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SEPSU

Policy Study No. 7

RESEARCH SUPPORT FOR YOUNG INVESTIGATORS

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RESEARCH SUPPORT FOR YOUNG INVESTIGATORS

A report for the Science and Engineering Research Council

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SCIENCE AND ENGINEERING POLICY STUDIES UNIT
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FOREWORD

For some time, the SERC (and many other organizations), have been concerned to know whether or not younger research workers are at a disadvantage when seeking external funding of their research. This concern surfaced clearly in the Advisory Board for the Research Council's report on "peer review" (the Boden Report) published last year and much anecdotal evidence underlines the worry that younger researchers experience frustration and difficulty in mounting and maintaining a viable research activity.

Until now, the direct evidence has been ambiguous. In-house studies by SERC on "new-blood" lecturers (originally in Science Board subjects only and recently repeated in all areas of SERC) showed this group had a higher success rate in obtaining SERC funds than the average grant applicant. Conversely, a study on those with "unfunded alpha" research grant applications suggested that more younger than older investigators fell into this category. It was to resolve some of these issues that SERC contracted SEPSU to undertake the study reported here.

SEPSU's main finding is that younger investigators do no worse than their older colleagues in obtaining funding for their research (and SEPSU confirm the Council's finding that "new blood" lecturers do somewhat better). SERC, obviously, welcomes this conclusion. But there is no room for complacency. In the present financial climate, all research workers find obtaining research funding extremely difficult and it must be cold comfort to the newly appointed lecturer to learn that he or she is not being singled out for particularly harsh treatment by the funding bodies. Failure to obtain at least some funds when trying to establish a research activity must be particularly frustrating and may well lead to a greater loss of motivation, and even loss of manpower, than would be the case with older, better established colleagues.

SERC thus remains very concerned about the problems of younger investigators and will be considering what steps it can take to ensure that funds are available for them at least to begin their research careers and establish active research programmes. The need for such steps may be may well be hastened by the proposed transfer of some research-support funds from the Universities Funding Council to the Research Councils. This could result in an even greater responsibility for the Research Councils to ensure that the work of the best young researchers is supported.

In the meantime, I would like to thank SEPSU for their excellent study.

Sir Mark Richmond FRS
Chairman, SERC

September 1991

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I would like to thank all members of SEPSU staff for their help and support throughout this project. Particular thanks are extended to Anna Zouga who assisted in the data analysis and preparation of the report. The guidance of the Task Group is also gratefully acknowledged; the members were Prof D. Noble (chairman), Dr I. Forsythe, Prof E. Gabathuler, Prof G. Holt, Prof H. Kroto and Dr L. Smaje.

I am grateful to all those who took time to complete the questionnaire, and especially to those who subsequently agreed to be interviewed.

SUMMARY

The SERC commissioned this survey of research support for young investigators as they were concerned that younger scientists and engineers were not competing successfully for limited research resources. The survey, consisting of a questionnaire followed up by selective interviews, included young (up to 35) and older (36-45) permanent academic staff in five university disciplines and one polytechnic discipline, as well as all Royal Society University Research Fellows in post at the time. Three of the subjects (chemistry, electrical engineering and physics) were chosen as ones largely supported by the SERC, biology was chosen for its diversity of funding sources and physiology because it is predominantly funded by sources other than the SERC.

The frequency and value of grant applications and value of awards did not differ significantly between older and younger staff, although newly appointed young staff applied for grants more frequently. Furthermore, the success rate of older permanent academic staff in obtaining grants was only slightly higher than that of younger researchers in number of grants, and there was no significant difference between the groups when the success in value was compared. Thus, while a general increase in competition for research funds may mean that there is less money for individual researchers, young permanent academic staff are faring no worse than older staff in general.

There were clear differences between permanent academic staff in different disciplines and sectors. Polytechnic staff (biology) applied for the smallest grants, the least often and received the smallest awards. Within the university sector physiologists submitted the most requests but for the smallest value and they received the smallest grants, along with biologists. In contrast, electrical engineers and physicists applied the least frequently but for the largest grants and they were awarded the biggest grants on average. There were also large differences in the success rates between disciplines and sectors. Polytechnic (biology) staff had the lowest average success rate in value and number of grants, with biologists having the lowest percentage success and physicists having the highest amongst the university disciplines included in the survey.

Those permanent academic staff who were the most active in research (in terms of number of papers, students, staff and time spent collaborating) submitted larger grant requests, more often and had a higher success rate in terms of number and value of grants. There was no difference in the success rate of males and females or between lecturers and more senior staff. In contrast, Royal Society University Research Fellows and permanent staff who had been appointed under the New Blood Scheme and those in departments with high UFC ratings were more successful in obtaining grants.

The most common primary (but not secondary) source of external funding for all groups of researchers in the survey was research councils. A higher proportion of older than younger permanent academic staff used industry as a primary source, but a higher proportion of younger staff used charities. The most frequent comment on funding bodies was a criticism of the inconsistency of the feedback received, both between funding sources and even between committees of the same body.

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CHAPTER 1: INTRODUCTION

In order to establish a career in academic science or engineering it is important for young investigators to obtain funding to support their research activities. The SERC and the science and engineering community in general are concerned about the career structure of young academic investigators, and part of this concern is whether young researchers can compete successfully for limited research funds.

Background

Some evidence that young researchers were not faring as well as older researchers in obtaining research funds came from a SERC study of unfunded alpha rated grants. One conclusion of this study was that there seemed to be a high proportion of young applicants (under 40) amongst the unfunded alphas, compared to a control group of funded applicants. In contrast, a more recent study by the SERC has shown that New Blood lecturers, who form a subset of young permanent academic staff, had more of their alpha rated applications funded than investigators in general. However, New Blood lecturers are probably not representative of young researchers as a whole. In the light of this conflicting evidence and the general concern about the ability of young scientists and engineers to obtain funds, the SERC commissioned SEPSU to conduct a survey of research support for young investigators.

Objectives

The objectives of the study, each of which is addressed in a chapter of the report, were as follows:

i To define the national population of young academic researchers in order to ensure that the sample of researchers in the survey is representative of the whole population.

ii To compare the rate, value and success of grant applications of young researchers, older researchers and a group of research fellows (Royal Society), and to explore other factors which influence pattern and success of applications.

iii To examine sources of research funding, to what extent they are used by young compared to older researchers, how accessible they are to young investigators and the experiences of young staff seeking funding from various sources.

Monitoring

For all major projects undertaken by SEPSU a Task Group is appointed to monitor and advise on the study. The members of the Task Group for this study were Professor D. Noble, FRS (Chairman), Professor G. Holt, Professor E. Gabathuler, FRS, Dr I. Forsythe, Dr L. Smaje and Professor H. Kroto, FRS. The Task Group advised SEPSU on the design of the study, the analysis of the results and the final report.

CHAPTER 2: METHODOLOGY

The major part of the study was a questionnaire survey of researchers in higher education institutions (HEIs), followed up by selected interviews. To put the survey data into context, data from the University Statistical Record (USR) were analysed to determine the characteristics of the population of young staff in UK universities. No national data are available for staff in the PCFC sector. Sources of funding were reviewed to highlight conditions of eligibility and any special schemes for young or new staff.

(i) Definitions

Key terms used throughout the report are defined below.

Permanent academic staff — Full-time, non-clinical teaching and/or research staff with a long-term or tenured position. These staff are usually paid by the university/polytechnic out of general funds, therefore in considering USR data wholly university funded staff are considered to be permanent.

Short-term academic staff — Full-time, non-clinical staff on a fixed term contract, usually paid from external funds.

Discipline — A respondent's discipline was taken as the department in which they worked.

Young staff — Staff up to and including 35 years old.

Older staff — Staff in the control group between 36 and 45 years old.

Research funds — Any source of income used to support research activity, including departmental funds, grants and contracts.

Research grant — A sum of money awarded to a researcher or research group by an external body such as a research council or charity (not the UFC/PCFC) to support a particular research project. Research studentships, use of central facilities and contracts were excluded from this definition.

(ii) The questionnaire survey

Content of the questionnaire — The questionnaire covered background, career history, activity (papers, patents, collaboration), general sources of funding and details of recent grant applications. The full questionnaire can be seen in Annex A.

Sample of researchers — For the purposes of this study, young staff were considered to be those up to and including 35 years old. The questionnaire was distributed to a sample of permanent academic staff in this age group, plus a control group of permanent academic staff between 36 and 45. In addition, the questionnaire was sent to all Royal Society University Research Fellows (URFs), as a group of non-permanent academic staff who are eligible for most sources of funding. Thus there were three main sample groups: young staff, older staff and URFs.

There were 142 URFs at the start of the project, covering all science disciplines. It was decided approximately to match this number for the other two sample groups. So that comparisons could be made between disciplines, we aimed to collect data from about 30 young and about 30 older permanent academic staff in each of five disciplines in universities and in one discipline in polytechnics. The university disciplines which we chose were chemistry, physics and electrical & electronic engineering, to represent three areas predominantly funded by SERC, biology to represent a subject which is funded by several research councils and other sources, and physiology which has a large proportion of charity funding. Biology was selected as the subject to be sampled in polytechnics.

Sample of departments

Heads of the appropriate departments or their secretaries at a wide range of HEIs were telephoned and asked to give the total number of permanent academic staff in their department, the approximate number up to 35 years old and the number between 36 and 45. From these data we decided which departments to send the questionnaire to in order to reach the appropriate number of young and older permanent academic staff, ensuring a good mix of geographical locations and UFC ratings (for university departments).

Questionnaires were distributed to young and older staff in 26 university and five polytechnic departments and to young staff only in a further 19 university and four polytechnic departments.

Distribution and collection

The questionnaire was first piloted on about 15 members of permanent academic staff in the departments of the Task Group. This led to a few changes. The final version of the questionnaire was sent to each URF to be returned directly to SEPSU. For the permanent academic staff, it was felt that a questionnaire distributed and collected through the Head of department might be most effective. We therefore wrote to the Heads of the selected departments to introduce the project and to give them the chance to decline to participate, but none did. A week later we sent them a number of questionnaires, based on the figures obtained by telephone, for them to distribute, collect and return. The Heads of department were also asked to provide the accurate numbers of staff in their department and the numbers in the two age groups.

A reminder was sent to the Heads of department and the URFs who had not responded shortly after the deadline for returns. In the case of departments which still gave no response or a poor response the Heads were reminded again by telephone.

Response rate

Replies were received from 115 out of 142 (81%) of the URFs who received questionnaires. The number of departments sampled in each discipline and the number that responded are shown in Table 2.1. In total 52 of the 54 (96%) departments sent back some replies. Table 2.1 also shows the actual numbers of permanent academic staff in the departments which were sampled in the two age categories, and the number of completed questionnaires. The overall response rate from permanent academic staff was 79%.

(iii) Interviews

Follow-up interviews served to put the results of the questionnaire in context and gave an opportunity to discuss some of the most frequent comments made at the end of the questionnaire. Visits were made to five departments around the UK; one polytechnic biology department, two university biology departments and two university chemistry departments. Individual interviews were held with as many of the

Table 2.1 Number of departments and staff in sample and response rate

		Poly Biology	Biology	Chem	Elec Eng	Physics	Physiol	Total
Departments	No. sampled	9	8	7	6	9	15	54
	Responses	8	8	7	6	9	14	52
	Response rate							96%
Staff up to 35	No. sampled	40	40	41	55	32	23	231
	Responses	26	34	33	42	29	21	185
	Response rate	65%	85%	80%	76%	91%	91%	80%
Staff 35–45	No. sampled	29	69	29	30	38	32	227
	Responses	21	47	24	24	32	27	175
	Response rate	72%	68%	83%	80%	84%	84%	77%
URFs	No. sampled							142
	Responses							115
	Response rate							81%

permanent academic staff up to 35 as possible (a total of 22) and four of the Heads of department.

The discussions were generally wide ranging, but usually addressed the feelings of the interviewee about the project, the financial support obtained from the department now and when they started, the research structure of the department and where they fitted into it, the help and feedback they obtained from funding bodies and senior staff in applying for external grants and what happened to unfunded proposals.

Points which were made during interviews, along with comments on the questionnaire form, are raised in the appropriate results chapters of this report to comment on the data. We have not attempted to quantify how frequently any comment was made, since a small sample of researchers was interviewed and the comments on the questionnaire were optional and very varied in detail and content.

(iv) Background data

USR data

Data from the Universities' Statistical Record (USR) on the number of young university staff were analysed by sex, source of funding and highest qualification. This was to define the population from which most of our sample was drawn, and to ensure that the sample was representative.

Survey of funding sources

A survey was conducted of large funding bodies, to establish what sort of advice and guidelines they provide, in particular to young staff, what their conditions of eligibility are and if they have any special schemes for young or new researchers. Generally, the funding bodies were initially contacted by telephone, after which they usually sent current literature.

The following bodies were contacted: SERC, MRC, AFRC, NERC, the Royal Society, the Wellcome Trust, the Leverhulme Trust, the Nuffield Foundation, Venture Research International, British Diabetic Association, Cancer Research Campaign, Foundation for the study of research into crippling diseases (Action research).

Royal Society research grants

Data were collected on the Royal Society research grants scheme, as a source of funds under £10,000 which until recently was not covered by the SERC. A form for supplementary statistical information was sent, after piloting, to all those who received a Royal Society research grant in the first round. The form was sent directly to the grantholders and a reminder was sent to those who had not replied by the deadline. A total of 171 out of 177 (97%) responses were received. Data on the age, position and number of years in post of the grantholders were analysed for this study.

(v) Statistics

Throughout the report populations are compared using the non parametric Mann-Whitney test (two-tailed). In this test the probability (p) that two groups of data are derived from the same population is tested. The two groups are considered significantly different if $p<0.05$, i.e. if there is a less than 5% chance of them being part of the same population. Populations are not considered to be significantly different if $p>0.05$. A non parametric test can be applied to populations that are not normally distributed, as well as ones that are, and a two-tailed test does not presuppose the direction in which the populations may differ.

Throughout the report, when groups of researchers are being compared the distributions of data are given as well as the means, as means alone can be misleading if there are any extreme values in the population. The Mann-Whitney test also compares the differences between populations and not means.

CHAPTER 3: CHARACTERISTICS OF RESEARCHERS IN THE SURVEY

(i) The proportion of young staff in the sample universities

The number of permanent academic staff and the number up to 35 in the sample were provided by most heads of Department when they returned the questionnaires. From these we calculated the percentage of young staff in the sample departments and the means and ranges are shown in Table 3.1. The overall mean proportion of staff up to 35 years old was 15%. The proportion varied widely between departments in all the sample disciplines. There was also a difference in the mean proportions between disciplines, such that electrical engineering had the highest proportion and physiology the lowest proportion of young staff. These data can be compared, to some extent, to the data for all UK university staff (Table B.1A, Annex B). From the USR data, the proportion of permanent university staff up to 35 was 19%. The percentage of staff up to 35 in our sample of university science and engineering departments (excluding physiology as this is a subject allied to medicine under the USR definition) was comparable at 16%.

(ii) Characteristics of permanent academic staff in the survey

Sex

The sample of permanent academic staff up to 35 years old was made up of 12% females and 88% males, while only 7% of the 36-45 year old group were female (Table 3.2). Amongst the young staff there was a higher proportion of females in biology (polytechnic and university) and physiology than in the other subjects.

Table 3.1 Percentage of staff up to 35 in the sample departments

	Poly Biology	Biology	Chem	Elec Eng	Physics	Physiol	Total
Mean %	19	10	16	31	13	8	15
Range of %	0–43	0–18	0–50	17–46	0–32	0–15	0–50

Table 3.2 The percentage of permanent academic staff in the sample who were female (Total in each group is shown)

	Poly Biology	Biology	Chem	Elec Eng	Physics	Physiol	Total
Staff up to 35	19% (26)	18% (34)	6% (33)	7% (42)	10% (29)	14% (21)	12% (185)
Staff 35–45	19% (21)	6% (27)	4% (47)	4% (24)	0 (32)	11% (27)	7% (175)

From the data in Annex B it can be calculated that 12% of permanent academic staff aged up to 35 in all UK universities were female; the same as the percentage in our sample of young staff (Table 3.2). The proportions of female staff in biological sciences, physical sciences and engineering and technology respectively were 21%, 11% and 8%. These national values were comparable to our sample values of 18% for biology, 6% and 10% for chemistry and physics and 7% for electrical engineering. Thus our sample contains a representative proportion of female staff.

Highest qualification

The highest qualification held by 97% of the staff up to 35 and 96% of the staff over 35 in our sample was a PhD. Those without a PhD in the young population were six electrical engineers. In the older category one physiologist, three chemists, one biologist and one electrical engineer had a highest qualification other than a PhD. These numbers are rather high compared to the numbers of permanent academic staff with a PhD in the UK university population; in all science and engineering subjects 55% of permanent academic staff up to 35 and 76% over 35 have PhDs (USR data). The older age group in the sample was between 36-45, while the older group in the USR data spanned all ages from 36 upwards, so these were not strictly comparable. However, there was also a difference in the proportion with a PhD between the sample group and the USR data for staff up to 35; the reason for this difference is not clear.

Nationality

The majority of permanent academic staff in both age categories had UK nationality; 91% of the young staff in the sample, compared to 81% of the up to 35 staff from USR data, and 95% of the older staff in the sample, compared to 90% of the over 35 staff in the UK population. Of the 25 non-UK nationals, seven were from other EC countries.

Position

Most of the permanent academic staff had positions funded by the UFC or PCFC, with the exception of six who were funded by charities, three partly funded by the SERC (staff working in IRCs), one by the NERC and two from other sources.

The grades of permanent academic staff in each of the age groups are shown in Table 3.3. Most of the young staff in each subject sampled were lecturers; overall 91% were lecturers compared to 92% of UK permanent academic staff under 35 years old. In the older group the percentage of the sample who had posts more senior than a lecturer post varied slightly from subject to subject but it was particularly low in polytechnic biology at 10%.

Overall 60% of 36-45 year old staff in our sample were lecturers, 31% were senior lecturers/readers and 6% were professors, compared to 69%, 23% and 7%, respectively for the UK science and engineering population between 35-44.

None of the young staff had been in post for more than 11 years, 81% of them had been in post for 5 years or less and 54% had only been in post for up to 2 years. In contrast, permanent academic staff between 36-45 had been in their present post for up to 21 years with only 39% having been in post for 5 years or less and 13% two years or less.

Table 3.3 The positions of permanent academic staff in the sample

		Poly Biology	Biology	Chem	Elec Eng	Physics	Physiol	Total
Staff up to 35	Lecturer	96%	88%	91%	91%	90%	95%	91%
	Senior lecturer/reader	4%	12%	9%	9%	7%	5%	8%
	Professor							
	Other					3%		1%
	Total	26	34	33	29	42	21	185
Staff 36–45	Lecturer	90%	51%	42%	63%	66%	59%	60%
	Senior lecturer/reader	10%	38%	42%	29%	38%	33%	32%
	Professor		7%	8%	8%	6%	8%	6%
	Other		4%	8%				2%
	Total	21	47	24	24	32	27	175

NOTE: Polytechnic staff who were senior lecturers were categorised as lecturers and principal lecturers were categorised as senior lecturers/readers as these are the equivalent university grades.

(iii) Characteristics of Royal Society URFs in the survey

A higher proportion of Royal Society URFs than permanent academic staff were female (28%). Like the permanent staff a higher proportion were female in biology and physiology than in physics or chemistry. All but one of the 115 URFs had a PhD, 86% had been in post for five years or less and 50% for two years or less, and all were UK nationals, as this is a condition of eligibility.

CHAPTER 4: FREQUENCY AND SUCCESS OF GRANT APPLICATIONS

(i) Frequency of submitting grant proposals

The total number of grant proposals that each respondent had submitted (to any external source) in the last five years was divided by the number of years in post or five, whichever was smaller, to give the annual application rate. The mean and the distribution of these values are shown for researchers in different categories in Table 4.1.

In some cases researchers had submitted no proposals because they were so newly appointed that they had not started preparing applications or were still in the process of doing so. Others had not applied for grants because they were part of a well funded research team or an IRC.

Age category

Permanent academic staff up to 35 years old applied for grants more frequently than permanent academic staff between 36-45 on average, and Royal Society URFs applied with an average frequency between the two (1.6, 1.2 and 1.4 grants/ year respectively; Table 4.1A). However, the distribution of application rates did not differ significantly between the categories; the diffference in means can be accounted for by the fact that those who applied for more than three grants per year in the older group or the URFs had never applied for more than five, whereas six young staff had submitted five to ten proposals per year. This may reflect the views held by some young researchers that if they made enough grant applications, at least some would be successful. Others, however, believed that spending more time over fewer applications was likely to yield greater success in obtaining funds.

Time in post

It was noted in Chapter 3 that about half of the younger staff had been in post for two years or less. Since it might be expected that recently appointed and more established researchers would have different patterns of application, permanent academic staff in post for two years or less and those in post for more than two were compared (Table 4.1B). A higher proportion of new than established young staff had applied for no grants (20% and 7% respectively) or for more than two grants per year (25% compared to 11%). The mean application rate for new staff was also higher than that for more established young staff (2.0 and 1.2 grants/year respectively) and there was a significant difference between the two populations.

The mean and distribution of rate of application for established young staff was very similar to the mean and distribution for older staff. Therefore the differences that do exist between old and young staff in this respect are due to the fact that half of the young staff have been in post for less than two years.

Sector and subject

The mean and distribution of frequency of grant applications also differed between disciplines and sectors (Table 4.1C). Permanent academic staff in polytechnic biology departments submitted significantly fewer proposals in the period investigated than university staff in biology, or any other discipline.

University biology, physiology and chemistry staff did not differ in their annual application rate, but physiology and chemistry staff applied for

Table 4.1 Mean rate of grant applications/year in the last 5 years (or number in post if less than 5) and the distribution of rates as a proportion of researchers in each sample category

A. Permanent academic staff up to 35 and 36–45 years old and URFs

	Up to 35	36–45	URFs
Rate			
0	14%	10%	9%
up to 1	39%	42%	50%
1–3	28%	36%	25%
>2	19%	12%	17%
Mean rate	1.6	1.2	1.4
Number	162	173	109

B. Staff up to 35 in post for up to 2 years (new) or longer (established)

	New	Estab
Rate		
0	20%	7%
up to 1	30%	49%
1–3	24%	33%
>2	25%	11%
Mean rate	2	1.2
Number	87	75

C. All permanent academic staff by discipline

	Poly Biol	Biology	Physiol	Chem	Physics	Elec Eng
Rate						
0	30%	6%		7%	11%	19%
up to 1	45%	39%	39%	29%	51%	41%
1–3	17%	35%	35%	44%	27%	32%
>2	8%	19%	26%	20%	11%	8%
Mean rate	0.8	1.5	2	1.8	1.2	1.2
Number	40	79	43	55	55	63

significantly more grants per year than physics or electrical engineering staff.

(ii) Average value of grant applications and awards

The distribution of the mean value applied for in the five most recent grant applications, or the number made in the last five years if smaller than five, is shown in Table 4.2 with the mean of the mean values for researchers of different categories. Table 4.3 shows the distribution and mean of the mean value of those grants which were awarded from the last five applications (or number in the last five years if less than five).

Age category

There were no significant differences in the pattern of mean grant values, applied for or awarded, between permanent staff up to 35,

Table 4.2 Mean of the average value of the last 5 grant applications (or number if less than 5) and the distribution of average value as a percentage of number of researchers in each category

A. Permanent academic staff up to 35 and 36–45 years old and URFs

	Up to 35	36–45	URFs
Value (£)			
up to 50K	40%	33%	38%
50–100K	34%	34%	32%
100–200K	17%	18%	20%
>200K	9%	14%	10%
Mean val	£109K	£157K	£100K
Number	139	152	94

B. Staff up to 35 in post for up to 2 years (new) or longer (established)

	New	Estab
Value (£)		
up to 50K	31%	48%
50–100K	40%	29%
100–200K	19%	14%
>200K	10%	9%
Mean val	£109K	£110K
Number	68	69

C. All permanent academic staff by discipline

	Poly Biol	Biology	Physiol	Chem	Physics	Elec Eng
Value (£)						
up to 50K	64%	35%	43%	33%	34%	22%
50–100K	21%	46%	39%	37%	23%	27%
100–200K	4%	14%	16%	18%	15%	35%
>200K	11%	5%	2%	12%	32%	16%
Mean val	£63K	£80K	£69K	£98K	£290K	£200K
Number	28	72	44	51	47	40

older permanent staff and URFs (Tables 4.2A and 4.3A). However, the average value of applications for the older staff was high (£157K) compared to young staff (£109K) and URFs (£100K), but this was partly due to two older researchers with average values applied for of around £3M.

Time in post

The distribution of average value of grant applications and awards for young permanent staff in post for up to two years and over two years did not differ significantly (Tables 4.2B and 4.3B). The mean of the mean values of grant applications in the last five years was £109K for new young staff and £110K for more established young staff. The mean value of those grants that were awarded was an average of £83K for new staff and £101K for more established young staff. Thus, length of time in post had no effect on the mean value of applications and only a small effect on the mean value of awards.

Table 4.3 Mean of the average value of the grants awarded from the 5 grant applications (or number if less than 5) and the distribution of average value as a percentage of number of researchers in each category

A. Permanent academic staff up to 35 and 36–45 years old and URFs

	Up to 35	36 – 45	URFs
Value (£)			
up to 25K	27%	27%	34%
25–50K	30%	28%	23%
50–100K	24%	23%	26%
>100K	21%	23%	16%
Mean val	£91K	£107K	£79K
Number	105	120	88

B. Staff up to 35 in post for up to 2 years (new) or longer (established)

	New	Estab
Value (£)		
up to 25K	29%	24%
25–50K	21%	36%
50–100K	31%	18%
>100K	18%	22%
Mean val	£83K	£101K
Number	48	55

C. All permanent academic staff by discipline

	Poly Biol	Biology	Physiol	Chem	Physics	Elec Eng
Value (£)						
up to 25K	67%	40%	33%	13%	21%	13%
25–50K	11%	26%	30%	43%	21%	28%
50–100K	22%	26%	25%	22%	17%	26%
>100K		9%	12%	21%	41%	34%
Mean val	£25K	£46K	£55K	£76K	£192K	£165K
Number	9	58	40	37	42	39

Sector and subject

The distributions of average value of grants applied for and awarded were most skewed towards the low values for permanent academic staff in polytechnic biology departments, giving them the lowest means (£63K applied for and £25K awarded), and were significantly different from that of university biologists or any other group except for physiologists (Tables 4.2C and 4.3C). The mean of the mean values applied for and awarded were highest for electrical engineering (£200K and £165K respectively) and Physics (£290K and £192K) and nine out of the ten researchers whose average application was for over £500K were in these two disciplines.

(iii) Success in obtaining research grants

The percentage of grant applications for which researchers received funding in the last five years, or number of years in post if less than five, is shown in Table 4.4. The distribution and mean percentage successful (in numbers) are shown for various categories of researcher, excluding those who had applied for no grants. Table 4.5 shows the value of grants received as a percentage of the value applied for in the last five grants, or the number if less than five. The distribution and mean percentage success (in value) are shown for researchers in different categories, excluding those who applied for no grants but including those who applied but received no awards.

Age category

There was little overall difference in the success of older and younger researchers in obtaining research grants. The distribution of success rates in terms of number of grants was only slightly more skewed towards a higher percentage success for older than for younger researchers (the means were 59% and 52% respectively; Table 4.4A), but sufficiently for the two populations to differ significantly in this

Table 4.4 Mean percentage of grant requests awarded (by number) in the last 5 years (or number in post if less than 5) and the distribution of percentage awarded as a proportion of researchers in each sample category

A. Permanent academic staff up to 35 and 36–45 years old and URFs

	Up to 35	36–45	URFs
Percent			
up to 25%	27%	24%	18%
25–50%	30%	18%	18%
50–75%	18%	19%	20%
75–100%	26%	39%	44%
Mean %	52	59	66
Number	142	156	100

B. Staff up to 35 in post for up to 2 years (new) or longer (established)

	New	Estab
Percent		
up to 25%	29%	27%
25–50%	29%	29%
50–75%	16%	20%
75–100%	27%	24%
Mean %	54	51
Number	70	70

C. All permanent academic staff by discipline

	Poly Biol	Biology	Physiol	Chem	Physics	Elec Eng
Percent						
up to 25%	69%	26%	16%	27%	12%	22%
25–50%	7%	35%	16%	24%	8%	35%
50–75%	3%	20%	27%	20%	18%	14%
75–100%	21%	9%	41%	29%	61%	29%
Mean %	26	47	66	59	76	55
Number	29	74	44	51	49	51

respect. The distribution of success rate in terms of value of grants differed even less between older and younger investigators (means of 49% and 43% respectively; Table 4.5A), and, in fact, the populations did not significantly differ with respect to this parameter. Royal Society URFs tended to have a higher mean success rate in number of grants obtained (mean 66%) and in value (mean 55%) than either group of permanent academic staff.

Time in post

As in the previous sections, the young permanent staff were divided into those who had been in post for up to two years and those who had been in post longer (Table 4.4B and Table 4.5B). No significant difference was found between the percentage of grants awarded by number or by value to researchers in the two groups. The mean percentage of successful applications was 54% for new staff and 51%

Table 4.5 Mean percentage of value of last 5 grant applications (or number if less than 5) awarded and the distribution of percentage awarded as a proportion of researchers in each sample category

A. Permanent academic staff up to 35 and 36–45 years old and URFs

	Up to 35	36–45	URFs
Percent			
up to 25%	38%	38%	21%
25–50%	18%	13%	24%
50–75%	23%	20%	18%
75–100%	22%	29%	38%
Mean %	43	49	55
Number	138	151	93

B. Staff up to 35 in post for up to 2 years (new) or longer (established)

	New	Estab
Percent		
up to 25%	45%	33%
25–50%	13%	21%
50–75%	19%	25%
75–100%	22%	21%
Mean %	39	46
Number	67	67

C. All permanent academic staff by discipline

	Poly Biol	Biology	Physiol	Chem	Physics	Elec Eng
Percent						
up to 25%	71%	50%	22%	39%	20%	32%
25–50%	7%	14%	26%	12%	13%	18%
50–75%		20%	22%	25%	33%	20%
75–100%	21%	16%	30%	25%	35%	30%
Mean %	26	36	56	45	60	50
Number	28	70	46	49	46	50

for more established staff. Mean success rate by value was 39% and 46% for the two groups respectively.

Subject and subject

The greatest differences in percentage success in obtaining grants were between researchers in different sectors and subjects (Table 4.3C and Table 4.4C). With a mean success rate of 26% by number and value of grants, polytechnic biology staff had a significantly lower percentage success than permanent academic staff in any of the university disciplines, including biology. The group of researchers with the highest rate of obtaining grants was the physicists (mean success of 76% in number and 60% in value), who had significantly higher success by number than any other group and significantly higher success in value than biologists and chemists, but not than physiologists and electrical engineers. Physiologists had the second highest success rates and biologists were the least successful of the university disciplines examined.

In general the young and older researchers in any discipline had similar success rates (data not shown). In chemistry, however, young researchers were less successful than older researchers in the percentage value of grants obtained (35% and 57% respectively), although not in the percentage by number (56% and 62%). In contrast, young electrical engineers were more successful in obtaining grants by value (mean percentage success 55% and 41% respectively), but not by number (55% and 56%).

(iv) The influence of other factors on frequency of success and application

Research activity

Researchers were asked to give the following information about their research activity in the last five years; number of refereed papers published (excluding abstracts), number of research students and staff supervised and the proportion of their research time spent in collaboration. All four measures were used as any one could be too subject dependent. Permanent academic staff were divided into two approximately equally sized groups with respect to each of these activity measures. For each pair of groups a comparison was made of the number of grant applications per year, the average value of grants and the average percentage success in value and number. The mean of each of these parameters is shown for each pair of groups, along with a measure of the distribution and the number in each group, in Table 4.6. The measure of distribution was the percentage of researchers in the group for whom the parameter was above a certain value (eg the percentage whose average application rate was more than one/year).

There was a clear relationship between level of research activity and pattern of applying for research grants, whichever of the measures of activity was measured and whether the mean or distribution of parameters was used (Table 4.6). The number of grant applications per year was higher for permanent academic staff who , in the last five years, had published more than ten papers, who had supervised more than two research students or more than one member of research staff or who had spent more that 25% of their research time in external collaboration, than those who had done less in these respects. These more active researchers were much more likely to have applied for

Table 4.6 The relationship between grant application rate, value and success and 4 measures of activity: number of papers, number of research students and of research staff supervised in the last 5 years and proportion of research time spent on collaboration. Permanent academic staff are divided into 2 groups (of approx. equal size) with respect to each measure and compared.

		Papers		Research students		Research staff		Collab time	
		<10	>10	<2	>2	<1	>1	<25%	>25%
Average application rate/year	% for which >1	34%	60%	36%	60%	36%	62%	40%	53%
	mean rate/year	1.1	1.7	1.3	1.5	1.3	1.7	1.3	1.5
	number	159	173	170	164	139	132	143	188
Average value last 5 grants	% for which >£100K	26%	32%	24%	34%	22%	38%	24%	34%
	mean value (£K)	91	170	89	175	100	185	91	169
	number	132	156	140	151	123	125	126	162
% grants awarded by number	% for which >50%	34%	65%	42%	60%	45%	62%	41%	58%
	mean % awarded	43	66	50	61	54	64	48	62
	number	136	159	144	154	125	128	127	168
% value of grants awarded	% for which >50%	36%	54%	40%	53%	42%	55%	40%	52%
	mean % awarded	36	54	40	52	43	54	43	49
	number	132	154	141	148	125	128	128	158

more than one grant per year and their mean application rate was higher. The more active researchers, by any of the measures, were also more likely to have applied for grants greater than £100K on average and the mean of their mean grant application values was higher. The relationship between size and frequency of research grants and number of staff and students and amount of collaboration is not surprising; the research grants would have been necessary in order to fund most of the staff and some of the students and the collaborative research. The fact that researchers with more papers apply for larger grants and more often may indicate that there is a correlation between the amount of funding required and research output in terms of papers.

The researchers who were more active, in terms of papers, students, staff and collaboration, were also more successful in obtaining grants (Table 4.6). Both in terms of number and of value they were more likely to have obtained more than 50% of the grants that they applied for and they had a higher mean success rate. These figures may in part support the view expressed by many young researchers that a good track record increases the chances of obtaining a grant. In addition, those with more of a track record are likely to be more experienced at writing grant proposals, which will generally increase their success rate. However, it is also likely that those with more success in obtaining grants have better resources for their research and are therefore likely to produce more papers, supervise more staff and students and be involved in more collaboration. It is not possible from these data to say whether greater activity led to greater success in obtaining grants, or whether the resultant higher levels of funding allowed greater activity.

In Table 4.7 permanent academic staff have been broken down into two groups with respect to a number of other characteristics. As in the previous table, the number of grant applications per year, their average

Table 4.7 The relationship between grant application rate, value and success and sex, position (lecturer or more senior), if appointed under New Blood Scheme and departmental UFC rating for permanent academic staff in the sample.

		Sex		Position		New Blood		Dept UFC rating	
		m	f	lect.	other	yes	no	1–2	3–5
Average application rate/year	% for which >1	48%	41%	46%	52%	46%	48%	57%	46%
	mean rate/year	1.4	1.1.	1.4	1.4	1.4	1.4	1.5	1.4
	number	308	27	225	110	52	280	70	197
Average value last 5 grants	% for which >£100K	31%	14%	29%	32%	38%	28%	31%	35%
	mean value (£K)	139	68	112	179	129	135	86	167
	number	207	21	195	96	47	241	62	173
% grants awarded by number	% for which >50%	51%	52%	48%	56%	58%	50%	42%	59%
	mean % awarded	56	56	56	56	65	55	47	64
	number	277	21	201	97	48	247	64	176
% value of grants awarded	% for which >50%	47%	43%	46%	47%	55%	46%	39%	52%
	mean % awarded	46	44	45	47	54	45	39	50
	number	268	21	194	95	45	241	61	173

value and the percentage of successful applications have been compared for each pair of groups.

Gender

Female permanent academic staff applied for smaller research grants but almost as often as their male counterparts. The difference in the average value of grants of female staff can largely be explained by the fact that the majority of women in the sample were in biology or physiology (Table 3.2), disciplines in which the average size of grants was smaller (Table 4.2). The success rate by number or by value did not differ between male and female permanent academic staff.

Position

Permanent academic staff were broken into those who were lecturers and those in other (more senior) positions, and into those who were and were not appointed as New Blood lecturers (or under the New Academic Appointments Scheme; Table 4.7). There were no differences between the lecturers and the more senior staff with respect to average application rate nor between New Blood appointees and other staff. The mean value of grants applied for by more senior staff was higher than lecturers (£179K and £112K respectively), but this was due to a few very large grant requests and the proportion of researchers applying for an average of more than £100K was similar for the two groups. New Blood and other staff applied for grants of a similar average value.

There was no difference in the average success rate of lecturers and other staff, either by number or value of grants. New Blood staff had more success than others in obtaining grants by number (mean percentage success 65% and 55% respectively) and in value (54% and 45% respectively). This is in keeping with the results of a recent study by the SERC that showed that New Blood lecturers had a higher than average success rate in applying for SERC research grants.

Departmental rating

Permanent academic staff in universities were divided into those whose department had a UFC research rating of one or two and those for whom it was three or more (Table 4.7). Those in more highly rated departments did not apply for grants more often on average. The average value of their grants was higher but this was due to some particularly large grants, since the proportion with a mean value over £100K was only slightly higher for those in highly rated departments. Their success rate was better than those staff in weaker research departments, both in terms of number of grants awarded (means of 64% and 47% respectively) and value of grants (and means of 50% and 39% respectively). A similar result was obtained if researchers within departments with research ratings of one or two were compared to those where the rating was four or five.

(v) Funding Shortfalls

A large proportion of grant requests are not funded at all or are only partially funded, which raises the question of what happens to the proposed research. A study of unfunded alpha rated applications conducted by the SERC showed that 50% of unfunded alpha projects were eventually funded, 30% on resubmission to the SERC and 20% from departmental funds, industry or private foundations.

We asked the young researchers who were interviewed what happened to their proposals which had not been fully funded. Since only 22 young investigators were interviewed, no attempt was made to quantify their responses. If the application was rejected altogether some resubmitted it to the same funding body or sought funding elsewhere, and sometimes funding was obtained at a subsequent attempt. Some proposals remained unfunded after several attempts, however, even if they had obtained an alpha rating. Some young investigators who had had more than one alpha rated proposal rejected gave up applying for that project, and one had given up applying to the SERC altogether. Unfunded projects, especially larger ones, were often dropped totally and other lines pursued, perhaps cheaper or more applied ones. Others attempted to conduct the experiments with borrowed equipment or central facilities, but examples were given of how inefficient this could prove to be.

There were several ways of coping with cuts in a research grant. Some people deliberately asked for more than they needed, so that the amount awarded was, in fact, sufficient. Small shortfalls sometimes could be made up by the department. Sometimes equipment was borrowed, revamped second hand equipment was used or a cheaper version was bought, but it was generally felt that this tended to reduce efficiency. It was fairly common for recipients of reduced grants to take on a research student or research assistant to do a job initially intended for a postdoctoral worker. Not only did this tend to reduce the output of the project, but it was not considered to be fair on the students as they could end up doing more difficult, speculative work rather than working on an established line.

CHAPTER 5: SOURCES OF RESEARCH FUNDING

(i) Major sources of funding of researchers in the survey

Researchers were asked in the questionnaire what their three major sources of external (non-university/polytechnic) funds were. The frequency at which various funding sources were used as a primary source and as a secondary or tertiary (combined) source was compared to age category (Table 5.1) and to subject category for permanent academic staff (Table 5.2).

Age category

All three categories of researchers, permanent academic staff up to 35, permanent academic staff between 35-45 and URFs, predominantly used research councils as a primary source of funds (66%, 63% and 60% respectively). For young staff the next most important primary source was charities, while for older staff charities, industry and government and EC were equally frequently the primary source of funds. In contrast, the secondary/tertiary source used by both age groups of permanent academic staff was fairly evenly split between the Research councils (23% and 29% for young and older respectively), charities, industry and government and EC. It should be noted that some respondents included The Royal Society in the "other" category rather than as a charity, which explains why the primary and secondary/tertiary source of quite a high proportion of URFs was classified as "other".

Subject category

The primary source of research funding of permanent academic staff (ages combined) was influenced by subject and sector (Table 5.2A). Research Councils were the most frequent primary source for all subjects except physiology (where charities were), especially chemistry, physics and electrical engineering. Industry was more often a primary source in polytechnic biology than in university biology or any other subject.

Table 5.1 Proportion of researchers in each category using each source as a primary and secondary/tertiary source of external research funds

	Up to 35		36–45		URFs	
	Primary	Sec/tertiary	Primary	Sec/tertiary	Primary	Sec/tertiary
SERC	52%	10%	47%	12%	33%	8%
Other RCs	14%	13%	16%	17%	27%	10%
Charities	18%	18%	11%	17%	16%	24%
Industry	6%	28%	13%	25%	3%	8%
Gov & EC	8%	18%	10%	22%	3%	17%
Others	2%	12%	3%	6%	19%	31%
Number	149	153	159	202	108	144

Table 5.2A Frequency with which each source is used as a primary source of external research funds

	Poly Biol	Biology	Physiology	Chemistry	Physics	Elec Eng
SERC	23%	21%	4%	85%	84%	75%
Other RCs	15%	36%	34%		2%	
Charities	15%	10%	62%	4%	2%	4%
Industry	27%	16%		2%	2%	11%
Gov & EC	15%	14%		4%	10%	11%
Others	4%	4%		4%		
Number	26	73	47	49	57	55

Table 5.2B Frequency with which each source is used as a secondary/tertiary source of external research funds

	Poly Biol	Biology	Physiology	Chemistry	Physics	Elec Eng
SERC	15%	14%	9%	6%	12%	13%
Other RCs	11%	37%	29%	7%	6%	3%
Charities	11%	16%	38%	18%	12%	9%
Industry	15%	14%	4%	40%	33%	47%
Gov & EC	22%	22%	18%	22%	25%	20%
Others	26%	7%	2%	6%	13%	9%
Number	27	95	55	67	52	70

Research Councils were a secondary/tertiary source of research funds (Table 5.2B) much less frequently than they were a primary source in chemistry, physics and electrical engineering. In biology and physiology, however, research councils were almost as often a secondary/tertiary source as a primary one. On the other hand, industry was more frequently a secondary/tertiary source in chemistry, physics and electrical engineering than in other subjects. Charities and government and EC were used almost equally by the six groups for secondary tertiary funding except for a high proportion of charity funding in physiology.

(ii) Users of The Royal Society Research Grants Scheme

Application to the Royal Society Research Grants scheme is straightforward, the response time is rapid and awards of up to £10000 can be made to any postdoctoral researcher. To establish if such a small grant scheme was particularly attractive to new/young staff, a survey of recipients was conducted. A higher proportion of permanent academic staff with Royal Society grants are up to 35 years old (31%) than in the general UK population of permanent academic staff (19%).

A very high proportion of Royal Society grant holders are fairly new in post; 57% had been in their present post and department for less than five years. About half of these were researchers who were probably in their first permanent post, since 26% of the permanent staff with grants had been in a short term position in the last five years. The remaining staff who had been in post for less than five years were presumably recently appointed to a promoted post or had been transferred. Thus the Royal Society Research Grants Scheme is used extensively by young researchers and staff who have a new position, whether this is their first or a promoted permanent post.

(iii) General comments on obtaining research funds

The comments and opinions discussed in this section were raised at the end of the questionnaire or during interviews. This section is intended to give an overall flavour of opinions on research funding; a few quotes and examples are used to illustrate the most commonly expressed views. No attempt has been made to quantify how frequently comments were made as those on the questionnaire form were wide ranging in content and detail, and interviews were conducted with too few people (22 young staff and four Heads of Department) to justify quantification.

Departmental funds

Systematic data were not collected on the level of research funding obtained from a researcher's department, but comments suggested that the amount of money received by newly appointed permanent academic staff varied considerably, within and between departments, and in some cases no start up money was provided. The researchers usually had little say in what they were awarded. Many young researchers felt that the money obtained from their department, for starting up and on an annual basis, was insufficient to conduct the pilot experiments thought necessary to obtain external funding. In the words of one respondent, "the well-found laboratory is a myth". Thus new staff are usually encouraged and expected to seek external funds immediately.

Other measures were taken by departments to help new staff to establish their research. It was very common for them to have a reduced teaching and administration load to give them more time for research, and in some cases departmental studentships were preferentially awarded to new lecturers. Some new staff were encouraged to join existing research groups, although it was generally recognized that they had to develop their own lines of research in due course.

Strategy for otaining funds

It was widely felt that insufficient research funds were available and that the time and effort required to apply for research grants were not balanced by the chances of success. However, a number of strategies were perceived to improve the chances of success.

Help from more experienced colleagues in preparing proposals was often (but not always) thought to improve the chances of success, with the guidance of a member of the committee or board of the funding agency being especially valuable. It was also considered useful to identify an individual member of the funding agency's administrative staff to get help from. Collaboration, particularly if it was interdisciplinary, or applying for grants jointly with more senior staff was generally thought to improve levels of research funding, but young researchers were also aware of the necessity to develop an independent research area. Some young researchers thought that their first application, but not subsequent ones, had been favoured and recommended that it should be stated if it was a first application on the form, even if this information was not asked for. While some scientists were unwilling to compromise their research others recognized that orienting their research towards a special initiative or an area funded by industry increased the likelihood of obtaining financial support.

Studentships or the use of central facilities were found to be easier to obtain than larger grants, but the former were often hard to fill and too much reliance on central facilities was not as efficient as having some of one's own equipment.

Suggested improvements

Some funding agencies were found to be more helpful than others (see below). The most general criticisms were of the guidelines, in particular some researchers wanted more information on how grants were decided on, and of feedback. Feedback was often seen as an excuse for rejection rather than constructive criticism that could improve subsequent applications. The practice adopted by some funding bodies of sending referees reports to applicants (automatically or by request) was generally appreciated and there were calls for this to become normal practice. Scientists are used to learning from the criticism of their peers with respect to papers, after all. It was understood that there was no valid alternative to peer review, but as one researcher put it, "while funds are limited it becomes something of a lottery". A number of researchers thought that the person was judged as well as the proposal, therefore younger people with less of a track record would be discriminated against. To overcome this, and the fact that with fewer contacts young researchers have fewer available funding sources, it was suggested by some researchers that some funds should be earmarked for inexperienced scientists.

(iv) Specific funding sources

This section consists of information gained from the funding bodies themselves, together with the comments of young investigators on the funding bodies.

SERC

Research grants from the SERC are available to any member of permanent academic staff in an HEI or SERC (or other) advanced fellows. Until recently the lower limit for research grants was £25K. There is no special scheme for young/new researchers and there is nowhere on the application form to indicate if it is a first application. The application form was criticized for being too long with insufficient guidelines, however since then the "Beginner's Guide" has been published to supplement the already extensive general research grants guide. Some people felt that there should be better coordination between the different SERC committees and between SERC and the other research councils over what areas they fund, and information about this should be made clearer. Several researchers found applying to special initiatives more straightforward than applying for a general grant as it was more obvious which committee to apply to and what to stress in the application, and felt that they had a more reasonable chance of success. Administrative staff at the SERC were regarded as generally helpful, once the right person had been identified.

Feedback from the SERC seemed to be very variable and there were calls for a more consistent policy. Some committees, such as the chemistry committee, send referees reports to applicants automatically and many scientists would like this to become a normal practice.

Other researchers had obtained informal feedback from members of committees, particularly the chairperson, or from members of administrative staff who they had contacted or knew already. Many people were frustrated by the lack of constructive criticism when a grant was rejected, making it difficult to know how to improve on the next attempt, particularly when an alpha rated grant was rejected.

Other research councils

Grants from the other research councils are also available to permanent academic staff or research fellows in HEIs, except for MRC grants which are available to all graduates. The AFRC is the only council with a special scheme for new investigators and up to 20% of research grant funds may be earmarked for them, although since only a small proportion of AFRC money is available for research grants this is not a large pool. New investigators applying to the AFRC are asked to identify themselves as such on their application form and to include a CV. They are judged by normal peer review, but more emphasis is put on research promise than on track record. Although this scheme was seen as a move in the right direction by the few investigators who we interviewed who had applied to the AFRC, some would have preferred a separate pool of money to have been made available by the AFRC. The MRC grant application form also asks for the age and a brief CV of the applicant(s), so that promise can be identified and lack of polish can be accounted for in the proposals of inexperienced research staff. NERC offer no particular scheme or advice for young investigators, but they do have a small grants scheme (upper limit £15K) which is simpler and quicker to apply to and may appeal particularly to younger staff.

All the research councils produce general guidelines for applicants and will advise on application procedure. The AFRC seemed to be particularly approachable and would even arrange for a member of staff to come to an HEI to talk to researchers about applying for grants.

As with the SERC, feedback from the other research councils was variable. Again the AFRC was recognized as having improved in this respect in recent years, although feedback was still slow sometimes. The AFRC sent edited referees reports to applicants on demand and sometimes automatically. This was generally appreciated, but the reasons for rejection were not always clear or were frustrating. Some simple comments from the chairman of the grants board might improve things further. Some applicants to the AFRC and the NERC had received referees comments before the committee met to decide on grants and had had the opportunity to reply. However, not much time was given to reply and researchers doubted whether their answers were taken into consideration.

Charities

Some large charities will award grants to any postdoctoral researcher in an HEI (the Royal Society) and others to any graduate researcher (British Diabetic Association, Foundation for the Study of Infant Death). Only the Nuffield Foundation had a specified scheme for newly appointed lecturers, who may apply for up £14K in their first 12 months in post.

Most of the charities had application forms with guidelines. In some cases the project had to be given a preliminary approval by staff or the director of the foundation or trust before application proceeded (Wellcome Trust, Nuffield Foundation, National Asthma Campaign). Almost all the charities surveyed asked for the CV of the applicant, at least if it was a first grant request to that body. The following charities had small grants schemes with simpler application procedures and more rapid responses: The Royal Society, the Wellcome Trust and The British Diabetic Association. Since it seems likely that small grants would be particularly attractive to young investigators, the recipients of Royal Society grants were examined in section (ii) above.

EEC

Details on applying for research funding from the EEC can be found in SEPSU's "Guide to European Collaboration in Science and Technology" (second edition, 1990). The young researchers with experience of applying to the EEC found it a lengthy process, because of negotiations with partners and difficult administrative questions. It was particularly important to make individual contacts with EEC staff, in order to identify target areas early. EEC staff were generally found to be helpful, especially those in Brussels.

Venture Research

The amount of money provided by Venture Research International (previously BP Venture Research) is a small fraction of research funding, but they have a novel approach to funding. Venture Research International do not fund applied research, but they try to fund research that will eventually influence industry, and any scientist may apply. Researchers must first write or telephone and if their idea sounds promising they are invited for a series of interviews at which they have to develop their proposal and explain the significance of the work to Venture Research staff. There is no peer review or consultation with experts, but Venture Research staff do visit the department of the researcher and talk to their colleagues. Eventually the researcher must put the proposal in writing, but by this time it is highly likely they will be successful. The whole process can take anything from three months to two years, depending on the clarity of the aims, but the awards are substantial.

CHAPTER 6: CONCLUSIONS

The population seeking research support

There has been an overall drop in the number of permanent academic staff in science and engineering in UK universities since 1980. Of this reduced number the proportion who are up to 35 has remained constant. Thus there are fewer members of permanent academic staff competing for research funds from the SERC and other sources. However, the number of short-term academic staff in science and engineering, the majority of whom are young, has increased dramatically over the same period. A growing proportion of these will be research fellows who are eligible to apply for many sources of funding, since a number of fellowship schemes have been introduced (e.g. the Royal Society URF Scheme) or expanded (e.g. the SERC Advanced Fellowship Scheme) since 1980. In addition, the salaries and research needs of a high proportion of short-term staff are provided from the research funds of permanent academic staff. Therefore, although the number of permanent science and engineering staff has declined, the increase in short-term staff is putting pressure on limited research funds available from the SERC and other sources.

The sample population

The sample of researchers included in the survey worked in a range of universities and polytechnics. Most of the disciplines of the researchers were chosen as ones largely funded by the SERC (chemistry, electrical engineering and physics), but a subject with mixed funding (biology) and one with very little SERC funding (physiology) were chosen for comparison.

The characteristics of the sample population of young permanent academic staff were very similar to those of the population of young permanent academic staff in UK universities. The average percentage of young staff in the sample institutions was similar to the proportion in the total UK population, and the make-up of the sample and total population was similar with respect to gender, nationality and position, although not with respect to highest qualification. The sample of permanent academic staff surveyed was, therefore, generally representative of the whole population.

The influence of age and time in post on pattern and success of grant applications

Length of time in post had a large influence on the rate of applying for grants. New young staff (in post for up to two years) on average applied for more grants per year than established young staff but they were also more likely to have applied for none. The new staff who had applied for several grants per year were presumably in the process of setting up their own research and those who had applied for none had not yet started to do so. The difference in application rate of young and older staff was entirely due to the fact that about half of the young staff had only been in post for up to two years. Age and time in post had little effect on the average value of grants, except that a few older staff had exceptionally high averages, which raised the overall average of this group.

Older researchers only had slightly more success in obtaining the grants they had applied for than young researchers in number while there was no significant difference in success rate by value. There was also no significant difference between the success rates of new and more established young researchers. Thus, while lack of departmental funds (see below) may make it essential to apply for grants even to get research started up, new and young staff are not less successful in obtaining funds from research grants. Young staff did tend to have less industry funding though (see below), so their overall level of funding may be lower.

In this study we have not separated grants that young investigators applied for on their own from ones where they were coapplicants, perhaps with more senior staff. It may be that a difference in success rate would exist between older and younger staff had only single applicant proposals been considered. However, the important question was whether young investigators were being successful in gaining funds for their research, even if they were obtaining them by collaborating with others, so it was appropriate to consider all grant proposals that investigators were named on.

The influence of subject and sector on pattern and success of grant applications

Polytechnic biology staff applied for smaller grants less frequently and had a lower success rate in number and value than university staff in biology or any other discipline. The university discipline with the lowest average value of grants and success rate was biology. Researchers in physics applied for the largest grants the least frequently and had the highest success rate. Although overall young and older researchers were equally successful in obtaining grants, in chemistry young staff had a lower success rate and in electrical engineering they had a higher success rate than older staff, in terms of value of grants.

Other factors

Of the other factors examined, research activity was the one which correlated best with frequency, value and success of grant applications. More active researchers applied for bigger grants, more frequently and had more success in obtaining them, whether activity was measured by number of papers, number of staff or students supervised or time spent in research collaboration. Other factors which influenced success rate, but not frequency or value, of grant applications were whether the researcher had been appointed as a New Blood lecturer and departmental research rating. New Blood lecturers and staff in departments with a UFC rating of three or above had a greater proportion of their grant requests funded, by number and value. Gender and seniority did not influence success in obtaining grants.

Major funding sources of researchers in the survey

The majority of young staff, older staff and URFs all used research council (particularly SERC) grants as their major source of external research funds, but much less frequently as a secondary or tertiary source. The next most frequent primary source was charities for young staff but evenly split between charities, industry and government (including EC) for older staff. This may reflect the more sympathetic attitude of charities to younger staff (see below) or that more senior staff are likely to have more contacts in industry or government. The secondary/tertiary source was almost equally often charity, industry, government (including EC) and Research Council, for young and old permanent academic staff. The major source of funding strongly depended on discipline, as might be expected. For example, charities were more often the primary source of physiologists and industry more often for polytechnic biologists that any in other discipline.

Departmental funds Departments showed willingness to support their new staff by reducing teaching and administrative loads initially, but the amount of financial support available was variable, though generally limited. As a result, young staff found it difficult to get their research started in the first place and to conduct pilot projects which they felt in turn reduced their chances of obtaining research grants.

External funding bodies SERC and other Research Council grants are generally available to permanent academic staff or research fellows in HEIs. The only one with a scheme for new researchers was the AFRC, but no new or specific money was set aside for this. Assistance and feedback from research councils were very variable, within and between councils, and many young researchers called for both to be improved. In particular it was suggested that referees' reports, or edited versions of them, should always be sent to the applicant automatically, as they are in some cases now. Of the Research Councils the AFRC appear to have improved the most with respect to giving advice and feedback in recent years. The size of the SERC and the large number of grants it deals with makes improvements more difficult to implement, although it has recently produced a guide for first-time applicants which should help with advice.

Charitable funding bodies generally seem to be more aware of the needs of young scientists than the Research Councils, but they usually deal with a smaller and more specialised community than the Research Councils, particularly than the SERC. A number of charity grant schemes are open to any graduate or postdoctoral researcher in a UK HEI. Almost all the charities surveyed asked first-time applicants to include a *curriculum vitae*, so that promise could be identified, and a number had small grant schemes, which are particularly attractive to new or young researchers.

ANNEX A : THE QUESTIONNAIRE

1 BACKGROUND

1.1 Name: ....

1.2 Department and university/polytechnic: ....

....

1.3 Area of research

general (eg neuroscience, inorganic chemistry) ....

....

specific (eg electrophysiology of sensory neurones, transition metal complexes) ....

....

(*Royal Society University Research Fellows need not answer 1.4 and 1.5*)

1.4 Position

Lecturer ( )
Senior Lecturer ( )
Reader ( )
Professor ( )
Other ( ) Please specify ....

Were you appointed under the New Blood Scheme? (Y / N)

Is your position associated with an interdisciplinary research centre (IRC)? (Y / N)

1.5 Source(s) of salary for present post:

UFC / PCFC ( )

Research council ( ) Please specify ....

Charitable body ( ) Please specify ....

Industry ( )

Other ( ) Please specify ....

1.6 Number of years in current position and department: ....

1.7 Highest qualification:

BSc / BA ( )
BTEC ( )
MSc / MA ( )
PhD ( )
Other ( ) Please specify ....

Date received: ....

1 BACKGROUND (continued)

1.8 Age (years): ....

1.9 Sex: ....

1.10 Nationality:

UK ( )

EEC (non UK) ( ) Please specify ....

non EEC ( ) Please specify ....

2 CAREER HISTORY

2.1 Academic employment

Please list details of your last three **academic** posts (excluding your current one) with the most recent one first.

	1	2	3
Duration (years)	....	....	....
Department	....	....	....
University/College	....	....	....
	....	....	....
Country	....	....	....
Position:			
Research assistant	( )	( )	( )
Research fellow	( )	( )	( )
Lecturer	( )	( )	( )
Senior Lecturer	( )	( )	( )
Reader	( )	( )	( )
Professor	( )	( )	( )
Other (specify)	....	....	....
Salary funded by:			
UFC / PCFC	( )	( )	( )
Research council (specify)	....	....	....
Charitable body (specify)	....	....	....
Industry	( )	( )	( )
Other specify	....	....	....

2.2 Other employment (since first full-time employment)

Number of years of employment outside academe: ....

Of these, how many were spent in research?: ....

Where were these positions held?

UK ( )
EEC (non UK) ( )
other ( )

Number of years outside employment (excluding years of study): ....

2.3 Publications and patents

How many refereed papers (excluding abstracts) have you been an author/coauthor on in the last five years? ....

Have any of your inventions/discoveries been patented in the last five years? (Y / N)

Have you obtained any royalties from your discoveries which have been used to fund further research? (Y / N)

2.4 Collaboration

What proportion of your research time has been spent collaborating with others outside your own university/polytechnic in the last five years?

None ( )
0 – 10% ( )
10 – 25% ( )
25 – 50% ( )
more than 50% ( )

How many of your papers published in the last five years were in collaboration with others outside your own university/polytechnic? ....

How many of these were in collaboration with individuals/groups in:

UK academe ....
non-UK academe ....
UK industry ....
non-UK industry ....
Research Council ....
Other .... Please specify ....

3 FUNDING

3.1 General funding

Please indicate your three main sources of external (non-UFC/PCFC) research funds in your present post over the last five years, and rank them 1–3, with 1 being the major source:

SERC	....
AFRC	....
MRC	....
NERC	....
European Commission	....
Charities/Private foundations	....
UK Government	....
Overseas Government	....
UK Industry	....
Overseas industry	....

Other (specify) ....

3.2 Research students

How many research students (with studentships) have you supervised in your present post in the last five years? ....

How many of them have already completed? ....

Who funded them? Please state number for each source (for joint funding use fractions):

SERC	....
AFRC	....
MRC	....
NERC	....
Charities/Private foundations	....
UK Government	....
Overseas Government	....
UK Industry	....
Overseas industry	....
Other	.... Please specify ....

3.3 Research staff

Please indicate the number of staff that you have supervised in your present post in the last five years:

Research assistants ....

3.3 Research Grant applications

Please list, as far as possible and in chronological order, all the research grant applications (excluding applications for studentships) that you have made while in your present post, since September 1985. (Continue, if necessary on next page.)

	1	2	3	4	5
Date (year)	....	....	....	....	....
Status on grant:					
Principal investigator	( )	( )	( )	( )	( )
Other investigator	( )	( )	( )	( )	( )
Named postdoc	( )	( )	( )	( )	( )
Other (specify)	....	....	....	....	....
	....	....	....	....	....
Funding Body	....	....	....	....	....
Was the grant:					
Awarded (i.e. funded)	( )	( )	( )	( )	( )
Recommended, not funded	( )	( )	( )	( )	( )
Rejected	( )	( )	( )	( )	( )
Total value requested	....	....	....	....	....
Total value awarded	....	....	....	....	....
Did you receive guidance from more senior academic staff in the preparation of the proposal relating to: *					
Style (Y / N)	....	....	....	....	....
Costing (Y / N)	....	....	....	....	....
Scientific content (Y / N)	....	....	....	....	....
If rejected/reduced, did you receive any feedback from the funding body:					
Automatically (Y / N)	....	....	....	....	....
By request (Y / N / no request)	....	....	....	....	....
If the proposal was a modification of a previous one, state which	....	....	....	....	....

* Permanent staff in the 36–45 year-old group need not answer this

3.3 Research Grant applications (continued)

What modifications had you made?					
Change in style of proposal	( )	( )	( )	( )	( )
Change in value	( )	( )	( )	( )	( )
Change of scientific content	( )	( )	( )	( )	( )
Other (specify)	....	....	....	....	....
	....	....	....	....	....

	6	7	8	9	10
Date (year)	....	....	....	....	....
Status on grant:					
Principal investigator	( )	( )	( )	( )	( )
Other investigator	( )	( )	( )	( )	( )
Named postdoc	( )	( )	( )	( )	( )
Other (specify)	....	....	....	....	....
	....	....	....	....	....
Funding Body	....	....	....	....	....
Was the grant:					
Awarded (i.e. funded)	( )	( )	( )	( )	( )
Recommended, not funded	( )	( )	( )	( )	( )
Rejected	( )	( )	( )	( )	( )
Total value requested	....	....	....	....	....
Total value awarded	....	....	....	....	....
Did you receive guidance from more senior academic staff in the preparation of the proposal relating to: *					
Style (Y / N)	....	....	....	....	....
Costing (Y / N)	....	....	....	....	....
Scientific content (Y / N)	....	....	....	....	....
If rejected/reduced, did you receive any feedback from the funding body:					
Automatically (Y / N)	....	....	....	....	....
By request (Y / N / no request)	....	....	....	....	....

* Permanent staff in the 36–45 year-old group need not answer this

3.3 Research Grant applications (continued)

If the proposal was a modification of a previous one, state which	....	....	....	....	....
What modifications had you made?					
Change in style of proposal	( )	( )	( )	( )	( )
Change in value	( )	( )	( )	( )	( )
Change of scientific content	( )	( )	( )	( )	( )
Other (specify)	....	....	....	....	....
	....	....	....	....	....

4 OTHER COMMENTS

We would welcome any other comments relating to the questionnaire or the study in general. In particular, please identify any factors which you feel have influenced your success, or lack of, in obtaining research funds:

....

....

....

....

....

....

....

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....

....

Thank you very much for your cooperation in completing this questionnaire.

Note: Personal data provided in response to this questionnaire will be held and processed on The Royal Society's computer. A summary of The Society's data protection policy can be obtained from the Executive Secretary (ref: DPSA/JHS).

ANNEX B: THE POPULATION OF YOUNG ACADEMIC STAFF IN UK UNIVERSITIES

Table B.1 shows the number of UK University academic staff who are up to 35 years old and the percentage of staff in this age group, taken from USR data. The table is broken down into B.1A, which shows permanent academic staff and B.1B which shows short term academic staff. Each table shows the trends in the numbers of male and female staff over the last ten years in the main science cost centres and in all other subjects combined.

Permanent academic staff

Since 1980 there has been a drop in the total number and the proportion of permanent academic staff who are up to the age of 35, most of the loss having occurred between 1980 and 1985 (Table B.1A). However, there was only an 18% drop in the number of young staff in science and engineering and little change in the proportion who were young, compared to a 46% decline in the numbers and a substantial reduction in the proportion of young staff all other subjects. The difference betwen science and engineering and other disciplines may partly be due to the fact that more New Blood appointments were made in science and engineering. The overall number of young females fell between 1980 and 1985, but has picked up again, although the small number in science and engineering has risen steadily.

The most recent figures show that in 1989/90 the percentage of permanent staff up to 35 years old was fairly consistent between engineering and science subjects and the mean for science and engineering and all other subjects was the same. A higher percentage of females than males were up to 35, although the overall number of female staff was much lower. The higher proportion of female science and engineering staff who were young may partly reflect the increase in numbers of female staff, since most of the increase was likely to have been in the younger age group. It may also be that more women leave permanent academic jobs when they are younger, bringing down the average age.

Short term academic staff

In contrast to permanent academic staff, the total number of young short-term (externally funded) staff has increased by 73% since 1980 (Table B.2B). The increase has been similar for science and engineering and for other subjects, although within science there has been less of an increase in physical sciences and more of one in maths. There have been greater increases in the number of females than males. While the absolute numbers of young short-term staff have been going up, the proportion of short-term staff who are young has been slowly declining since 1980, overall and for males and females in all science and engineering subjects. In all other subjects there has been a slight recovery in the proportion of young short-term staff after a drop between 1980 and 1985.

In 1989/90, 71% of all short-term staff were up to 35, but the number and proportion in science and engineering was higher than in all other subjects. The number of female short-term staff who were young was lower than the number of males but the proportions of males and of females up to 35 years old were similar.

Table B.1A Permanent (wholly university funded) academic staff up to 35 years old in UK universities, by number and as a percentage of all permanent academic staff

1980/81	Male		Female		Total	
	Number	Percent	Number	Percent	Number	Percent
COST CENTRE						
Biological Sciences	482	26	68	36	550	26
Physical Sciences	684	17	35	32	719	18
Maths	579	27	33	26	612	26
Eng & Tech	789	19	24	41	813	19
Total Science & Eng	2534	21	160	33	2694	21
All others	5478	30	1271	39	6749	31
TOTAL	8012	26	1431	39	9443	28

1985/86	Male		Female		Total	
	Number	Percent	Number	Percent	Number	Percent
COST CENTRE						
Biological Sciences	360	18	79	39	439	20
Physical Sciences	519	15	48	51	567	16
Maths	492	22	44	30	536	22
Eng & Tech	731	18	44	44	775	19
Total Science & Eng	2102	18	215	39	2317	19
All others	2956	18	1025	33	3881	21
TOTAL	5058	18	1240	34	6298	20

1989/90	Male		Female		Total	
	Number	Percent	Number	Percent	Number	Percent
COST CENTRE						
Biological Sciences	245	13	69	34	314	15
Physical Sciences	486	16	58	48	544	17
Maths	477	20	68	34	545	22
Eng & Tech	748	19	68	49	816	20
Total Science & Eng	1956	18	263	40	2219	19
All others	2478	15	1156	31	3634	19
TOTAL	4434	16	1419	33	5853	19

Table B.1B Short term (externally funded) academic staff up to 35 years old in UK universities, by number and as a percentage of all short term academic staff

1980/81	Male		Female		Total	
	Number	Percent	Number	Percent	Number	Percent
COST CENTRE						
Biological Sciences	752	90	325	89	1077	89
Physical Sciences	1227	86	177	91	1404	86
Maths	226	86	28	90	254	87
Eng & Tech	1229	83	111	87	1340	84
Total Science & Eng	3434	86	641	89	4075	86
All others	2162	75	1226	76	3388	75
TOTAL	5596	81	1867	80	7463	81

1985/86	Male		Female		Total	
	Number	Percent	Number	Percent	Number	Percent
COST CENTRE						
Biological Sciences	966	85	544	87	1510	85
Physical Sciences	1311	83	217	83	1528	83
Maths	451	84	74	84	525	84
Eng & Tech	1812	82	229	88	2041	82
Total Science & Eng	4540	83	1064	86	5604	83
All others	2886	57	1791	69	4677	61
TOTAL	7426	71	2855	75	10281	72

1989/90	Male		Female		Total	
	Number	Percent	Number	Percent	Number	Percent
COST CENTRE						
Biological Sciences	1159	83	769	85	1928	84
Physical Sciences	1556	79	323	80	1879	79
Maths	629	82	112	72	741	79
Eng & Tech	2101	81	307	86	2408	81
Total Science & Eng	5445	81	1511	83	6956	81
All others	3513	60	2419	66	5938	63
TOTAL	8958	71	3930	72	12894	71

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