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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

P.J. Waddell

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SCIENCE AND ENGINEERING POLICY STUDIES UNIT

of

The Royal Society and The Fellowship of Engineering

FOREWORD

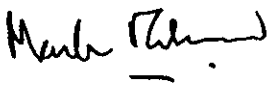
For some time, the SERC (and many other organizations), have been concerned to know whether or not younger research workers are at a disadvantage when seeking external funding of their research. This concern surfaced clearly in the Advisory Board for the Research Council's report on "peer review" (the 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

ACKNOWLEDGEMENTS

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.