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# Recruitment and Retention of Women in Academic Chemistry

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A Report from Evaluation UK  
December 2002



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## Foreword

**As Chairman of the Athena Advisory Committee and former chairman of the Scientific Affairs Board of the RSC I am pleased to introduce this report presenting the findings of a follow-up study to the Royal Society of Chemistry's 1999 "Study of the Factors Affecting the Career Choices of Chemistry Graduates". The follow-up study sought to identify good practice in university chemistry departments in the retention and recruitment of women academic chemists.**

Significantly fewer women than men work in Science, Engineering and Technology (SET) occupations. The Government's 1993 White Paper "Realising our Potential" acknowledged that women are the country's biggest single most under-valued and therefore under-used human resource.

Currently chemistry compares well overall with other SET subjects in the proportion of women undergraduate and postgraduate students it attracts (approximately 38 per cent), but the proportion of women post doctoral fellows falls to around 25 per cent. Only around 2 per cent of chemistry professors in the UK are women which is one of the lowest proportions of any subject.

We must move from a situation where some of our best chemistry departments can attract young women at a ratio of one to three at postgraduate level but then for whatever reason fail so that by the post doc stage they have only one woman to twenty men. If these young women are leaving chemistry completely, the waste that this represents for chemistry and for the women themselves is unforgivable. If they are simply leaving academic research, the loss to chemistry departments of all that trained competence is unacceptable.

The work by Evaluation UK is a valuable contribution with its examples of good practice, many of them quite simple which make a difference to the 'culture and comfort' of our workplaces and our enjoyment of a career in chemistry.

Although specific to chemistry the report contains important messages for all SET disciplines and not just for women. It complements the work we are doing in Athena to achieve our aim- 'the advancement of women in science, engineering and technology in higher education and a significant increase in the number of women recruited to the top posts.'

This study does find that there are a number of examples of good practice which seem to affect the recruitment and retention of women positively. Undoubtedly there is a long way to go to make such policies and practices universal but it is my belief that the fuller participation of women in academic chemistry will strengthen the subject in the long term. Information in this report combined with similar work in other subjects and other schemes piloted under the Athena Project umbrella will I hope make a difference.

*Julia Higgins*

*Professor of Polymer Science, Chemical Engineering Department, Imperial College  
Chairman of the Project Working Group*



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# Summary

## S1. Introduction

The Scientific Affairs Board of the Royal Society of Chemistry commissioned Evaluation UK to conduct this study. Its aim was:

*To identify what it is about the culture in certain departments and/or institutions, which causes women to apply for, and accept, posts and subsequently encourages them to remain in these departments and/or institutions.*

Fieldwork was based on structured interviews with 35 women across seven chemistry departments across the UK, plus the heads of those departments. It was conducted between January and March 2002. Departments were selected to represent a spread of RAE scores and differing percentages of women staff. The interviews covered three career stages:

- ◆ applying for first permanent post: lecturer or equivalent
- ◆ retention after first appointment
- ◆ promotion: to senior lecturer and above.

Because of the nature of our fieldwork, our report discusses departmental culture solely as it affects women. We recognise that:

- ◆ many male staff will share some of the concerns raised by interviewees
- ◆ the good practice we identify below will be as welcome to most men as to women.

## S2. Good Practice in First Appointment

All departments observed basic good practice but varied considerably in the extent to which they went beyond this in:

- ◆ **identifying women candidates** through:
  - ◆ targeting specific external female candidates for inclusion in the shortlist
  - ◆ always including a woman in the shortlist
  - ◆ encouraging internal female staff to apply, to gain practice with interviews; and providing them with feedback
  - ◆ actively seeking to attract Royal Society and Dorothy Hodgkin Fellows to their institution and giving these parity of treatment with established lecturers
- ◆ **ensuring equity in selection procedures** through:
  - ◆ spreading the interview process over two days, to include dinner and discussions with the head of department and other members of staff
  - ◆ requiring at least two women to sit on the interview panel, including one from human resources and, if needed, a female academic from outside chemistry
  - ◆ having lay representation on all panels and asking all candidates to present their research to a non-chemist
  - ◆ appointing a panel chair from outside the department.

These additional efforts are important because they:

- ◆ create a more rounded interview process in which candidates are not judged on first impressions or on a single presentation
- ◆ reduce the tendency of departments to appoint in their own image or on the basis of personal contacts.

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### S3. Good Practice in Induction

There is wide disparity between departments in the extent and robustness of their induction processes. The best departments do not target measures solely at women but have procedures in place for all new staff. These include:

- ◆ **briefing:** a formal induction programme, which includes a meeting with the Registrar and a briefing on how promotion operates within the department and the institution
- ◆ **allocation of work:**
  - ◆ arranging visits before appointees take up post to discuss overall workload, including the balance of their portfolio between teaching, research and administration
  - ◆ giving new appointees the opportunity to raise personal circumstances that might affect allocation of duties
- ◆ **training:** formal training in lecturing and requirements to attend—this is helpful in ensuring that all appointees are treated equally and have to meet standard probation criteria
- ◆ **mentoring:** while departments varied in their provision of initial mentoring, most interviewees noted its value for all new appointees.

### S4. Good Practice in Retention

Departments that were regarded as having a positive approach to women also had better retention rates. The words most often used to describe these departments were: ‘open’, ‘friendly’ and ‘supportive’. We identified two sets of conditions that define such departments:

- ◆ the first are the result of management style and decisions and are largely discretionary: we focus on these in our report
- ◆ the second are a function of physical factors, including location and institutional and departmental size and history; they are less amenable to change.

We found that good management practice was dependent on:

- ◆ the personality and management style of the head of department
- ◆ his actions to open up the structure and style of decision-making.

### S5. Good Practice in Management Structure

Actions that create a supportive environment for women—and men also—include:

- ◆ making membership of the board of studies open to all members of staff, with open discussion of allocation of teaching
- ◆ ensuring that the board of studies is not male dominated, intimidating, traditional, hierarchical
- ◆ introducing selection of the head of department by democratic vote rather than automatic rotation between heads of section
- ◆ bringing in a flat structure with lots of collegiality and where decisions are taken by committees and are open and transparent
- ◆ organising research on a floor-wide basis, rather than segregated into separate units or laboratories
- ◆ ensuring equity in the allocation of administration and support duties through a rota system avoiding:
  - ◆ women taking on too many support duties
  - ◆ gender segregation in the allocation of those duties.

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- ◆ an open bidding system for studentships, rather than allocation
  - ◆ the introduction of open accounting across the whole department to ensure that everyone knows how much funding others receive.

### **S6. Good Practice in Management Style**

The personal style of heads of department and senior staff is also important and good practice includes:

- ◆ operating an ‘open door’ policy
- ◆ letting people know they can put themselves forward for increments and promotion
- ◆ legitimising decisions about balancing work and home
- ◆ supporting and rewarding individuals through:
  - ◆ appraisal, development and mentoring
  - ◆ broadly based reward mechanisms
  - ◆ peer support, through facilitating social contact.

### **S7. The Need for Good Practice in Promotion**

While the remaining barriers at first appointment stage are lowering, the ‘glass ceiling’ at mid-career stage remains firmly in place. Interviewees identified four structural barriers:

- ◆ the lack of formal procedures
- ◆ a potential side-lining of women into atypical posts, with unclear future progression routes
- ◆ the emphasis on research in the selection criteria for the most senior jobs
- ◆ women’s relative lack of mobility, coupled with a perceived bias to external candidates.

### **S8. The Broader Context**

Many of the issues raised by interviewees are not specific to women or to chemistry departments. Women identified three broad issues over which departments themselves have little control:

- ◆ the long hours, low-pay culture, which creates additional barriers for women with child care responsibilities
- ◆ the university career structure, which offers little provision for part-time work and rewards an unbroken research record
- ◆ the undergraduate crisis in chemistry, which is reducing the number of opportunities overall.

### **S9. Conclusions**

Our fieldwork shows that the introduction of good management practice has an identifiable impact on the willingness of women to apply to and remain within departments. It is equally clear that:

- ◆ the personality—and personal circumstances—of the head of department are significant in determining good management practice
- ◆ institutions have a role in ensuring that selection procedures for department heads prevent departments selecting leaders in their own image
- ◆ the best departments do not target measures specifically at women: they create a culture of diversity where all individuals can thrive and be rewarded for their contribution, regardless of gender or family circumstances.

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## S10. Strategic Messages

From our research we identify six strategic messages for the RSC, institutions and chemistry departments:

1. The problem of increasing the number of women in chemistry and in senior positions is not intractable. There are already departments creating the supportive environment needed to help women succeed.
2. This good practice is, however, patchy and needs to be spread to become the prevailing ethos in UK chemistry departments and in science departments in general.
3. Good practice is embedded in department cultures, histories and personalities. For this reason, it will take time for good practice to become universal.
4. The RSC, institutions and departments need to plan to sustain long-term change in the culture of chemistry departments, as well as taking short-term initiatives to improve the immediate position of women.
5. Flexible employment opportunities during child bearing years are key to any improvement in women's career prospects. Both cultural change and short-term measures need to take account of the needs of women over two timescales:
  - ◆ the working week: promoting flexible hours and scheduling teaching and other commitments to fit with childcare
  - ◆ the career trajectory: allowing for a longer career development path for women with children.
6. In general, departments should take action that is:
  - ◆ gender-neutral
  - ◆ will lead to cultural and practical changes that will create a better professional and employment environment for both men and women.

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# Introduction

## 1. Background

The Royal Society of Chemistry (RSC) has been concerned for some time about the difficulties academic chemistry faces in recruiting, retaining and promoting women. Four in ten undergraduates are female but only 2% of professors. The RSC commissioned Evaluation UK to undertake research in 1999 on the factors affecting the career choices of chemistry graduates:<sup>1</sup> especially why so many women leave at post-doctorate stage. That study found that the working environment in academic chemistry deters large numbers of women from remaining, while the structure of departments and the nature of the subject creates barriers to their promotion. It concluded that a significant increase in numbers would come about only through changes to the culture of chemistry departments.

## 2. This Study

As a follow-up to the 1999 study, the Scientific Affairs Board (SAB) of the RSC agreed in October 2000 to:

*Examine what differentiates 'good' and 'bad' chemistry departments in the context of the recruitment of women.*

After discussions with the project manager of Athena,<sup>2</sup> the RSC:

- ◆ agreed to set up a small-scale study
- ◆ appointed a working group of the SAB to progress the study.<sup>3</sup>

To address concerns that retention is as important an issue as recruitment, the working group expanded the aims of the study:

*To identify what it is about the culture in certain departments and/or institutions, which causes women to apply for, and accept, posts and subsequently encourages them to remain in these departments and/or institutions.*

## 3. Methodology

Our methodology had four main components:

- ◆ RSC analysis of HESA staff data for 1999/2000 to identify departments for fieldwork.
- ◆ Selection of eight<sup>4</sup> departments across the UK, representing:
  - ◆ a spread of RAE scores
  - ◆ differing percentages of women staff
  - ◆ wide geographical coverage
  - ◆ a mix of established universities and former polytechnics.
- ◆ Structured interviews within each department with:
  - ◆ head of department
  - ◆ female academic staff.
- ◆ A presentation to the RSC working group.

## 4. Survey Tool

Our initial proposal, developed with RSC and Athena, was to trial a standardised survey tool, which might be used as the basis for interviews across different disciplines and institutions to identify elements of good practice within departments. It became clear early in our fieldwork that the development of a standard instrument would not be feasible for this study because:

- ◆ the range of positions of interviewees was very broad: from initial post-doctoral appointment to professorial post

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- ◆ as a result, the diversity of their experience of appointment and selection meant that standard questions were inappropriate
  - ◆ some senior staff had been appointed several years ago and their experience is no longer representative of departmental procedures.

It also became apparent that:

- ◆ interviewees' decisions to select and remain within a department were based on complex interactions between a web of personal, family, historic and professional circumstances
- ◆ the department itself was not always the key influence on interviewees' decisions:
  - ◆ junior staff in large, research-intensive departments perceived their research unit or section as having most influence
  - ◆ for senior staff contemplating promotion, the culture of the faculty or institution was often more central to their decisions.

In these circumstances, isolating the impact of departmental culture on women's career paths is not straightforward and it does not lend itself easily to the application of a single survey instrument. We found examples of women with good experiences in departments that failed to recruit and retain women and of women with bad experiences in departments with good reputations. In Annex C, we offer guidance on conducting future studies of this kind.

## 5. Developing Good Practice

Notwithstanding these complexities, it was possible to:

- ◆ develop a simplified list of topics which could be adapted to the different experiences of interviewees
- ◆ identify elements of good practice, that might be incorporated into existing departmental and institutional policies and practices.

The list of survey topics is at Annex B.

## 6. Our Sample

We interviewed 35 women:

- ◆ 10 senior: defined as senior lecturer, principal lecturer, reader and professor
- ◆ 22 junior: defined as lecturer and researcher
- ◆ 3 other: administrative and managerial staff.<sup>5</sup>

They were located in seven institutions:

- ◆ in four institutions, we interviewed all women staff including post-docs
- ◆ in three, we sampled across the department.

Interviews were conducted face-to-face<sup>6</sup> and lasted one hour. We guaranteed anonymity to all the departments and individuals who took part in the study and have made every effort to safeguard that anonymity in our text. We use anonymised quotes in the text to illustrate the main findings.

## 7. Similarities between Men and Women

Our fieldwork was conducted solely with a sample of women. Many of the women thought that they might differ in their perceptions and experiences from an equivalent sample of men. We were not able to test this assumption. However, we note that:

- ◆ many of the concerns that women have are likely to be shared by some men
- ◆ the relative weighting of those concerns may be different.

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Throughout the report we discuss the issues raised solely as they relate to women. We recognise, however, that many male chemistry staff will face similar concerns. We recommend that, if similar work is undertaken in other subjects, it should encompass equal samples of men and women.

## 8. Categorizing Women

Part of our remit was to analyse cultural differences by specialism. We were not able to do this because:

- ◆ many women found it hard to classify themselves within the traditional divisions: organic, inorganic and physical
- ◆ they tended to describe their affiliation by:
  - ◆ field of interest: atmospheric, biomimetic catalysts, polymers, etc.
  - ◆ technique: crystallography, modelling, etc.
- ◆ departments themselves are abandoning the traditional distinctions in their attempts to change culture and promote interdisciplinary research
- ◆ many women covered a range of fields, teaching in one and researching in another; or were engaged in interdisciplinary research at the margins of their specialism or discipline
- ◆ the small sample size meant that women were very widely distributed across different branches: it was difficult to determine the relative influences of the department and section.

The received wisdom is that the large organic laboratories are those least conducive to women. There was some limited evidence to support this view.

*Organic chemistry is very general, which makes it more competitive. Unlike physical chemistry, no-one has a safe niche, based on what equipment they have.*

But we also heard opposing theories:

- ◆ the theoretical side has fewer resources, which makes it harder for women
- ◆ theoretical and computational chemistry provides an easier environment because it is much less aggressive, and much more flexible in working hours and contact time.

Overall, the evidence on organic laboratories is inconclusive.

## 9. Our Thanks

Trudy Coe wrote this report and conducted the fieldwork jointly with Pauline Amos-Wilson, former research coordinator, and Viv Clements, researcher. Viv transcribed interviews, conducted data analysis and contributed to the report. Andy Boddington analysed the data and edited the report. We are very grateful to all the women who gave freely of their time to be interviewed and for their frank but fair views. We also thank heads of department, who gave consent to the fieldwork and gave generously of their own time; and the departmental administrative staff who smoothed our path.

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## Women's Early Careers

### Applying for a First Post

#### 10. Why Women Apply

The transition to first permanent lecturer appointment is the key hurdle for women. We examined in our interviews the factors affecting women's decisions to apply for, and subsequently accept, a post. With one exception, departmental reputation appears to have little bearing on those decisions: Key factors are:

◆ **Opportunism.** Nine interviewees took their first or current job simply because it was offered to them. Most felt that they had little choice of department, because of:

- ◆ the scarcity of academic posts
- ◆ the fierce competition for them.

*The reason we're here is that this place gave us a job. Just to find an academic job is very difficult.*

◆ **Partner location.** Thirteen of our 35 interviewees were also constrained in their choice of first post by the location of their partner's work.

◆ **Research topic.** Four interviewees mentioned the relevance or reputation of the department's research as a contributory factor in their decision.

For most interviewees, the presence of other women in the department was not a factor in choice of where to apply, though there were exceptions:

*I don't think I'd like to go and work in a department where I was the only woman in it. I'd think very seriously about taking a job in that sort of institution.*

*That's one of the reasons that attracted me here. They have a relatively high number of female staff. Female staff do attract other female staff.*

#### 11. Impact of Choices

We were not able to contrast women's motivations with those of their male colleagues. Women perceived that there might be differences:

*Men who are driven to this type of job are very research driven. Men are really driven by the force of the research—they could easily get a job elsewhere.*

The suggestion, which merits further exploration, is that:

- ◆ women select departments for pragmatic reasons
- ◆ men select them for the reputation of their research.

However, in a difficult job market and within dual career couples, many men may also be selecting departments for practical reasons.

#### 12. Ensuring 'Fit'

One of the departments in our sample took a proactive stance in welcoming prospective candidates before they took up post:

*The head of department was very encouraging. He set up a timetable to see people, talk to people, have a look at things, was very welcoming.*

This department has a good reputation for employing women and a high proportion of female staff. Its approach points to the importance of taking steps to create a supportive culture that encourages women and builds a positive reputation.

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## Appointment

*With all interviews you choose the best researcher. You cannot afford to choose the less good for the sake of the department. (Head of department)*

### 13. Advantages for Women

None of our interviewees identified any barriers within departments, whether tangible or attitudinal, at first appointment stage:<sup>7</sup>

*There is no real discrimination. I've sat on interview panels and it's always down to potential and merit. You're hired because you're an asset. (Woman professor)*

If anything, women perceived they had a slight advantage at first appointment, precisely because of the paucity of women:

- ◆ as a minority, women are more visible and more memorable
- ◆ all departments are concerned to increase the proportion of women on their staff.

Heads of department reinforced this view:

*We pray and hope that good women will apply and if all other things were equal we would appoint a woman candidate.*

### 14. Lack of Discrimination

First appointments are generally subject to university-wide policies and procedures. The appointment is made to and by the department, usually through an appointment committee. This ensures a minimum degree of fairness. As a result, none of our interviewees had encountered prejudice during the interview procedures for their current jobs.

### 15. Beyond Good Practice

All departments were aware of the basic elements of good practice, such as the desirability of having a woman on the interview panel. Interviewees confirmed the importance of this:

*I'm sure the recent appointments haven't been chosen because they were women. I'm sure they were the best person for the job. But I'm not sure they would have got the job if I hadn't been on the committees.*

*I think they watch what they say about women when I'm on a panel.*

Departments varied considerably, however, in their efforts to go beyond minimum requirements. A department with low representation of women claimed it was not possible to include a woman in every instance, without over-burdening current female staff. Other departments were more creative:

- ◆ one brought in women from the arts and humanities for all interviews
- ◆ one with a high proportion of women staff spreads the interview process over two days, to include dinner and discussions with the head of department and other members of staff
- ◆ another requires at least two women to be present on the interview panel, including one from human resources
- ◆ one has lay representation on all panels: all candidates have to present their research to a non-chemist
- ◆ another requires the panel to be chaired by someone external to the department.

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## 16. Diversity

*The department is very friendly and is a good mix of young friendly people and old, wise heads. You don't have the same problem here as [in other universities] of big egos.*

The departments most supportive of women were the most diverse in age and gender—though the head of one department pointed out the penalties of lowering the age profile of staff. He had brought new blood into the department, including several women. The aim was to grow talent within the department, rather than attract established researchers, but he felt the RAE had penalised him for taking this risk:

*The RAE is not doing us any favours.*

One head of department underlined the importance of building diversity in at interview stage: he had appointed a woman, not because she was a woman but because of her experience with disabled students. Once diversity is built into appointment procedures, it becomes self-perpetuating:

*When the culture is one of diversity, you look for people who are comfortable with that.*

And once you have a more diverse culture, you attract people who will thrive in it:

*When that is the culture, you look for people who are comfortable with that and are reinforced by it. People who have a good way with people as well as academic merits are appointed.*

## 17. Positive Action

*How can we get more in post unless more apply? The encouragement has to be put to them.*

*Women are less aggressive about careers in the first place. They tend to need encouragement to put lots of proposals in.*

Positive discrimination—appointing a woman solely because she is a woman—is illegal. None of our interviewees argued that it should be otherwise but there were large differences in the degree to which departments take positive action to attract women candidates. A department with a low proportion of female staff currently takes no positive action. Others:

- ◆ target specific external female candidates for inclusion in the shortlist
- ◆ always include a woman in the shortlist
- ◆ encourage internal female staff to apply, to gain practice with interviews
- ◆ actively seek to attract Royal Society and Dorothy Hodgkin Fellows to their institution.

Our interviewees confirmed that this type of positive action is needed:

- ◆ one, now a professor, had not contemplated applying for her first lectureship until her head of department encouraged her to do so
- ◆ another believed that women were less good at presenting their CVs in the best light:

*We always sell ourselves short on paper and come across better in interviews.*

## 18. The Need for Feedback

Departments in general need to be aware of the talent of their women members of staff and to take positive action to seek it out. Women often question their own abilities and will only apply for positions where they are confident of meeting the majority of the selection criteria. In this context, feedback on failed promotions is critical: yet interviewees felt that most panel members are uncomfortable with giving feedback. This is an important point. It may be helpful to include women on every shortlist to boost confidence at interview stage, but only if confidence is sustained after the interview through giving detailed feedback and maintaining motivation.

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## 19. The Benefits to Women

All these additional efforts and approaches are helpful to women because they:

- ◆ create a more rounded interview process in which candidates are not judged on the basis of a single presentation
- ◆ reduce the possibility of departments:
  - ◆ continuing to appoint in their own image
  - ◆ favouring candidates already known to them through existing networks.

## 20. The Role of Personal Contacts

Despite the apparent openness in appointments, some of our interviewees believed that:

- ◆ some appointments still depend as much on personal contacts as candidate qualities:

*My supervisor said he knew that I was probably going to get the job before I even went for interview. Just because of the phone conversations he'd had with the people at [university] beforehand.*
- ◆ these informal contacts still largely work to the advantage of men:

*[This field] appears to be meritocratic, but it's much more about who knows who. Pedigree is important.*

We recognise that personal contacts are important in any field and do not work solely to the disadvantage of women: some men may also be excluded from these informal networks. What is important is to ensure that all interview processes are as transparent and open as possible, so that each candidate is judged against the same criteria, regardless of their personal contacts.

## Induction and Mentoring

### 21. Induction

We define induction as covering: briefing, allocation of work, training and mentoring. We found significant variations between departments in the extent of their induction programmes. The most 'women-friendly' departments have the most comprehensive procedures. However, these are not gender-specific but reflect good management practice:

- ◆ **Briefing.** In the department with most women there is a formal induction programme. This includes a meeting with the Registrar and a briefing on how promotion operates within the department and the institution. This is helpful to women in clarifying expectations about the criteria that will determine promotion.
- ◆ **Allocation of work.** One department arranges visits before appointees take up their post to discuss overall workload, including the balance of their portfolio between teaching, research and administration. Interviewees are given the opportunity to raise personal circumstances that might affect allocation of duties. The colleague of one interviewee had to pick up a child from nursery at a particular time: her lectures were scheduled around this commitment a year in advance.
- ◆ **Training.** Most departments now have some kind of formal training in lecturing, with requirements to attend. This is helpful in ensuring that all appointees are treated equally and have to meet standard probation criteria. Some women noted an irony in the requirement: that the workload lost by cutting the teaching hours of new appointees is compensated for by an intensive course—this may increase the personal pressures on young women.
- ◆ **Mentoring.** Departments varied in their provision of initial mentoring; and interviewees had mixed views on its value:
  - ◆ women who had succeeded felt that they had created their own support networks by

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identifying people they empathised with; and that a formal requirement was not helpful:

*You're not going to discuss your personal problems with someone you don't like or admire.*

- ◆ younger women saw the value of a mentor in providing a buffer between new appointees and pressures from above, and in explaining the workings of the department:

*There was a lack of mentoring. No-one took a direct interest in you. I was naïve. I hadn't realised how much contacts meant. I assumed everything was done on merit.*

## 22. Value of Mentoring

The merits of mentoring and good practice in its introduction have been fully debated by the Athena Development Programme:<sup>8</sup> four of its 1999 projects addressed the issue. We heard differing views on the value of mentoring. The best departments offer it and women generally found it helpful to have at least the option of a mentor. Our interviews show that during induction:

- ◆ what matters is the opportunity for all staff, men and women, to have a departmental mentor
- ◆ getting the right mentor is as important as mentoring in itself: having the wrong mentor during induction can be as damaging as having no formal support:

*It would be a bit worrying if you had someone you couldn't approach. I didn't really have any say in who was my mentor. I just kind of got told 'x' is your mentor.*

We make two observations:

- ◆ mentoring is only one element of a supportive culture, rather than a solution in itself
- ◆ a formal mentoring requirement is likely to be most needed and most valuable in those departments that are least supportive of their staff, whether male or female.

There is much less need for formal mentoring in 'good' departments which provide broadly-based support and have an open culture.

## 23. Role of Fellowships

There were differing views among the women on the importance of externally funded fellowships—Royal Society and Dorothy Hodgkin in particular—in providing an entry route. Interviewees recognised their value in getting women established in research:

- ◆ if women are not funded by the department, it is easier for them to dictate their terms and not become over-burdened by administration
- ◆ an individual fellowship allows women to move between institutions if necessary, at the stage when a partner may be establishing their career and be mobile.

But two women identified problems:

- ◆ because Dorothy Hodgkin Fellowships are targeted primarily at women and have less research money attached to them than RS Fellowships, they are seen as less prestigious, thereby putting women at a disadvantage<sup>9</sup>
- ◆ not belonging to a department can be problematic because you are not party to decision-making and do not receive parity of treatment with established lecturers; as a woman, this can reinforce feelings of isolation:

*You're out of the loop as a Research Fellow.*

*They have no obligation to the Fellows [to offer the statutory training course for new staff]. I didn't like that: we are doing the same job.*

Research fellowships will only benefit women if the holders receive parity of treatment with established staff.

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## Retention

### 24. Personal and Professional Factors

It was beyond the remit of our study to review historic data and determine how successful departments had been in retaining female staff after first appointment. But there were a number of women in our sample who had remained at their current institution for several years. There was a complex interplay of personal and professional factors in their decisions to remain and we cannot judge the relative weight of these factors. Fifteen of the women had stayed in their current institution at least in part because they had a partner and sometimes family in that location. But, even with family ties, women are unlikely to stay in a hostile department. What is important is that departments have a culture that can support and develop any members of staff who are constrained in their ability to move by personal factors.

### 25. Factors in Retention

*When you get them, you then try and support them. (Head of department)*

*You need to encourage them and ensure they don't fall out for stupid reasons. (Head of department)*

*When you're talking about getting people to feel comfortable, it's the very steady run-in, good mentoring, good opportunities to do what you do well and be seen to and be patted on the back.*

Our remit was to identify whether there was anything that distinguished the culture of chemistry departments that were successful in recruiting and retaining women. We found that the better departments had relatively few measures targeted specifically at women. Instead, they had focused on building a culture which:

- ◆ embraced and encouraged diversity
- ◆ was supportive of all staff, regardless of gender.

*Good departments treat people well and I don't really feel that's gender specific.*

The words women most often used to describe these departments were 'open', 'friendly' and 'supportive.' We identify two sets of conditions that define such departments:

- ◆ the first are the result of management style and decisions and are largely discretionary; key elements are:
  - ◆ opening up and ensuring equity in decision-making
  - ◆ legitimising the work/life balance
  - ◆ supporting and rewarding individuals
- ◆ the second are a function of physical factors and less amenable to change:
  - ◆ size (of department and institution)
  - ◆ location
  - ◆ history
  - ◆ buildings.

### 26. Broader Factors

We restrict our analysis in this section to the departmental factors that can play a role in retaining women. However, many of our interviewees considered that departments themselves could do little to make chemistry more attractive to women in the face of other obstacles to their retention:

- ◆ poor pay
- ◆ long hours
- ◆ work/family balance
- ◆ women's individual preferences.

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None of these issues are specific to chemistry and are largely beyond the remit of this study. We return to them briefly in our conclusions because it is far from clear that chemistry departments acting in isolation, or even institutions, will be able significantly to increase the numbers of women choosing a career in chemistry.

## Decision-Making

### 27. The Impact of Personalities

*So much depends on the head of department.*

*It requires a head of department who cares about his staff.*

*It has to be an all-pervading thing and it has to come from the top.*

Interviewees recognised that personalities exert a huge influence on departmental culture. The culture of departments depends to a large degree on the passions and priorities of those leading them at two levels: head of department and head of departmental section. The best departments for women are those where the key personalities:

- ◆ take the lead in changing culture
- ◆ open up decision-making to lessen the influence of personal interventions.

In the better departments, women identified the head of department as key in setting the tone and leading by example. It may not be coincidence that the two most women-friendly departments in our sample were led by younger heads of departments who were each part of a dual-career couple with children. Both were keen to introduce a working culture compatible with family life which supported all staff.

### 28. Obstacles to Change

In research-led or large departments, heads often faced opposition to change from section heads or heads of research units. In departments less good at recruitment and retention, women perceived heads of section as:

- ◆ exerting undue informal influence
- ◆ thwarting the good intentions of the head.

*It's difficult as these things are devolved to the section heads. If, for example, the next vacancy was in organic, I can't see the organic head of section being happy to let that position go to me.*

For one woman, who was on the point of leaving, a new section head had made a big difference:

*Little things like congratulatory emails when something gets published make a big difference.*

For another, the right person had played a key role in her retention:

*[X] has a reputation for having senior women and creating an environment in which women can flourish: I knew he would fight battles on my behalf.*

Two departments in our sample were trying to achieve major cultural change but neither underestimated the difficulty in the face of academics' individuality.

*On the one hand people want an aware and responsive management structure, and on the other hand they don't want to be told what to do.*

### 29. Openness

*It's fairly open... It's very forward looking. They don't have this heavy sort of traditionalism. The fact that all the members of staff are really keen. It does breed a more open culture.*

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Transparency of decision-making is key to a culture supportive of women, by reducing the possibility of decisions being made on the basis of personal contact or hidden prejudice. Openness is a function of both style and structure and is grounded in good management practice. Women cited the following examples:

◆ **Structure:**

- ◆ membership of the board of studies open to all members of staff, with open discussion of allocation of teaching:  
*The board of studies is not male dominated, intimidating, traditional, hierarchical*
- ◆ selection of the head of department by democratic vote rather than automatic rotation between heads of section: in one department, the head was elected on the basis of his agenda for change
- ◆ a flat structure with lots of collegiality, decisions are taken by committees and are open and transparent
- ◆ research organised on a floor-wide basis, rather than segregated into separate units or laboratories.

◆ **Style:**

- ◆ senior staff who operate an 'open door' policy  
*I see the head of department near enough every day and he always asks how I am and if everything is OK.*
- ◆ letting people know they can put themselves forward for increments and promotion
- ◆ a new system for open bidding for studentships, rather than allocation: if you're successful, the department matches them
- ◆ the introduction of open accounting across the whole department: everyone knows how much funding others receive.

In departments with a poor recruitment and retention record by contrast, decisions were based on subjective criteria and force of personality:

*Its very difficult to find out what's going on. You don't know where colleagues are on the pay scale. They don't want to tell you and you can't find out.*

*To get an increment, you have to shout about it.*

### **30. Ensuring Equity**

*There are jobs to be done and so I think women are a bit more conscientious about doing these jobs than men.*

*Men who are asked to do things don't pull their own weight.*

Women and heads of department concurred that women are:

- ◆ more likely to take on non-research duties
- ◆ more conscientious in fulfilling them.

*My biggest problem is doing jobs well, which is what I like to do. And of course, the more you do jobs well, the more jobs you get.*

*Women get more admin jobs as they are more willing and less likely to say no. Very co-operative people get lumbered with a lot of stuff.*

In the departments with the poorest record:

- ◆ women take on a disproportionate share of pastoral duties

- 
- ◆ there is gender segregation in the allocation of those duties.

*There is some gender segregation in the type of admin women end up doing. For two years I was disabilities and women's officer at the same time.*

*My perception is that women end up with the social workery type jobs.*

As a result, women have less time to spend on research. The best departments avoid these pitfalls through:

- ◆ strict procedures for rotating the allocation of duties: this avoids stereotyping
- ◆ reward systems that go beyond the RAE.

We also note that women themselves must carry some responsibility for refusing to take on additional duties.

## The Work/Life Balance

### 31. Handling Pregnancy

*You need to deal seriously with the issue of pregnancy and confront it. It's still the one big difference between men and women. You need to legitimise it. Women have to deal with guilt.*

*Women also have to deal with their own guilt. Most guys don't have a problem if you are honest with them. Everyone faces difficulties and challenges.*

The best departments are up-front about recognising pregnancy as a fact of life. The key issue is to remove women's sense of guilt about the inevitable:

- ◆ information on maternity leave provision needs to be clear and easily available
- ◆ one department helps staff on maternity leave in moving forward grant proposals and supervisions.

In contrast, the worst departments ignore pregnancy as a possibility, reinforcing cultural values that see it as denoting lack of commitment:

*There is an underlying assumption that if you are a woman, you won't be committed. The trouble is it puts you in the corner, it forces you to try and abuse your position. No info available on maternity leave, cover, etc. No-one in personnel knows anything about it.*

### 32. Managing Families

Departments with a good record were supportive in recognising conflicts between home and work, often taking the lead from a head of department who took time off to look after children:

*A younger head of department takes the lead in taking time off to be with children.*

The irony is that, as the pressures of all academic careers have increased, it is now harder for women to juggle home and family. Some of the senior women in our study:

- ◆ had worked part-time or from home when their children were small
- ◆ had not completed a PhD or a post-doc.

None of our interviewees thought that this career path would be possible now:

- ◆ the career structure is a strictly linear progression from post-doctoral appointments to first lectureship
- ◆ the pressures of the job are such that all these posts need to be full-time.

Women feel that it is now almost impossible to take any career break longer than the minimum maternity leave:

*A large proportion of time is spent doing things that are specific to oneself, like running one's research*

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group. So, if you're away, no-one is going to take that over. Someone might keep an eye on your students or deal with day-to-day things, but no-one is going to write your papers for you or your grant proposals.

### 33. Working Hours

None of the departments had taken innovative measures to tackle the long hours culture—though several women cited flexibility as one of the key attractions of an academic career:

*We probably work more than we could reasonably be expected to, but on the other hand, we work our own time and for our own interests.*

Virtually all the women perceived a job in chemistry as a total commitment. None could envisage job shares:

*It's too individual a culture to demand shorter hours—no-one would mind but the person wouldn't get so much done.*

Here, the main issue is the primacy of research as a reward criterion. Interviewees thought that it would be possible to share teaching commitments but not research:

*Part-time, it would take so long, it would have already been published by someone else. Job sharing wouldn't work, there's IPR issues, you'd have to find someone with the same research interests.*

*I'm very aware at the moment that there are certain projects that I'm working on that I'm worried that somebody's going to scoop me.*

There were three suggestions for change but none had been implemented:

- ◆ heads of department to receive small amounts of funding to provide relief for women from non-core duties
- ◆ institutions to provide additional funds to department heads willing to take the perceived risk of sharing an appointment between two individuals
- ◆ more formal working hours, with core time—though this might remove some of the flexibility:

*Hours depend a lot on your supervisor and on self-motivation. A more formal structure and working hours would be helpful.*

## Supporting and Rewarding Individuals

### 34. A Supportive Culture

Interviewees recognised that a supportive culture is not a product of chance:

*It's something that's consciously aimed for and it's something you have to work at to achieve. I think a lot of people don't realise that you have to work at it to achieve it.*

They identified three key elements, none of which are specific to women:

- ◆ support for the individual: appraisal, development and mentoring
- ◆ broadly-based reward mechanisms
- ◆ peer support.

### 35. Appraisal and Development

Interviewees regretted the absence of formal appraisal systems. These are standard in industry but were lacking even in departments with the best recruitment and retention record. Interviewees saw them as critical in ensuring equity of treatment of men and women, in both development and promotion:

*You get appraisal interviews with the head of department. They are being taken more seriously than they were but they still carry no weight in terms of promotion. They could be developmental. The appraisal could suggest what you could focus on and develop.*

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Rigorous appraisal systems would ensure that women received formal feedback on their strengths and weaknesses:

*A year ago... so fed up, I was going to leave. It was caused by lack of feedback.*

*[My] only appraisal was pre-RAE and then was put in for increment, but the finance director said [it was] ineligible. No-one had explained the system.*

*You don't get, within the university system, a lot of feedback. You just hear you've got it or you haven't. Unless you know someone on one of the committees.*

There were conflicting views on the need for development. More advice on career development would be helpful:

*There's no career development, you're not told what your options are, or it's done in a very general way. How do you go about an academic career?*

But personal development—management and skills training—would be seen as a distraction from research:

*Most academics just want to get on with their research.*

### **36. Rewarding Research**

*There is too little emphasis on science for its own sake in the department and too much emphasis on being productive. Too much focus on getting grants and not enough on spreading and rewarding scientific achievement. It's getting the grant that gets you favourable mentions, not doing the science. If women are really dreaming of being a scientist, this is not the right place, because all the emphasis is on getting grants. There needs to be more science.*

*It's very hard to position yourself if you're not a good researcher.*

The departments least attractive to women were those where there was greatest pressure on securing grant income and research ratings. The culture of these departments was highly competitive and focused on outcomes rather than processes. It attracted individuals comfortable with competition; and a competitive nature was one of the selection criteria:

*You need a street-fighting type, who won't get upset by referees' comments.*

*We need to fill posts with people who can bring in more cash. Men fight more aggressively for cash. The ability to raise cash is fundamental. You've got to be seen to get grants, you've got to be pushy.*

### **37. Broader Reward Criteria**

*[X] values different types of work. Some head of departments just look at research income. [X] does very well in encouraging people across the board and recognising their value.*

*The whole department should not have to be full of people who are good at all three areas. I am in favour of units who have devolved money and responsibility and do their own thing with people who are good at it.*

The departments most supportive of women judged the contributions of staff against broader criteria than the RAE:

- ◆ one has an annual teaching prize that is highly valued
- ◆ others gave equal value to administrative and teaching skills.

*2 out of 3 areas must be good. All must be satisfactory. Young people can get promoted for teaching and admin as well as research.*

*There's a healthy competitiveness... They always announce it when you get a research grant, for example. But there's not a back-biting atmosphere.*

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## 38. Peer Support

The best departments had created a culture in which support came from peers as well as superiors. Facilities were critical in building this culture; especially dedicated common rooms and coffee bars open to all staff:

*When I first turned up, they'd come and knock on my door and say: it's coffee time and come and drag me away. And within inorganic chemistry, all the lecturers go to lunch together. So you generally know what's going on within the department.*

Some departments retained a culture based on male networking and women recognised the need to find ways to build their own contacts:

*There is a pub culture but it doesn't exclude women. Having children does though. You do suffer because you don't go. You have to just be aware of that and do other things like lunch and coffee.*

There were differing views on the value of female networks. Some, particularly those with children, recognised their value and inevitability:

*You probably have an automatic affinity for other women, they have the same experiences. That's the kind of thing you notice, particularly if you have children. [These relationships] go across the specialisms, whereas that doesn't tend to happen so much between male and female colleagues.*

Others shunned women's networks and saw more value in contacts within the discipline:

*I slightly resent the fact that you want to interact with other people just because they are women. I'm uncomfortable with a tendency for women to be a special case. We need opportunities but we don't need some kind of special support network.*

*I'm not a member of the RSC's women's group. I'd rather speak to chemists who share my research interests. I've never felt the need for that kind of support. But I don't deny that that kind of support should be there if somebody wants it.*

There was some concern that the growing pressures of the job meant that it was becoming more difficult to maintain any form of networking:

*This is a very friendly department. [But] it's getting more difficult, people are busier than they used to be. People don't socialise regularly after work like we used to. There's less casual interaction because of the pressure.*

## Physical Factors

### 39. Organisation Size

Women perceive smaller departments and institutions as more supportive of women:

- ◆ women can more readily approach senior staff and decision making is less opaque
- ◆ culture change is easier to achieve: within large units, decision-making is more fragmented and section heads assume more importance.

*It's quite a small department here, you know everybody and you can use other people's expertise to help you with your research.*

*University in general... Not bogged down in administration and layers of seniority... It's quite small, based on just the VC and then the head of departments. You don't have a sense that you're so far down the ladder that you don't count.*

*It's hard to do practical things, like booking rooms. It's the university culture rather than the people... It's not responsive, it's a big institution.*

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## 40. Location

Geography has some role in determining culture:

*Geography plays a role in the culture of [university]. Everyone appointed has been eager to come... Well connected, nice, inexpensive, good value for time and money... Low house prices.*

The London factor appeared to work both ways:

- ◆ the increased travel time and higher costs add yet more pressure, particularly for women with children
- ◆ but they are offset by the benefits of broader job opportunities for dual career families.

The history of the department and institution is also important. Women perceived newer universities (not solely former polytechnics) as having a more open and innovative culture:

*They don't have this heavy sort of traditionalism.*

A new building also helps in creating a more open culture, by mixing different specialisms and breaking down traditional barriers.

## Promotion

### 41. The Glass Ceiling

At first appointment, women identified few remaining hurdles to women that are not:

- ◆ specific to the individual
- ◆ endemic in an academic career.

At the stage of promotion to senior posts, however, women perceived structural barriers that perpetuate both the reality and the fear of a glass ceiling. They identified four issues:

- ◆ the lack of formal procedures
- ◆ a potential side-lining of women into atypical posts, with unclear future progression routes
- ◆ the emphasis on research in the selection criteria for the most senior jobs
- ◆ their relative lack of mobility, coupled with a perceived bias to external candidates.

### 42. Lack of Guidance

*Its much more transparent than it used to be. It could still be more transparent.*

Interviewees identified a number of issues with promotion:

- ◆ lack of guidance on how to apply for senior posts
- ◆ lack of mentoring for those thinking of applying:  
*There's a gap in the middle—mentoring for junior lecturers and courses for new head of departments. In the middle, you simply talk to the previous incumbent.*
- ◆ the role of key staff in recommending individuals for promotion: while formal appointment procedures may exist in principle, they are not always followed in practice:

*In principle you can apply yourself but in practice you are suggested to by the head of department. A lot of attention is paid to how the head of section thinks you are getting on.*

At the same time, women recognised the differences between a career in industry and academia:

*Academics are very individual people. One wouldn't want a career to be so structured that you had targets for every promotion.*

*Whether you're promoted depends on who you're competing against. There's an element of luck. If there's one very strong competitor, you don't get the position.*

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There were few examples of good practice, although in one institution, the personnel manager sends out a letter to all staff once a year, defining the opportunities, criteria and timescales for promotion.

### 43. Unclear Progression Routes

Within our sample, only four senior women were in conventional posts with a mix of research and teaching responsibilities. There is a suggestion that, because of women's willingness to take on non-research duties, they may be side-lined in jobs which are seen as less prestigious than research-focused roles and from which there is no clear promotion route:

*My head of department said 'find out about promotion' but he didn't know what the route was. Rang personnel, got vague email, told there was no clear promotion route from this position.*

The evidence from our sample is inconclusive but the issue merits further investigation with a sample of equal numbers of male and female senior staff.

### 44. Reward Criteria

Most interviewees identified the key issue as the emphasis of selection criteria on research:

*Senior lecturer is the most significant promotion for most people. You have to have fulfilled certain criteria, supervised PhD students, been a director of studies. It's the most well defined target. Over and above that, promotion comes on the basis of research.*

There are two aspects to this:

- ◆ departments find it difficult to devise promotion criteria not based on research achievement:  
*How do you get external validation and recognition of quality [for skills other than research? You need to broaden what is acceptable as a measure of success.*  
*The criteria for being a successful academic don't take account of people skills.*
- ◆ the most prestigious external recognition is for research excellence.

This is perceived to disadvantage women because of their broader focus. They are more likely than men to:

- ◆ take on a broader range of non-research duties
- ◆ fulfil those duties better than men
- ◆ be less single-minded in their approach to research
- ◆ have gaps in their research record.

### 45. The RAE

Heads of departments perceive the RAE as compounding rather than creating the problem because of:

- ◆ its tendency to reward mainstream research
- ◆ perceptions that departments will be penalised for less than complete research records.

*If you employ a woman, there may be gaps in her research record; she may have fewer publications. Also possible that work is more likely to be at the edges of the discipline... But the RAE reflects the interests of its panel members. They're chosen from within mainstream chemistry. The RAE disposes of departments with a bias towards interdisciplinarity.*

On page 28, we show that departments that increased the percentage of female staff between 1996 and 2001 received a bigger increase in RAE rating. This provocative data needs to be interpreted cautiously as:

- ◆ the percentage of women remains small in most departments

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- ◆ 5\* male dominated departments could not improve their rating
  - ◆ many other factors including age and institution history will have had an impact on the rating.
- Nevertheless, the data do suggest that recruiting women does not harm a department's RAE rating.

#### **46. Lack of Mobility**

All the senior women in our sample had been promoted within their current institution. With one exception, they all had children. Yet they perceived a ceiling on women's ability to reach the most senior posts because of their lack of mobility. Within our sample, there were no women who had reached senior levels in the highest rated departments and there are no female heads of single chemistry departments. There are two issues:

- ◆ if women have a partner tied to a specific location and/or a family, they have less flexibility about moving to other institutions to advance their careers: social pressures mean that men's careers still tend to take priority
- ◆ there is a perception that the most senior posts are more likely to go to external candidates and that men are more likely than women to move to advance their careers:

*There is always a tendency to appoint an external candidate [to senior posts]. The internal candidate is disadvantaged.*

We recognise that many male staff face similar mobility problems.

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## Conclusions

*The problem is that the cycle of aggressive men is perpetuated. Unless you find a woman who is exceptionally single minded and wants to attain the same goals as men, women will remain on the periphery.*

*I would advise a woman to go for it but she has to believe in herself. If she doesn't, no matter how much support you get, it's not going to work.*

### 47. The Messages from Our Research

We outline below the conclusions from our fieldwork. The six strategic messages for the RSC, universities and departments are:

1. The problem of increasing the number of women in chemistry and in senior positions is not intractable. There are already departments creating the supportive environment needed to help women succeed.
2. This good practice is, however, patchy and needs to be spread to become the prevailing ethos in UK chemistry departments and in science departments in general.
3. Good practice is embedded in department cultures, histories and personalities. For this reason, it will take time for good practice to become universal.
4. The RSC, institutions and departments need to plan to sustain long-term change in the culture of chemistry departments, as well as taking short-term initiatives to improve the immediate position of women.
5. Flexible employment opportunities during child bearing years are key to any improvement in women's career prospects. Both cultural change and short-term measures need to take account of the needs of women over two timescales:
  - ◆ the working week: promoting flexible hours and scheduling teaching and other commitments to fit with childcare
  - ◆ the career trajectory: allowing for a longer career development path for women with children.
6. In general, departments should take action that is:
  - ◆ gender-neutral
  - ◆ will lead to cultural and practical changes that will create a better professional and employment environment for both men and women.

### 48. Women in Academic Chemistry

Our 1999 report found that:

- ◆ both men and women had concerns about:
  - ◆ the long hours culture
  - ◆ low pay
  - ◆ career structure
- ◆ women alone were concerned about:
  - ◆ poor working conditions
  - ◆ emphasis on results rather than process
  - ◆ isolation and segregation.

We concluded that the working environment of chemistry and the culture created by that

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environment creates a situation where it is more difficult for women than men to succeed. This study has considered the impact on that environment of departmental culture and initiatives. Below, we consider:

- ◆ the significance of the factors we identified in 1999 for women who remain in academia
- ◆ the key elements of departmental good practice, and their significance in attracting and retaining women
- ◆ the relative importance of other factors in enabling women to stay within chemistry:
  - ◆ university career structures
  - ◆ chemistry as a subject—and as a career
  - ◆ personal circumstances
  - ◆ gender differences in temperament.

#### **49. Rewards and Conditions**

The current study shows that, of the reasons specific to women, the most important factors in women's negative feelings about departments are:

- ◆ undue emphasis on results
- ◆ feelings of isolation.

Hence the importance of departmental measures which create a more inclusive culture, including:

- ◆ reward criteria which are broader than the RAE
- ◆ emotional support, through mentoring, and communal facilities, such as coffee bars.

Working conditions in laboratories, however, play little part in women's decisions to remain. There are two possible reasons for this:

- ◆ the women who stay are either those who are least concerned by conditions, or they have become resigned to them:

*You become immune and no-one blames the department... You know it's bad but what can you do?*

- ◆ as the women who stay become more senior, they spend less time in the lab and the issue becomes less pressing.

#### **50. The Impact of Department Practice**

It is clear from our fieldwork that the introduction of good management practice within departments has an impact on the willingness of women to apply to and remain within those departments. We identify below the key elements of that practice. It is equally clear that:

- ◆ the personality—and personal circumstances—of the head of department is significant in determining good management practice
- ◆ institutions have a role in ensuring that selection procedures for department heads prevent departments selecting leaders solely in their own image
- ◆ the best departments do not target measures specifically at women: instead, they create a culture of diversity where all individuals can thrive and be rewarded for their contribution, regardless of gender or family circumstances.

#### **51. Monitoring the Consequences**

Regardless of the importance of good practice, departments need to be alert to the danger of making adjustments to a system and culture built around full-time male participation in work. Some of these adjustments are vital in the short term in building up numbers of women. But departments need to be aware that they may have potentially damaging impacts in the longer term:

- 
- ◆ in reinforcing stereotypical attitudes to women's careers
  - ◆ in raising the barriers to their participation in a 'full' academic career.

For example:

- ◆ **Research rewards.** Athena recommends allowing women to switch between research and lecturing to allow for family commitments. But in a system where the primary rewards are for research excellence, there is a danger that women will be sidelined in teaching and further marginalized.
- ◆ **Salary rewards.** Some departments have introduced higher salaries for first appointments. This should in theory help with child care costs. But because salary increments have to be financed from departmental resources, women perceive them as further increasing the pressures within a department and making it a less attractive place to work.

## 52. University Career Structures

*To address the issue of women, you need to re-organise the whole university system. You can't split out the issue of women.*

Many of the issues we identified are generic: they are not specific to women or to chemistry. For that reason, even the best departments can only go so far in tackling the structural barriers to women. Many of these barriers stem from the particular organization of the UK system and can only be tackled on a broader basis by the Funding and Research Councils. The central issue is equivocation over the importance of research. As one overseas appointee put it:

*In the US research is unequivocally the most important factor. You are appointed on your ability to research and not expected to teach. Here, you are appointed on your ability to conduct first class research—but then expected to shoulder a full teaching load.*

This makes it very difficult for anyone with commitments outside work to participate in a mainstream, research-based career:

*I want to do well in my career—but I will be hampered by the fact that I want to have a family and enjoy doing other things apart from this. So I'm not going to have time to put in the kind of work that other women that are very successful do... I really think that I won't make it because of that.*

## 53. Chemistry as a Career

We heard opposing views from interviewees on whether the attractions of academic chemistry as a career are sufficient to outweigh departmental and structural barriers. Some recognised that they were unlikely to get the rewards of flexibility and intellectual challenge outside academia:

*The combination of working with younger people and doing research is really great fun.*

*University chemistry is intellectually challenging, chemists need to get across to women that it's hard to find that [intellectual challenge] elsewhere.*

*It's been a career that has allowed me to have a family and have a career that I have felt fulfilled in and I have been promoted along with my peers.*

Others felt that the demands of chemistry and its overriding culture were simply unattractive to women:

*If they're bright enough, women realise they need to get out of chemistry. It's not an attractive career.*

*Chemists are an awkward bunch. Chemists see their ability to show their excellence as an ability to point fault in others.*

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## 54. Subject Crisis

Interviewees identified an additional obstacle within chemistry: the subject itself is in decline. As undergraduate recruitment falls, staff are less likely to be replaced. In theory, this reduces promotion opportunities equally for men and women. However, the perception among interviewees is that, in a subject crisis:

- ◆ departments are less likely to appoint women, because they see it as higher risk:

*Now the subject is under pressure. It's seen as more risky to appoint a woman; and people won't take that risk.*

- ◆ heads of department have other priorities than equal opportunities—they become defensive and focus on what they see as priorities:

*You need to remember the subject is declining. Recruitment to the subject as a whole is much more important than discrimination. (Senior woman)*

## 55. Gender Differences

Many interviewees identified inherent differences between men and women in ways of working and in personality and temperament. We were not able to test these views with a sample of men.

Women see themselves as:

- ◆ preferring to work towards a goal as a whole, rather than something narrow and individualist
- ◆ feeling the pressure more, taking things personally and letting criticism put them off:

*Personally hate whole applying for grants... It makes me think twice about submitting something that I know is as good as something I've seen funded. I don't know if that's a female thing. I'm aware I don't put in enough proposals, because I don't like the knock-backs.*

- ◆ having a greater fear of failure:

*You can't apply for a job, without everyone knowing about it. I didn't want to apply and be embarrassed and feel I had to move.*

*I'm gutted when I don't get a grant...*

- ◆ being more honest
- ◆ not as tough—they tend to internalise problems more rather than just getting on with it

*Women tend to be more isolated and worry too much. If a man has a bad day and doesn't achieve very much, he shrugs it off. Women worry that they haven't achieved anything. Mentoring would help in motivating you and giving you a sense of worthwhile achievement*

- ◆ being more collaborative and consultative:

*They're less single-minded. Less intent on ploughing their own furrow.*

Many interviewees recognised that women had to tackle some of these confidence issues themselves:

*You can't be sensitive to be an academic... Women have a problem with confidence whereas men can say such rubbish with such confidence.*

*Women are their own worst enemies... They're not socialised to have as much intellectual confidence as men.*

However, institutions can also help: for example, through making available courses in personal development and confidence-building.

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## 56. Need for Structural Change

*There are lots of small differences which all add up: every little step, every little fight makes it harder.*

We have identified much good practice in departments best at recruiting and retaining women. This could be spread more widely throughout chemistry and through science departments in general. However, we caution against reliance on the implementation of good practice alone in achieving a substantial increase in the numbers of women progressing in chemistry. Many of the issues that make chemistry unattractive to women as a career are largely beyond the control of individual departments: for example, pay, hours, promotion prospects and reward criteria. None of these issues is particular to women or specific to chemistry. Added together, however, and combined with women's external commitments, they combine to make a university chemistry career unattractive to any but the single-minded. Short-term measures are important and necessary to mitigate the worst effects of the current system. But for departments to achieve a step change in the proportion of women they employ, adoption of good practice will need to be accompanied by longer-term structural change to the shape and pattern of academic careers.

## The Characteristics of a Supportive Culture

### 57. Good Practice

Below we list examples of good practice in creating a women friendly chemistry department. These are all drawn from the departments we visited. The list is not exclusive: there will be examples of good practice elsewhere; and the Athena development programme has supported other initiatives. The measures we identify have few cost implications and most departments had funded them from their own resources as an integral part of good management practice. Beyond existing good practice, however, two departments identified a key need for additional funds. The aim of these would be to provide women with relief from teaching and administration during their early career stages, when they might be struggling to combine a full-time academic career and family. This would allow women to concentrate on their research and maintain the consistent publication record needed for promotion.

### 58. Good Practice Before Appointment

- ◆ Include external women candidates in the short-list.
- ◆ Positively encourage internal female staff to apply: don't wait for them.
- ◆ Take action to attract women Royal Society and Dorothy Hodgkin Fellows.

### 59. Good Practice at Appointment

- ◆ Spread the interview process over a two day visit, allowing candidates to meet other departmental staff and demonstrate a range of skills.
- ◆ Include in the selection criteria a range of non-research skills, including presentation ability and people skills.
- ◆ Include on every interview panel:
  - ◆ a non-chemist
  - ◆ at least two women.
- ◆ Consider appointing an external chair.
- ◆ Provide feedback to all failed candidates and train panel members in giving feedback.

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## 60. Good Practice in Induction

- ◆ Set up a formal induction programme for all new staff, which includes briefings on promotion criteria and maternity provision.
- ◆ Discuss allocation of work in advance with new appointees, taking account of external commitments.
- ◆ Offer initial mentoring to all staff—but ensure that the mentoring requirement doesn't place undue burden on senior female staff.
- ◆ Provide close support and guidance to all staff in their early career stages, including advice on career development and progression.

## 61. Good Practice in Retention

- ◆ Open up decision making:
  - ◆ discuss allocation of teaching openly
  - ◆ make membership of the board of studies open to all staff, regardless of formal position
  - ◆ hold democratic elections for the head of department
  - ◆ make minutes of committee meetings publicly available
  - ◆ ensure senior staff cultivate an 'open door' policy
  - ◆ hold open bidding for studentships, rather than allocation
  - ◆ make department accounts publicly available, including details of staff salaries and funding, including grants.
- ◆ Ensure parity of treatment:
  - ◆ provide parity of treatment for all staff, including Fellows, regardless of formal position
  - ◆ ensure clear job descriptions for support and administrative roles, with details of the duties expected and the time to be allocated to them
  - ◆ have a fair and transparent rota system for allocation of administration and support roles.
- ◆ Work environment:
  - ◆ provide easily accessible social areas to facilitate peer networking and interdisciplinary work
  - ◆ encourage gender-neutral social activities during working time: for example, shared lunches
- ◆ Work/life balance:
  - ◆ legitimise pregnancy: make information on maternity leave provision clear and easily available
  - ◆ timetable meetings during 'core hours'
  - ◆ encourage a 'permissive' culture where senior staff take the lead in arranging work schedules that take account of external commitments and allow flexibility around caring responsibilities.

## 62. Good Practice in Promotion

- ◆ Update staff yearly on the procedures and criteria for internal promotion. Ensure those criteria are publicly available and well publicised.
- ◆ Actively seek out candidates for promotion: don't rely on them putting themselves forward.
- ◆ Provide advice and guidance on career planning, including CV writing.
- ◆ Create reward systems that recognise excellence in teaching and administration, such as an annual teaching prize.
- ◆ Include in promotion criteria non-research skills.

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## Annex A: Data

Below, we update the statistics from our 1999 report to show the overall position of women in chemistry within higher education. The data is drawn from HESA statistics.

### Chemistry Students

#### 63. Undergraduates

The proportion of female chemistry undergraduates continues to increase slowly, but steadily (Figure 1). This is in contrast to physics and astronomy where numbers appear to be reaching a plateau (Figure 2).

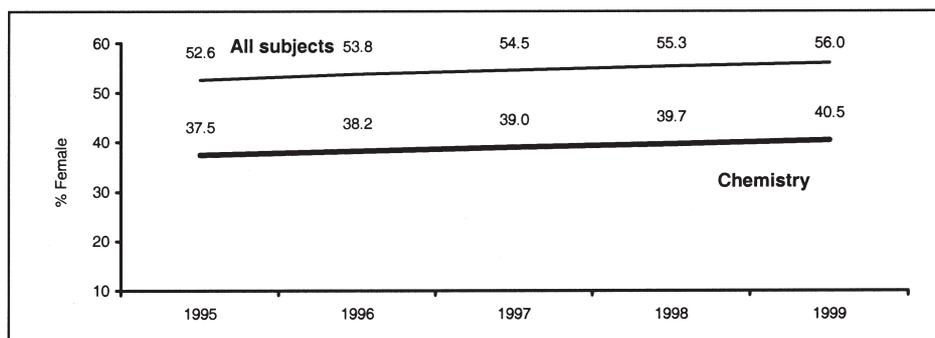


Figure 1. Undergraduates

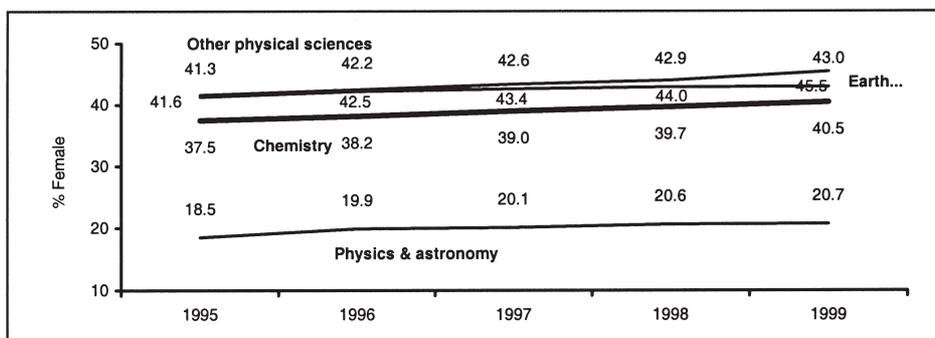


Figure 2. Undergraduate physical scientists<sup>10</sup>

#### 64. Postgraduates

The proportion of female post-graduates continues to hold up reasonably well (Figure 3): though chemistry is less successful than physics in converting women undergraduates to postgraduates.

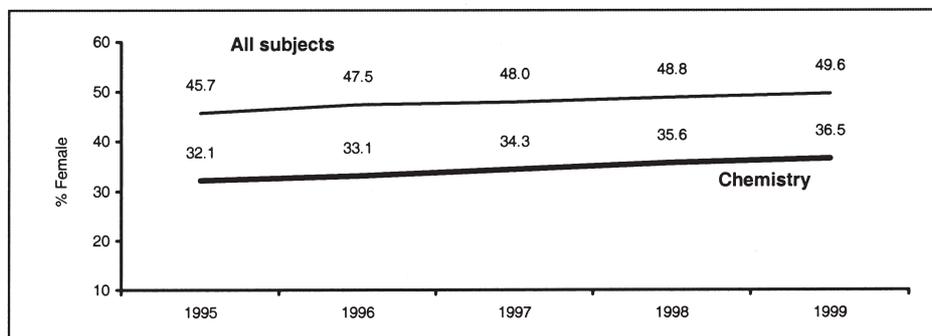


Figure 3. Postgraduates

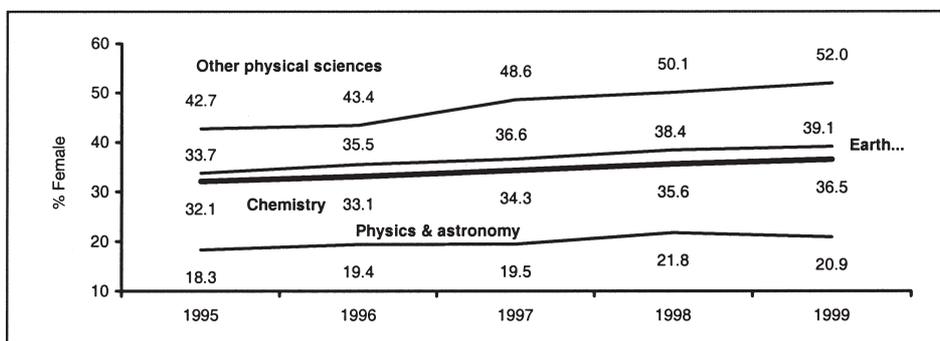


Figure 4. Postgraduate physical scientists

## Chemistry Staff

### 65. Horizontal Segregation

During transition from post-graduate to first appointment, chemistry loses large numbers of women. Compared to an average of 35% in other subjects, only 18% of chemistry staff are women (Figure 5).

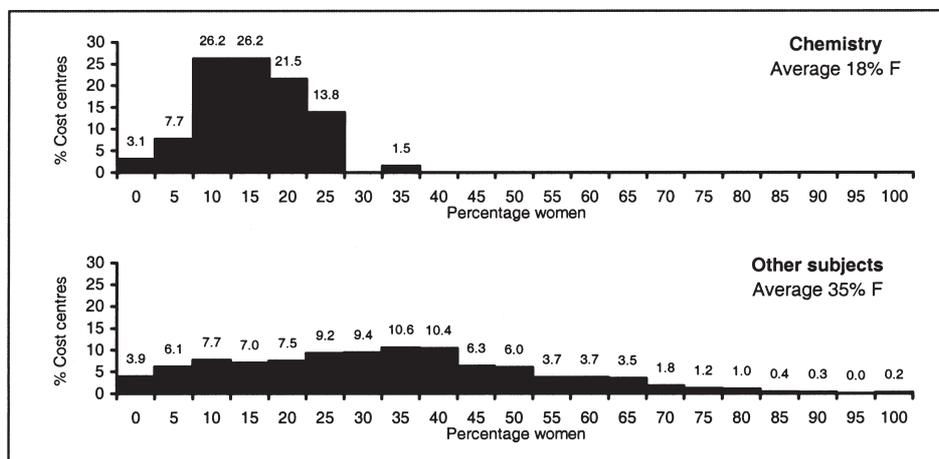


Figure 5. Staff in 1999

### 66. Vertical Segregation by Grade

Women are also segregated by grade within chemistry: the higher the post, the lower the proportion of women (Figure 6). Half of male staff are at the level of lecturer or above, compared to less than a quarter of female staff. The position has not notably improved since 1995 (Figure 7). There is a slight increase in representation at senior levels but no improvement at the crucial transition stage from post-doc to lecturer.

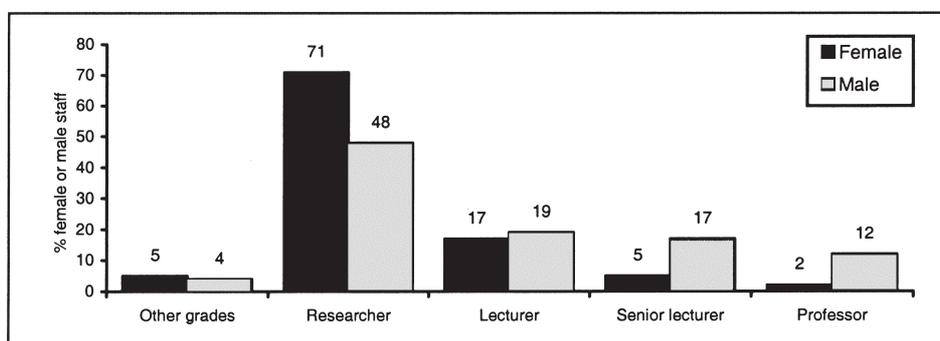
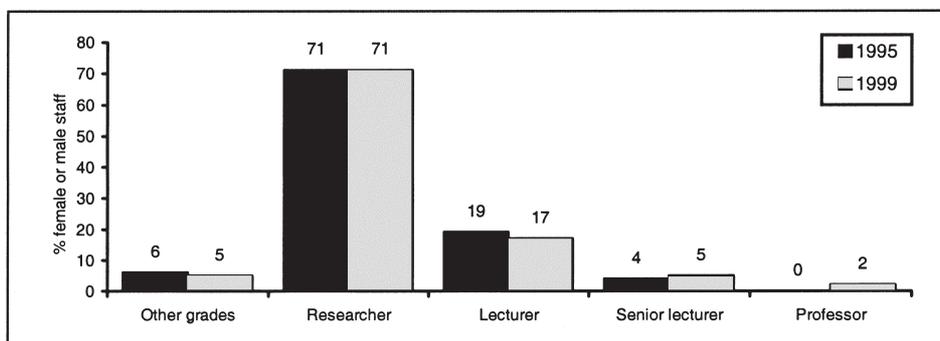


Figure 6. Segregation by Grade: Chemistry 1999

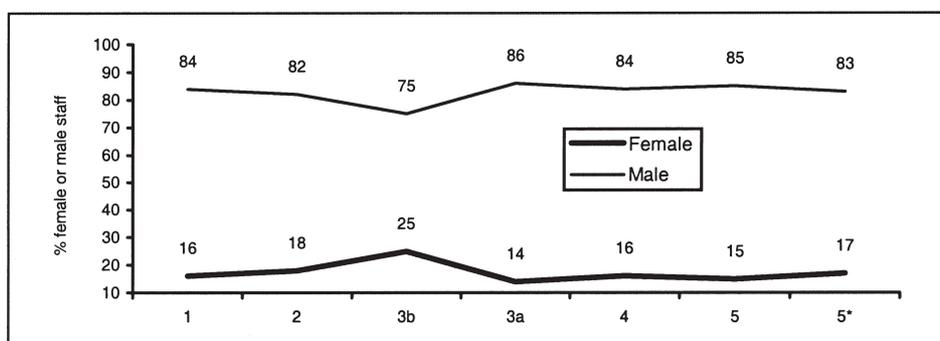


**Figure 7. Segregation by Grade: Chemistry 1995 & 1999**

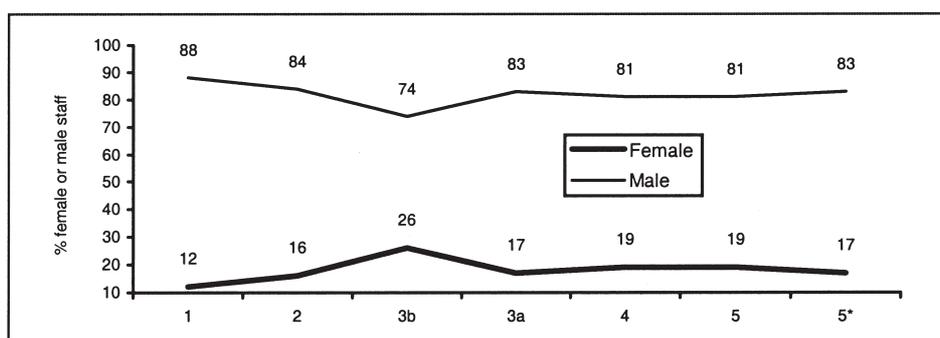
## 67. Departmental Research Ratings

In our interviews, both women and heads of department cited the RAE as a major barrier to women. From this, it might be expected that there is an inverse correlation between the proportion of women in a department and its RAE rating. This is not the case. Although there is a slight concentration of women in departments rated 3 (*Figure 8* and *Figure 9*), there is also a correlation between *an*:

- ◆ increase in the proportion of women in a department
- ◆ improvement in RAE score between 1996 and 2001 (*Figure 11*).



**Figure 8. Staff (data for 96/97) and RAE 1996 grade**



**Figure 9. Staff (data for 99/00) and RAE 2001 grade**

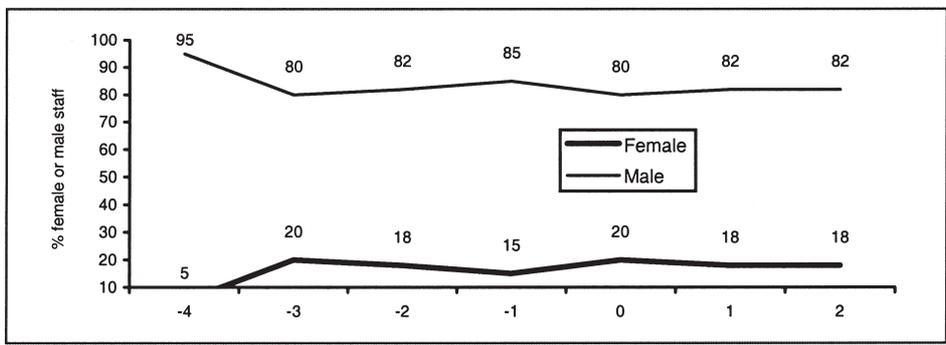


Figure 10. Staff (data for 99/00) and change in RAE grade (1996-2001)

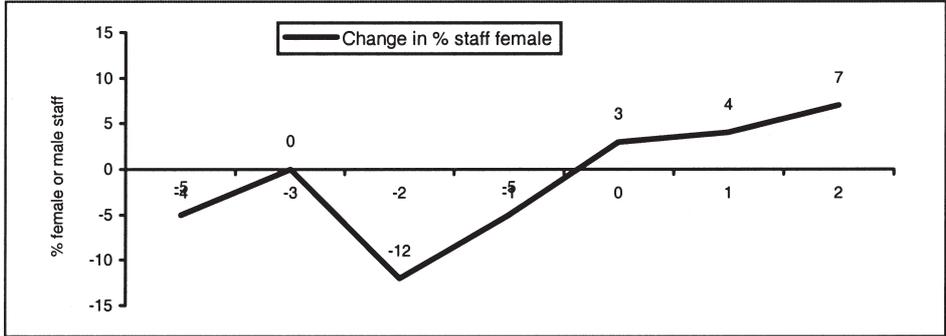


Figure 11. Change in % of female staff and change in RAE grade (1996-2001)

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## Annex B: Survey Questions

Interviewees were asked questions covering the following areas:

1. The background to your career choice:
  - ◆ educational background
  - ◆ why choose chemistry?
2. Career history:
  - ◆ previous appointments
  - ◆ why choose this department?
  - ◆ role of geography and family in career choices.
3. Your current post and responsibilities:
  - ◆ current responsibilities
  - ◆ job security.
4. Departmental processes:
  - ◆ appointment procedures and criteria
  - ◆ staff appraisal and development
  - ◆ promotion criteria
  - ◆ impact of university level processes and gender policies.
5. Departmental management strategies:
  - ◆ transparency v. opacity
  - ◆ democracy v. hierarchy
  - ◆ change v. conservatism
  - ◆ university level strategy and culture
  - ◆ influence of the RAE.
6. Organizational culture:
  - ◆ interactions with peers and superiors
  - ◆ interactions with junior staff.
7. Networking and mentoring activities:
  - ◆ formal women's networks
  - ◆ formal mentoring schemes
  - ◆ informal networking, mentoring and role models.
8. Family issues:
  - ◆ childcare/domestic responsibilities
  - ◆ careers of partners.
9. Physical environment issues:
  - ◆ effect on departmental culture
  - ◆ health and safety
  - ◆ issues specific to women.
10. What advice would you give to a young woman in academic chemistry?



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## Annex C: Revisions to Methodology

### 68. Our Remit

Our remit was to develop through fieldwork in departments of chemistry a draft survey tool ‘which can eventually be used as the basis for interviews across a number of disciplines within different institutions.’ The survey tool would be designed to determine:

*The extent to which the particular department/institution has a culture which is supportive of all staff, irrespective of gender.*

The draft survey tool was based on the checklist used in our earlier report and Athena questionnaires. From initial fieldwork, it soon became clear that a standardised tool of this type would not be appropriate to this particular study. We were sampling *within* departments; and interviewing only women. This meant that:

- ◆ our sub-samples were very small
- ◆ in most departments, a minority within that sub-sample had experience of recent appointment or promotion within the department; the remainder were post-docs or senior staff whose appointment pre-dated current practice
- ◆ we could not compare the views of the few women with current experience with those of a comparable group of men.

### 69. Proposed Revisions

We do not believe that our experience invalidates the potential usefulness of a standard survey tool. Much of its content proved to be useful and enabled us to identify elements of good—and bad—practice. But we do identify a need to revise the way in which fieldwork is conducted in other disciplines or other institutions. If a survey tool of this kind is to be of broader use:

- ◆ the fieldwork should be conducted with a sample selected horizontally across all institutions, rather than vertically within a sub-sample of departments
- ◆ the sample should include:
  - ◆ all recent appointments (say over the last two years):
    - ◆ to researcher or first lecturer position
    - ◆ to senior posts
    - ◆ equal numbers of both men and women, stratified by age
- ◆ fieldwork should be widened to include interviews with:
  - ◆ institution (or faculty) personnel or human resource officers
  - ◆ departmental administrators
  - ◆ heads of sections or research groups.

We also recommend that all interviews are conducted face-to-face. The issues covered are sensitive and the interviews tend to be discursive. Telephone interviewing is not appropriate in these circumstances and does not elicit rich data.

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## Notes

- 1 'Study of the Factors Affecting the Career Choices of Chemistry Graduates': see [www.rsc.org](http://www.rsc.org).
- 2 The Athena Project was launched in 1999 as part of the Commission on University Career Opportunity's initiative to remove barriers to women's progress in HE. Its aims are: 'the advancement of women in science engineering and technology in higher education and a significant increase in the number of women recruited to the top posts.' It is supported by Universities UK, SCOP, the UK funding bodies and the Office of Science and Technology. See [www.athena.ic.ac.uk](http://www.athena.ic.ac.uk)
- 3 Working group membership: Professor Julia Higgins (chair), Professor Sue Gibson, Professor Ian Wilson, Dr Sean McWhinnie (RSC).
- 4 For practical reasons, we could arrange interviews in only seven of these.
- 5 Although these staff were not the focus of our investigation, they were helpful in giving insights into departmental culture. We have not included their views in our analysis and have not quoted from their views.
- 6 There were two exceptions: we conducted two interviews by telephone, where interviewees were not available during our fieldwork visits.
- 7 We include in 'first appointment' lectureships, including temporary cover, and research fellowships, including Dorothy Hodgkin, Royal Society, college and university Fellowships.
- 8 See [www.athena.ic.ac.uk](http://www.athena.ic.ac.uk).
- 9 The same problem was identified with women only colleges: they are perceived as being of lower status. While they may have offered more opportunities to women, those were not seen as mainstream appointments.
- 10 Earth... = Earth and environment.