventh and sixth, respectively) lower than men.

Table 30: Ranking of respondents' ratings of the importance of different aspects in their career, by gender (N = 776).

Quality	Female		Male	
	Rank	Score[14]	Rank	Score
Job security	1	334.4	1	327.9
Safe working environment	2	326.1	9	296.4
Making a positive difference	3	322.7	2	319.7
Good professional development opportunities	4	321.6	8	298.1
Lots of variety in the work	5	320.0	3	316.6
Living in a pleasant area	6	315.8	5	312.6
Flexible working options	7	313.7	10	293.1
Be near my partner's place of work/study	8	305.8	11	288.8
Autonomy at work	9	300.9	4	314.9
Opportunities to publish	10	297.3	7	307.3
Access to state-of-the-art equipment/resources	11	295.5	6	307.5
Holding a respected position	12	281.3	14	269.1
Prospects for a leadership role	13	279.6	12	278.0
Benefits package	14	270.4	15	266.2
Prospects for receiving a high salary	15	269.5	13	269.7
Opportunities to travel	16	254.5	16	247.5

Rows highlighted in yellow signify a difference in men's and women's ranking of four or more inclusive.

Table 31 presents ranking data for female and male chemists. Female chemists ranked a "Safe working environment" (first and eighth, respectively), and "Good professional development opportunities" higher than men (second and sixth, respectively). "Access to state-of-the-art equipment/resources" was ranked lower by women than men (ninth and fourth, respectively).

[14] In Tables 30, 31 and 32, scores were calculated by multiplying the percentage of respondents in each of the categories very important, important, somewhat important and not important by four, three, two or one, respectively, and summing the individual products. The scores were then ordered for females and males to produce the rankings.

Early work by the RSC looking at male and female chemists found that women highlighted health and safety as a much more important factor in chemistry than men.[15]

There were more differences in the way that female and male physicists ranked the factors (table 32). Women ranked "Flexible working options" (third and seventh, respectively) and "Opportunities to publish" (tenth and fifteenth, respectively) more highly than men. Women ranked "Autonomy at work" (ninth and second, respectively), "Access to state-of-the-art equipment/resources" (eleventh and sixth, respectively) and "Prospects for receiving a high salary" (sixteenth and eleventh, respectively) lower than men.

Table 31: Ranking of chemistry respondents' ratings of the importance of different aspects in their career, by gender (N=371).

Quality	Chemistry			
	Female		Male	
	Rank	Score*	Rank	Score*
Safe working environment	1	336.6	8	304.9
Good professional development opportunities	2	334.7	6	309.8
Job security	3	333.9	1	326.0
Making a positive difference	4	325.2	2	322.2
Lots of variety in the work	5	323.8	3	322.1
Living in a pleasant area	6	315.8	7	308.5
Flexible working options	7	304.8	9	293.1
Autonomy at work	8	300.8	5	310.2
Access to state-of-the-art equipment/resources	9	299.2	4	317.6
Be near my partner's place of work/study	10	298.4	11	285.2
Opportunities to publish	11	297.5	15	246.5
Prospects for a leadership role	12	290.2	12	284.2
Holding a respected position	13	289.3	14	277.6
Prospects for receiving a high salary	14	279.5	10	293.1
Benefits package	15	278.0	13	278.3
Opportunities to travel	16	250.8	16	246.5

[15] Factors Affecting the Career Choices of Graduate Chemists, RSC, London, 2000 (http://www.rsc.org/ScienceAndTechnology/Policy/Documents/FactorsAffecting.asp)

Table 32: Ranking of physics respondents' ratings of the importance of different aspects in their career, by gender (N=370).

Quality	Physics			
	Female		Male	
	Rank	Score*	Rank	Score*
Job security	1	329.3	1	329.6
Lots of variety in the work	2	323.8	5	314.5
Flexible working options	3	321.7	7	293.8
Making a positive difference	4	317.6	3	317.2
Be near my partner's place of work/study	5	315.2	8	291.2
Living in a pleasant area	6	314.3	4	316.4
Safe working environment	7	312.0	9	289.1
Good professional development opportunities	8	305.6	10	287.3
Autonomy at work	9	300.0	2	320.7
Opportunities to publish	10	295.7	15	249.5
Access to state-of-the-art equipment/resources	11	291.3	6	298.2
Prospects for a leadership role	12	270.7	13	257.9
Holding a respected position	13	269.6	12	261.0
Benefits package	14	264.0	14	256.8
Opportunities to travel	15	257.6	16	249.5
Prospects for receiving a high salary	16	253.8	11	264.6

6.3 Summary

- Overall, 63% of chemists and 66% of physicists believed that they were most likely to be on a permanent academic contract in 6-10 years' time. Significantly smaller proportions of both physicists and chemists indicated that they might be a scientist in industry or commerce, or a scientist in the public sector, or still be undertaking postdoctoral research.
- Similar proportions of male and female chemists on first contracts selected "Academic on a permanent contract" (65% female; 69% male), but significantly fewer female chemists on second and subsequent contracts selected this compared with males (44% female; 66% male).
- The pattern for physics was different. Similar proportions of male and female physicists on a first contract saw themselves as an academic in the longer-term (57% female; 65% male), but for those on second or subsequent contracts, the proportions of females stayed the same and the proportion of males actually rose (55% female; 76% males).

7. Career development

7.1 Awareness of career opportunities

Respondents were questioned about their awareness of career options. Table 33 gives respondents' views of their awareness of career opportunities within academia

Table 33: Respondents' reported awareness of career options within academia, by department and gender.

Awareness of career options within academia	Chemistry			Physics			Overall
	Female	Male	Overall	Female	Male	Overall	
Very good	15.1%	17.1%	16.2%	15.1%	14.9%	14.9%	15.5%
Good	30.2%	35.4%	33.2%	45.2%	42.9%	43.8%	38.5%
Adequate	42.1%	32.1%	35.9%	31.2%	31.6%	31.4%	33.6%
Poor	11.9%	14.2%	13.6%	7.5%	9.1%	8.6%	11.1%
Very poor	0.8%	1.2%	1.1%	1.1%	1.5%	1.4%	1.2%
Sample size	126	246	376	93	275	370	746

Overall, 88% of respondents rate their awareness of career options within academia as adequate or better. A higher proportion of physicists than chemists rated their awareness as good or very good (59% and 49%, respectively) but the differences between chemists and physicists were not significant.

Table 34 examines the same data based on whether or not respondents were on their first postdoctoral research contract. More experienced chemists and physicists ranked their awareness higher than those on their first postdoctoral research contract, which is, of course, to be expected.

Table 34: Respondents' reported awareness of career options within academia, by department and whether or not it is their first postdoctoral contract.

Awareness of career options within academia	Chemistry			Physics			Overall
	First PDR contract	Subsequent PDR contract	Overall	First PDR contract	Subsequent PDR contract	Overall	
Very good	13.8%	18.5%	16.2%	11.3%	17.5%	14.9%	15.5%
Good	33.7%	32.8%	33.2%	42.1%	45.0%	43.8%	38.5%
Adequate	35.9%	35.9%	35.9%	35.8%	28.0%	31.4%	33.6%
Poor	15.5%	11.8%	13.6%	10.1%	7.6%	8.6%	11.1%
Very poor	1.1%	1.0%	1.1%	0.6%	1.9%	1.4%	1.2%
Sample size	181	195	376	159	211	370	746

Table presents data on respondents' awareness of career opportunities outside academia, with only 57% describing their knowledge as adequate or better. In fact, 36% of chemists and 51% of physicists described their knowledge as poor or very poor.

Table 35: Respondents' reported awareness of career options outside academia, by department and gender.

Awareness of career options outside academia	Chemistry			Physics			Overall
	Female	Male	Overall	Female	Male	Overall	
Very good	2.4%	5.7%	4.5%	0.0%	4.4%	3.2%	3.9%
Good	19.0%	25.6%	23.1%	12.9%	14.2%	14.1%	18.6%
Adequate	44.4%	32.5%	36.4%	33.3%	30.9%	31.4%	33.9%
Poor	30.2%	31.7%	31.6%	45.2%	41.5%	42.2%	36.9%
Very poor	4.0%	4.5%	4.3%	8.6%	9.1%	9.2%	6.7%
Sample size	126	246	376	93	275	370	746

In contrast to the data presented in Table 34, the awareness of career opportunities outside academia of those respondents on their first and subsequent postdoctoral researchers (Table) shows that those on their first postdoctoral research rated their awareness higher than those on subsequent postdoctoral research. It is possible that those respondents who were on subsequent contracts were more motivated toward academic careers to the exclusion of careers outside academia. This accords with the data on long-term career plans, especially in the case of physicists.

Examining the data in table 36 by gender shows that, in contrast to other groups, female physicists' knowledge of opportunities outside academia improves after their first postdoctoral research contract.

Table 36: Respondents' reported awareness of career options outside academia, by department and whether or not it is their first postdoctoral research contract.

Awareness of career options outside academia	Chemistry			Physics			Overall
	First PDR contract	Subsequent PDR contract	Overall	First PDR contract	Subsequent PDR contract	Overall	
Very good	3.3%	5.6%	4.5%	1.9%	4.3%	3.2%	3.9%
Good	29.3%	17.4%	23.1%	11.9%	15.6%	14.1%	18.6%
Adequate	39.2%	33.8%	36.4%	32.7%	30.3%	31.4%	33.9%
Poor	25.4%	37.4%	31.6%	45.3%	39.8%	42.2%	36.9%
Very poor	2.8%	5.6%	4.3%	8.2%	10.0%	9.2%	6.7%
Sample size	181	195	376	159	211	370	746

7.2 Careers advice prior to undertaking the first postdoctoral research contract

Table 37 presents information on whether or not respondents received any careers advice before undertaking their first postdoctoral research contract. Overall, just 38% of respondents reported that they did receive careers advice. There is a statistically significant difference between the proportion of female and male physicists that received careers advice ($p < 0.05$).

Table 37: Whether or not respondents received any careers advice before undertaking their first postdoctoral research contract, by department and gender.

Careers advice before first postdoctoral research contract	Chemistry			Physics			Overall
	Female	Male	Overall	Female	Male	Overall	
Yes	36.5%	35.8%	35.9%	47.3%	38.2%	40.5%	38.2%
No	63.5%	64.2%	64.1%	52.7%	61.8%	59.5%	61.8%
Sample size	126	246	376	93	275	370	746

Those respondents who had received careers advice were asked to specify its source. The results are shown in Table 38. 76% of respondents had received advice from their PhD supervisors, 46% from other academic staff, 45% from university careers services and 41% from friends and family. There was a similar pattern for chemists and physicists, and women and men.

Table 38: Respondents' source of careers advice prior to undertaking first postdoctoral research contract, by department and gender (respondents were asked to indicate all that applied).

Source of careers advice	Chemistry			Physics			Overall
	Female	Male	Overall	Female	Male	Overall	
PhD supervisor	77.8%	77.3%	77.6%	75.0%	73.3%	74.0%	75.7%
Other academic staff	37.8%	43.2%	41.0%	43.2%	52.4%	50.0%	45.8%
University careers service	40.0%	44.3%	43.3%	50.0%	44.8%	46.7%	45.1%
Family or friends	40.0%	40.9%	40.3%	40.9%	43.8%	43.3%	41.9%
Careers/recruitment fairs	17.8%	12.5%	14.2%	6.8%	9.5%	9.3%	11.6%
Professional careers service	4.4%	5.7%	5.2%	2.3%	4.8%	4.0%	4.6%
Industrial placement supervisors	8.9%	4.5%	6.0%	0.0%	1.0%	0.7%	3.2%
Research council	0.0%	2.3%	1.5%	2.3%	4.8%	4.0%	2.8%
Sample size	45	88	134	44	105	150	284

While it is not surprising that so high a proportion of respondents had received careers advice from their PhD supervisors, it is also important to note that only 50% had received "professional" advice from a careers service: in other words overall just 19% of all the respondents.

7.3 Careers advice received during current postdoctoral research contract

Table 39 presents information on whether or not respondents had received careers advice during their current postdoctoral research contract. Overall 45% of respondents reported that they had received careers advice. There was no significant difference between physicists and chemists although female chemists were slightly more likely to have received careers advice than male chemists.

Table 39: Whether or not respondents received any careers advice during current postdoctoral research contract, by department and gender.

Careers advice during the current postdoctoral research contract	Chemistry			Physics			Overall
	Female	Male	Overall	Female	Male	Overall	
Yes	50.8%	43.1%	45.7%	40.9%	46.5%	45.1%	45.4%
No	49.2%	56.9%	54.3%	59.1%	53.5%	54.9%	54.6%
Sample size	126	246	376	93	275	370	746

Table 40 shows the source(s) of careers advice. 47% of respondents who had received careers advice had done so from university careers services meaning that, overall, 21% of all respondents had received advice from university careers services. However, 56% of respondents reported that they had received advice from their manager/group leader and 48% from other academic staff.

Table 40: Respondents' source of career advice during current postdoctoral research contract, by department and gender (respondents were asked to indicate all that applied).

Source of careers advice	Chemistry			Physics			Overall
	Female	Male	Total	Female	Male	Total	
Your PI/group leader	53.1%	47.2%	50.0%	50.0%	64.1%	61.1%	55.5%
Other academic staff (including PDRs)	35.9%	46.2%	42.4%	52.6%	54.7%	54.5%	48.4%
University careers service	46.9%	51.9%	50.0%	52.6%	42.2%	44.3%	47.2%
Family or friends	29.7%	23.6%	26.2%	34.2%	22.7%	25.1%	25.7%
Your mentor	18.8%	24.5%	22.1%	21.1%	24.2%	23.4%	22.7%
Research council	3.1%	2.8%	2.9%	2.6%	2.3%	2.4%	2.7%
Professional careers service	1.6%	5.7%	4.1%	0.0%	1.6%	1.2%	2.7%
Sample size	64	106	172	38	128	167	339

There were some differences between chemists and physicists. Physicists were more likely to have received advice from their manager/group leader and other academic staff than chemists; chemists were more likely to have used the university careers service. There were also differences between men and women although the patterns varied between chemistry and physics.

7.4 Appraisal

Respondents were questioned about appraisal.
Table 41 presents data on respondents' knowledge of whether or not their institution had an appraisal system.

The data are interesting in that a significantly lower proportion of chemists than physicists ($p < 0.01$) were not sure whether there was an appraisal system, albeit not necessarily for postdoctoral researchers, in their university. Examination of data for individual institutions suggests that all those institutions in the survey with reasonable numbers of respondents (say five or more) did have one or more respondents that reported that there was an appraisal system. It may well be that appraisal systems in some institutions were not obligatory for postdoctoral researchers and therefore some respondents did not know if there is such a system.

Table 41: Respondents' knowledge of whether or not their university has an appraisal system in general, by department.

Respondents knowledge of whether university has an appraisal system	Chemistry	Physics	Overall
Believe there is an appraisal system	55.1%	72.7%	63.8%
Believe that there is not an appraisal system	10.1%	4.6%	7.4%
Do not know	34.8%	22.7%	28.8%
Sample size	376	370	746

The significantly greater proportion of physicists that were aware that their university had an appraisal system may well be due to work surrounding the implementation of the IOP's Juno Project, which includes appraisal of postdoctoral researchers as one of its requirements.

Respondents who replied that there was an appraisal system in their institution were questioned further about whether postdoctoral researchers were normally appraised (table 42).

Table 42: Respondents' knowledge of whether or not postdoctoral researchers are normally appraised department by department.

Respondents knowledge of whether or not PDRs are normally appraised	Chemistry	Physics	Overall
Believe PDRs are normally appraised	66.7%	83.6%	76.3%
Believe PDRs are not normally appraised	14.5%	5.6%	9.5%
Do not know if PDRs are normally appraised	18.8%	10.8%	14.3%
Sample size	207	269	476

Again, following the same pattern as for whether or not there was an appraisal system in their institutions, chemists were less sure than physicists whether or not postdoctoral researchers in their departments were appraised even though the respondents answering this question had already confirmed that there was an appraisal system, albeit not necessarily for postdoctoral researchers. Examining the data for individual departments suggested that there was a good deal of uncertainty among postdoctoral researchers as to whether or not they were appraised. Taking into account all postdoctoral researchers, including those who were not sure if there was an appraisal system at all, 16 physics departments and 14 chemistry departments had more than 75% of postdoctoral researchers reporting that there was an appraisal system for postdoctoral researchers.

73% of those respondents who reported that postdoctoral researchers were appraised said that appraisal took place once a year, 11% reported that appraisal took place every two years and another 11% that it took place twice a year.

44% of all respondents had been appraised at some point and this set of postdoctoral researchers were asked how many times they had been appraised. The results are shown in Table 43, cross-tabulated with the length of time spent undertaking postdoctoral research.

The data below should be treated with some caution because some respondents may have answered in respect to their current contract rather than in relation to the total time spent undertaking postdoctoral research. Nonetheless, the data do seem to suggest that although some respondents have been appraised regularly over the length of their contract(s), a number of others have only been appraised intermittently. Furthermore, data presented earlier in this

section suggest that the majority of postdoctoral researchers (56%) had not been appraised during their current contracts.

Table 43: Number of times respondents had been appraised and the total length of time spent undertaking postdoctoral research.

Number of times appraised	Total length of time spent undertaking postdoctoral research (years)						Total
	< 1	1-2	3-4	5-6	7-10	10+	
0				1			1
1	33	43	53	17	7	8	161
2	2	26	25	10	7	4	74
3		1	14	10	6	4	35
4	1	5	12	2	7	3	30
5		1	1	2	4	3	11
6			1			1	2
7			1				1
9						1	1
10				1		1	2
10+						2	2
Sample size	36	76	107	43	31	27	320

Data on who normally carries out appraisals is presented in Table 44. It is interesting to note that physicists were more likely than chemists to have their appraisals carried out by a member of staff other than their supervisor/PI. There are no obvious reasons why this might be except perhaps the group structure in physics is different to that in chemistry and that IOP has recommended that appraisal should not be carried out by a postdoctoral researcher's supervisor/PI.

Table 44: Who normally carries out respondents' appraisals, by department and gender.

Who carries out appraisals	Chemistry			Physics			Overall
	Female	Male	Overall	Female	Male	Overall	
PI/supervisor	83.3%	81.7%	82.4%	44.9%	71.1%	64.5%	71.3%
Another member of staff	16.7%	18.3%	17.6%	55.1%	28.9%	35.5%	28.7%
Sample size	42	82	125	49	152	203	328

It is also interesting to note that female physicists were less likely than male physicists to be appraised by their supervisor/PI. Clearly the reasons for this cannot be discerned but the relative lack of exposure to the group leader by females may affect their careers, as the group leader may be less familiar with their work and so be less likely to recommend them for permanent posts or further postdoctoral research contracts.

Respondents were asked whether they found the appraisal experience relevant and/or useful. The data in table 45 show that there was relatively little difference between chemistry and physics with around one-third of respondents feeling that appraisal was useful, one-third that it is somewhat useful and one-third that it was not useful. Female physicists were less likely than other groups to find the experience useful and relevant.

Table 45: Usefulness and relevance of appraisal, by department and gender.

Usefulness and relevance of appraisal	Chemistry			Physics			Overall
	Female	Male	Overall	Female	Male	Overall	
Useful/relevant	41.5%	35.4%	37.1%	22.4%	36.2%	33.5%	34.9%
Somewhat useful/relevant	29.3%	35.4%	33.1%	46.9%	29.6%	33.5%	33.3%
Not useful/relevant	29.3%	29.3%	29.8%	30.6%	34.2%	33.0%	31.8%
Sample size	41	82	124	49	152	203	327

Similar data are shown in Table 46 but broken down by who carries out the appraisal and gender. Respondents were more likely to find the appraisal experience useful and relevant if it was carried out by their supervisor/PI; thus the fact that female physicists were less likely to find the appraisal useful or relevant than other groups is probably because they were less likely to be appraised by their supervisor/PI.

Table 46: Usefulness and relevance of appraisal, by who normally carries out the appraisal and gender.

Usefulness and relevance of appraisal	PI/supervisor			Another member of staff			Overall
	Female	Male	Overall	Female	Male	Overall	
Useful/relevant	36.8%	37.7%	37.6%	21.2%	30.5%	28.0%	34.9%
Somewhat useful/relevant	38.6%	32.0%	33.3%	39.4%	30.5%	33.3%	33.3%
Not useful/relevant	24.6%	30.3%	29.1%	39.4%	39.0%	38.7%	31.8%
Sample size	57	175	234	33	59	93	327

Respondents were asked to explain why they find the process useful or not. Summaries of the responses are presented in table 47 and Table 48. The most frequently mentioned reasons for why postdoctoral researchers found their appraisal useful centred on having the opportunity to review and set goals/plan. Respondents also relished the opportunity to receive advice on their careers and to receive feedback.

The main reason why respondents did not find their appraisal useful was that it was merely a box-ticking exercise or a formality. Additionally, a number of respondents did not find the process useful or constructive, or found that their appraiser did not seem to take the process seriously. A small number of respondents commented that the appraisal seemed to be aimed at permanent (academic) staff rather than researchers on short-term contracts.

The information in both tables suggests that postdoctoral researchers need better information about the purpose of appraisal. The information also suggests that postdoctoral researchers did not feel that they had enough opportunities to raise or discuss issues in general, which in turn suggests that postdoctoral researchers need opportunities to raise issues within departments such as through postdoctoral forums or through direct representation on departmental committees.

Table 47: Reasons provided by respondents as to why their appraisal had been relevant/useful.

Reason provided	Frequency mentioned
Opportunity to set goals, assess project; Clear vision/overview of where you stand; Provides focus; Chance for review; Opportunity for long-term planning	64
Advice on career; Focus on future career plans; Chance to assess career progress; Chance to identify career/professional development (needs)	34
Chance to receive (critical) feedback	18
Other issues mentioned, but with low frequency: • Helped to identify strengths and weaknesses; personal development • Improves communication with PI/supervisor • Found out about resources available • Chance to see how the university determines success factors • Learned that projects are interesting to supervisors/that I am appreciated • Appraiser understood area of work • Enables focus to be maintained • Discussed requirement for more guidance • Encouraged me to apply for promotion and then a fellowship • Someone to listen to concerns	

Table 48: Reasons provided by respondent as to why their appraisal had not been relevant/useful.

Reason provided	Frequency mentioned
It was a box-ticking/form-filling exercise; It was a just a formality	33
Generally unnecessary; Makes no difference; Did not add anything; Did not address issues; Don't see the point	8
Not constructive; Not very helpful; Appraiser not suitable; No feedback given	8
Not taken seriously; Poorly carried out; Appraiser hadn't prepared	8
Didn't learn anything new; Nothing new covered	7
Carried out by someone who didn't know me/no understanding of field	5
Aimed at permanent members of staff; Too general; Not suitable for those on a short-term contract	5
Other issues mentioned, but with low frequency: • Already have regular meetings with PI/supervisor • No follow through • Appraiser not trained to give careers advice • Generally unsupportive • No impact on salary, responsibilities, etc • Boring • Concept (of appraisal) flawed and unnecessary • Didn't have any problems • Was told work was sufficient to keep paying grant • No real influence on postdoc • (PI) Only interested in publications • Can't address major issues of management, etc	

Those respondents who had responded that their institution did not have an appraisal scheme, that they did not know if it had one or that they had not been appraised were asked if they would like to be appraised. The results are shown in Table 49: around two-thirds of respondents said that they would like to be appraised. It is, however, interesting to note that one-third of that group of respondents do not want to be appraised.

Table 49: Whether respondents would like to be appraised, by department and gender.

Whether respondents would like to be appraised	Chemistry			Physics			Overall
	Female	Male	Overall	Female	Male	Overall	
Yes	69.5%	68.3%	68.2%	65.9%	65.3%	65.5%	67.1%
No	30.5%	31.7%	31.8%	34.1%	34.7%	34.5%	32.9%
Sample size	82	161	245	44	121	165	410

7.5 Development of transferable skills

Respondents were questioned about the development of their transferable skills (Table). Just under two-thirds of respondents reported that they were encouraged to undertake activities to develop their transferable skills. Relatively small proportions of all groups said that they were not encouraged.

Table 50: Whether or not respondents are encouraged to undertake activities to develop their transferable skills, by department and gender.

Encouraged to undertake activities to develop transferable skills	Chemistry			Physics			Overall
	Female	Male	Overall	Female	Male	Overall	
Encouraged	63.5%	62.2%	62.0%	72.0%	64.7%	66.5%	64.2%
Not encouraged	8.7%	5.7%	6.6%	1.1%	4.4%	3.5%	5.1%
Neither	27.8%	32.1%	31.4%	26.9%	30.9%	30.0%	30.7%
Sample size	126	246	376	93	275	370	746

Respondents who were neither encouraged nor discouraged were asked whether they believed that they possessed the majority of general skills that employers often look for (Table 51). The vast majority, around 80% of chemists and more than 90% of physicists, believed that they had the skills.

Table 51: Whether or not respondents believe they possess the majority of general skills that employers often look for, by department and gender.

Possess general skills employers look for	Chemistry			Physics			Overall
	Female	Male	Overall	Female	Male	Overall	
Possess general skills	85.7%	79.7%	80.5%	96.0%	92.9%	92.8%	86.5%
Do not possess general skills	2.9%	1.3%	1.7%	0.0%	2.4%	2.7%	2.2%
Don't know	11.4%	19.0%	17.8%	4.0%	4.7%	4.5%	11.4%
Sample size	35	79	118	25	85	111	229

All respondents, except those who were not encouraged to undertake development activities, were asked which activities from a list they had undertaken during postdoctoral research at their current institutions. The results are shown in Table 52.

Different patterns were discernable between chemists and physicists. Physicists were statistically significantly ($p < 0.01$) more likely than chemists to have attended external conferences (89.6% and 74.3%, respectively), to have done teaching (60.6% and 48.4%, respectively) and to have given external presentations (76.8% and 49.6%, respectively). They were statistically significantly less likely ($p < 0.01$) to have attended training courses (50.1% and 60.9%, respectively). The most noticeable gender differences were that male physicists were more likely than female physicists to report that they had attended training courses and had undertaken teaching. The latter difference is statistically significant ($p < 0.05$).

Table 52: Activities undertaken during current postdoctoral research contract.

Activities while undertaking postdoctoral research at current institution	Chemistry			Physics			Overall
	Female	Male	Overall	Female	Male	Overall	
Attend conferences	81.8%	70.7%	74.3%	88.8%	89.8%	89.6%	82.0%
Attend training courses	61.8%	60.7%	60.9%	42.7%	53.1%	50.1%	55.5%
Networking	51.8%	44.5%	47.2%	40.4%	47.6%	45.8%	46.5%
Teaching	48.2%	48.0%	48.4%	51.7%	63.8%	60.6%	54.5%
Give internal presentations	79.1%	81.2%	80.8%	83.1%	79.5%	80.3%	80.5%
Give external presentations	51.8%	47.6%	49.6%	70.8%	79.1%	76.8%	63.2%
Other	2.7%	2.2%	2.3%	2.2%	5.1%	4.3%	3.3%
Sample size	110	229	343	89	254	345	688

7.6 Mentoring schemes

Respondents were asked whether or not they were aware of a mentoring scheme at their institution. The results are shown in table 53. Approximately one-third of respondents reported that there was a scheme, and around two-thirds said that they were unaware. A relatively small proportion of respondents reported that there was not a scheme. There was little difference between the awareness of male and female chemists, but female physicists were more likely to report that there was a scheme than male physicists, who are in turn were more likely to say that they were unaware.

Unsurprisingly, there were a variety of responses from postdoctoral researchers at the same institution/department and this suggests that there was confusion among the majority of postdoctoral researchers about whether their departments had a mentoring scheme.

Respondents who responded that there was a mentoring scheme were asked whether they had participated in it, either as a mentor or a mentee: only around one in five of the 242 respondents who reported that there was a scheme had participated, which means that overall less than 5% of postdoctoral researchers have participated in a mentoring scheme in their current institution.

Table 53: Respondents' awareness of whether or not there is a mentoring scheme at their university.

Mentoring scheme at university	Chemistry			Physics			Grand total
	Female	Male	Total	Female	Male	Total	
There is a scheme	33.3%	36.2%	35.4%	37.6%	26.9%	29.5%	32.4%
There is not a scheme	4.0%	4.1%	4.0%	6.5%	4.7%	5.1%	4.6%
Not aware	62.7%	59.8%	60.6%	55.9%	68.4%	65.4%	63.0%
Sample size	126	246	376	93	275	370	746

7.7 Applying for fellowships

Respondents were asked whether or not they had ever applied for a fellowship and overall half had done so. Interestingly around 60% of female physicists had applied for a fellowship compared with 52% of male physicists. The results are shown in table 54.

Table 54: Whether or not respondents have applied for fellowships, by departments and gender.

Fellowship applications	Chemistry			Physics			Overall
	Female	Male	Overall	Female	Male	Overall	
Applied	47.6%	47.2%	47.3%	60.2%	51.6%	53.8%	50.5%
Not applied	52.4%	52.8%	52.7%	39.8%	48.4%	46.2%	49.5%
Sample size	126	246	376	93	275	370	746

Table 55 presents the data on fellowship applications broken down by length of time spent undertaking postdoctoral research. The relative proportions of women and men in chemistry and physics who have applied for fellowships vary so it is difficult to spot any particular pattern. However, it appears that for a given length of service, women were more likely to have applied for a fellowship than men and that women in their first year of undertaking postdoctoral research in physics were much more likely to have applied for a fellowship than men in a similar position.

Table 55: Whether or not respondents have applied for fellowships, by department, gender and length of time spent undertaking postdoctoral research.

Gender	Length of time as a postdoctoral researcher (years)						Overall
	< 1	1-2	3-4	5-6	7-10	10+	
	Chemistry						
Female	33.3%	38.2%	55.6%	68.8%	57.1%	66.7%	47.6%
Male	39.3%	45.5%	38.3%	48.5%	66.7%	66.7%	47.2%
Overall	37.4%	38.3%	51.4%	67.4%	61.5%	50.0%	47.3%
	Physics						
Female	45.5%	40.0%	56.0%	75.0%	80.0%	57.1%	60.2%
Male	26.8%	50.0%	36.2%	60.0%	75.0%	59.4%	51.6%
Overall	32.8%	42.2%	63.5%	75.9%	60.0%	48.0%	53.8%

Data in Table 56 show whether or not respondents were encouraged to apply for fellowships. Slightly more than half of all respondents had been encouraged, with a higher proportion of female than male physicists having been encouraged.

Table 56: Whether or not respondents were encouraged to apply for fellowships, by department and gender.

Encouraged to make fellowship applications	Chemistry			Physics			Overall
	Female	Male	Overall	Female	Male	Overall	
Encouraged	56.0%	52.3%	53.8%	62.4%	53.5%	55.7%	54.7%
Not encouraged	44.0%	47.7%	46.2%	37.6%	46.5%	44.3%	45.3%
Sample size	125	241	370	93	273	368	738

As shown in table 57, 86% of respondents had been encouraged to apply for fellowships by their PI and 37% by other academic staff, 24% by other postdoctoral researchers and 15% by the head of department. Physicists reported that they were statistically significantly more likely to be

encouraged by other academic staff, other postdoctoral researchers and the head of department than chemists ($p < 0.05$).

Table 57: The source of respondents' encouragement to apply for fellowships, by department and gender (respondents were asked to indicate all that applied).

Source of encouragement	Chemistry			Physics			Overall
	Female	Male	Overall	Female	Male	Overall	
My PI	82.9%	85.7%	84.9%	89.7%	85.6%	86.8%	85.9%
Head of department	8.6%	11.1%	10.6%	27.6%	17.1%	20.0%	15.3%
Other academic staff	30.0%	32.5%	31.7%	31.0%	47.3%	42.9%	37.4%
Other postdoctoral researchers	15.7%	23.8%	21.1%	29.3%	26.0%	27.3%	24.3%
Sample size	70	126	199	58	146	205	404

There were few gender differences for chemists, but more for physicists. Female physicists were more likely to be encouraged by the head of department, and statistically significantly less so ($p < 0.01$) by other academic staff. Perhaps female physicists are more inclined to receive encouragement from more formalised routes; it is possible that this is linked to the isolation reported earlier when considering the "downsides" of undertaking postdoctoral research.

7.8 Summary

- 88% of respondents rate their awareness of career options within academia as adequate or better. A higher proportion of physicists than chemists rate their awareness as good or very good (59% and 49%, respectively) but the differences between chemists and physicists are not significant.
- 57% of respondents rate their awareness of career opportunities outside academia as adequate or better than for their awareness of opportunities within academia. 36% of chemists and 51% of physicists described their knowledge as poor or very poor. Those on their first postdoctoral research rated their awareness higher than those on subsequent postdoctoral research.
- 38% of researchers had taken careers advice before undertaking their first contract and a slightly higher proportion of respondents had received careers advice during their current postdoctoral contract (45%).
- There was a good deal of confusion among respondents as to whether there was an appraisal system in their department: in some institutions well over 90% of respondents said that there was an appraisal system, which suggests that some institutions are doing a good job in communicating information about appraisal to postdoctoral researchers.
- 56% of respondents had never been appraised during their postdoctoral research careers. 67% of respondents who had not been appraised said that they would like to be.
- Physicists are more likely than chemists to have their appraisals carried out by a member of staff other than their supervisor/PI.
- Around one-third of respondents feel that appraisal is useful, one-third that it is somewhat useful and one-third that it is not useful: there is relatively little difference between chemistry and physics. Female physicists were less likely than other groups to find the experience useful and relevant.

- The most frequently mentioned reasons for why postdoctoral researchers found their appraisal useful centred on having the opportunity to review and set goals/plan. Respondents also relished the opportunity to receive advice on their careers and to get feedback. The main reason for why respondents did not find their appraisal useful was that it was merely a box-ticking exercise or a formality.
- 64% of respondents reported that they were encouraged to undertake activities to develop their transferable skills and physicists were more likely than chemists to undertake activities that may be seen to be supporting academic careers (external presentations, teaching, attending conferences, etc).
- There is confusion among the majority of postdoctoral researchers in the majority of departments about whether their departments have a mentoring scheme.
- Less than 5% of PDRs had participated in a mentoring scheme in their current HEI.
- Half the respondents had ever applied for a fellowship. Around 60% of female physicists had applied for a fellowship compared to 52% of male physicists.

8. Culture of departments

8.1 Relationship with supervisor

The research on PhD chemists demonstrated that the relationship with a supervisor was a very important factor defining the quality of the overall PhD experience. The postdoctoral researcher respondents were questioned about the relationship with their PI/group leader.

The data in Table 58 show that around 47% of respondents described their relationship with their supervisors as excellent and another 36% described their relationship as good. Only 5% of respondents described their relationship as poor or very poor. There was no significant difference between the responses of physicists and chemists, or between women and men.

Table 58: Relationship with supervisors, by gender and department of respondents.

Relationship with supervisor	Chemistry			Physics			Overall
	Female	Male	Overall	Female	Male	Overall	
Excellent	48.7%	48.0%	48.5%	42.7%	47.2%	46.0%	47.2%
Good	31.1%	36.5%	34.6%	39.3%	36.1%	37.0%	35.8%
Fair-average	16.0%	12.3%	13.4%	11.2%	11.2%	11.1%	12.3%
Poor	2.5%	1.2%	1.6%	5.6%	3.3%	3.9%	2.8%
Very poor	1.7%	2.0%	1.9%	1.1%	2.2%	1.9%	1.9%
Sample size	119	244	367	89	269	359	726

Although not significant, female physicists are less likely than male physicists to rate the relationship with their PI/group leader as excellent, which mirrors the STFC study on PhD students.

Respondents were asked to select from a list ways that their relationship with their supervisor could be improved: the results are shown in Table 59. 28% of respondents indicated that their relationship with their supervisor could not be enhanced, but women were less likely than men to select this option. This means that more than 70% of respondents believe that the relationship with their PI/group leader could be enhanced to some degree.

Table 59: Ways in which relationship with supervisor could be enhanced (select all that applied).

How relationship with supervisor can be enhanced	Chemistry			Physics			Overall
	Female	Male	Total	Female	Male	Total	
More general advice and mentoring	38.7%	33.6%	35.4%	40.4%	35.3%	36.8%	36.1%
More research support	35.3%	26.6%	29.4%	38.2%	29.7%	31.8%	30.6%
More careers advice	29.4%	32.0%	30.8%	36.0%	27.1%	29.2%	30.0%
Could not be enhanced	20.2%	29.5%	26.7%	24.7%	30.1%	28.7%	27.7%
Less general advice/more independence	3.4%	9.4%	7.6%	6.7%	5.2%	5.6%	6.6%
Other ways	5.9%	5.7%	5.7%	4.5%	7.1%	6.4%	6.1%
Sample size	119	244	367	89	269	359	726

8.2 Induction

Respondents were questioned about whether or not they received an induction when starting in their current department as a postdoctoral researcher. Overall only 50% of postdoctoral researchers reported having had a departmental induction; more detailed results are shown in table 60.

Table 60: Whether respondents received a departmental induction when joining their current department as a postdoctoral researcher, by department, gender and whether they are undertaking postdoctoral research in the same group that they did their PhD in (N = 744).

Whether respondents received a departmental induction	Chemistry			Physics			Overall
	Female	Male	Overall	Female	Male	Overall	
Same group as PhD							
Departmental induction	10.0%	56.8%	42.4%	23.3%	44.6%	39.5%	40.6%
No departmental induction	90.0%	43.2%	57.6%	76.7%	55.4%	60.5%	59.4%
Sample size	20	44	66	30	83	114	180
Different group as PhD							
Departmental induction	54.3%	60.7%	58.4%	41.3%	49.5%	47.3%	53.4%
No departmental induction	45.7%	39.3%	41.6%	58.7%	50.5%	52.7%	46.6%
Sample size	105	201	308	63	192	256	564

Around 41% of those staying in the same group reported that they had received a departmental induction and around 53% of those moving to a different group reported likewise. There were statistically significant differences ($p < 0.05$) in the proportions of female and male chemists and physicists that reported having a departmental induction overall. Although the numbers involved were too small to measure statistical significance, it is notable that much smaller proportions of women than men reported having had departmental inductions when starting as a postdoctoral researcher in the same group as they did their PhD. It is possible that men and women have differing expectations as to what induction entails and consequently answer the question differently (e.g. men may be more likely to report something like a safety talk as an induction). Nonetheless the difference is worthy of further investigation and needs to be highlighted to departments.

Respondents who had received an induction were asked whether it was useful and informative. The results are shown in Table 61.

Table 61: Whether or not respondents found the induction informative and useful, by department and gender.

Induction useful	Chemistry			Physics			Overall
	Female	Male	Overall	Female	Male	Overall	
Useful	64.4%	73.6%	70.8%	66.7%	59.1%	60.2%	66.1%
Not useful	35.6%	26.4%	29.2%	33.3%	40.9%	39.8%	33.9%
Sample size	59	148	209	33	132	166	375

Around two-thirds of respondents found the induction useful with a statistically significantly ($p < 0.05$) higher proportion of chemists than physicists reporting that to be the case. Gender patterns were different between chemistry and physics. Male chemists reported the greatest satisfaction and male physicists the least.

Of those who were doing their postdoctoral research in the same group as their PhD, around 53% reported that the induction was useful. The majority of the 25 reasons given as to why the induction was not useful was that the respondents had been in the department for some time and that therefore the information was redundant. It is clear that departments and institutions need to ensure that induction courses are relevant to all staff, and perhaps courses can be designed so that those who have already spent time in the department, for example as a PhD student, can join for only part of the course when procedures and issues relevant to their new role as a postdoctoral researcher are discussed.

8.3 Respondents' feelings about their status

Respondents were questioned about whether they feel more like a staff member, a student or neither. As shown in table 62, overall 51% of respondents reported feeling more like staff members than students. However, there were statistically significant differences between chemists and physicists ($p < 0.01$). 59% of physicists reported feeling more like staff than students and only 11% reported feeling more like students than staff. In contrast, 43% of chemists reported feeling more like staff than students and 17% said that they felt more like students than staff. Although there were relatively small differences between male and female physicists, there were larger, statistically significant ($p < 0.05$), differences between male and female chemists: 38% of female chemists and 47% of male chemists reported feeling more like staff than students, and 23% of female chemists and 15% of male chemists reported feeling more like students than staff.

Among the reasons listed by respondents for feeling more like a staff member than a student were having responsibility, having supervision duties, doing teaching, age and experience, and independence. Reasons why respondents felt more like a student than a staff member included being in the same group as they did their PhD, feeling that there was little separation between PhD students and postdoctoral researchers, and that there was separation between permanent academic staff and postdoctoral researchers.

Table 62: Respondents' views as to whether they feel more like staff members or students, by department and gender.

How respondents feel	Chemistry			Physics			Overall
	Female	Male	Overall	Female	Male	Overall	
More like a staff member than a student	38.1%	46.7%	43.4%	55.9%	59.6%	58.6%	50.9%
More like a student than a staff member	23.0%	15.0%	17.6%	10.8%	10.5%	10.5%	14.1%
Neither like a member of staff nor a student	38.9%	38.2%	39.1%	33.3%	29.8%	30.8%	35.0%
Sample size	126	246	376	93	275	370	746

It is not possible to discern why chemistry and physics appear to be different. All that can be surmised is that physics departments overall may allow postdoctoral researchers to be independent, have responsibility, etc, while chemistry departments do not, and furthermore, physics departments may make more of a distinction between postdoctoral researchers and PhD students than chemistry departments.

8.4 Departmental postdoctoral researcher representation

Respondents were asked whether or not there was postdoctoral researcher representation in departmental/important meetings. As table 63 illustrates, 47% of respondents did not know whether or not there was postdoctoral researcher representation at departmental meetings, 38% of respondents reported that there was postdoctoral researcher representation and 15% said that there was none.

As with postdoctoral researchers' knowledge of whether or not there were mentoring schemes at their institutions, postdoctoral researchers' knowledge of representation at departmental/important meetings did seem to vary. There were postdoctoral researchers who believed that there was representation in 24 (out of 29) chemistry departments and 26 (out of 30) physics departments, but there were postdoctoral researchers who either believed that there was no representation or did not know in 27 chemistry departments and 28 physics departments. From these data it is reasonable to conclude that the majority of departments in the survey do have some form of postdoctoral researcher representation, but that the majority of postdoctoral researchers were unaware of this.

Table 63: Respondents' knowledge of whether there is postdoctoral researcher representation at department/important meetings, by department and gender.

Is there postdoctoral researcher representation?	Chemistry			Physics			Overall
	Female	Male	Overall	Female	Male	Overall	
Yes	35.7%	37.8%	37.0%	35.5%	41.1%	39.7%	38.3%
No	19.0%	15.9%	16.8%	17.2%	11.3%	12.7%	14.7%
Don't know	45.2%	46.3%	46.3%	47.3%	47.6%	47.6%	46.9%
Sample size	126	246	376	93	275	370	746

Respondents were asked how the outcomes of any meetings were relayed back to everyone. Responses from within the same department varied with, for example, respondents stating that e-mail was used, that minutes were available on request and that the outcomes were not relayed back. The most common method reported was e-mail.

8.5 How postdoctoral researchers are regarded

Respondents were asked whether they thought that postdoctoral researchers were well regarded in their department. As shown in table 64 it is concerning that only four out of 10 postdoctoral researchers believed that they are well regarded in their departments. It is also interesting that chemists and physicists felt differently, although the results are in line with earlier issues covered, such as whether postdoctoral researchers felt more like staff or students. It is concerning that only four out of 10 postdoctoral researchers believed that they are well regarded in their departments. It is also interesting that chemists and physicists felt differently, although the results are in line with earlier issues covered, such as whether postdoctoral researchers felt more like staff or students.

Table 64 Around 40% of postdoctoral researchers felt that postdoctoral researchers were well regarded, 36% had mixed opinions on the issue and 11% felt that postdoctoral researchers were not well regarded. There were statistically significant ($p < 0.01$) differences between the opinions of chemists and physicists: 34% of chemists and 45% of physicists believed that postdoctoral researchers were well regarded in their departments. Also, while there was very little difference in the views of male and female physicists, there were larger, but not significant, differences in the opinions of male and female chemists: 29% of female and 37% of male chemists felt that postdoctoral researchers were well regarded in their departments.

It is concerning that only four out of 10 postdoctoral researchers believed that they are well regarded in their departments. It is also interesting that chemists and physicists felt differently, although the results are in line with earlier issues covered, such as whether postdoctoral researchers felt more like staff or students.

Table 64: Respondents' opinions as to the regard with which postdoctoral researchers are held, by department and gender.

Whether postdoctoral researchers are respected and well regarded	Chemistry			Physics			Overall
	Female	Male	Overall	Female	Male	Overall	
Respected	29.4%	37.0%	34.0%	45.2%	45.1%	45.1%	39.5%
Mixed experience	40.5%	37.8%	38.8%	33.3%	33.8%	33.8%	36.3%
Not respected	16.7%	12.6%	14.1%	7.5%	8.0%	7.8%	11.0%
Don't know	13.5%	12.6%	13.0%	14.0%	13.1%	13.2%	13.1%
Sample size	126	246	376	93	275	370	746

Respondents were asked to explain their responses. Many did and many who reported that they were not well regarded suggested that they were seen as "expendable" in the sense that because they are temporary they are to be made the most of while they are employed. Others wrote about feeling that they were "dumped on" by academics and were regarded as "lowly". Some postdoctoral researchers wrote about being regarded as "failed academics".

In contrast, respondents who felt that postdoctoral researchers were well regarded said that they were treated well by all staff, that they felt that everyone was equal and that they felt that, by being given teaching and supervision, it was demonstrated to them that they were trusted.

A number of positive comments were made about departments in which postdoctoral researchers felt that they were consulted and that their opinions were valuable. Other comments from those who believed that postdoctoral researchers were well regarded were about their relationships with their respective supervisors. Supervisors who give their researchers some independence, treated their ideas seriously and involved them in research planning were appreciated. Other comments, especially from those who had mixed opinions as to whether or not postdoctoral researchers were well regarded, made it clear that although researchers' treatment by their principle investigators was important, how they were regarded by others in the department was also important, as were issues such as feeling that postdoctoral researchers' views were important and that they had a voice.

8.6 Career breaks

Respondents were asked if they knew what their department's arrangements were for handling career breaks. The results are shown in Table 65

Table . There were no significant differences between chemists' and physicists' knowledge or between men's and women's.

A total of 41 respondents, 18 chemists and 23 physicists, reported that they had had a career break in the UK. The majority of career breaks were for maternity or paternity leave, although a few respondents had taken breaks for illness or surgery, or had experienced periods of unemployment. The majority of respondents reported a smooth return to work, some had returned part-time, others had gone straight back to full-time work. On the whole, respondents' research was put on hold while they were away; in some cases responsibility was shared with other members of their groups.

Table 65: Postdoctoral researchers' knowledge of their department's arrangements for career breaks, by department and gender.

Whether respondents know of the arrangements for career breaks	Chemistry			Physics			Overall
	Female	Male	Overall	Female	Male	Overall	
Know of arrangements	32.5%	27.6%	29.0%	36.6%	29.8%	31.6%	30.3%
Do not know of arrangements	42.1%	39.4%	40.2%	39.8%	40.4%	40.3%	40.2%
Don't know	25.4%	32.9%	30.9%	23.7%	29.8%	28.1%	29.5%
Sample size	126	246	376	93	275	370	746

8.7 Flexible working

Respondents were asked whether their departments allowed flexible working to, for example, pick up children. As shown in Table 66, 80% of respondents reported that there was flexible working, however, there was a significant difference between the distributions for chemists and physicists ($p < 0.01$): 89% of physicists reported that there was flexible working, but only 71% of chemists reported the same. It should be noted, however, that 27% of chemists did not know if flexible working was allowed, compared with just 10% of physicists. There were no significant differences between men's and women's knowledge of flexible working.

Table 66: Postdoctoral researchers' knowledge of whether their department allows flexible working, by department and gender.

Whether respondents know if their department allows flexible working	Chemistry			Physics			Overall
	Female	Male	Overall	Female	Male	Overall	
Allows flexible working	69.0%	71.5%	70.5%	88.2%	89.5%	89.2%	79.8%
Does not allow flexible working	3.2%	2.8%	2.9%	0.0%	1.5%	1.1%	2.0%
Don't know	27.8%	25.6%	26.6%	11.8%	9.1%	9.7%	18.2%
Sample size	126	246	376	93	275	370	746

The key question is why a smaller proportion of chemists than physicists said that their departments supported flexible working. As the data show, it is not the case that the chemists believed that their departments do not allow flexible working; it is rather that they do not know. The lack of knowledge does fit with the overall impression that chemists were less content than physicists.

Table 67 shows data on whether respondents felt that they were able to work flexibly when they needed to. Overall 90% of respondents felt that they were able to, although once again there was a smaller proportion of chemists than physicists reporting this. It is interesting that higher proportions of postdoctoral researchers felt that they had the flexibility they needed than believed that their departments allowed them flexibility. This may be related to the fact that many departments have informal flexible working arrangements and consequently individuals were unsure how much flexibility they would have if they were to establish a formal arrangement. In addition, flexible working arrangements may depend on individual PIs.

Table 67: Postdoctoral researchers' belief as to whether they are able to work flexibly when they need to, by department and gender.

Whether respondents are able to work flexibly if they need to	Chemistry			Physics			Overall
	Female	Male	Overall	Female	Male	Overall	
Able to work flexibly	83.3%	86.2%	85.1%	97.8%	92.7%	94.1%	89.5%
Not able to work flexible	9.5%	9.3%	9.3%	2.2%	4.0%	3.5%	6.4%
Don't know	7.1%	4.5%	5.6%	0.0%	3.3%	2.4%	4.0%
Sample size	126	246	376	93	275	370	746

8.8 Supervision of PhD students

Respondents were questioned about the expectations placed on them in respect of supervising PhD students and the results are shown in table 68.

56% of respondents were expected to supervise PhD students and another 25% did so even though they were not expected to. However, there were significant differences between the responses for chemists and physicists ($p < 0.01$). 65% of chemists were expected to supervise PhD students compared with 47% of physicists. Men were more likely than women to supervise students even when not expected to, and women were more likely than men not to be expected to supervise PhD students.

Table 68: Postdoctoral researchers' expectation to help supervise PhD students, by department and gender.

Expected to help supervise PhD students	Chemistry			Physics			Overall
	Female	Male	Overall	Female	Male	Overall	
Are expected to	65.1%	63.8%	64.6%	45.2%	48.0%	47.3%	56.0%
Not expected to, but do	19.8%	23.6%	22.1%	23.7%	28.7%	27.3%	24.7%
Are not expected to	11.9%	7.3%	8.8%	26.9%	18.9%	21.1%	14.9%
Don't know	3.2%	5.3%	4.5%	4.3%	4.4%	4.3%	4.4%
Sample size	126	246	376	93	275	370	746

Table 69 shows data about whether the responsibility for supervising PhD students was formalised and recognised. Only 12% of respondents stated that the responsibility for supervising PhD students was formalised and recognised. 63% of respondents said that the responsibility was not recognised and 24% did not know whether or not it was.

Closer examination of the responses shows that the respondents who said that the supervision of PhD students was recognised and formalised were spread over a number of institutions, which means that the true picture is confused: the majority of respondents in the majority of institutions either stated that PhD supervision was not recognised or they did not know. Perhaps those respondents who stated that the responsibility was recognised had had a formal discussion with their PI to discuss their role in supervising students, rather than there actually being a formal system in the department. It may also be the case that the requirement to supervise PhD students is included in the role description, or was included in the role's further particulars.

Table 69: Respondents reporting whether or not the responsibility of supervising PhD students is recognised and formalised, by department and gender.

Responsibility for supervising PhD students formalised and recognised	Chemistry			Physics			Overall
	Female	Male	Overall	Female	Male	Overall	
Formalised	12.0%	13.9%	13.4%	9.8%	12.1%	11.4%	12.4%
Not formalised	64.0%	62.3%	63.0%	57.6%	65.9%	63.8%	63.4%
Don't know	24.0%	23.8%	23.6%	32.6%	22.0%	24.8%	24.2%
Sample size	125	244	373	92	273	367	740

Of those respondents who stated that the responsibility for supervising PhD students was not recognised or that they did not know, 65% said that they would like the responsibility to be recognised and formalised (Table 70). Chemists were more likely than physicists to be in favour, perhaps in line with the fact that a higher proportion were expected to supervise PhD students, and men were more likely than women to say that the responsibility should not be recognised, although women were more likely to respond that they did not know.

Table 70: Respondents' views on whether they would like to see the responsibility for supervising PhD students recognised and formalised, by department and gender*.

Whether respondents would like the responsibility for supervising PhD students to be formalised and recognised	Chemistry			Physics			Overall
	Female	Male	Overall	Female	Male	Overall	
Like responsibility formalised	67.3%	69.0%	68.4%	59.0%	62.9%	61.8%	65.1%
Not like responsibility formalised	4.5%	15.2%	11.8%	8.4%	17.1%	15.1%	13.4%
Don't know	28.2%	15.7%	19.8%	32.5%	20.0%	23.1%	21.5%
Sample size	110	210	323	83	240	325	648

* *Only those respondents who said that PhD supervision was not formalised or recognised, or did not know, were questioned.*

Only 6% of respondents had had any training to supervise PhD students (table 71); more than 80% of those that had received training found it valuable.

Those that had received training were spread over a number of institutions suggesting that where training was available it was only taken up by a minority of postdoctoral researchers.

Table 71: Whether respondents have received training to supervise PhD students, by department and gender.

Training to supervise PhD students	Chemistry			Physics			Overall
	Female	Male	Overall	Female	Male	Overall	
Training received	3.2%	4.1%	3.8%	8.7%	6.9%	7.6%	5.7%
No training received	96.8%	95.9%	96.2%	91.3%	93.1%	92.4%	94.3%
Sample size	124	243	371	92	275	369	740

8.9 Opportunities to teach

Respondents were questioned on whether or not they had the opportunity to teach if they wished to and the results are presented in Table 72. 73% of respondents reported that they had the opportunity to teach. There was a significant difference between the distributions of responses for chemists and physicists ($p < 0.01$), with 82% of physicists and 63% of chemists reporting that they had had the opportunity to teach. A larger proportion of chemists than physicists stated that they did not know if there was the opportunity to teach: 23% of chemists and 10% of physicists.

Table 72: Whether respondents are given the opportunity to teach, by department and gender.

Opportunity to teach	Chemistry			Physics			Overall
	Female	Male	Overall	Female	Male	Overall	
Given opportunity	65.1%	62.2%	63.3%	78.5%	83.6%	82.4%	72.8%
Not given	14.3%	14.2%	14.1%	11.8%	6.9%	8.1%	11.1%
Don't know	20.6%	23.6%	22.6%	9.7%	9.5%	9.5%	16.1%
Sample size	126	246	376	93	275	370	746

Those respondents who indicated that they had the opportunity to teach were asked if they had actually done any teaching; around 70% of respondents had done some teaching as shown in table 73 with few differences between chemists and physicists or between men and women. Considering the whole population of respondents, 43% of chemists and 58% of physicists in the sample had done some teaching, which is a significant difference ($p < 0.01$).

Table 73: Whether or not respondents have done any teaching, by department and gender.

Whether respondents have done any teaching	Chemistry			Physics			Overall
	Female	Male	Overall	Female	Male	Overall	
Done teaching	68.3%	66.0%	67.2%	64.4%	72.2%	70.2%	68.9%
Not done teaching	31.7%	34.0%	32.8%	35.6%	27.8%	29.8%	31.1%
Sample size	82	153	238	73	230	305	543

Table 74 sets out the types of teaching activity undertaken by respondents. Perhaps unsurprisingly 70% of respondents had taken on small-group tutorial work and 57% had undertaken practical class supervision. 31% of respondents who had undertaken teaching reported that they had undertaken some lecturing, but a significantly smaller proportion of chemists than physicists had had this opportunity ($p < 0.01$). Furthermore a notably smaller proportion of female chemists had experience of lecturing than other groups, although the numbers were too small to test statistical significance.

Table 74: Teaching activities undertaken by respondents, by department and gender.

Teaching activities	Chemistry			Physics			Overall
	Female	Male	Overall	Female	Male	Overall	
Small-group tutorials	73.2%	75.2%	75.0%	68.1%	65.1%	65.9%	69.8%
Practical class supervision	46.4%	57.4%	53.1%	57.4%	59.6%	59.3%	56.7%
Lecturing	16.1%	23.8%	21.9%	36.2%	38.6%	37.9%	31.0%
Other	12.5%	6.9%	8.8%	4.3%	7.2%	6.5%	7.5%
Sample size	56	101	160	47	166	214	374

As Table 75 shows, 34% of respondents who had undertaken teaching had received some training: there were no notable differences between chemists and physicists, or between women and men. Overall around 17% of all respondents had received some training in teaching.

Table 75: Whether respondents who have done teaching have received any training, by department and gender.

Training to teach	Chemistry			Physics			Overall
	Female	Male	Overall	Female	Male	Overall	
Training received	32.1%	26.7%	29.4%	34.0%	37.0%	36.6%	33.5%
No training received	67.9%	73.3%	70.6%	66.0%	63.0%	63.4%	66.5%
Sample size	56	101	160	47	165	213	373

8.10 Summary

- There was no significant difference between physicists or chemists or between males or females in how they described their relationship with their supervisors, with 83% of respondents reporting that it was excellent or good.
- 50% of all PDRs reported having an induction when joining their current department and, of these, 66% found it useful, although there were differences between those who stayed in the same group as their PhD and those who moved groups.
- 51% of all PDRs reported feeling more like staff members than students, although physicists (59%) were significantly more likely to report this than chemists (43%), and female chemists (38%) were the least likely to report that they felt more like staff members than students.
- 40% of PDRs felt that they were respected and well regarded in their department and there was a significant difference between physicists (45%) and chemists (34%), with physicists feeling more respected and well regarded within their departments. Female chemists (29%) were the group least likely to feel respected and well regarded in their departments.
- 80% of respondents reported that there was flexible working in their department, however, there was a significant difference between the distributions for chemists and physicists: 89% of physicists reported that there was flexible working, but only 71% of chemists.
- 90% of respondents felt that they were able to work flexibly when they needed to.
- 56% of respondents said that they were expected to supervise students, and a further 25% reported that they did so even though they were not expected to. Of those respondents who stated that the responsibility for supervising PhD students was not recognised, or that they did not know whether or not it was, 65% said that they would like the responsibility recognised and formalised. Only 6% of respondents had had any training to supervise PhD students.
- 82% of researchers in physics and 63% of chemists reported having the opportunity to teach. 34% of respondents who had undertaken teaching had received some training: there were no notable differences between chemists and physicists, or between women and men. Overall around 17% of all respondents had received some training in teaching.

9. Conclusions and recommendations

This study was undertaken to examine the experiences and career intentions of chemistry and physics postdoctoral researchers, to find out whether there were differences between chemists and physicists and between men and women.

Previous studies have found that the majority of students reported choosing to study science because they were interested in the subject: 70% of chemistry undergraduates reported that they were driven by an interest in chemistry[16] and a similar proportion of PhD students reported likewise.[17] Physicists also reported similar motivations at undergraduate level[18] and at PhD level.[19] Data in this study have now shown that the majority of postdoctoral researchers, too, were driven by interest and enthusiasm for science, although a higher proportion of physicists fell into this category compared with chemists.

Despite this, and one of the main reasons for carrying out this survey, was the study by the RSC[20], which found that a significant proportion of female chemists, and a smaller proportion of male chemists, disliked the process of carrying out scientific research and this drove many of them to decide not to pursue research careers, although they still wished to have careers that utilise their science. In other words, their interest in science remained, but their dislike of the culture that surrounded scientific research meant that they decided to leave it. The RSC research on PhD chemists also found that a number of those who wanted research careers did not want academic careers; women in particular did not see many role models with whom they could identify and felt that the long-hours culture was incompatible with raising a family.

So a useful framework to interpret the findings of this study and the earlier work on PhD students is the interplay of three competing factors: a passion for science; a like or dislike of the research/academic culture; and the need to have a career with some stability and security.

There is another contextual issue concerning the difference between chemists and physicists, which is that the populations of men and women are continually filtered as they progress along the educational pipeline and that a greater proportion of potential female physicists have been filtered from the physics population before reaching university, compared with potential female chemists from the chemistry population. The female physics population may well therefore be more robust than the female chemistry population as it progresses through university and on to undertake work as a postdoctoral researcher. That is to say, a higher proportion of female physicists progress to the next level in the academic pipeline than female chemists.

Nevertheless, the majority of both the physics and chemistry populations were pleased with their decision to carry out postdoctoral research and most of these individuals indicated that this was because they enjoyed advancing knowledge, the challenge of research or the academic environment itself.

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16 An Investigation of the Factors Affecting the Post-University Employment of Chemical Science Graduates in the UK, Royal Society of Chemistry, London, 2009 (http://www.rsc.org/images/IERFullReport_tcm18-159366.pdf)

17 Change of Heart - Career intentions and the chemistry PhD, Royal Society of Chemistry, 2008, London (www.rsc.org/images/ChangeofHeart_tcm18-139211.pdf)

18 Physics – building a flourishing future. Report of the Inquiry into Undergraduate Physics, Institute of Physics, London, 2001

19 http://www.stfc.ac.uk/Funding%20and%20Grants/674.aspx

20 The Chemistry PhD: the impact on women's retention, Royal Society of Chemistry, London, 2009 (www.rsc.org/ScienceAndTechnology/Policy/Documents/WomenRetention.asp)

The most commonly selected upside, by both physicists and chemists, men and women, was "Exciting and interesting projects", which accorded with the interest in science being the main driver for postdoctoral researchers.

By far the most commonly selected "downside" was "No job security": overall 78% of respondents selected this, although physicists were significantly more likely to select this than chemists. The biggest difference between the genders was that female physicists were significantly more likely to select "Working long and irregular hours" than male physicists. Female physicists were also significantly more likely to select "Isolation" than male physicists and female chemists. This may reflect the smaller proportion of women in physics compared with women in chemistry.

Career ambitions and advice

About one-fifth of respondents reported that they had fully planned their next career step and around three-fifths said that they had planned this a little. Only a small minority of respondents had already accepted a job offer, the majority of whom had accepted another role in a university, generally as a postdoctoral researcher.

There was no significant difference between chemists and physicists in terms of the effect that undertaking postdoctoral research had had on their intentions to stay in research science. There was, however, a significant difference between the responses of male and female chemists, with almost half of female chemists compared to one-third of male chemists reporting that they were now less intent on a research science career. This is in line with findings from the survey of chemistry PhD students. In contrast, the responses for male and female physicists were similar.

However, this difference only arose for those chemists on their second or subsequent postdoctoral research contracts. The responses of women and men on their first postdoctoral research contract were similar, but the responses for those on their second or later postdoctoral research contracts presented the significant difference: double the number of female chemists on their second or later contracts reported that they were now less inclined towards pursuing careers as research scientists, compared with those on their first. Furthermore, in contrast to the chemists, there was relatively little difference in the distributions of responses of female and male physicists on their second or subsequent contracts, but there were differences in the responses of those on their first contract, with higher numbers of female physicists stating that they were more intent on pursuing a research a career.

It might have been expected that those less inclined towards research careers would have left during, or at the end, of their first contract, leaving behind a higher proportion of those who enjoyed working in universities as postdoctoral researchers and were committed to long-term research careers. However, the data seem to indicate that respondents' ambitions for careers as research scientists wane after their first contracts, and this is more noticeable for chemists, and women chemists in particular.

The data therefore raises questions about the effect of undertaking postdoctoral research on women chemists' ambitions to remain as research scientists. There may be many reasons why working as a postdoctoral researcher for more than one contract seemed to make women chemists in particular become less inclined to want to follow a research career. It could be that the reality of the difficulty of gaining a permanent academic post becomes more apparent, the cultural issues identified in the PhD study may come to dominate, or that, because many

postdoctoral researchers reported that they were relatively uninformed about industrial research careers, the alternative is to give up research completely.

It is particularly difficult to know why female physicists were not affected to the same extent as female chemists; it may be related to the significantly smaller proportion of female physicists, or that the smaller core of female physicists were more committed to careers as research physicists than their chemistry counterparts.

Despite this, almost two-thirds of all groups of respondents then selected "Academic on a permanent contract" as what they were most likely to be doing in 6-10 years' time. This was followed by "Scientist: Industry or commerce" and "Continuing postdoctoral research". Again, there were interesting differences found between physicists and chemists. In both physics and chemistry, among those on their first contracts, there were similar proportions of both females and males who selected "Academic on a permanent contract".

However, in chemistry, for those on second and subsequent contracts, the proportion of females who selected "Academic on a permanent contract" fell dramatically, but the proportion of males stayed more or less the same. Correspondingly, the proportion of females who selected "Scientist: industry or commerce" almost doubled. The picture for physics was very different. The proportion of females who chose "Academic on a permanent contract" stayed almost the same between first and second/subsequent contracts and that of males actually rose. The proportion of females who selected "Scientist: industry and commerce" also fell and those who selected "Continuing postdoctoral research" rose.

Nevertheless, in both chemistry and physics, men were statistically significantly more likely than women to see themselves as an academic in 6-10 years time once they moved on from their first postdoctoral research contract.

Alongside this, almost all respondents rated their awareness of career opportunities within academia as at least adequate, although physicists rated their awareness of this higher than chemists. In contrast, just over half of respondents rated their awareness of career opportunities outside academia as adequate or better, although chemists rated their awareness higher than physicists.

In terms of careers advice taken before accepting their first postdoctoral research contract, just over one-third of respondents had taken careers advice and only one-fifth had taken advice from professional sources. The bulk of those who had received advice had received it from their PhD supervisors. These data might suggest again that the majority of respondents were focused on an academic path and consequently did not feel the need to take much advice, or that the advice they received was to pursue an academic career at the expense of everything else.

Research councils regard postdoctoral research positions as stepping stones, both for academic and industrial positions, yet the postdoctoral researchers in chemistry and physics did not necessarily share this view. With better knowledge of opportunities outside academia, postdoctoral researchers may be better disposed towards research careers outside academia. This all emphasises the importance of initiatives such as Vitae,[21] and the support offered at local level through careers services and staff development initiatives, which have also been aimed at

[21] Vitae is a national organisation that champions the personal and professional development of researchers and aims to improve knowledge of experiences outside academia and useful transferable skills (www.vitae.ac.uk).

raising awareness of opportunities outside academia. Better careers advice is needed for all postdoctoral researchers so that individuals have a realistic view of the likelihood of gaining a permanent position and so that they have better and more realistic views of research opportunities outside academia. However, ensuring that postdoctoral researchers feel motivated to access any sources of advice will be a challenge.

The departmental experiences of chemistry and physics postdoctoral researchers

The majority of respondents had not been appraised during their current contracts and, although some respondents had been appraised regularly over the length of their contract(s), a number of others had only been appraised intermittently.

A significantly lower proportion of chemists than physicists were not even sure whether there was an appraisal system in their university. Physicists were more likely than chemists to have had their appraisals carried out by a member of staff other than their supervisor/PI, and female physicists were less likely than male physicists to be appraised by their supervisor/PI. Respondents were more likely to report finding the appraisal experience useful and relevant if it was carried out by their supervisor/PI: thus the fact that female physicists were less likely to find the appraisal useful or relevant than other groups was probably because they were less likely to be appraised by their supervisor/PI.

Appraisal is clearly something that needs a great deal of attention, especially as only around one-third of postdoctoral researchers found the appraisal process useful and/or relevant. The message from the survey respondents is that all departments should review how they communicate the purpose of appraisal to their postdoctoral researchers and should ensure that the appraisal system for postdoctoral researchers is fit for purpose. It is also important that appraisal is timed appropriately to ensure that the appraisal timetable for each individual postdoctoral researcher is in sympathy with the timing of his or her contract, but this will mean that someone will need to take responsibility for overseeing the appraisal process for postdoctoral researchers.

While the content of each appraisal will vary, and note should be taken of the qualitative data on what respondents liked and disliked about their experiences of appraisal, the main purpose of appraisal should be to identify future development needs of the postdoctoral researchers, while also giving time for review. Better trained and more effective researchers will yield better research outcomes, which in turn will benefit the researchers, their PIs and their departments. One thing that could usefully be covered in appraisal is an assessment of an individual's likelihood of securing a permanent academic position.

Following on from this is the need to quality assure the appraisal process. Someone needs to have the responsibility within each department to ensure that appraisal is carried out and that it covers the correct topics, as well as, as noted above, needing to ensure that appraisal is held at the appropriate time for each postdoctoral researcher. Finally, responsibility needs to be assigned for ensuring that development needs of postdoctoral researchers identified through appraisal are met.

Two-thirds of respondents reported that they had been encouraged to develop their transferable skills. It was striking how different the patterns of activities undertaken by chemists and physicists were, in particular that physicists seemed to be more likely to undertake activities that might be seen as supporting academic careers (e.g. giving external presentations). Some of the

differences may be related to the balance of departments in the two samples, but the differences were large enough to raise questions about whether the two disciplines have different cultures with regard to the activities that postdoctoral researchers undertake.

The majority of chemistry and physics departments had some respondents reporting that there was a mentoring scheme but the data suggested that there was confusion among the majority of postdoctoral researchers in the majority of departments about whether their departments had a mentoring scheme.

Very few respondents had participated in a mentoring scheme and this suggests that the availability of both formal and informal mentoring should be investigated, and that access to mentoring should be better publicised where it exists.

Around two-fifths of those staying in the same group and around half of those moving to a different group reported that they had had a departmental induction. Much smaller proportions of women than men reported having had departmental inductions when starting as a postdoctoral researcher in the same group as they did their PhD. It is possible that men and women have differing expectations as to what induction entails and consequently answered the question differently. Nonetheless the stark difference is worthy of further investigation and needs to be highlighted to departments as well as highlighting the need to implement induction more universally for postdoctoral researchers.

It is also clear that departments and institutions need to ensure that induction courses are relevant to all staff, and perhaps courses can be designed so that those who have already spent time in the department, for example as a PhD student, can join for only part of the course when procedures and issues relevant to their new role as a postdoctoral researcher are discussed.

The majority of chemists and physicists reported that they helped look after PhD students, although only a minority stated that this responsibility was formalised and recognised and even smaller numbers had received training to do so. Two-thirds of those who had the responsibility for looking after PhD students would like this responsibility to be formally recognised.

The overriding message was that postdoctoral researchers' knowledge and experiences seemed to vary, even within the same department. Given this variable knowledge that postdoctoral researchers appeared to have about policies and practices in departments, perhaps the biggest issue is that all institutions and departments need to review their policies and practices for postdoctoral researchers, and the communication and implementation of the policies that already exist. There was confusion among the respondents from virtually all departments that had reasonable numbers of individuals participating in the survey as to exactly what policies were in place, especially with regard to issues like appraisal, mentoring, flexible working, representation and teaching. Institutions and departments need to improve their consistency with respect to postdoctoral researchers. Some departments are better than others but the survey data suggest that even the best need to do more.

Overall treatment of postdoctoral researchers

Respondents were questioned about whether they felt more like a staff member, a student or neither. Overall, half the respondents reported feeling more like staff members than students. However, there were statistically significant differences between chemists and physicists, with physicists feeling more like staff than chemists. There were also statistically significant

differences between male and female chemists, with male chemists feeling more like staff than female chemists.

Only four out of 10 postdoctoral researchers believed that they were well regarded in their departments and chemists and physicists felt differently, with more physicists reporting feeling well regarded. The results are in line with whether postdoctoral researchers felt more like staff or students.

The overall sense is that much seems to depend on the experiences of postdoctoral researchers in their research groups and the overall involvement of postdoctoral researchers in the department. Many postdoctoral researchers suggest that they are seen as "expendable" in the sense that because they are temporary they are to be made the most of while they are employed. Others wrote of feeling that they were "dumped on" by academics, and are regarded as "lowly". Some postdoctoral researchers wrote of being regarded as "failed academics".

In contrast respondents who felt that postdoctoral researchers were well regarded said that they were treated well by all staff, that they felt that everyone was equal and that they felt that by being given teaching and supervision it was demonstrated to them that they were trusted. Nonetheless, it is apparent that to feel that they are well regarded, the majority of respondents felt that they needed to be respected both by their PI and by others in the department.

The fact that there are gender differences means that departments need to monitor their postdoctoral researcher populations by gender, perhaps through regular surveys, or by collating information from appraisals and exit interviews. Furthermore, institutions need to be sensitive to the culture of different disciplines when introducing policies, and individual departments would do well to compare notes with others.

Clearly, because the majority of postdoctoral researchers are driven by their interest in science, and because they prize academic values, they seem tolerant of how many of them are treated. Nonetheless, earlier work, including the surveys of chemistry and molecular bioscience PhD students, suggests that bad working practices are more likely to affect adversely women than men. This research suggests that there are currently many bad practices in the employment of postdoctoral researchers in chemistry and physics and so another driver for improving working practices and culture is the need to provide more attractive working environments for women.

The survey's purpose was not to collect and identify examples of good practice in the management and support of postdoctoral researchers. Work by the Institute of Physics and the Royal Society of Chemistry, and by the Athena Project and Athena SWAN has identified much good practice that is already in place through the chemistry and physics academic communities. However, even in departments where there is a great deal of good practice, it will be a challenge to ensure that this spreads to all research groups.

In conclusion, the majority of the members of the postdoctoral researcher communities in chemistry and physics are driven by their interest in their subjects and would like a permanent academic post, however unrealistic this ambition might be. The way in which postdoctoral researchers are regarded and treated from department to department and from research group to research group varies, leading to the conclusion that much work needs to be done communicating and applying an institution's human resource policies to postdoctoral researchers. More challenging is the pressing need to change the culture of all departments so that researchers are valued by all staff, and so that the researchers themselves feel like valued

employees who will take responsibility for their own personal development. Work also needs to be done to ensure that the gender difference in both chemistry and physics is monitored and the gender issues that have been identified in this study are addressed.

Despite work that has already been done nationally and locally, in particular on developing training for research students and staff, the evidence from the chemistry and physics postdoctoral research communities is that a great deal remains to be done. Work needs to be done on supporting the development of postdoctoral researchers through better induction and appraisal, through more mentoring opportunities and through ensuring that researchers do access appropriate training and careers advice.

A bigger challenge is the need to change the culture in departments with respect to how postdoctoral researchers are regarded, and how researchers regard themselves. This will take time but that change should be initiated quickly.

10. Recommendations

A number of recommendations have been developed and each recommendation is followed by the names of the key stakeholder(s) considered to be the most appropriate to take it forward.

1. Consideration should be given to how schemes such as Juno and Athena SWAN can enable and encourage the implementation of good practice for postdoctoral researchers. Best practice should be shared among HEIs in the training, treatment and management of postdoctoral researchers. Vitae are already taking the lead in this, and the Institute of Physics should continue to promote and use Project Juno as a tool for enabling best practice to be shared among physics departments.

   ►*ECU, UKRC, Institute of Physics, Concordat Strategy Group and Vitae*

The postdoctoral researchers' knowledge of the careers available outside academia was generally reported as poor or very poor.

2. Making impartial careers advice available for all PDRs is essential in ensuring that individuals have a realistic view of their likelihood of, and suitability for, gaining a permanent position. Mechanisms need to be explored to ensure that PDRs have access to independent, alternative sources of advice on careers outside academia, and the uptake of this should be monitored by gender.

   ►*HEIs, professional bodies, Vitae and Concordat Strategy Group*

Better and more consistent application of policies and practices, together with individual research units or groups paying more attention to their overarching cultures with regard to postdoctoral researchers, may improve the experience for those researchers.

3. While many institutions are implementing the Concordat to Support the Career Development of Researchers principles at senior levels, implementation must also be monitored at the departmental level to ensure that institutional and departmental policies and practices for postdoctoral researchers, both formal and informal, are communicated and applied consistently.

   ►*Vitae, HEIs and Concordat Strategy Group*

4. Mechanisms should be implemented to allow PDRs to be consulted on departmental issues and they should, as a matter of course, be represented on relevant departmental committees. As part of this, appropriate and effective departmental mechanisms need to be in place to communicate directly with all postdoctoral researchers.

   ►*HEIs, heads of departments and Concordat Strategy Group*

5. All postdoctoral researchers, whether they are new to a department or not, should have a targeted induction covering their role and responsibilities as a member of staff, the appraisal system, flexible working, training opportunities, careers advice, the institution's expectations of them, and other relevant departmental/institution staff policies and procedures. PDRs who are new to a department should also have an appropriate departmental induction covering general issues of how they should carry out their research role (e.g. access to services, etc).

   ►*HEIs, departments and Concordat Strategy Group*

6. PDRs should have regular, timely, independent appraisals covering their personal development. During appraisals, clear and impartial feedback on career options (including suitability for an academic career) should be provided. The person carrying out the appraisal should have the appropriate training to run appraisals for research staff.

   ►*HEIs, departments, research funders and Concordat Strategy Group*

7. Resources should be made available to make mentoring schemes more widely available for postdoctoral researchers. Universities UK should consider the role that it can play in national mentoring initiatives for postdoctoral researchers. The benefits and impact of mentoring schemes should be actively promoted, and it should be recognised as a valid activity through the dissemination of guidance, communication and awareness-raising.

   ►*Universities UK, HEIs, ECU and Concordat Strategy Group*

8. Opportunities should be provided for PDRs to gain experience of teaching, where they wish to and it is deemed appropriate, and appropriate training should be provided for this. PDRs should not be able to teach without this training.

   ►*HEIs, departments, Staff Development Units, Vitae and Concordat Strategy Group*

9. Where it is expected that PDRs will play a significant role in the supervision of PhD students, that activity should be formally recognised as part of their role and appropriate training, including diversity awareness, should be provided.

   ►*HEIs, departments, Staff Development Units, Vitae*

Appendix A: The demographics of the sample

A total of 776 completed questionnaire responses were received. Table 76 shows the breakdown of the respondents by department and gender. Respondents were asked to specify the department that they worked in; most specified chemistry or physics but some indicated other departments.

Table 76: Gender and department of respondents.

Gender	Department					Overall
	Chemistry		Physics		Other	
	Count	%	Count	%		
Female	126	33.5	93	25.1	11	230
Male	246	65.4	275	74.3	17	538
Prefer not to say	4	1.1	2	5.4	2	8
Total	376	100	370	100	30	776

Similar numbers of responses were received from chemists and physicists, which ensures that statistically sound comparisons can be made between respondents working in the two disciplines. Women are over-represented in both disciplines compared with the HESA data presented in Figure 1 and Figure 2. Women make up 30% of chemistry researchers and 17% of physics researchers. It is normally the case that women are more likely to respond to surveys than men.

Table 77: Gender, age and department of respondents (N = 740).

Age	Female		Male		Total	
	Count	%	Count	%	Count	%
	Chemistry					
<25	0	0.0	1	0.4	1	0.3
25-30	65	51.6	113	45.9	178	47.8
31-35	44	34.9	95	38.6	139	37.4
36-40	8	6.3	18	7.3	26	7.0
41-45	5	4.0	12	4.9	17	4.6
46-50	0	0.0	2	0.8	2	0.5
50+	2	1.6	5	2.0	7	1.9
Prefer not to say	2	1.6		0.0	2	0.5
Chemistry total	126	100.0	246	100.0	372	100.0
	Physics					
<25	0	0.0	0	0.0	0	0.0
25-30	55	59.1	119	43.3	174	47.3
31-35	24	25.8	102	37.1	126	34.2
36-40	5	5.4	26	9.5	31	8.4
41-45	4	4.3	17	6.2	21	5.7
46-50	1	1.1	6	2.2	7	1.9
50+	2	2.2	4	1.5	6	1.6
Prefer not to say	2	2.2	1	0.4	3	0.8
Physics total	93	100.0	275	100.0	368	100.0

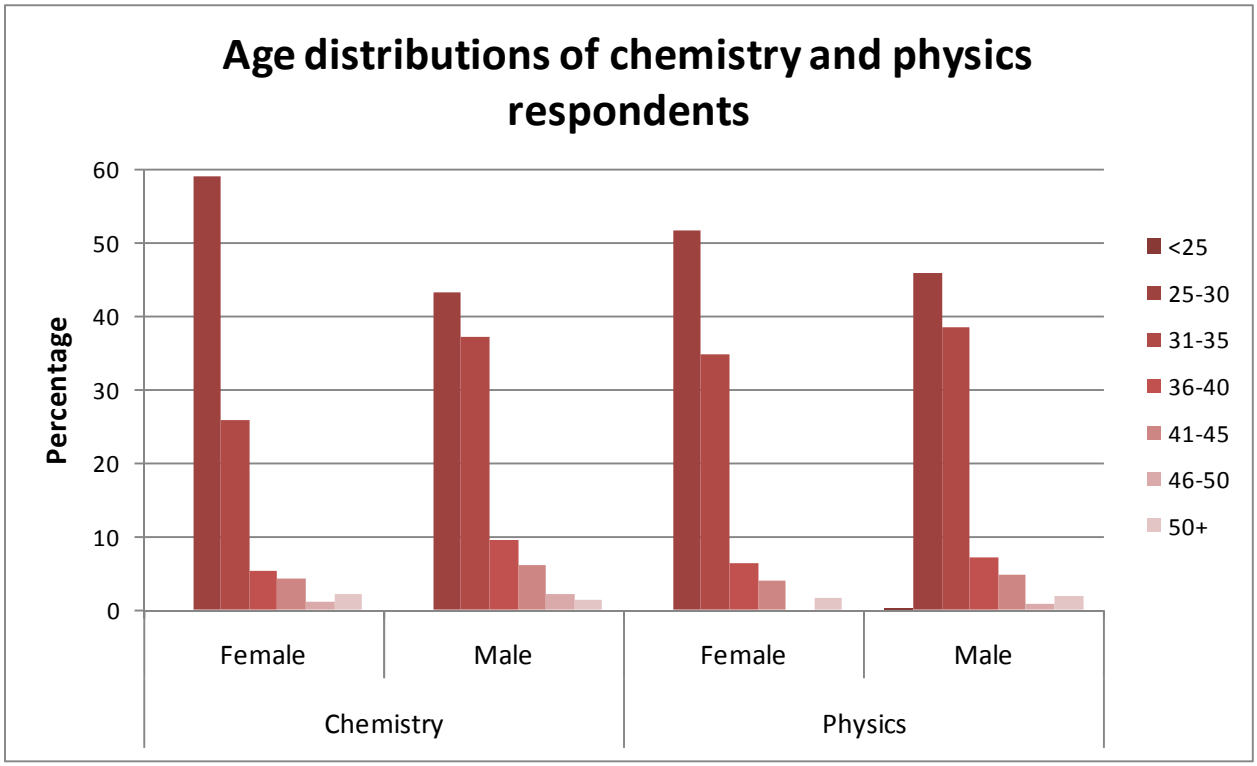

Figure 9: Age distributions of female and male chemistry postdoctoral researchers (N = 374).

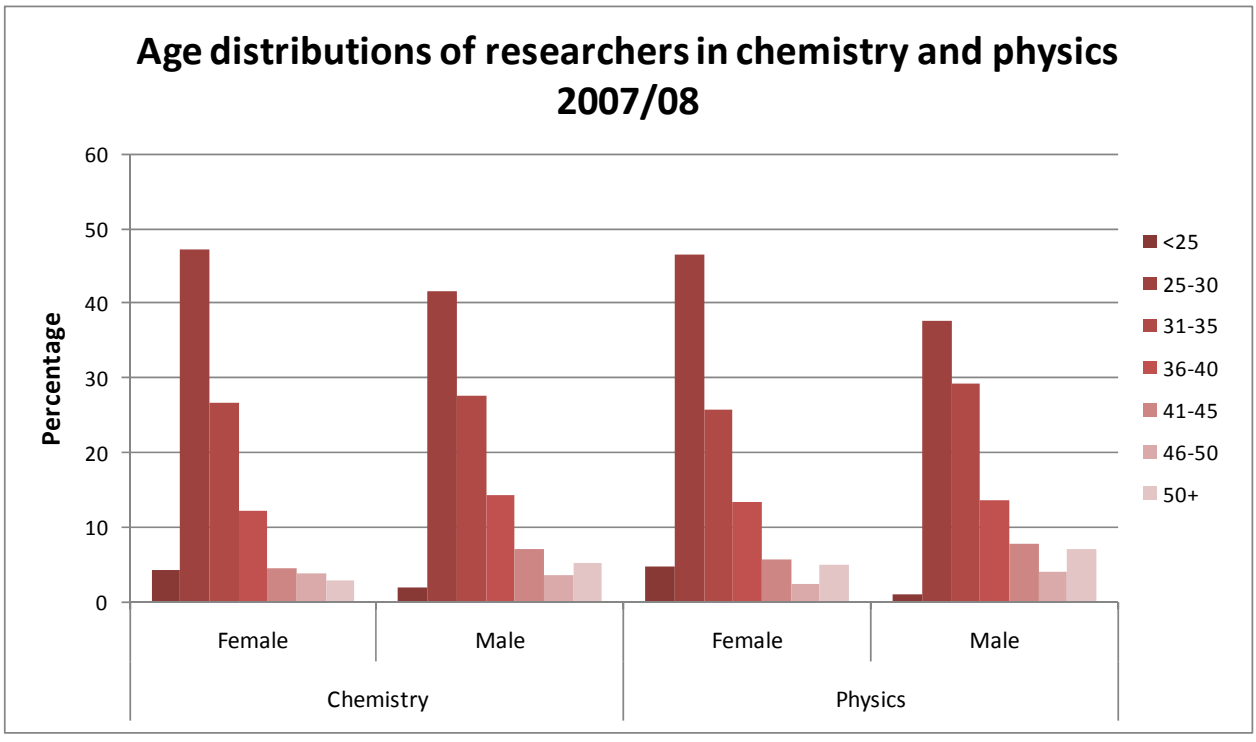

Figure 10: Age distributions of researchers in the chemistry and physics cost centres (HESA 2007/08).

The age distributions of the four main groups (female and male chemists, and female and male physicists) are broadly similar but the women are on average younger than the men, and there is a significantly higher proportion of female physicists in the 25-30 age range than there are

male respondents. Figure 10 shows the age distributions of researchers drawn from HESA data for 2007/08.

The HESA data suggest that the younger researchers are slightly over-represented in the chemistry sample: women are on average younger than men. In the physics sample, younger researchers, and women in particular, are over-represented. Both the sample and the HESA data suggest that women had spent less time undertaking postdoctoral research than men.

Table 78: Nationality, gender and department of respondents (N = 744).

Nationality	Female		Male		Total	
	Count	%	Count	%	Count	%
	Chemistry					
British	57	45.2	109	44.3	170	45.2
Non-British	62	49.2	135	54.9	197	52.4
Unknown	7	5.6	2	0.8	9	2.4
Chemistry total	126	100	246	100	376	100
	Physics					
British	51	54.8	155	56.4	206	55.7
Non-British	38	40.9	114	41.5	153	41.4
Unknown	4	4.3	6	2.2	11	3.0
Physics total	93	100	275	100	370	100

Table 78 presents data on the nationality of respondents broken down by department and gender and Table 79 shows the same data but with the non-British respondents' nationalities broken down in more detail. HESA data for 2007/08 show that 42% of female chemists were British, 44% of male chemists, 47% of female physicists and 50% of male physicists. Table 78 shows that the chemistry sample is representative of the proportions of British and non-British postdoctoral researchers, and British postdoctoral researchers are slightly over-represented in the physics population.

Table 79: Detailed nationality of respondents, by department.

Nationality	Chemistry		Physics		Overall	
	Count	%	Count	%	Count	%
British	168	44.7	202	54.6	391	50.4
EU	107	28.5	86	23.2	198	25.5
Asian	28	7.4	17	4.6	47	6.1
North American	19	5.1	21	5.7	40	5.2
Chinese	15	4.0	9	2.4	25	3.2
Unknown	11	2.9	11	3.0	22	2.8
Australasian	10	2.7	10	2.7	20	2.6
European (non-EU)	5	1.3	4	1.1	9	1.2
African	6	1.6	2	0.5	8	1.0
British Mixed	2	0.5	6	1.6	8	1.0
Russian	4	1.1	1	0.3	6	0.8
South American	1	0.3	1	0.3	2	0.3
Total	376	100.0	370	100.0	776	100.0

Table 80: Nationality and ethnicity of respondents, by department.

Ethnicity	Chemistry			Physics			Overall
	British	Non-British	Overall	British	Non-British	Overall	
White British	84.1%	2.0%	40.4%	85.4%	3.3%	49.2%	45.4%
White Other	3.5%	62.9%	35.1%	4.9%	64.7%	31.1%	32.6%
Asian or Asian British	1.8%	10.2%	6.1%	3.4%	9.2%	5.9%	6.1%
Chinese	3.5%	10.2%	7.2%	1.9%	7.8%	4.3%	5.7%
Other	0.0%	6.6%	3.5%	0.5%	3.9%	2.2%	2.8%
Prefer not to say	4.1%	1.5%	2.9%	2.4%	2.6%	2.7%	3.0%
White Irish	0.6%	4.1%	2.4%	0.0%	6.5%	2.7%	2.4%
Mixed/Dual Heritage	2.4%	1.0%	1.6%	1.5%	1.3%	1.6%	1.5%
Black or Black British	0.0%	1.5%	0.8%	0.0%	0.7%	0.3%	0.5%
Sample sizes	170	197	376	206	153	370	776

Table 80 shows a breakdown of respondents' ethnicity by nationality and department. Unsurprisingly around 85% of the British chemists and physicists classify their ethnicity as White British. However, it is surprising that the percentages of White British are similar for physicists and chemists because data suggest that there is a higher proportion of White British physicists than chemists.[22] The numbers of individuals who classify themselves as other ethnic groups are too low to come to any firm conclusions. However, it is noteworthy that there are no British postdoctoral researchers who classify themselves as Black or Black British. As expected, there is more ethnic variation among the non-British population in the sample, and in particular a lower proportion of individuals who classify themselves as white.

Table 81: Marital status, gender and department of respondents.

Marital status	Chemistry			Physics			Overall
	Female	Male	Overall	Female	Male	Overall	
Married/civil partnership	34.1%	42.3%	39.6%	30.1%	40.7%	38.1%	38.5%
Single	24.6%	22.8%	23.4%	34.4%	20.4%	24.1%	23.8%
Cohabiting	27.0%	18.5%	21.5%	14.0%	24.0%	21.4%	21.8%
In relationship but not living together	11.9%	15.0%	13.8%	16.1%	11.3%	12.4%	13.1%
Separated/ divorced	0.0%	1.2%	0.8%	2.2%	1.1%	1.4%	1.0%
Prefer not to say	2.4%	0.0%	0.8%	3.2%	2.5%	2.7%	1.7%
Sample sizes	126	246	376	93	275	370	776

[22] P. Elias, P. Jones and S McWhinnie, Representation of Ethnic Groups in Chemistry and Physics, Institute of Physics, London, 2006 (http://www.iop.org/publications/iop/2006/file_38241.pdf)

Table 81 shows data on the marital status of respondents. Male and female chemists are equally likely to be in a relationship as each other (73.0% and 76.0%, respectively), but female physicists are significantly less likely ($p < 0.01$) than male physicists to be in a relationship (60.2% and 76.0%, respectively). In both chemistry and physics, males are more likely to be married/in a civil partnership than females and conversely, in chemistry females are more likely to be cohabiting than males, but in physics males are more likely to be cohabiting than females. The finding that women physicists are significantly less likely than male physicists to be in a relationship is perhaps surprising, as is the finding for both physics and chemistry that women are less likely to be married. Although women in the sample are on average younger than the men, perhaps the data suggest that women are less willing to get married than men until they are in a more secure career, that is, in a role with a permanent contract.

Table 82: Nationality and marital status of respondents.

Marital status	British	Non-British	Overall
Married/civil partnership	38.5%	38.4%	38.5%
Single	24.4%	22.6%	23.8%
Cohabiting	21.7%	22.0%	21.8%
In a relationship but not living together	13.4%	13.6%	13.1%
Prefer not to say	0.8%	2.5%	1.7%
Separated/divorced	1.3%	0.8%	1.1%
Sample sizes	397	359	776

Table 82 compares the marital status of British and non-British respondents. As might be expected non-British respondents are more likely to be married or in a civil partnership, more likely to be single, and less likely to be cohabiting than British respondents. This is because non-British respondents may well have got married before travelling to the UK, and when they are here they may be less willing to enter into a relationship because their presence in the UK is likely to be temporary.

Table 83: Parenthood, gender and department of respondents.

Marital status	Chemistry			Physics			Overall
	Female	Male	Overall	Female	Male	Overall	
Children	15.9%	22.0%	19.7%	18.3%	20.4%	19.7%	19.3%
No children	82.5%	78.0%	79.8%	79.6%	78.5%	78.9%	79.8%
Prefer not to say	1.6%	0.0%	0.5%	2.2%	1.1%	1.4%	0.9%
Sample sizes	126	246	376	93	275	370	776

Table 83 presents data on whether or not respondents have children. Physicists are equally likely to have children as chemists (19.7%), and men (20.5%) are more likely than women (16.5%), although the difference is not significant. This probably correlates with the data on marital status. It also suggests that around one-fifth of respondents have childcare responsibilities that may require a degree of flexibility at work to cope with.

Consideration of the data suggests that female researchers are less likely to be married and less likely to have children than male researchers, and this might be an area worth looking at in more detail in the future.

Table 84 shows that less than 1% of the sample disclosed that they have a disability. This figure is broadly in line with that for academic staff in physical sciences, which itself is low compared with academic staff in HEIs generally.

Table 84: Disabled status and department of respondents.

Disabled	Chemistry	Physics	Other	Overall
Yes	4	3	0	7
No	365	365	29	759
Prefer not to say	7%	2	1	10
Sample sizes	376	370	30	776

Table 85 shows data on whether respondents work full-time or part-time. Overall, 97% of respondents work full-time. Women are more likely to work part-time than men: around one in 20 female chemists and around one in 10 female physicists work part-time. The fact that a higher proportion of female physicists than chemists work part-time correlates with the fact that a higher proportion have children.

Table 85: Full-time or part-time status and department of respondents.

Mode of employment	Female		Male		Total	
	Count	%	Count	%	Count	%
	Chemistry					
Full-time	120	95.2	241	98.0	361	97.0
Part-time	5	4.0	0	2.0	1	2.7
Prefer not to say	1	0.8	5	0.0	10	0.3
Chemistry total	126	100	246	100	376	100
	Physics					
Full-time	85	91.4	272	98.9	357	97.0
Part-time	1	7.5	3	1.1	10	2.7
Prefer not to say	7	1.1	0	0.0	1	0.3
Physics total	93	100	275	100	368	100

So overall the sample is broadly representative of the population of researchers in chemistry and physics drawn from the 2007/08 HESA data. Women are slightly over-represented and the sample is younger than the actual population. The proportions of British and non-British postdoctoral researchers in the sample are representative of the proportions in the HESA population.

Men are more likely to be married or in a civil partnership than women and are more likely to have children than women. Women are more likely to work part-time then men.

Appendix B: Comparison with the Careers in Research Online Survey (CROS) 2009

The Concordat and Careers in Research Online Survey

Many of the areas covered in the survey of chemistry and physics postdoctoral researchers are referred to directly or indirectly in the Concordat to Support the Career Development of Researchers.[23] The Concordat principles are:

1. Recognition of the importance of recruiting, selecting and retaining researchers with the highest potential to achieve excellence in research.
2. Researchers are recognised and valued by their employing organisation as an essential part of their organisation's human resources and a key component of their overall strategy to develop and deliver world-class research.
3. Researchers are equipped and supported to be adaptable and flexible in an increasingly diverse, mobile, global research environment.
4. The importance of researchers' personal and career development, and lifelong learning, is clearly recognised and promoted at all stages of their career.
5. Individual researchers share the responsibility for and need to pro-actively engage in their own personal and career development, and lifelong learning.
6. Diversity and equality must be promoted in all aspects of the recruitment and career management of researchers.
7. The sector and all stakeholders will undertake regular and collective review of their progress in strengthening the attractiveness and sustainability of research careers in the UK.

51 institutions participated in CROS 2009 in spring 2009. 5908 responses were received, which equated to 21% of the target sample, or 16% of the total UK research staff population. Among the respondents, 1645 were in the broad areas of physical sciences and engineering (PSAE). While CROS and the Survey of Postdoctoral Researchers' Experiences and Careers Intentions (PDR Survey) cover similar ground, few of the questions were equivalent. The data below compares the two samples and a small number of responses to questions.

Demographics

Table 86 compares the demographics of the respondents in the CROS 2009 and PDR survey. Overall the CROS sample was significantly older than the PDR survey sample, had a much greater proportion of females, a greater proportion of part-time workers and a significantly lower proportion of non-UK nationals. Comparison of the CROS 2009 PSAE respondents with the PDR survey sample shows that the PSAE respondents were significantly older, but that the

[23] The Concordat to Support the Career Development of Researchers, UK Research Councils, Swindon, 2008 (www.researchconcordat.ac.uk/index.html)

gender balance is the same and that the proportions of part-time and non-UK nationals are similar. The different demographics of the two samples may well lead to different attitudes and responses.

Table 86: Comparison of the demographics of the CROS 2009 and the PDR survey respondents.

Quality		CROS 2009		PDR Survey
		Overall	PSAE	
Age	Under 30	23%	27%	48%
	30-44	61%	61%	49%
	45 and over	16%	11%	3%
Gender	Male	45%	70%	70%
	Female	55%	30%	30%
Status	Full-time	87%	93%	97%
	Part-time	13%	7%	3%
Nationality	UK	65%	53%	50%
	Non-UK	35%	47%	50%

Figure 11 and figure 12 show the years of service of respondents. Although the years bands are not equivalent, it is clear that repondents to CROS 2009 have, on average, spent more time as research staff than PDR survey respondents.

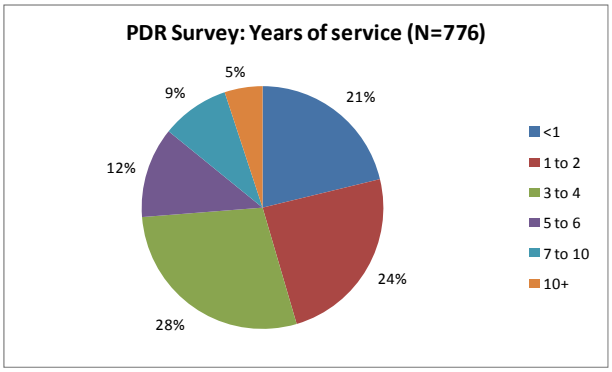

Figure 11: The years spent as a postdoctoral research by respondents to the PDR survey.

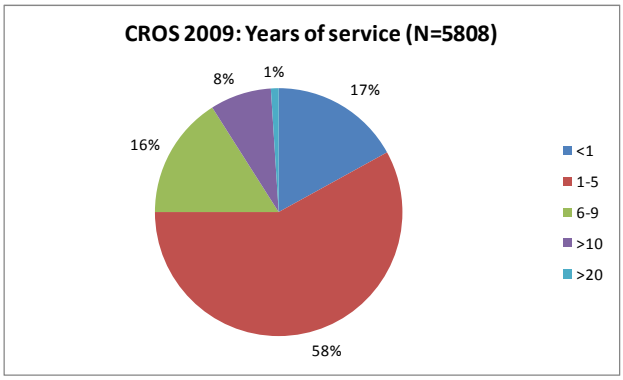

Figure 12: The years spent as a postdoctoral research by respondents to CROS 2009.

Figure 13 to Figure **15** show the number of contracts that respondents have had. Interestingly the proportions of respondents to both surveys who have had just one contract are very similar, but on average respondents to the PDR survey have had fewer contracts.

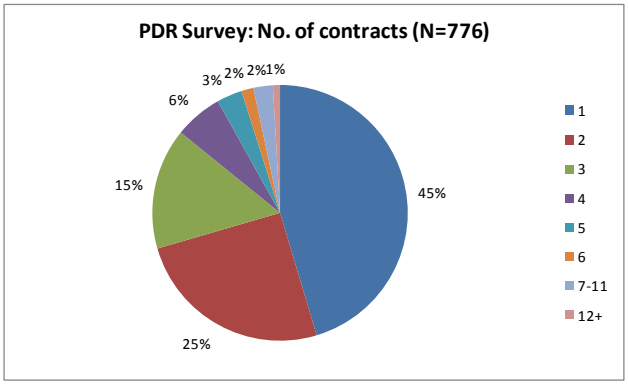

Figure 13: The number of contracts of respondents to the PDR survey.

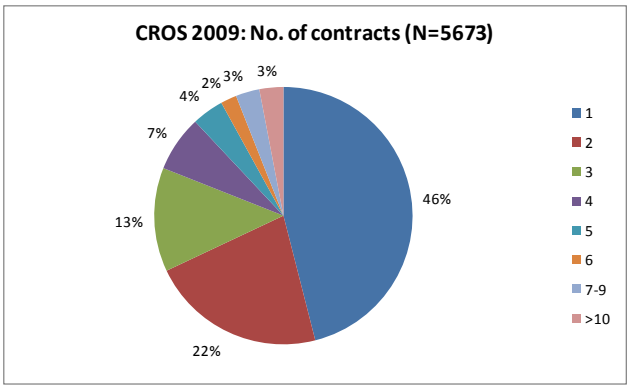

Figure 14: The number of contracts with current institution of respondents to CROS 2009.

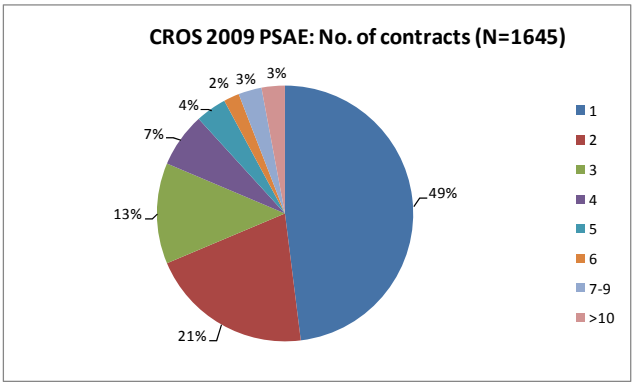

Figure 15: The number of contracts with current institution of physical sciences and engineering respondents to CROS 2009.

Comparison of responses

It proved difficult to make direct comparison between CROS 2009 and the PDR survey: a few comparisons are given below.

Table 87 compares the degree to which respondents to both surveys have career plans. The data are not directly comparable because the PDR survey questioned respondents about their next career step while CROS 2009 asked about respondents' career-development plans. Within CROS 2009 respondents, the subset that had formed a career-development plan was found to be more engaged and take more advantage of the opportunities on offer.

Table 87: Careers plans of respondents to CROS 2009 and the PDR survey.

PDR survey		
Degree to which next career step has been planned	Fully	22%
	A little	59%
	Not at all	20%

CROS 2009			
		Overall	PSAE
To what extent do you agree that you have a clear career development plan?	Agree strongly	14%	12%
	Agree	36%	38%
	Disagree	43%	43%
	Disagree strongly	7%	7%

Table 88: Experience of supervising students and teaching of respondents to CROS 2009 and the PDR survey.

Activity	CROS 2009		PDR Survey
	Overall	PSAE	
Supervision of students	43%	45%	71%
Teaching	50%	51%	50%

Table 88 compares whether or not respondents have undertaken teaching and supervision of masters/doctoral students. While in both surveys 50% of respondents had some experience of teaching, a significantly higher proportion of respondents to the PDR survey had undertaken supervision of research students. This may reflect the relatively high number of doctoral students in chemistry and physics compared with other disciplines.

Table 89 compares the career aspirations of respondents in the short- and long-term. Respondents to the PDR survey are as focused on having an academic post, and less on holding a pure research post, than PSAE respondents to CROS 2009. This may be related to the fact that CROS 2009 respondents are older than PDR survey respondents and have spent longer as researchers. Perhaps CROS 2009 PSAE respondents are more realistic about their chances of securing an academic post and consequently more focused on maintaining a career as a postdoctoral researcher. The majority of respondents to both surveys are focused on careers in higher education both in the short- and long-term.

Considering appraisal, 50% of CROS 2009 respondents had had an appraisal over the last two years (or since taking up their current position if that was more recent). In contrast 44% of respondents to the PDR survey had been appraised at some point in their careers as a postdoctoral researcher.

Table 89: Career aspirations of respondents to CROS 2009 and the PDR survey.

Career aspiration	Now			Long-term		
	CROS 2009		PDR Survey*	CROS 2009 (in five years)		PDR survey* (In 6-10 years)
	Overall	PSAE		Overall	PSAE	
Career in higher education – primarily research and teaching	34%	44%	43%	51%	62%	64%
Career in higher education – primarily research	64%	67%	78%	38%	38%	15%
Career in higher education – primarily teaching	4%	5%	NA	9%	11%	N/A
Research career beyond higher education (e.g. in a private research organisation, charity or in an industrial environment)	11%	16%	35%	34%	42%	39%
Teaching career outside higher education	2%	2%	0	6%	8%	1%
Self-employment (including setting up own business)	3%	4%	NA	13%	18%	N/A
Non-research career in business/industry/public sector	4%	7%	4%	17%	22%	19%
Any other professional career	3%	2%	NA	8%	6%	N/A
Other (including not planning to enter employment)	2%	1%	0%	4%	3%	0%

* *Responses to the PDR survey were grouped as far as possible into categories specified in the CROS 2009 survey. Nonetheless there are some differences, for example, the "Career in higher education – primarily research and teaching" in CROS 2009 was deemed to be equivalent to "a lectureship" or " Academic on a permanent contract".*

Table 90: Views of respondents to CROS 2009 and the PDR survey on appraisal.

PDR survey		
Did you find the appraisal useful/relevant?	Useful/relevant	35%
	Somewhat useful/relevant	33%
	Not useful/relevant	32%

CROS 2009			
		Overall	PSAE
How would you rate the institution's (appraisal) scheme?	Very useful	12%	12%
	Useful	49%	47%
	Not very useful	29%	29%
	Not at all useful	11%	12%

Table 90 compares the views of respondents on the usefulness of appraisal. Although the responses are not directly comparable, it does appear that overall CROS 2009 respondents found appraisal more useful than PDR survey respondents; this may be because the CROS respondents are older than the PDR survey respondents.

Two-thirds of respondents of CROS 2009 had participated in some form of training in the past 12 months, while 55% of respondents to the PDR survey had participated in training during their current contract.

General comments

The comparisons between the CROS 2009 and PDR survey respondents are difficult because the demographics of the two samples are different, in particular the age profiles. A number of the differences between the responses to the PDR survey and the CROS 2009 PSAE respondents may be related to the different age profiles.

The findings of the PDR survey, and the breakdown of CROS 2009 data into broad subject areas, underlines the need to bear in mind individual subject cultures when implementing Concordat principles.

Appendix C: Survey participants

The following tables show the gender profile of participants by institution. Participants were asked to indicate which department they belonged to (chemistry, physics or other). Some participants have listed institutions/departments that had not agreed to participate: in these cases there was a participating chemistry or physics department in the institutions so presumably the link to the questionnaire had been forwarded to those individuals. In addition some participants listed institutions not in the UK, presumably because they were visiting.

A number of participants listed other departments and these are listed in the third table below.

Table 91: Participants reporting themselves as working in chemistry departments.

Institution	Gender			Total
	Male	Female	Not stated	
University of Aston				0
University of Wales, Bangor		1		1
Bath University	2	5		7
The Queen's University of Belfast	2	6		8
University of Birmingham	1			1
University of Bristol	10	16		26
University of Cambridge	8	23	1	32
Cardiff University	2	5	1	8
University of Durham	8	4		12
Edinburgh University	7	15		22
Heriot Watt University		2		2
Huddersfield University	2	1		3
Hull University	3	1		4
Imperial College London	10	21		31
University of Leeds	8	10		18
Liverpool John Moores University		1		1
Loughborough University	1	4		5
University of Manchester	9	7		16
University of Nottingham	10	5		15
Nottingham Trent University				0
University of Oxford	21	54	2	77
University of St Andrews	2	12		14
Strathclyde University	2	9		11
University of Surrey	1	3		4
Sussex University*	1			1
University of Sheffield	2	6		8
University of Southampton	3	8		11
University College London		7		7
University of Warwick	3	8		11
University of York	6	9		15
Visitors	2	2		4
Unknown		1		1
Total	126	246	4	376

* Department not officially participating.

Table 92: Participants reporting themselves as working in physics departments.

Institution	Gender			Total
	Male	Female	Not stated	
The Queen's University of Belfast	2	9		11
University of Bristol	4	12		16
University of Cambridge	15	28		43
Cardiff University*		1		1
University of Central Lancashire		2		2
University of Dundee	2	2		4
University of Edinburgh	2	13		15
University of Exeter		3		3
University of Glasgow	2	10		12
Heriot-Watt University		7		7
University of Hertfordshire	1	2		3
Imperial College London	7	28	1	36
University of Kent at Canterbury				0
King's College London	2	1		3
Lancaster University		7		7
University of Leeds		5		5
University of Liverpool	3	3		6
University of Leicester	3	7		10
University of Manchester	3	15		18
University of Nottingham	11	5		16
The Open University	2	2		4
University of Oxford	11	34		45
University of St Andrews	4	17		21
University of Sheffield		8		8
University of Surrey		4		4
University of Sussex	1	4		5
University of Wales Swansea	1	2		3
University of the West of Scotland		3		3
Queen Mary, University of London		3		3
University of York	2	4	1	7
University College London	5	11		16
University of Warwick	5	19		24
Visitors	4	3		7
Unknown	1	1		2
Total	93	275	2	370

Table 93: Participants reporting themselves as working in other departments.

Institution	Gender			Total
	Female	Male	Gender not stated	
Bath University		1		1
University of Bristol	1			1
University of Cambridge		1		1
Edinburgh University	1			1
University of Hertfordshire		1		1
Huddersfield University	1			1
Imperial College London	1			1
University of Leeds	1			1
Liverpool John Moores University		3		3
University of Manchester	1	1		2
University of Nottingham		1		1
Oxford University	1	1	2	4
Queen Mary, University of London	1	4		5
Queen's University Belfast	1	2		3
Reading University		1		1
UCL	1			1
Warwick University	1			1
Unknown		1		1
Total	11	17	2	30

Appendix D: The questionnaire

The questionnaire is a paper version of the web-based version that was used in the survey. In the web version the system was set up to navigate respondents to the correct questions.

SURVEY OF POST DOCTORAL RESEARCHERS'
EXPERIENCES AND CAREER INTENTIONS

Closing date 30 April 2010

This survey is an opportunity for YOU as physics or chemistry postdocs to share YOUR experiences and voice YOUR opinions. Being a postdoc can be one of the most exciting periods in one's career but also one of the most frustrating.

The Institute of Physics and Royal Society of Chemistry would like your help by filling in a questionnaire to enable us to learn about your experiences, what you think about your role, and what your longer-term career intentions are. The results of this survey will enable us to assess any differences between men's and women's experiences and career intentions, as well as those between different ethnic groups. We are also interested in differences between the experiences and intentions of chemistry and physics postdocs.
The results will help us to improve support for ALL postdocs.
Your responses will be **completely anonymous**.
After you have finished the questionnaire you will be invited to enter into a ***prize draw*** to have a chance of winning one of the **12** following prizes:

First Prize: **£100 Amazon token**
Second Prize: **£50 Amazon token**
Third Prize: **10 x £10 Amazon tokens**

Your contact details left for the prize draw will be retained separately to your completed questionnaire to ensure your responses remain anonymous. We will not use your contact details for any other purpose other than for the prize draw.

The prize draw will take place on **10 May 2010**, so be sure to have responded to the survey by the deadline - **30 April 2010**.

Please note we are interested in your responses regardless of whether you intend to continue your career as a research scientist.
There are **8** sections to this survey **(A-H)**. The number of questions in each section will vary and some questions will be dependent on your answer to a previous question so not all question numbers may will be displayed. For enquiries about this survey please contact the Diversity Programme Leader at the Institute of Physics jennifer.dyer@iop.org.

You may have filled in other questionnaires about your experiences, such as the Careers in Research Online Survey (CROS) or more recently the Athena Survey of Science, Engineering and Technology (ASSET). We will be comparing data from those surveys with this survey. However, this survey is more detailed, specifically about your career intentions, and is for physics and chemistry postdocs. **We would like to thank you in advance for your help.**

This survey is being funded by a grant from the UKRC through the Innovative & Collaborative Grants Scheme.

Section A: About You

A1. What age range are you in?

☐ <25 ☐ 25-30 ☐ 30-35 ☐ 35-40 ☐ 41-45 ☐ 46-50 ☐ 50+

A2. What gender are you?

☐ Male ☐ Female ☐ Prefer not to say

A3. Nationality ……

A4. How would you describe your ethnic origin?

☐ White Black ☐ White Irish ☐ White Other ☐ Black or Black African
☐ Asian or Asian British ☐ Chinese ☐ Mixed/Dual Heritage ☐ Prefer not to say
☐ Other (please specify)……

A5. What is your marital status?

☐ Married / civil partnership ☐ Cohabiting ☐ In a relationship but not living together
☐ Single ☐ Separated/Divorced ☐ Widowed ☐ Prefer not to say

A6. Do you have any children?

☐ Yes ☐ No ☐ Prefer not to say

A7. Do you consider yourself to be disabled?

☐ Yes ☐ No ☐ Prefer not to say

A8. At which university or institute are you employed as a postdoctoral researcher?

……

A9. Do you work full or part-time?

☐ Full-time ☐ Part-time

A10. If part-time, what proportion of full-time equivalent (FTE) do you work? *(eg 25%, 50%, 60%, 80%, etc)*

.....

A11. Are you a member of a learned society (professional organisation)?

☐ Yes ☐ No

A12. If yes, which one(s)? *Please mark all that apply*

☐ Royal Society of Chemistry ☐ Institute of Physics
☐ American Chemical Society ☐ American Physical Society
☐ Other (please specify)……

Section B: Your route to your postdoc

B1. Which department is your postdoc based in?

☐ Physics ☐ Chemistry
☐ Other (Please specify).....

B2. What was the subject(s) of your first degree and where did you obtain it (e.g. Chemistry at University of Manchester, UK; Biochemistry at Harvard, USA; Applied Physics at Heidelberg, Germany)?

……
B3. What year did you obtain it?

……

B4. What was the subject(s) of your first degree and where did you obtain it (eg Chemistry at University of Manchester, UK; Biochemistry at Harvard, USA; Applied Physics at Heidelberg, Germany)?

……

B5. What year did you obtain it?

……

If you answered "chemistry" in question B1, please answer question B6

B6. In which discipline is your postdoc research? Please mark the most appropriate boxes (Mark only one box)

☐ Chemical biology ☐ Organic chemistry ☐ Physical chemistry
☐ Materials chemistry ☐ Inorganic chemistry ☐ Biochemistry
☐ Theoretical/Computational Chemistry
☐ Other e.g. multi disciplinary (please specify)
……

If you answered "physics" in question B1, please answer question B7

B7. In which discipline is your postdoc research? Please mark the most appropriate boxes (Mark only one box)

☐ *Astronomy, astrophysics, cosmology, space physics* ☐ *High energy and particle physics*
☐ *Surfaces, interfaces and materials* ☐ *Soft condensed matter*
☐ *Semiconductors* ☐ *Magnetism, metals, quantum fluids and superconductivity*

☐ *Mathematical physics*
☐ *Nuclear physics*
☐ *Atmospheric, geo and environmental physics*
☐ *Medical physics*
☐ *Thermal physics and fluid dynamics*
☐ *Atomic and molecular physics*
☐ *Biophysics/Biological physics*
☐ *Plasma physics*
☐ *Electrical and Electronic physics*
☐ Other e.g. multi disciplinary (please specify)
……

Section C: Your Postdoc

C1. Are you postdocing in the same research group that you did you PhD in?

☐ Yes ☐ No

C2. Is this your first postdoctoral contract?

☐ Yes - **Go to Question C4** ☐ No- **Go to Question C3**

C3. How many previous contracts have you had?

☐1 ☐ 2 ☐ 3 ☐ 4 ☐ 5 ☐ 6-10 ☐ 11+

C4. How long have you spent in total as a postdoc?

☐ <1 year ☐ 1-2 years ☐ 3-4 years ☐ 5-6 years ☐ 7-8 years ☐ 10+ years

C5. Where were the most recent (no more than 5) held?

……
……

……

C6. How long is your current contract and how far into it are you?

……

C7. Which of the following statements best describe the <u>main</u> reason(s) you decided to postdoc?

Please mark <u>no more than two</u> boxes.
☐ Out of interest and enthusiasm for science
☐ I was inspired/encouraged by a supervisor
☐ To enhance my earning potential
☐ To give myself time to think about what to do next
☐ For financial reasons
☐ To be near my partner's place of work/study
☐ Other (please specify)……
☐ To publish PhD research
☐ To gain a permanent academic position
☐ To enable me to travel abroad
☐ Don't know

C8. Who funds your postdoc?

☐ University ☐ Industry ☐ Charity ☐ Royal Society

☐ Research council, please specify which one……

☐ Other (please specify)……

C9. Are you pleased you decided to postdoc?

☐ Yes - **Go to Question C10**

☐ No, I somewhat regret my decision - **Go to Question C11**

☐ Don't know **- Go to Question C12**

C10. Which of the following statements, best describe the main reason why you *are pleased* with your decision to postdoc?

Please mark only one box.

☐ I enjoy researching my topic
☐ I enjoy the challenge of advancing knowledge
☐ I am gaining/have gained the experience I need for the career I want
☐ I have a better idea about my long-term career plans
☐ I enjoy the academic environment
☐ Don't know
☐ Other

If you have answered Question C10, please now go to Question C12

C11. Which of the following statements best describe the main reason why you *somewhat regret* deciding to postdoc?

Please mark only one box.

☐ My academic research isn't going well
☐ Financial worries
☐ I've felt isolated
☐ I no longer want to work in science
☐ Don't know
☐ Other (please specify)……
☐ Supervision issues
☐ Administrative issues
☐ Teaching burden (tutorials)

C12. What, if any, are the main 'downsides' (i.e. negatives aspects) of doing postdoc research?

Please mark all that apply

☐ Working long and irregular hours
☐ Working environment

☐ Repetitive and/or frustrating
☐ Isolation
☐ Research funding issues
☐ No job security
☐ No downsides
☐ Few role models
☐ Supervision/management problems
☐ Salary
☐ Length of contracts
☐ Other (please specify)……

C13. What, if any, are the main 'upsides' (i.e. positives aspects) of doing postdoc research?

Please mark all that apply

☐ Flexible working hours
☐ Exciting and interesting projects
☐ Collaboration potential
☐ Travel and networking opportunities
☐ Salary
☐ Working environment
☐ Location
☐ Independence and freedom
☐ Gaining transferable skills
☐ No upsides
☐ Other (please specify)……

C14. *How would you describe your relationship with your PI/group head?*

☐ Excellent ☐ Good ☐ Fair / Average ☐ Poor
☐ Very poor

C15. **How** could your experience of being managed be enhanced, if at all? Please mark all that apply.

☐ Could not be enhanced
☐ More general advice & mentoring
☐ Less general advice/more independence
☐ Other (please specify)
……
☐ More research support
☐ More careers advice

Section D: Your Next Steps

D1. How much have you planned your next (i.e. once you've completed this postdoc contract) career steps?

☐ Fully ☐ A little ☐ Not at all

D2. Do you intend to work in the UK or abroad?

☐ UK ☐ Abroad ☐ Would consider either ☐ Undecided

D3. Have you already accepted a job offer or another postdoc position due to start on or near completion of your current contract?

☐ Yes – **Go to Question D4** ☐ No – **Go to Question D5**

D4. Which of the following best describes the job offer you have accepted?

Please mark one box.

- ☐ Academic: ***post doc***
- ☐ Teacher Training
- ☐ Academic: ***fellowship***
- ☐ Scientific Publishing
- ☐ Scientist: ***industry/commerce***
- ☐ Consultant
- ☐ IT Professional or Technician
- ☐ Sales (inc. technical
- ☐ Human Resources/Recruitment)
- ☐ Financial Professional
- ☐ Government/Civil Service
- ☐ Further Study: ***non*-scientific**
- ☐ Academic: ***lecturer***
- ☐ Scientist: ***public sector***
- ☐ Writer/Journalist/Broadcaster
- ☐ Marketing/PR Officer
- ☐ Other

If you answered Question D4, please now go to Section E

D5. My experience of research science as a postdoc has…*Please mark the most appropriate statement*

- ☐ made me more intent on pursuing a career as a research scientist
- ☐ given me doubts about pursuing a career as a research scientist
- ☐ at present had no influence on my career intentions

D6. Do you intend to seek, or are you seeking, employment in role which requires a scientific background?

- ☐ Yes – **Go to Question D7**
- ☐ No – **Go to Question D10**
- ☐ Don't know – **Go to Question D10**

D7. Do you intend to seek, or are you seeking any of the following:

Please mark all that apply

- ☐ Another postdoc position
- ☐ A lectureship
- ☐ A position in a research institute
- ☐ Employment as a research scientist in industry
- ☐ An academic fellowship (e.g. Royal Society Fellowship)

D8. Do you intend to seek, or are seeking, employment as a research scientist in any of the following sectors?

Please mark all that apply.

- ☐ University (not as a post doc/lecturer)
- ☐ Chemical Industry
- ☐ Food or Drink Industry
- ☐ Water, Electricity, Oil or Gas
- ☐ University spin-off R&D
- ☐ University (as a post doc/lecturer)
- ☐ Pharmaceutical Industry
- ☐ Defence
- ☐ Medical Services
- ☐ Commercial Research or Services

☐ Cosmetic Industry ☐ Public Sector
☐ Research Institute ☐ Don't know
☐ Other (please specify)……

D9. What appeals to you about working in the sector(s) you have marked/specified?

……

……

If you have answered Question D9, please now go to Section E

D10. Did you begin your current postdoc contract thinking you would continue your career as a research scientist?

☐ Yes – **Go to Question D11** ☐ No - **Go to Question D12**
☐ Don't know **– Go to Question D12**

D11. What has made you change your mind about continuing your career as a research scientist?

……

……

D12. Do any of the following options describe what you intend to do on completion of your postdoc contract?

Please mark all that apply.

☐ Further Study: *non*-scientific ☐ Scientist: industry/commerce
☐ Scientist: public sector ☐ Scientific Publishing
☐ Manager/Consultant ☐ IT Professional or Technician
☐ Patent Work ☐ Writer/Journalist/Broadcaster
☐ Science Policy ☐ Human Resources/Recruitment
☐ Sales (inc. technical) ☐ Marketing/PR Officer
☐ Financial Professional ☐ Career Break
☐ Government/Civil Service ☐ Teacher Training
☐ Travel ☐ Voluntary Work
☐ Other (please specify)……

Section E: Your Long Term Career Plans

E2. In the longer-term future (i.e. in 6-10 years time), which of these job(s) do you think you are <u>most likely</u> to be doing?

Please mark <u>no more than two</u> boxes.

☐ Academic ☐ Scientist: industry/commerce
☐ Scientist: public sector ☐ Scientific Publishing
☐ Management Consultant ☐ IT Professional or Technician

☐ Patent Work	☐ Writer/Journalist/Broadcaster
☐ Science Policy	☐ Human Resources/Recruitment
☐ Sales (inc. technical)	☐ Marketing/PR Officer
☐ Financial Professional	☐ Voluntary Work
☐ Government/Civil Service	☐ Teacher
☐ Career Break	☐ Don't know

☐ Other (please specify)……..

E3. How important to you is it to have a career which involves the following?

Please mark one box in each row.

	Very important	***Important***	***Somewhat***	***Not important***
Benefits package	☐	☐	☐	☐
Opportunities to publish	☐	☐	☐	☐
Lots of variety in the work	☐	☐	☐	☐
Prospects for receiving a high salary	☐	☐	☐	☐
Access to state-of-the-art equipment/resources	☐	☐	☐	☐
Making a positive difference	☐	☐	☐	☐
Prospects for a leadership role	☐	☐	☐	☐
Flexible working options	☐	☐	☐	☐
Safe working environment	☐	☐	☐	☐
Diversity of roles	☐	☐	☐	☐
Job security	☐	☐	☐	☐
Extensive benefits packages and/or bonuses	☐	☐	☐	☐
Living in a pleasant area	☐	☐	☐	☐
Autonomy at work	☐	☐	☐	☐
Working at an unhurried pace	☐	☐	☐	☐
Working at a fast pace	☐	☐	☐	☐
Holding a respected position	☐	☐	☐	☐
Good professional development opportunities	☐	☐	☐	☐
Opportunities to travel	☐	☐	☐	☐

Section F: Career Development

F1. How would you rate your awareness of career options within academia?

☐ Very Good ☐ Good ☐ Adequate ☐ Poor ☐ Very Poor

F2. How would you rate your awareness of career options outside academia?

☐ Very Good ☐ Good ☐ Adequate ☐ Poor ☐ Very Poor

F3. Prior to undertaking your (first) postdoc did you receive any careers advice?

☐ Yes – **Go to Question F4** ☐ No – **Go to Question F7**

F4. Where did this careers advice come from? Please mark all that apply

Please mark all that apply.

☐ University careers service ☐ Industrial placement supervisors ☐ Careers/recruitment fairs
☐ Your supervisor ☐ Other academic staff ☐ Research council
☐ Family or friends ☐ Professional careers service

F5. What was the topic of the careers advice you received (***prior to*** beginning your first postdoc)?

Please mark all that apply.

☐ Types of jobs available and/or where to look for jobs
☐ Filing out application forms and writing a CV
☐ Insights into working in particular jobs e.g. pay, conditions
☐ Interview techniques
☐ Don't know
☐ Other (please specify)……

F6. On the whole, did you seek out this careers advice or was it offered to you unsolicited (*prior to* beginning your first postdoc)?

Please mark only one box.

☐ I sought the advice ☐ The advice was offered to me unsolicited
☐ Both ☐ Don't know

F7. <u>During this postdoc contract</u> have you receive any careers advice?

☐ Yes – **Go to Question F8** ☐ No – **Go to Question F11**

F8. Where did this careers advice come from?

Please mark all that apply.

☐ University careers service ☐ Industrial placement supervisors ☐ Careers/recruitment fairs
☐ Your supervisor ☐ Other academic staff ☐ Research council
☐ Family or friends ☐ Professional careers service

F9. What was the topic of the careers advice you received (***during*** your postdoc)?

Please mark all that apply.

☐ Types of jobs available and/or where to look for jobs
☐ Filing out application forms and writing a CV

☐ Insights into working in particular jobs e.g. pay, conditions
☐ Interview techniques
☐ Don't know
☐ Other (please specify)……

F10. On the whole, did you seek out this careers advice or was it offered to you unsolicited (eg in your appraisal)?

Please mark only one box.

☐ I sought the advice ☐ The advice was offered to me unsolicited
☐ Both ☐ Don't know

F11. Is there an appraisal (performance management) system at the University?

☐ Yes – **Go to Question F12** ☐ No- **Go to Question F19**
☐ Don't know **– Go to Question F19**

F12. Are postdocs in your department normally appraised?

☐ Yes – **Go to Question F11** ☐ No- **Go to Question F14**
☐ Don't know **– Go to Question F14**

F13. How frequently does appraisal normally occur for postdocs?

☐ Twice a year ☐ Once a year
☐ Once every two years
☐ Other (please specify)……

F14. Have you been appraised?

☐ Yes – **Go to Question F15** ☐ No – **Go to Question F19**

F15. How many times have you been appraised? ***……***

F16. Who (normally) carries out your appraisal(s)?

☐ Your PI/supervisor ☐ Another member of staff

F17. Did you find appraisal relevant/useful?

☐ Yes ☐ No ☐ Somewhat

F18. Why?

……

After answering question F18, please go to question F20.

F19. Would you like to be appraised?

☐ Yes ☐ No

F20. Are you encouraged to undertake activities good for your career progression (e.g. networking, attendance at conferences, etc)?

☐ Yes – **Go to Question F22** ☐ No – **Go to Question F23**
☐ Neither encouraged nor discouraged – **Go to Question F21**

F21. Would you say you possess the majority of general skills that employers often look for?
Note: 'General skills' refers to non-technical skills e.g. communication, team-working and problem-solving skills

☐ Yes ☐ No ☐ Don't know

F22. Which of the following activities have you undertaken whilst postdocing at your current institution? Please mark all that apply

☐ Attend conferences ☐ Attend training courses
☐ Networking ☐ Teaching
☐ Give internal presentations ☐ Give external presentations
☐ Other (please specify)…….

F23. Are you aware of a mentoring scheme at your university?

☐ Yes – **Go to Question F24** ☐ No – **Go to Question F26**
☐ Not aware – **Go to Question F26**

F24. Have you been involved in any mentoring scheme for postdocs at your university either as a mentor of as a mentee?

☐ Yes – **Go to Question F25** ☐ No – **Go to Question F26**

F25. Please describe a little about what you did/were involved in.

……

……

F26. Have you ever applied for a fellowship?

☐ Yes ☐ No

F27. Were you encouraged to do so?

☐ Yes – **Go to Question F28** ☐ No – **Go to Section G**

F28. Who encouraged you? (please mark all that apply)

☐ My PI ☐ My Head of Department
☐ Other academic staff ☐ Other postdocs
☐ No-one

Section G: Culture of Department

G1. When you joined the department as a postdoc were you given a departmental induction?

☐ Yes – **Go to Question G2** ☐ No – **Go to Question G5**

G2. Did you find induction useful and informative?

☐ Yes – **Go to Question G3** ☐ No – **Go to Question G4**

G3. If Yes, please explain what was good about the induction

……
……

G4. If No, please explain what was not so good about the induction

……
……

G5. Do you feel:

☐ More like a staff member than a student?
☐ More like a student than a member of staff?
☐ Neither like a member of staff nor a student?

G6 . What makes you feel this way?

……
……

G7. Is there postdoc representation in departmental/important meetings?

☐ Yes – **Go to Question G8** ☐ No – **Go to Question G9**
☐ Don't know – **Go to Question G9**

G8. How are the outcomes of meetings relayed back to everyone?

……
……

G9. Do you feel that postdocs are respected and well regarded in the department?

☐ Yes ☐ No ☐ Mixed experienced ☐ Don't know

G10. Please explain your answer.

……

……

G11. Do you know what your department's arrangements are for career breaks (e.g. maternity leave, leave for caring responsibilities, long-term sick leave)?

☐ Yes ☐ No ☐ Don't know

G12. Have you ever had a career break, either in this or a previous contract, in the UK?

☐ Yes – **Go to Question G12a** ☐ No – **Go to Question G15**

G12a. If you are prepared to, please explain why you needed a career break

……

G13. If you are prepared to, please describe how your return to work after your career break was managed

……

G14 What happened to your work/research in your absence?

……

G15. Does your department allow flexible working (e.g. working your hours when you want, being able to leave early to pick up children)?

☐ Yes ☐ No ☐ Don't know

G16. As a postdoc do you feel able to work flexibly when/if you need to?

☐ Yes ☐ No ☐ Don't know

G17. In your department, are you expected to help supervise PhD students?

☐ Yes ☐ No ☐ Not expected but do ☐ Don't know

G18. Is this responsibility for supervising PhD students recognised and formalised?

☐ Yes - **Go to Question G20** ☐ No- **Go to Question G19**
☐ Don't know- **Go to Question G19**

G19. Would you like to see this responsibility recognised and formalised?

☐ Yes ☐ No ☐ Don't know

G20. Have you received any formal training to supervise PhD students?

☐ Yes – **Go to Question G21** ☐ No – **Go to Question G22**

G21. Did you find the training valuable?

☐ Yes ☐ No ☐ Don't know

G22. Are postdocs given the opportunity to carry out any teaching if they wish to?

☐ Yes – **Go to question G23** ☐ No – **Go to Section H**
☐ Don't know –G**o to Section H**

G23. Have you done any teaching?

☐ Yes – **Go to question G24** ☐ No – **Go to Section H**

G24. What teaching activities have you done (please mark all that apply)?

☐ Lecturing ☐ Practical class supervision
☐ Small group tutorials
☐ Other (Please specify)……..

G25. Did you receive any training before you carried out teaching?

☐ Yes ☐No

Section H: Your Comments

In the space below (or on a separate sheet) we would be grateful for your comments on all or some of the following:

- your postdoc experience
- your perceptions/experiences of working as a scientist
- your perceptions/experiences of working in the university sector versus working in industry/commerce
- your career plans
- the level/nature of careers advice you have received

……

END OF QUESTIONNAIRE

May we contact you?

All responses to this questionnaire will remain anonymous.
If you wish to provide your contact details to receive the results of our study or to participate in any follow-up work or future research on postdocs, please provide your preferred contact details below.
This information will be stored separately from the questionnaire and will only be used by the IOP or RSC to provide you with study results or details of future work. It will not be used for any other purpose and will only be passed on to our researcher for the purpose of contacting you about future or follow-up work on this issue.

Name: ……..
E-mail Address: …….....
Mobile Phone No: …….....

If you wish to be included in the prize draw then please enter your details below. These details will be stored separately to the main questionnaire and will only be used in connection with the prize draw. They will not be used for any other purpose, nor passed on to any other third party.

Name: ……..
E-mail Address: …….....
Mobile Phone No: …….....

Appendix E: List of tables

Appendix F: List of figures