National Board of Employment, Education and Training

Australian Research Council

Waiting in the Wings: A Study of Early Career Academic Researchers in Australia

Pat Bazeley

Lynn Kemp

Kate Stevens

Christine Asmar

Carol Grbich

Herb Marsh

Ragbir Bhathal

University of Western Sydney Macarthur

July, 1996

Australian Government Publishing Service
Canberra

Table of Contents

1 Opportunity lost? Academic Research Careers in Australia in the '90s **1**

A Changing Pattern in Academic Research Careers 1

Pressures in the System 2

Specific Objectives of this Study 5

An Overview of the Methodology for this Study 6

2 Establishing an Academic Research Career **9**

Becoming an Academic 10

Prospects for an Academic Career 11

Gaining Academic Employment 12

Building a Research Focus into an Academic Career 15

Facing the Competing Demands of an Academic Role 17

Everyone Tells Me I'm Lucky'—Taking the Postdoctoral Research Path 19

Gaining Overseas Experience 20

The Departmental Environment and Research 22

Establishing a Personal Research Profile 26

Personal Motivation and Commitment 27

Networking and Becoming Known 29

'The Visibility is in the Publications' 30

Overview: The Making of an Academic Researcher 33

3 Funding an Emerging Academic Research Career **35**

University Funding for Early Career Researchers 35

Grants for Early Career Researchers 36

Grants for More Experienced Researchers 38

Faculty and Departmental Dollars for Early Career Researchers 39

Early Career Academics' Experience of Accessing University Funded Schemes 42

External Funding for Early Career Researchers 45
External Grant Opportunities for Early Career Researchers 45
PhD Graduates' and Early Career Academics' Experience of Accessing External Funds 46
Strategies Employed by Early Career Researchers to Gain Funding 51
Early Career Researchers and the ARC Large Grants Scheme 53
Applicant Demographics: Trends and Success Rates 54
Assessment of Applications for ARC Large Grants 59
Academic Reputation: On the 'Coat Tails' of a Successful Researcher 66
The Review Process: Communication with Applicants 73
Early Career Researchers and the ARC Small Grants Scheme 75
The Impact of Funding Failure 79
Impact on Projects 79
Impact on People 81
How Much Funding Do Early Career Researchers Need? 84
Project Funding Levels in the ARC Large Grants Scheme 85
Project Funding Levels in the ARC Small Grants Scheme 86
Estimates of Need by Early Career Researchers 87
Overview 88

4 Defining 'Early Career' in Research 91
Criteria for Grants Targeted to 'New Researchers' 91
Early Career from the Researcher's Perspective 94
Early Career from the Perspective of ARC Funding 96
Setting Criteria for a Definition of Early Career 97
Assessing Early Career Status 105
Arriving at a Definition 106

5 In Conclusion: Issues and Strategies **107**

The Locus of Concern:Beginner, Early Career or Mid Career? 107

Strategies of Benefit to Early Career Researchers, for Implementation by the Australian Research Council 108

Other Issues of Concern to Early Career Researchers 118

In Conclusion 121

References **123**

Appendices **127**

1. Methodology for a Study of Early Career Researchers 127

A framework for data collection and analysis 127

Strategies for Data Collection 130

2. University Classifications and Abbreviations 143

3. Survey of 1993 PhD Graduates 145

4. Survey of Early Career Academics 149

List of Tables

2.1	Inhibitors of Academics' Publishing/Research, Post PhD	16
2.2	Dissemination of PhD Research	31
2.3	Disciplinary Differences in Research Output Over Five Years	32
3.1	University Funded Grants Schemes for Early Career Researchers (1995)	37
3.2	University Funded Grants Schemes for More Established Researchers (1995)	39
3.3	Application Rates and Success with Internal Funding Schemes by Selected Groups of Academics	43
3.4	Sources of External Funding to Which Applications for Specific Projects Were Made at Different Attempts	47
3.5	Numbers of Applications to Different Sources and Success Rates for Different Investigator Groupings	48
3.6	Numbers of Respondents Applying/Applications Made and Success Rates for Different Discipline Groupings	49
3.7	Numbers of Applications to Different Sources and Success Rates for Different Disciplines	50
3.8	Age of Solo or First Named Applicants and Awardees for 1995 and 1996 Large Grants	55
3.9	Gender of Solo or First Named Applicants and Awardees for 1995 and 1996 Large Grants	56
3.10	Success of Large Grant Applications Submitted Through Different Universities for 1995 and 1996	58
3.11	All Sources of Support During Previous Three Years for Any of the Investigators' Projects, for 1995 Applications in Selected Disciplines	63
3.12	Previous Sources of Funding for 1995 Applicants in Relation to Success in their Current Application	63
3.13	Publication 'Track Records' of 1995 Large Grant Applicants in Selected Disciplines	65
3.14	Proportion of 1995 Investigators (All Applicants and Successful Applicants) at Various Levels of Appointment	67
3.15	Success in Funding for Solo 1995 Investigators at Various Levels of Appointment	68
3.16	Structure of 1995 Project Teams and Success of Application	68

3.17 Position of Most Senior Investigator and Success of Application 68

3.18 Total and Relative Contribution of Academic Status and Track Record to Assessor Ratings for Quality of the Researcher, 1995 70

3.19 ARC Small Grant Requests and Allocations Apportioned to Female Academics for Initial Awards in 1995 76

3.20 Concurrent Allocations of Small and Large Grants to the Same Solo or First-Named Chief Investigator for 1994 in Six Discipline Groups 78

3.21 Allocations of 1995 Small Grant Funds to University Groups in Relation to Academic Staff Numbers 79

3.22 Action Following Each Failure to Gain Funding for a Project 80

3.23 Success in Funding and Beliefs about Prospects for Research 82

3.24 Proportion of Requested Funding Allocated for Successful 1995 Grants 85

3.25 Financial Needs of Early Career Academics by Discipline 87

4.1 Average Lapse of Years Between Completion of First Degree and Commencement of PhD Candidature for Each of Six Discipline Groups 99

List of Figures

2.1	Reasons for Commencing a PhD	11
2.2	Current Destinations of a Sample of 1993 PhD Graduates	13
2.3	Discipline Variations in Full Time University Employment, During and Post PhD	14
3.1	Changing Pattern of Response to Successive Funding Failures (Both Internal and External)	81
3.2	Allocations of Large and Small Grants of Various Amounts in Engineering	86
3.3	Allocations of Large and Small Grants of Various Amounts in Social Science and Humanities	87
4.1	Age at Completion of PhD for a Sample of Male and Female Early Career Academic Researchers	98
A.1	Distribution of the Sample of PhD Graduates Across Disciplines	137
A.2	Distribution of Sample of 296 Early Career Academics Across Disciplines	139

Acknowledgments

In commissioning this project, the Australian Research Council has begun to respond to the needs of those academics finding it difficult to tap the resources necessary to become established in a research career. We have appreciated the support and encouragement of members of the steering committee and the discipline panels during the course of our investigations, and anticipate their continued interest in facilitating equitable access to funding by early career researchers.

We are indebted to the many research degree graduates, and academics who took time to reply to our surveys and to talk with us about their experiences in attempting to establish a research focus to their career. While our sense of helplessness was, at times, intense, as we heard from those who were so frustrated in their efforts to use the research skills they had developed, we were also inspired and encouraged by the resilience and creativity of those who have, against the odds, persevered and succeeded in the further honing of their skills and careers.

The Heads of Department who were 'pestered' by us, first of all for lists of staff who might be considered early career, then again for interviews about research opportunities and activities in their departments must be commended for their helpfulness and willingness to share their concerns and their strategies. We also appreciated those responses received from Pro Vice-Chancellors (Research) to our list of emerging concerns during the project (even when we didn't agree!).

Staff of Research Offices were generous in their response to our several calls for information about university schemes and policies. Similarly, postgraduate administrators in selected universities deserve special mention for their support in assisting the passage of both original and follow up surveys to specified graduates. Staff of Research Branch in the Department of Employment, Education and Training facilitated our access to data (both administratively and pragmatically) on which our analysis of the ARC large and small grants schemes was based.

To a very large extent this has been a project about early career academic researchers undertaken by early career academic researchers. It involved eight months of intensive, demanding but very fulfilling work from which we have emerged greatly enriched. It is our hope that this contribution will go some way toward enriching the lives and careers of others in a similar position.

Executive Summary

Background and Purpose

Since its inception, increasing pressure of competition for project grants awarded by the Australian Research Council (ARC) has led to a reduction in the success rate of applications—to a level below the 30–35 per cent generally considered to be the minimum desirable for schemes of this type. One consequence of declining opportunity is the discouraging effect it has on early career researchers in particular, so that fewer applications for funding are received from them and failure to obtain funding is more likely to seriously affect their development as researchers. Concern has therefore been expressed that researchers of promise are being lost, and that disciplines will consequently suffer in terms of their future development.

The study reported here set out to examine the needs and experiences of those within an academic setting who show promise as researchers. It was designed to derive a definition of an early career researcher, to identify the means by which early career researchers obtain funding for their research, to consider the impact on early career researchers of not receiving funding, and to determine whether some identifiable groups face particular obstacles in obtaining funding for their research.

Methodology

Data for the study was primarily obtained through surveys and interviews. Completed questionnaires were received from 208 recent (1993) PhD graduates across all disciplines from eight universities, and from 296 early career academic researchers in physics, engineering, psychology, history, nursing and social work, from twelve universities. Many of those surveyed wrote additional letters to expand on issues raised in the questionnaires, and a large proportion also made themselves available for follow-up interviews. Opportunity was provided through public advertising for those not reached by the surveys to contact the project office regarding their experiences: 61 responses were received, including a number from PhD graduates who had been frustrated in their attempts to obtain academic positions. Issues of relevance to early career academic researchers and the development of research careers were also discussed with 52 heads of departments in nine universities and with 30 additional established researchers. Two same-discipline departments with contrasting research performance were selected for intensive case studies. The opinions of those responsible for research policy and development within universities were sought, and of those

chairing the discipline panels which determine the final allocation of large grants within the ARC.

Funding schemes were reviewed with regard to their accessibility by early career researchers. Ways in which they defined 'early career' (if at all) were also considered. Schemes reviewed included those supported through university operating grants and offered internally, both centrally and at departmental level; external funding schemes available to academics on a regular (usually annual) basis; and, the project grant schemes (both large and small) offered by the ARC.

Defining 'Early Career'

It became apparent through the study that the early career academic researcher, as the term is understood within most universities, was a different person from the early career researchers who were the subject of concern on the part of those closely involved with the Australian Research Council. Thus 'early career researchers' need to be distinguished from 'beginning researchers'—those just starting out as researching academics who lack training, experience and confidence in research. Promising early career researchers have had extensive research training and typically have had additional post-PhD research experience, either as postdoctoral research fellows, as associate or junior researchers in a research team, or through the conduct of small, university-funded projects. Following this, such researchers are ready to work independently at a level of excellence meriting competitive research funding, and may anticipate building a career based on research. Thus:

> *An early career researcher is one who is currently within their first five years of academic or other research-related employment allowing uninterrupted, stable research development following completion of their postgraduate research training.*

Career interruption, where it occurs during the first few years of academic employment, serves to extend the period during which one might be considered early career. When an established researcher returns from a break in their career, they do not essentially start again, but they cannot be fairly judged on their research output for the past five years only, if it includes or even immediately follows on from the period of the interruption.

Milestones in Becoming Established in Academic Research

Promising researchers need to pass a number of milestones in their path to becoming established in an academic research career:

- It would normally be expected that the developing researcher would obtain a doctoral degree as formal recognition of their research training.

- Those not already in academic employment need to obtain an ongoing research position (i.e. one extending beyond one year) following their doctoral studies. This can be more difficult than obtaining funding for research, as research funding often accompanies a position.
- Having obtained an academic position, they will need to moderate the competing demands of preparation for teaching, in order to build a research focus into their new role. Small to moderate amounts of research funding are typically available through internal university sources (at central, faculty and/or departmental level) for those with contracts extending beyond one year.
- At mid-point in an academic career (Level C), the teaching and research academic will find their time for and commitment to research threatened once again by increased faculty responsibilities, while they simultaneously cope with the experience of independently seeking larger amounts of competitive research funding from external sources.
- The fully-fledged academic researcher must eventually step out independently of their immediate mentors and establish their own research direction at a level which demands greater or longer-term financial support, and from which they can begin to mentor a new generation of early career researchers. This step can be difficult to achieve; it requires perseverance and resilience in the face of failure.

Undoubtably, through this series of critical points in career development, many who could potentially make a contribution to the advancement of knowledge in Australia are lost to active research. Those who survive to grow and make a contribution are highly motivated by the intrinsic qualities of the research process, they are resilient and resourceful in the face of failure, and, at times, their future is shaped by chance and circumstance.

Issues in Establishing an Academic Research Career

- The starting point for an academic career depended to some degree on the discipline concerned: in newer disciplines a PhD facilitated rapid promotion, in applied disciplines a PhD could be somewhat less valued than relevant industry experience, while in disciplines oriented to basic research, a PhD was typically the minimum requirement for any academic position.
- Doctoral graduates not employed through their candidature reported difficulties in obtaining a job which allowed them to continue their research as being more significant than problems in obtaining research funding. Academic positions for graduates in the pure sciences and the humanities were particularly difficult to obtain. Departments surveyed were often 'top-heavy' and contracting, offering little opportunity for employment of new staff and nurturing of replacement senior researchers.

- Other than the small proportion obtaining research positions in government or industry, those unable to gain academic appointment faced the disheartening prospect of being unable to continue researching unless they could do so in their own time and at their own expense.
- Many graduates seeking academic appointments were employed on short term contracts which limited engagement in research—there was no guarantee of continuity, no access to study leave and often a lack of eligibility for university funding schemes. A series of short term contracts could mean imposed changes in research topics.
- Women were more likely than men to be employed casually or on contract, and at lower levels of appointment, impacting on the likelihood of their applying for research funding.
- Lack of security in employment was of considerable concern to postdoctoral research fellows, affecting much of what they did in the later stages of their fellowship.
- When academic employment was obtained, the pressures of competing expectations and roles served to inhibit research development. Teaching and administrative loads were rated as the most significant inhibitor of research for recent PhD graduates in both sciences and social sciences and humanities, but most particularly for the latter, where almost all were affected.
- Men reported lower teaching loads and lower administrative loads than women; time-release from teaching was generally perceived to be unavailable by both men and women. Lower loads were associated with greater involvement in research.
- Lack of funding or resources for research was commonly reported as an inhibitor of research by recent graduates in academic positions.
- For those recent graduates in academic positions in social sciences and humanities, post-thesis burnout was also commonly reported as an inhibitor of research.
- Academics in mid career (typically, tenured Level C) positions often assumed (or had been assigned) a greater level of responsibility for course design and management, and were taking other leadership roles within their faculties. Senior female academics found they carried a heavy load of university committee memberships. All competing responsibilities served to further inhibit research activity.
- Having had overseas experience and having international links were associated with current involvement in research. Access to overseas experience could be limited by family obligations (for both men and women).
- Attendance at conferences and building and maintaining personal contacts with other researchers (e.g. using email) were associated with greater involvement in research. Access to both of these was more limited for academics on short term contracts.

- Early career academics reported that locating and linking with a mentor was difficult, but where mentoring occurred, involvement in research was greater.
- De facto mentoring often occurred when the new academic was incorporated into a research team. This occurred primarily in the sciences, but was becoming more common in the social sciences.
- The majority of PhD graduates published from their thesis. Publication by early career academic researchers varied with their level and type of appointment: postdoctoral fellows were most productive, with the productivity of others related to their level (rather than their term) of appointment. Disciplinary differences in both type and volume of publication were recorded.
- Overriding all was the impact of the academic's personal motivation to undertake research. Those currently involved in research and with a strong belief in the place of research in academic life reported enjoyment from meeting the challenges of research, a strong degree of curiosity and a desire to communicate ideas.

In Summary:

The initial challenge for the early career researcher is to secure appropriate academic employment and to begin to establish a program of research and publication. This is facilitated by longer term appointments, commitment of departmental staff to research, mentoring, opportunities to attend conferences, and development and maintenance of professional networks. Intrinsic factors such as personal motivation and commitment to tenaciously pursue research questions are also crucial and cannot be underestimated in the development of a successful research career.

Issues in Funding an Academic Research Career

- Universities broadly accept that they have a responsibility to provide support to new researchers and/or new staff in order to assist their becoming established in research. There is a diversity of schemes offered across the higher education system to achieve this. Newer universities were more likely to additionally offer support to researchers who were becoming more established; older universities provided more collaborative, travel and infrastructure support. Some individual departments were also able to offer considerable financial support to their staff, particularly those with well established research traditions and/or significant industry links.
- Half of the academics surveyed had applied for internal support for their research, with three-quarters of their (often multiple) applications being successful. Mode of application (e.g. solo/team) did not influence outcome.

- Making application for, and winning internal university grants often had more to do with the provision of structural support and incentives at departmental level than with an intrinsic desire to do research. Failure to secure internal funding did not diminish a researcher's beliefs in the prospects for a research career.
- Although there were few external schemes which offered funding specifically for early career researchers, there were a large number of sources which were available to them and which were successfully accessed by them, particularly for those in the applied and professional disciplines. The ARC Large Grants Scheme was the exception, unless the early career researcher applied in collaboration with an experienced researcher.
- More early career academics had applied to external sources of funding in the past three years than to internal sources. Applications were most often made to Commonwealth Competitive Schemes (including ARC), both initially and in later attempts to secure funding; foundations, charities and other schemes became increasingly important, however, in later attempts. Researchers who did not abandon a project after an initial failure to obtain funding were more likely to continue to persist in seeking funding for it, or to start working on it anyway.
- Success rates for applications varied considerably by funding source and by whether the applicant was the only named investigator. The most beneficial arrangement varied with the source approached. Those in basic sciences experienced greatest difficulty in accessing funds, largely because they were most dependent on Commonwealth Competitive Schemes (and ARC in particular).
- Early career academic researchers who had a strong commitment to and enjoyment of research, and extensive collegial and external networks were more likely to apply for external funding. These factors, however, did not impact on the likelihood of success once an application was made. In contrast to the situation with internal funding, the departmental environment did not appear to impact on either applying for, or success with, external grants.
- ARC small grants potentially provided a bridge for early career researchers between internally funded schemes and the large grants scheme, typically after an early career researcher had exhausted their access to internal sources. Access to small grant funds was extremely variable across universities, and in some cases, across faculties within a university.
- The most significant financial hurdle for an early career researcher to overcome was to gain large grant funding from the ARC, independently of an established researcher. Researchers and projects which had not had previous ARC support were more likely to be eliminated early in the selection process; also those who had been successfully funded by other (non ARC) external sources may have been considered to lack

legitimacy, unless they had also published from that research in scholarly journals.

- Women who applied to ARC schemes experienced as much overall success as men, though more often as second or third named researcher; they were, however, much less likely than men to apply for ARC funding (for both small and large grants).
- Academics of less than 40 years of age were underrepresented among applicants to the ARC large grants scheme. Those who were successful applied in collaboration with an established researcher as members of research teams, or were in full time research positions. Research teams were not disadvantaged by the inclusion of a younger researcher.
- Those at lower levels of appointment and those from post-87 universities were underrepresented among those applying to the ARC for large grant support; they were also less successful in their applications.
- Early career researchers may have been disadvantaged in their applications to prestigious funding bodies, such as the ARC Large Grants Scheme, because they were not known among those at the more elite levels of the academic research community. The academic status of the applicant was found to add significantly to the prediction of variation in ratings for researchers given by assessors, well beyond the contribution of other aspects of track record. While panel decisions were primarily based on assessors' ratings, the applicant's academic status (at the level of professor or other) also added significantly to the explanation of variance in the final outcome.
- While early career applicants appreciated the opportunity to respond to assessors' comments on their ARC large grant proposals, they were dissatisfied with the overall level of feedback they received: specific evaluation of proposals was not forthcoming from the panels, of particular concern to those whose applications were removed before being sent to assessors. Panel chairs and applicants alike called for a reintroduction of panel interviews as a means of clarifying issues raised by applications and overcoming the 'facelessness' of the review process: the impact of institutional visits as an alternative to panel interviews was unable to be assessed, due to the recency of their introduction.
- A significant proportion of ARC small grants are held by researchers who also hold large grants and/or other small grants.
- Early career academic researchers typically estimate their ongoing research funding needs to be at a level which falls on or around the boundary between the Large and Small ARC Grants Schemes, that is, at a level where funding is particularly difficult to obtain.
- Early career researchers who failed to secure external funding perceived the prospects for developing a research career in Australia more negatively than others, they also reported greater levels of application burnout and greater lack of faith in the proposal assessment systems.

Established researchers evidenced resilience, perseverance and willingness to accept criticism in the face of repeated failures.

In Summary

Researchers of promise starting out in academic positions and seeking funding are generally able to find some financial support for their research, either through internally funded schemes, through becoming linked with established research teams, or by accessing external funding from sources other than the Australian Research Council. The most difficult hurdle for them to negotiate is to become independently funded through an ARC large grant, at a time when their funding needs typically place them at the boundary between small and large grants and their track records based on earlier research are less than those of established researchers. Those applying to external schemes were more intrinsically motivated than those applying to internal schemes, they were also more likely to become disheartened about a research career in response to the failure of their applications.

Recommendations

Strategies designed to facilitate the successful establishment of promising early career researchers were formulated. Some of these are recommended for implementation by the Australian Research Council in order that early career researchers might benefit, directly and indirectly. Other strategies are appropriate for implementation within universities.

Recommendations are:

1 That additional career-related demographic data be collected for all ARC Large Grant Scheme applicants, in a form which can be detached from the project application, to be used to assist in both the making of and the evaluation of allocations under the Scheme.

2 That 'early career' be designated a priority area under the ARC Large Grants Scheme. To be eligible for consideration as early career, all chief investigators must meet the criteria which determine that status, though a more senior researcher may be included in the role of associate investigator.

3 Applicants who have experienced career interruption during the past five years may make a claim for special consideration, and that consideration should take the form of having their research record assessed for their most recent five years of research activity.

4 Postdoctoral fellowships should be offered by the ARC on a 75:25 funding basis (ARC: 75%; host: 25%), with the fellow expected to spend 25 per cent of their time, either throughout the period of the fellowship or in regular block periods during it, on teaching or other duties not directly associated with their main project.

5 That an investigator be limited to holding a maximum of two ARC large grants and three ARC project grants of any kind, at any one time.

6 A statement of the extent of involvement and actual role in the research should be included for each person or position outlined within a grant application.

7 That projects submitted on or about the lower limit for ARC large grant funding be allowed to remain in consideration for funding;

and/or

That the lower limit for large grant allocations be set at $10 000 below the upper limit for small grant allocations.

8 That alternative options for allocation of small grant funds to universities be considered, for example, to take into account total academic staff numbers and the developing research profile of institutions.

9 Feedback from panel deliberations regarding details of their proposed projects should be provided to (early career) researchers, to benefit their future applications.

10 That teleconferencing or videoconferencing be used to facilitate interviews with early career (and other marginally placed) applicants by panel members.

A number of additional suggestions were made, for the attention of university administrations:

- There be expansion of the opportunities for higher degree candidates to undertake studies which will result in a professional doctorate as an alternative to the research based PhD;
- That universities seek ways of offering those unable to obtain research positions the opportunity to become affiliated with their researchers or teams (on a voluntary basis), in order to assist them to maintain a research profile and build collegial networks;
- Early career academics be employed, wherever possible, on three-year contracts, as a minimum, with a reduced teaching load in the first year;
- New academics be provided with opportunity for professional development in the teaching of adult learners, with a mentor assigned to assist them with their new responsibilities; and that
- Universities seek ways of recognising research achievements which do not necessarily earn flow-on benefits in financial terms but which are no less significant than competitively funded projects in terms of creativity, originality and scholarship.

In Conclusion

Ultimately, there arises a conflict between the expressed needs of the research elite to maintain their position, to continue to contribute research ideas, and/or to lead a team of active researchers, and the desire they express to encourage those who are early career. Unless significant funding is added to the system, research leaders must be increasingly prepared to bask in the reflected glory of the success of their proteges, rather than seek that which comes more obviously from their own achievements. Without such a change in perspective—encouraged perhaps by a change in reward systems, to recognise them for the achievements by others that they have made possible—early career researchers are unlikely to improve their access to that funding which is available and will continue to feel and express the frustration that comes from having their potential to make a contribution deferred, blocked or dissipated.

1

Opportunity lost? Academic Research Careers in Australia in the '90s

A Changing Pattern in Academic Research Careers

There is a traditional notion that the best and the brightest of our academic minds will progress from school through their undergraduate years to full time postgraduate research study, serving their time with an eminent professor to emerge—still relatively young—to forge their own career path in which they will make a significant contribution both to knowledge and to the development of further young minds. In such a context, 'young researcher', 'young academic' and 'promising researcher' would all equally suffice to describe the person in their early 30s with postdoctoral experience and about to launch their own research career.

Such a progression, while not uncommon, has become less often the pattern of academic experience. There are those who qualify early but are not entering an academic career until later in life, perhaps after years of professional, business or industrial experience which may or may not involve research, or perhaps after 'time out' to nurture children. In the current climate of vocational change and uncertainty and increased participation by women in the world outside the home, more are seeking qualifications as mature age students, often with a late flowering of promise. New disciplines, where the orientation has been to professional practice rather than research, are being brought into the academy. Even for those who qualify early and remain in an academic setting, there may be periods of intense curriculum development, or periods in an administrative role—roles in which garnering the time and resources for research is difficult, if it is feasible at all.

Kyvik (1995), reviewing both his own research in Norwegian universities and the work of others, suggests that scientific productivity (as indicated by publications) varies throughout the lifespan, with productivity at any point being related to both discipline and gender. Regarding discipline: researchers in the experimental sciences become more productive of publications as they approach their 40s then decline with advancing age, while those in the social sciences and humanities are likely to publish at a steady pace throughout their academic career. The decline in productivity for scientists is less for those who are more productive when younger, and across all disciplines there is a correlation between earlier and later productivity. Regarding gender: an apparently significant difference in

publication productivity between male and female academics was shown by Kyvik to be related to the caring responsibilities of women. Women's production of scientific articles progressively matched those of their male colleagues as their children grew older, so that those whose youngest child was over 10 years of age were publishing to within 10 per cent of the level of equivalent males.

If labelling academics who appear to have a promising but as yet unrealised research career as 'young' or even 'new' distorts the picture, how are they to be identified or named? The necessity to identify such people comes from a need for positive discrimination at that vital point where they are about to emerge as a researcher in their own right, no longer under the mantle of the professor, or other mentor. In a highly competitive funding environment 'early career' researchers, as they have come to be known, find it difficult to compete with those who have long since established their credentials, and who are well known to those advising or making the funding decisions.

Pressures in the System

With the introduction of the Unified National System of higher education in Australia, the number of publicly funded universities has increased from 19 to 36 as former colleges of advanced education and institutes of technology have either amalgamated with older universities or with each other to become universities in their own right. Staff in previously 'teaching only' institutions became not only able to engage in research, but were actively encouraged to do so. The expectation that academics will engage in research has extended not only to the new universities and to new disciplines within the university system, but also to long established professional disciplines in the older universities (e.g. law, accounting, social work, architecture). In consequence, there are increased numbers of academic staff, each with an increased expectation that they will conduct research as part of their academic role and each with the expectation that the system should therefore provide funds to support their research.

The provision of funding for academic research was originally the purview of the universities, to be provided from their operating grants. In 1965 the Australian Research Grants Committee (ARGC) was established to oversee the allocation of research funding, supported with direct government funding through a 'clawback' of funds from the operating grants of universities. The ARGC was designed to ensure that pure basic research in the sciences and humanities was funded on the basis only of excellence, with equal rigour across and within the universities (Brennan 1993). The replacement of the ARGC with the Australian Research Council (ARC) in 1988 was accompanied by a further clawback of funds from the universities. While excellence of the proposed research was, and remains, the primary

criterion on which funding is allocated,[1] changes in government research policy saw the introduction of relevance to the social and/or economic development of Australia as an additional (secondary) consideration in project funding.[2] Universities have also been actively encouraged to seek research and consultancy contracts with non-government sources, with the goal of facilitating the adoption of innovation in industry as well as bringing additional funds into the universities: this activity is now supported in most Australian universities through commercial consulting arms and/or technology transfer companies, and has been further encouraged by the introduction of a 150% taxation benefit to companies buying university research expertise.

About 41 per cent of research in universities is classified as pure basic (being 86 per cent of Australia's total), 22 per cent is strategic (36 per cent of Australian strategic research), 31 per cent of university research is identified as applied (22 per cent of the national total of applied research), and just 6 per cent involves the experimental development of research findings (with 96 per cent of experimental development occurring outside the university sector) (NBEET 1994a). The ARC remains the primary provider of support for basic research in the sciences, social sciences and humanities in Australia, being paralleled in clinical medicine and dentistry by the National Health and Medical Research Council (NH&MRC).

Their highly competitive nature, implications in flow-on funding and power to persuade promotion committees ensures that success in either the ARC Large Grants Scheme or with NH&MRC funding is generally regarded by academics as reaching the pinnacle of achievement in research funding, despite the fact that the amounts awarded are often significantly less than those available from industry or other granting agencies. Research funding

---

1 The criterion of excellence 'is applied by considering matters that are entirely intrinsic to the research activity: the quality of the researcher(s), the quality of the research in terms of its potential impact [within the particular field or on other fields], and the feasibility of the research (including its methodology and the availability of adequate resources' (Brennan 1993, p.95).

2 Relevance 'requires consideration of matters that are extrinsic to the research endeavour', being the potential for realising one or more of:

- contributions to the quality of our culture;
- graduates of high quality;
- direct application of research results;
- increased institutional capacity for consulting, contract research and other service activities; and
- international links (Brennan 1993, pp.94–5).

schemes such as the ARC are an 'integral part of the reward system of science' with the ARC dollar worth much more than others because it confers status and credibility, with a consequent multiplier effect (Over 1995a, 1995b; Rip 1993). The situation is compounded in that there are essentially just two schemes in Australia which command this level of prestige.

Increasing pressure on funds available in support of research projects through the large and small individual projects grants schemes operated by the ARC is evident in the number of applications received and the trend to a decline in success rates for those applications since the commencement of the scheme. The 1989 success rate of 41.5 per cent was sharply eroded (to 24 per cent) in the following year with the influx of applications following university amalgamations, to rise somewhat then fall again to an all time low of 19 per cent in 1993. When the success rate of a scheme falls to less than 30 per cent, applicants are likely to think twice about making the effort to apply (Rip 1993) and indeed, the ARC success rates then slowly rose again in the years following 1993 more as a consequence of a lower rate of applications than because more money was being made available.

There is, on the one hand, an expectation that a significant proportion of academics will conduct quality research, and on the other, limits on the funds to do so. In consequence, not all projects, and indeed not all excellent projects are able to be funded. The Boston Consulting Group, in their report on research infrastructure needs, wrote of the inevitability of there being 'winners and losers' with 'only the highest achievers [gaining] additional support' (NBEET 1993a, p.24). Research funding from government is implicitly no longer considered to be a right of all academics. With the consequent division between the haves and the have nots, and the linking of academic prestige with success in gaining elite funding, disappointment, perhaps disillusion, must be writ large on the face of all but the well established of academia (Wood, Meek & Harman 1992).

Given the pressures outlined above, it is no surprise that early career investigators frequently face rejection by funding bodies such as the ARC. Without an established track record in attracting research funding and being as yet unknown in the research community, they are less able to match established ARC researchers in the climate of extreme competition. Yet they must compete, and win support, if their potential is to be realised. If they attach themselves to the 'coat tails' of an established researcher to win funding, when are they able to implement their own research ideas? And how is Australia to benefit from new ideas, say, those brought home from overseas by returning postdoctoral students, if the ideas have to be put aside until the researcher has served a long apprenticeship here before he/she can be independently funded? How much of its intellectual capital is lost to Australia as disenchanted researchers seek better funding climates overseas? How many move out of a formative research environment and/or give up

entirely, embittered by lack of recognition of the contribution they could make?

Since the establishment of the Australian Research Council, a series of discipline based evaluative reviews of grants outcomes and related concerns has been set in motion, with seventeen reports being published so far. In nine of the more recent reports, the review panel has expressed concern that new or younger researchers (e.g. those under 40 years of age) were being severely frustrated in their attempts to establish a research profile in their discipline, with a consequent loss of those researchers and a fear that the pool of excellent researchers currently existing in the discipline would not be replaced (NBEET 1993b,c,d,e,f,g; 1994b; 1995a,b). The Research Grants Committee concurred with the concerns being expressed, supported by Chairs of Discipline Panels who often sought to give special consideration to younger researchers, but found they did not have the necessary information available to do so. It was in response to the call for identification of the steps which can and should be taken to ensure the future of Australia's research community, through the support of young investigators, that this study was commissioned.

Specific Objectives of this Study

In the context of the discipline reviews, the aim of this study was to identify the issues that impact on early career researchers within an academic setting, with a view to recommending policies and procedures which would support and encourage those who have the potential to make a significant contribution to the advance of knowledge within their discipline, and for the benefit of the Australian community more generally. Its specific objectives included:

- preparation of a definition of ‘early career researcher’ appropriate for use in defining eligibility for targeted development strategies;
- identification of the characteristics of promising early career academic researchers;
- review of strategies which have been adopted by universities to support early career researchers;
- identification of sources of funding designated for and/or accessible by early career researchers;
- identification of the particular strategies adopted by early career researchers to obtain funding and/or other support for their research, and the success of those strategies;
- examination of the impact on early career researchers of rejection of their proposals by funding bodies; and
- recommendation of proactive policies and procedures to ensure that the work of promising early career researchers is facilitated.

An Overview of the Methodology for this Study

Full details of the methodological approach adopted, including survey response rates and characteristics of respondents, are provided in Appendix 1. A brief overview only of the assumptions which guided the investigation and the particular strategies employed is given below.

The academic research environment provided the primary context for the study, with the concern being to view most particularly the future of those with a 'promising' research career, rather than all academics. In the current climate, the award of PhD was considered to provide the educational basis for a research career.

The need to be cognisant of disciplinary differences in academic traditions in a study of this kind has been well established. The study focused on researchers from six disciplines, designed to provide a cross section of the academic community: physics, engineering, psychology, history, nursing and social work. Institutional differences were also considered, with samples being drawn from a cross section of university groups (tabulated in Appendix 2) which took account of research traditions and institutional histories.

Surveys involving both questionnaires and interviews comprised the major data collection strategies employed in the study. Large scale surveys were conducted targeting a complete cohort of PhD graduates of 1993 from eight universities, and secondly, targeting a cross section of early career academics developing as researchers in the six focus discipline areas across twelve universities. Case studies were conducted of two departments which were similar in disciplinary base and historical antecedents but which nevertheless differed significantly in terms of organisational structure, research development and productivity. Interviews were also conducted with heads of many of the departments from which the survey samples had been drawn, also with successful researchers, with deputy or pro vice-chancellors for research in a number of universities, and with chairs of ARC discipline panels.

Submissions from research degree graduates, both employed and unemployed, from academics and from research and postdoctoral fellows were received in response to placement of an advertisement in university and news media.

Data from universities and from government and other external funding agencies was sought regarding the funding opportunities available to early career academics. The biographical characteristics and recent research history and productivity of applicants in the six discipline areas who sought large grant funding from the ARC for 1995 were examined in some detail,

with some additional biographical information becoming available for perusal from the 1996 round of applications. Limited biographical and financial statistics for those supported by ARC small grants for 1994–95 were also made available and analysed.

Wherever possible and appropriate, data were analysed and tested statistically. Qualitative material was considered both thematically and analytically, and in addition provided illustrative examples of quantitative findings. The report is organised by topic rather than by data source, thus each conclusion is drawn as much as possible on the basis of accumulated evidence in preference to solitary sources.

2

Establishing an Academic Research Career

Ensuring the future of promising researchers proved to be more than a matter of providing project funding and ensuring adequate facilities to those employed in universities or other research settings. The major concern among early career researchers (and some not-so-early career) contacting the project office in response to our early university and public advertising was not so much that they could not obtain funding for their research as that they could not get a job which allowed them to apply for funding, nor even one which simply used the research skills and knowledge they had worked so hard to obtain. The tone of the responses was one of dissatisfaction and intense frustration, often from people who had struggled to complete a PhD, only to find little improvement in their opportunities to follow up on or engage in research after completion of their PhD.

Preliminary consideration was therefore given to the early employment experience of those seeking to become academic researchers, the collegial environment in which they found themselves, and the personal attributes and professional strategies they adopted, as they impacted on the development of enthusiasm for and involvement in research. Funding issues will be discussed in detail in the following chapter.

The evidence regarding the interplay of environment, training, personal motivation and structural factors in the development of a promising researcher is, as yet, far from conclusive. An extensive review of the literature on the characteristics of productive researchers, by Bland and Schmitz (1986), identified the following attributes which may be considered of relevance to early career researchers:

- mastery of fundamental methodological skills, with in depth knowledge and skills in a particular research area;
- having had specific help before, during and after their training from advisers or mentors, including an early association with distinguished researchers;
- establishing scholarly habits, such as publishing, early in their career;
- maintenance of professional contacts with research peers/colleagues;
- location in a productive and supportive working environment;
- recognition for their work;
- pursuing several projects at once so that there was less ill effect when one of them stalled;
- needing significant periods of uninterrupted time.

The contribution of this study to an understanding of the potential for fulfilment of that promise in a successful academic research career was derived primarily from surveys (questionnaires and interviews) of a cohort of recent PhD graduates and a cross section of early career academics with a research orientation. Questionnaires used in the surveys were informed in their design by preliminary discussions with researchers as well as the considerations outlined above, and were supplemented by discussions with heads of departments and interviews with highly successful, well established researchers.

Becoming an Academic

The extent to which a PhD was viewed as the starting point for an academic career varied across disciplines. In disciplines oriented to basic research, such as the sciences and history, a PhD was often necessary to win the most junior (level A) appointment, while even highly competitive postdoctoral experience did not provide any guarantees:

> … in the present market it takes more than 5 years postdoctoral experience before you obtain an academic appointment and can seriously consider seeking research funding. I am a physicist who has just attained tenure after more than 8 years as a contracted researcher (including QEII and National Research Fellowships and postdoctoral positions overseas) and 2 years on probation as a lecturer… Academic positions (particularly in physics) are extremely competitive and in recent times (last 10 years) are rarely obtained straight from completion of a PhD.

Typically in history, too, potential new staff were now expected to have both a PhD and a published monograph when applying, despite there being a number of eminent historians without the same formal qualifications within recent and current university circles.

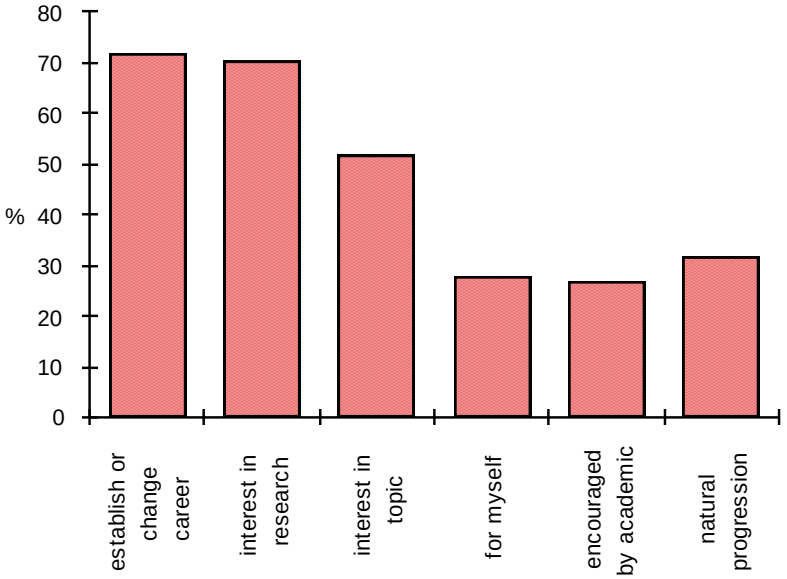
In contrast, in the more applied disciplines, industry experience (e.g. in engineering) or community experience (e.g. in social work) were often equally (if not more) valued for new lecturing staff. Nursing, as a newer discipline, continues to be characterised by staff still seeking to upgrade their qualifications, with the few who already have postgraduate research qualifications frequently experiencing rapid promotion. In these newer disciplines women might be expected to experience particular difficulties in balancing the desire to develop their research capacity and experience with the demands of both heavy teaching loads and the needs of their families. As older, teaching-only staff retire in these newer disciplines, they are more often being replaced by those who have research qualifications so that in years to come the discipline's staff profile may match those of the more established disciplines. Heads of department who are mindful of the pressures for their departments to achieve high research outputs often declared that no new staff would now be recruited unless they already

possessed an established research track record. Completion of research training, usually to the level of PhD, can therefore be regarded as the essential educational basis for a promising academic research career.

Prospects for an Academic Career

Motivation to undertake research training 'is affected not only by the quality of curricula and teaching, but also by student perceptions of career prospects' (Dawkins 1989, p.51). This was clearly evident in the survey of PhD graduates conducted in this study, where a desire to establish or change a career was one of two main reasons to undertake a PhD (Figure 2.1).

*Figure 2.1 Reasons for Commencing a PhD**



* *Respondents could nominate more than one reason.*

There is little financial reward during PhD candidature for the long hours, dedication and social isolation which accompany completion of the program of research and writing. It would be reasonable for candidates to expect that, upon submission of the thesis or award of the degree, there is hope for an improvement in financial standing and an increase in position security. In his 1989 paper John Dawkins, then Minister for Employment, Education and Training, claimed that academic career prospects looked strong from the mid 1990s, when he anticipated that the then current problems with age profiles and the distribution of permanent staff would be solved by expansion in the system and encouragement to take early retirements. In fact, those improved career prospects have not eventuated, and, with the removal of compulsory retirement, may not do so for many years to come. Many of the departments reviewed in this study were still 'greying' as well as being 'top heavy', some facing the need to reduce their academic staff

numbers with the consequence that there was little opportunity for employment of new staff. In the entire Faculty of Arts at one major institution there were only 16 Associate Lecturers, with a department head describing an ongoing process of 'attrition, lack of reappointments, and in recent years the loss of 58 members of staff'. Not surprisingly, then, the majority of the early career academics surveyed felt the extent of career openings for young/new academics in their department was quite poor.[3] And despite almost all being in work, 19.8 per cent of the cohort of recent PhD graduates, including 17.9 per cent of academic respondents, checked financial/work insecurity as something which inhibited further research or publishing.

For those who fail to secure academic or other employment which utilises their research skills, the over-supply of PhD graduates is not just a matter of statistics. Many become angry, frustrated and demoralised, yet some persist in their attempts to establish a career:

> I cannot convey to you how very disheartening this situation is: to be keen to embark upon an academic career but to be, as so many others are, unable to make a small entrance into a teaching position.
>
> My ambition was to become an academic, but I have now almost given up hope of attaining that goal. Hardly any positions in my field have been advertised in the last four years.
>
> I started this study when I was 32. I am now 43, still driving 36 hour taxi shifts on weekends...[I] have doubts whether I am employable within traditional structures. I nevertheless keep trying, as it is the thing I am best trained to do.

Gaining Academic Employment

The 1993 Graduate Careers Council postgraduate destination survey revealed that, of 982 doctoral graduates (639 males and 343 females—approximately 68 per cent of the total number graduating that year), 62.7 per cent were in full time employment in April 1993: 18.2 per cent in government positions, 8.8 per cent in the private sector (excluding education) and 34.8 per cent in education, broadly defined (Getty, Long & Perry 1994). A further 7 per cent were working other than full time (particularly females), 4.7 per cent were not working, 4 per cent were in full time study (including postdoctoral positions) in Australia and 21.6 per cent were working or studying overseas. Only one third of all responding doctoral graduates who were in full time employment were employed in the higher education sector, that is, just 19.7 per cent of the total pool of graduates (31.3% of the 62.7%). Although less in absolute terms, females were marginally more likely than males to be working in higher education,

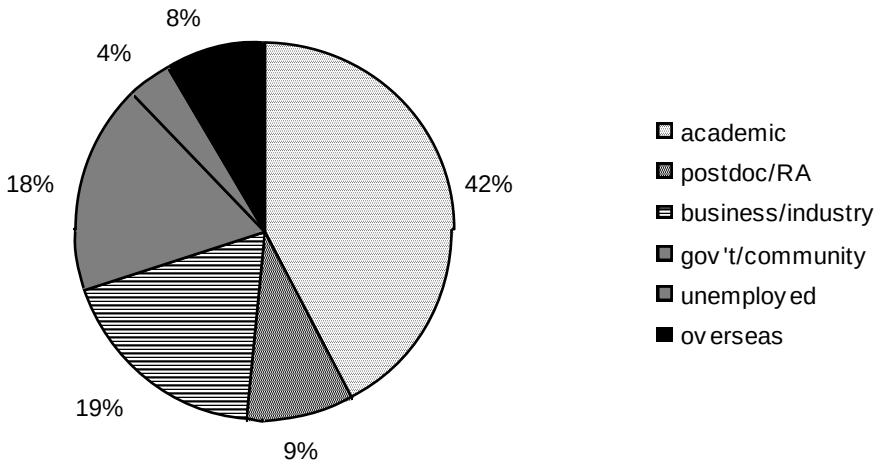
---

[3] On a scale of 1 (good) to 5 (poor), this item was given a mean rating of 3.9

at 23.0 per cent compared to 17.8 percent as a proportion of those who graduate. Females were more than twice as likely to be in part-time work. Given that there was a significant increase in the number of students enrolled in higher degree courses in Australia in the early 1990s, as Getty, Long & Perry (1994) note, then one might expect that the employment situation will not ease in the foreseeable future for research degree graduates.

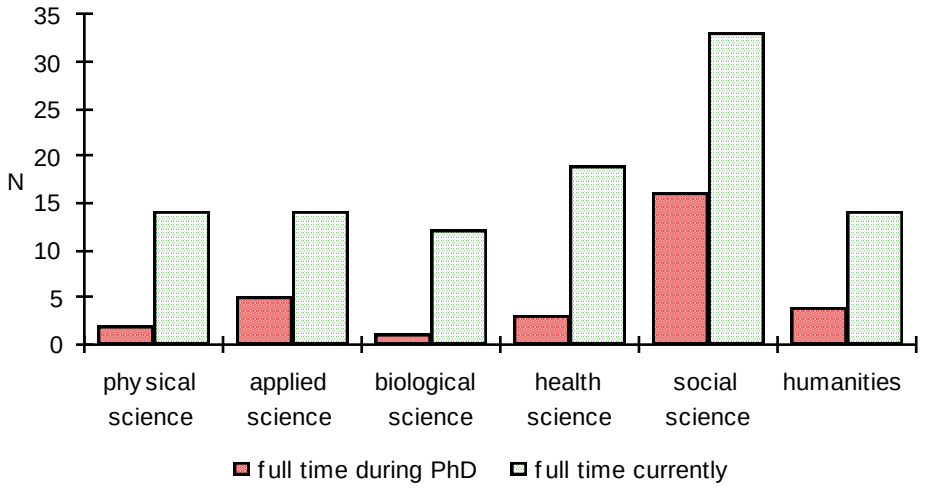
Our survey of 208 recent PhD graduates viewed much the same group some two years later, though with a lesser response rate—especially from those who had come from and returned to overseas countries. The current employment destinations of those who responded are shown in Figure 2.2: 50.9 per cent were engaged in the higher education sector, 41.8 per cent as academics and 9.1 per cent in research positions. Of those graduates currently located in Australia, 90.3 per cent were in full time employment, a figure which compares with the 88.3 per cent found to be in full time work or study in the 1993 Graduate Careers Survey. Four of the eight who were unemployed indicated that they were not looking for work, even so there are a proportion of PhD graduates for whom gaining full employment continues to be a problem, even two years later.

Figure 2.2 Current Destinations of a Sample of 1993 PhD Graduates



Those in the social sciences were found to be much more likely to be undertaking PhD studies *after* gaining a university position than was the case in the sciences (Figure 2.3). Many of those in the sciences gained experience as tutors or demonstrators during their PhD candidature, only to be replaced by a new generation on their completion.

Figure 2.3 Discipline Variations in Full Time University Employment, During and Post PhD



The perceived lack of a career structure for young researchers can remain an issue even if employment is obtained. The advent of the short term contract as a typical post-PhD path for an early career academic researcher, and the changes in employment which can accompany that, combined with increasing pressure on university departments to focus their research effort into limited areas, can serve to severely limit development of an individual's research program, as illustrated by Innes (1995, pp. 83, 85):

> I've changed research fields twice since completing my PhD [8 years prior]…With each change comes a dead time, as I move into the field…Changing topics also means I'm never in an area long enough to feel established—I just start to get into the problem, to the interesting stage, when it's time to pack up and move on…it's not the way to get known in a field of study. It's probably unnecessary for me to add that moving into an area where I become, effectively, a complete novice once more, after having been reasonably vital to the work in a previous job, can be a humbling experience, and doesn't always do wonders for my self confidence… I could say I spend 1.7 years in any given job, use up to 1.5 of those years settling in before I could write a paper and spend 0.5 years at the end of the contract looking for the next one .

Difficulties in obtaining employment lead some surveyed PhD graduates to move sideways to a new discipline:

> If I haven't got a job by the end of the year then I'll have to change my career in terms of moving in a completely different direction. Then all my research has been a waste of time.
>
> My placement in an education faculty has taken me away from my immediate interests, and I was encouraged to focus on educational research (which I find far less interesting than psychological

> research)...I have and do participate in research projects but have not played a major role in them. I feel a bit isolated and lack the motivation I used to have.

Thirty per cent of surveyed PhD graduates were currently working in a field which was different from their PhD research. The impact of changing employment on the development of a research profile is particularly evident in the sciences. Yet, even in social sciences or humanities where research interests may be more 'portable', changes in orientation and/or lack of security, at the very least, dissipate energy and can result in feelings of isolation, with a slowing of the research career.

Permanent staff can apply for university funded grants and accrue study leave, but contract staff are generally unable to obtain these kinds of support. One interviewee, who had held positions in four institutions in 18 months, described how she was never in one place long enough to apply for a grant. A significant number of new academics are employed on a series of rolling short term contracts— respondents to the survey of early career academics who were on one year contracts (N=30) had spent an average of just over three years in an academic position, and close to three years in their current department—so that while they continue to be employed in a university, they have no security and often no rights to apply for university funding for their research because they cannot guarantee making a continuing contribution to their department.

While many would welcome the provision of more post-doctoral fellowships to provide further opportunities for pursuing research, there is argument amongst the academic community regarding whether this measure would offer more than temporary relief to a growing problem, with concern being expressed that it would simply move 'the bottleneck' up the line to the end of the postdoctoral period.

Building a Research Focus into an Academic Career

In writing of her experience in attempting to encourage and develop research activity in an Australian university, Poole (1991, p.4) noted that:

> Research is a complex set of intellectual, social, environmental, and cultural activities. It requires thought, time, resources and a capacity to ask interesting and original questions. It also requires complex knowledge bases—substantive and methodological. Research does not occur in a vacuum, it requires development and nurturing.

The collegial environment offered by an academic's department is where one would most expect that development and nurturing to occur.

Only 17.2 per cent of the recent PhD graduates who were in academic employment had not felt inhibited in some way from publishing or undertaking further research after completing their thesis: most indicated three or four factors as having been a problem for them (Table 2.1). The most cited problems were teaching and administrative workloads—most particularly for those in the social sciences/humanities disciplines—followed by lack of funding and/or resources. Post-thesis burnout was also a significant problem for social science/humanities graduates, with lack of collegial contact also being more problematic in these disciplines. The role of family can be critical, with family pressures serving to inhibit more than a quarter of the graduates, while those reporting family support and encouragement for research were more likely to be currently involved in research and felt more positive about a research career.[4] Despite the very strong disciplinary pattern in responses, the factors which inhibited research were common to both male and female PhD graduates (including personal/family commitments) and were unrelated to their age.

Table 2.1 Inhibitors of Academics' Publishing/Research, Post PhD[1]

	Overall N=95[2]		***Sciences[3] N=46***	***SS&H[4] N=47***
Inhibiting Factors	***N***	***%***	***%***	***%***
academic teaching load	61	64.2	41.3	87.2
academic administration load	48	50.5	32.6	68.1
lack of funding/resources	40	42.1	45.7	40.4
post-thesis burnout	33	34.7	26.1	42.6
personal/family commitments	27	28.4	23.9	34.0
lack of track record in research	22	23.2	21.7	25.5
lack of collegial contact	21	22.1	13.0	31.9
lack of identity/direction	21	22.1	17.4	25.5
lack of managerial support	18	18.9	13.0	23.4
financial/work insecurity	17	17.9	19.6	17.0
unfashionable field of research	12	12.6	13.0	10.6
out-of-favour methodology	4	4.2	2.2	4.3
no current need to do research	3	3.2	2.2	4.3
co-workers moving on	2	2.1	0.0	4.3

1 Per cent of PhD cohort employed as academics responding to each item.

2 Two respondents did not indicate their discipline.

3 Sciences includes pure, applied and medical sciences

4 Social sciences and humanities

4 Family support and current involvement in research: r=.15, p=.005;
family support and belief about the prospects for a research career: r=.22, p<.001.

Whilst some inhibitors were relevant to only a small proportion of the PhD graduates surveyed who were employed as academics, the impact in individual cases could be to have a quite significant effect on the person concerned, at least in the short term. For example, one (male) reported that, because of family and financial commitments, a postdoctoral position in Darwin was accepted over a preferred overseas fellowship. An early career scientist was left unable to continue her research when her senior partner moved to another university and took all his equipment with him. Loss of collegial contacts was one of the factors which adversely affected a woman who left academia to have a family; she has 'no contacts any more, everyone has moved on. It is unlikely I will get back into my field now'. Overall, teaching load, post-thesis lack of identity/direction, lack of track record, and financial/work insecurity all significantly impacted upon the level of current involvement in research by graduates, but not on their current enthusiasm for research.

Facing the Competing Demands of an Academic Role

Those new to academic life find themselves having to concentrate largely on teaching (Main 1993). Older academics noted in interviews that new staff in Level A or B positions 'get slugged with these huge teaching loads' and 'just get thrown in a the deep end, they're teaching and they're just running to stand still'. Yet little consideration is given in most departments to the need for training or professional development of the new academic in preparation for this role as teacher. As noted above, teaching loads were seen as a major inhibitor of research by new graduates in academic positions, particularly for those in social sciences and humanities where 87.2 per cent indicated having had problems.

> Since completing my PhD I have not undertaken further research due to conditions of employment. I am employed as a lecturer on a year to year basis (contract); I am teaching 15 hours per week (face to face); I am also co-ordinating the subject.

Heads of schools commented that, even where new staff were initially given a reduced teaching load—'a honeymoon period'—staff often found they spent much of that time writing or preparing for courses rather than getting on with their research. Colleagues also sometimes resented taking on extra teaching when early career academics were given teaching relief. Moreover, heads themselves sometimes admitted that they were reluctant to reduce face-to-face teaching for new staff members when:

> We're under very strong pressure to put young dynamic people in front of our students because their student evaluations are usually very good.

In some departments established staff members maintained their pattern of teaching in particular areas, with the consequence that early career academics were expected to prepare and teach new topics when the structure

of awards and degrees changed. Similarly, opportunities to concentrate one's load into one semester so as to lighten the other to allow research were available to some researchers but not others. The issue of whether high performers in research should be given a reduced teaching load to compensate for the time they had committed was a vexed one, with the acceptability of such a program dependent on the provision of an equally valued career path based on teaching excellence.

Whereas teaching was generally seen to interfere with research (mean rating of interference of 4.2, maximum 5), research was not so likely to be considered to interfere with teaching (mean 2.5). Men were significantly more likely than women to report that research interfered with their teaching[5] and tended to report having experienced a low teaching load more than did women[6] while women, commenting on the factors causing them difficulty in their research, suffered significantly more than men from a lack of funding support for teaching relief.[7] Several heads of department admitted that women in their department were sometimes exploited in terms of their teaching loads:

> The women tend to be at level B and in many cases are actually on fractional appointments because they've chosen to prioritise their family…tends to mean that they work very hard teaching because you get exploited if you're on a fractional appointment.

Administrative loads are also experienced differently by men and women. Men tended to report experiencing low administrative loads more often than women, and women were more likely to complain of departmental administration loads causing difficulty for their research.[8] The requirement for all university committees to include female representation adds a further dimension to women's administrative load—particularly at senior level—as noted by one successful researcher:

> It doesn't get easier because the demands on your time get greater. Senior women in a university like this are in just about every committee that was ever constituted.

Where academics did experience a lower teaching or administrative load, they recorded significantly higher levels of current involvement in research[9]

---

5 Males—2.81, females—2.33, t=3.22 p=.001

6 Males—1.84, females—1.61; t=2.08, p=.04

7 Males—3.30, females—3.83; t=3.28, p=.001

8 Males—3.16, females—3.62; t=2.83, p=.005

9 Reduced teaching loads and involvement in research—r=.23, p<.001; reduced administrative loads and involvement in research—r=.24, p<.001.

and those whose department offered time release/reduced teaching for researchers also felt more positive about their prospects for a research career.[10] Time release/reduced teaching for researchers was, however, generally perceived to be unavailable and this, together with the demands of departmental/course administration or development were rated overall as 'some problem' to 'considerable problem' by academics at each level of appointment and for each term of employment. Those with longer term appointments (especially tenure) were, however, more likely than others to report that departmental/course administration or development[11]—'finding time free from administrivia'—and/or lack of support for teaching relief[12] had caused problems for them in developing their research. And significantly, it was those on level C who particularly felt the lack of teaching relief,[13] giving a mean rating of 4.2 (maximum 5) to this item. Thus these problems were experienced most keenly by the middle range academics—those on level C and with tenure, but who were still in the process of establishing a research profile. This was even more evident in newer departments/disciplines where there were only a small number of senior staff, for example in the school with one associate professor and eight senior lecturers in 60 staff, where those at the mid-career levels attracted not only more research students but also a significant extra burden in a high administrative loading.[14]

Difficulties in dealing with competing demands in establishing research as part of their academic role are therefore experienced by not only the very junior academic appointees but also by many mid-career Level C tenured staff. For those on a teaching and research academic path, successful negotiation of this period can take them over ‘the hump’ and establish them in their research career.

> An important problem is the loss of researchers in mid-career, who miss out on funding for more than two years in a row. Often these people are then allocated more teaching responsibilities which precludes them from becoming competitive for research funding again.

Thus there is evidence then of not one, but two critical periods for the teaching and research academic when the development of a successful research profile is under threat.

---

10 r=.16, p=.004

11 F=5.59, df=4,251 p<.001

12 F=7.43, df=4,256 p<.001

13 F=6.71, df=3,258 p<.001

14 Contrast this, for example, with the long established department which has three professors, four associate professors, three senior lecturers and just two lecturers!

'Everyone Tells Me I'm Lucky'—Taking the Postdoctoral Research Path

Competition for postdoctoral fellowships is intense, with success rates currently running at less than 10 per cent of usually highly screened applicants. Even so, as was pointed out by a recently appointed lecturer in Physics, this represents a better chance of success than is on offer for advertised academic positions with an equivalent period of tenure.

Those who had succeeded in gaining postdoctoral research fellowships raised similar issues to academics regarding lack of security, with those surveyed[15] stating that this was a major problem causing them difficulties in their research or the development of their research career (mean 4.7 on a scale of 1–5):

> There seems to be little possibility of long-term job security and I do not find endearing the continual search for research funding or jumping sideways from one short postdoctoral position to another.

As the fellowship nears completion funding sources may be restricted:

> As an ARC Fellow I have insufficient funds to do new research. As I have one year left I have the insecurity of not knowing whether I will be able to continue and this inhibits my research design.

Appointment as a postdoctoral fellow to a CRC can restrict funds for research from other bodies. These appointees also report that their research may be either very goal-directed or under commercial secrecy, in both cases resulting in fewer publications.

Postdoctoral fellowships were even regarded by some as a narrowing experience given that fellows do not supervise students, mark theses, or develop/acquire teaching experience:

> Everybody seems to think one wouldn't give up a postdoc before time (because time for research is precious) but I also miss the 'breadth' you get from teaching.

One department head has dealt with some of these problems by seconding his postdoctoral fellows to 'become a normal academic for a semester', during which time they are mentored into acquiring teaching skills.

Some postdoctoral research fellows reported unique problems such as lacking identity or status in their new department where they were considered neither staff nor student. More generally, however, they were

---

15 Note that the 9 postdoctoral fellows who were captured by our survey of early career academics were in teaching and research departments rather than research institutes. Those responding to the survey of recent PhD graduates, or to media advertising, could have been in either setting.

well placed to build an academic research career, having the opportunity to establish a substantial publication profile during their fellowship.

Gaining Overseas Experience

Networks, of course, must increasingly be extended overseas if the beginning researcher wants to achieve real recognition in his/her field:

> ...very important for young people to make those international contacts because in Australia in our sort of area I think you'd be lucky if there was anyone else in Australia working in the fields which are sufficiently close to yours to be able to understand what you're doing.

Graduates in the sciences in particular are encouraged to gain overseas postdoctoral experience, if they wish to obtain an academic position:

> It's quite hard for a new researcher to have an impact on the discipline. In physics the way that's typically done is by going overseas to a good institution working with the leaders in the field.

The ARC has come to view the development of international links in research as a priority concern. Such links have been shown to have increased significantly over the past 10 years (Bourke & Butler 1995). Links established through collaborative research are assumed to lead to the exchange of 'tacit' knowledge, as compared to the 'codified' knowledge which is gained through the international literature. They are seen as facilitating participation at the forefront of science, allowing Australia to benefit from new advances in science and technology and to have more influence in the international arena.

It is not only in the sciences, of course, that the international dimension is considered crucial; researchers in such fields as ancient history, for example, must in many cases carry out their actual field work overseas, as well as maintaining ongoing personal contacts with international scholars. Heads of departments often recognise this need:

> I make sure special duties overseas are very clearly granted to the young members of staff who are making their way.

While the value of gaining overseas experience in order to build those links was widely recognised by early career researchers, it was not always easy to achieve it:

> I attempted to get funding for postdoc fellowships to go overseas but was very discouraged by lack of success (and no feedback why applications were not successful) plus depressed by small salaries on offer.

Others could not take advantage of overseas opportunities because of family commitments. Males in the Postgraduate Destination Survey (Getty et al.

1994) were a little more likely than females to be working or studying overseas shortly after completing their PhD (23.5 per cent compared to 18.1 per cent). Women in our study appeared to lag behind men in a number of aspects of gaining international experience. They were less likely to report overseas research experience than men and were also less likely than men to report international links/networks with other researchers.[16] It has been noted that international links might be built alternatively through active participation in the sharing of tacit knowledge using electronic bulletin boards (Bourke & Butler 1995).

Although overseas experience is seen as an important step in launching a research career, some graduates who have followed this path then find that they have difficulty in reestablishing themselves in Australia: they have difficulty finding out about employment opportunities or research funding sources, or find institutions are reluctant to bring someone back for interviews because of the distance involved, for example. In some departments, however, the promising researcher is 'tracked' when he/she goes overseas, and recruited back into the department later:

> We've got a guy who's just started now, a guy who in fact did his PhD in this department, went away, did his post-doc and has come back. He knows what's here, we know him, and he will be able to get rolling fairly quickly because he knows the equipment that's here and he's talking about collaboration even as he comes in the door.

Our data also showed that current involvement in research was somewhat associated with having had overseas experience, but more so with having international links.[17] Bourke and Butler (1995) report that links established through postdoctoral research were more significant than those developed through postgraduate study, with the latter rarely surviving for more than a decade even amongst the most active scholars. While the 'most visible' international scholars had overseas postdoctoral experience followed by a period of study leave three or four years later with just frequent short visits thereafter, most academics relied heavily on their extended periods of study leave to develop or maintain their international links: 'No single institutional arrangement struck us as more important in the working lives of the majority of researchers than the various forms of salaried research leave' (Bourke & Butler 1995, p.61).

The Departmental Environment and Research

---

16 Overseas experience: males—2.36, females—1.75, $t=3.91$, $p<.001$; international links with other researchers: males—2.75, females—2.23, $t=3.77$, $p<.001$.

17 Overseas experience—$r=.14$, $p=.012$; international links—$r=.18$, $p=.002$.

Academic researchers do not exist in a vacuum. The departmental (and, to a lesser extent, the faculty or school) environment may in some cases stimulate and inspire an early career researcher, while in other contexts it may contribute to their demotivation and sense of isolation. Opinions vary as to how important the contextual factor may be in this respect: Pelz and Andrews (1976) found that productive, effective researchers benefit from being in an open environment and from being in a coordinated department but with individual autonomy (Pelz & Andrews 1976), and this view was echoed by one contented PhD graduate, who said:

> I am working autonomously but with a well recognised group. Being part of a medical faculty, I have excellent access to collaborative research.

Ramsden and Moses (1992) have argued that the most productive researchers are most likely to be found within productive departments, an issue which was vigorously debated in the pages of *Campus Review* in 1994. In contrast, Johnston (1993) reports a number of research studies which question whether there is any net benefit to an individual researcher from working within a larger research department.

The size and activity level of the department do impinge on an individual's research activity levels. If small departments seem to be tailor-made for a high degree of collegiality and the easy 'cross-fertilisation' of ideas, it is also true that larger, richer departments (many with well-developed links to industry and/or to overseas institutions) may well stimulate productivity in an exciting, if highly competitive arena. Yet one can suffer, in any context, from a kind of 'internal isolation', particularly if one's research interests lie in a new, or inter-disciplinary field:

> Not having anyone in this department who has the slightest interest in my work makes it very difficult to feel that it has any worth, and means that I have no one I can discuss my ideas with…I wish I collaborated more.

Another spoke of how he experienced difficulties in his research owing to a:

> …complete lack of quality research ethos in the department, different priorities and interests different from my own (with regard to research area).

In our study, academics who rated their department higher in terms of the priority given to research (compared to teaching) were inclined to be more involved in research.[18] Rating of the general research ethos of the department was not related to their involvement in research, nor to their feelings about the prospects for a research career, but in departments where their teaching could be related to their research, early career academics felt

---

[18] r=.12, p=.024

more positive about the prospects for research in their field in Australia.[19] Similarly, heads of departments where 'research informs the teaching' often also reported a high overall level of departmental research output.

Some academics in the post-87 universities cited difficulties in research caused by 'a whole lot of people being expected to do research who don't have any research traditions'.

> Oh well, I've always been interested in research...but it wasn't very easy initially in this institution because being a—coming from the old CAE side of this institution there was no real research culture for obvious reasons, and that's not a criticism, but it meant that anyone who wanted to do research, you did it in your spare time, it wasn't seen as central to your role.

This historical problem may be disappearing, since academics surveyed from all four university types gave equivalent ratings for departmental research ethos. Disciplinary differences may prevail, however, with academics in nursing and social work departments responding that their departments had a relatively weak research ethos when compared to other disciplines, physics in particular.[20] Some of these department heads were undoubtedly ambivalent about the need to pressure all their staff to become involved in research, particularly where staff themselves were reluctant.

Mentoring of New Academics

Mentoring was a sharply perceived and openly declared need on the part of many early career academics in writing about their experiences:

> It isn't funding that presents itself as a major obstacle. The real absence I am experiencing is the lack of a mentor.

Current involvement in research was greater by academics who were located in departments where mentoring of new academics occurred and where there was departmental affirmation and encouragement for researchers.[21] The need for mentoring is now almost universally recognised as beneficial when embarking on and developing a research career.

> That was my first successful grant application and what is absolutely clear about that is that it was done in a team with other women, it was done in a team where everyone was senior to me, were really mentors …it helped me enormously not only in thinking about those issues at the level of research but in the ground rules about how you apply for grants…the big funding goes to the sciences and to people who work

---

19 r=.14, p=.009

20 Nursing—3.0, social work—3.2 and physics—1.8 where 1=strong and 5=weak; F=3.40, df=5,147, p=.006.

21 r=.15, p=.005 for both.

> in groups—increasingly in multidisciplinary groups—and I think that that's something that social scientists are going to have to come to grips with and participate wholeheartedly as not only a way to get good work done and good research funding, but to make space, to make places for beginning researchers.

In disciplines with a strong tradition of team or group research, for example physics and engineering, de facto mentoring has been built into the system for many years. In such cases it appears that young researchers are relatively well looked after, with correspondingly less need for formal mentoring schemes to be instituted either at departmental or at university level. Disciplines with a tradition of more solitary scholarship, such as history, were more likely to have formal schemes. Historians reported significantly greater experience of mentoring than other disciplines, particularly social work and nursing.[22] In both humanities and the social sciences, early career academics in need of mentoring will probably benefit from any trend towards more collaborative research, as suggested by an experienced historian:

> I think what we need is mentoring systems and I think it is linking up with the established, with the starting in joint projects which will get the young a kind of record in publishing, in getting grants, and they can leap off on their own.

Academics who had been in the profession for shorter periods of time and those on shorter term employment contracts (usually level A) reported greater experience of encouragement from a senior colleague/mentor than others.[23] Some departments which appeared to lack mentoring schemes sometimes had either no new, or no inexperienced researchers being recruited: 'To get a job in here now you've got to be so good that you're up and away long before you get here'.

A major problem early career academics cited was in locating, and attaching oneself to an appropriate mentor:

> A leading academic in Australia and in my department told me I should hitch myself to a research star in the department. Unfortunately there were no stars in the department who were interested in the area I was interested in.

This may be caused by geographic isolation (sometimes related to being on split campuses), intellectual isolation when involved in innovative or cross-disciplinary research or in new disciplines, and lack of confidence. Potential mentors may lack interest, or be reluctant to include an increasing number of junior members in their research team when limited by funds, numbers of grants, academic workloads and perhaps by the need to firmly establish their

---

22 $F=4.74$, $df=5,276$, $p<.001$

23 $r=.19$, $p=.001$

own reputation. Even when mentored, it is not always plain sailing. Relationships can turn sour, and there is the potential for harassment and exploitation. Alternatively, the mentored person may become over-dependent on the mentor or on the project, and never go on to produce original or independent work.

There is not always a clear distinction between mentoring and other aspects of academic culture, such as supervision, collaboration, involvement in team or group projects, personal networking, peer review, collegiality and/or friendship. Those who are born to be self-motivated research 'stars' may in fact not need the support of mentors to the same extent as others, but as one researcher pointed out, 'most of us are not so pyrotechnical in our career trajectories and we value colleagues, doing it with somebody who's already had a few successful goes at it!' Moreover, one's need for a specific mentor or for a role model might well be reduced if one's department provides a sufficiently nurturing environment. An experienced researcher referred to 'the sort of climate in the department which was very collegial and supportive, but I certainly didn't have an academic mentor'.

Despite its problems, mentoring can provide a crucial bridge for the early career researcher who has recently emerged from student status, embarked on a research career at a later stage in life, or is located in an unsupportive department. When academic time for mentoring is under pressure, university or departmental support for research mentor schemes is therefore to be encouraged.

Establishing a Personal Research Profile

> Despite occasional exhortations by faculty, the research training of MA and PhD candidates resembles an ineffective vaccine—it works for only a small proportion of students. After carrying out their theses or dissertations, only a few continue to do any research or go on to have a career in research (Magoon & Holland 1984, p.682).

The same could be said, from our data, not only for PhD training (the characteristics of which appeared to have little influence on future involvement in research), but also for much of the organisational environment to support research. Three factors stand out for their influence in making for a successful research career.

- Personal motivation and commitment far outweighs anything else in its power to drive the researcher on and overcome all obstacles in achieving a research goal.
- Networking with colleagues who are supportive, whether or not they share your views, gently stimulates a sense of intellectual challenge on the one hand, and on the other establishes the kind of extensive contacts

which have an important strategic role in facilitating opportunities to conduct research.

- Finally, building a profile in publications or other output, in today's environment, is essential proof that a researcher has learned something from his/her research and is willing and able to communicate it to the benefit of the scholarly community.

These three factors are discussed more fully below.

Personal Motivation and Commitment

Amongst academics, individual differences in ability, energy, creativity, motivation, ambition and self-discipline were considered far more significant in determining differences in research productivity than environmental variables, including teaching and administrative loads (Bazeley, unpublished data; Wood 1990). Successful researchers demonstrated a single-mindedness and an unswerving commitment to their research. They were marked by an inner drive and intense focus, often working 70+ hour weeks and 12+ hour days.

> More than dedication, good research requires a doggedness and a conviction that what you are doing is good and right and you are really getting somewhere. I think it requires an obsession actually…my PhD really went somewhere when I became obsessed with it. The best and most creative work is done when a person is obsessed, when it sits under their skin and it's never far from what they are doing. And that's when the best work is done.

For early career academics, too, the perception that research has an important role in one's life, a strong personal commitment and determination to do research, the degree to which research is an academic priority, current involvement in research and being good at it were all strongly interrelated:[24]

> I was on contract from the uni when I did [the PhD], I had 17 hours teaching a week, contract, and got no release, no time, and in fact also had two children during the PhD, so I did that. But I see increasingly women are being forced to do that if they want to get their credentials.

—and:

> You have to be prepared to work your bum off. I think the career structure in Australia is good so long as you demonstrate independence and commitment to your efforts.

Reeves (1991) painted a picture of the nuclear scientist, aware of the horrors his research would unfold, still driven to investigate, to create. The peak

---

[24] All were significant at $p<.001$.

experience of making a scientific discovery when a topic of interest has become an obsession has been described as 'scientific rapture' (O'Neill 1991). When a successful researcher is asked about their area of investigation, a passion, drive and enthusiasm for their work is palpable. Merola (in Finn 1995) comments on the internal motivation that characterises many scientists:

> You have to go into science because almost from the day you were born you found yourself investigating, you found yourself being curious, you found yourself playing in the lab or building things, and this is exactly what you want to do with your life. So long as you have that internal motivation, science is a good career.

The desire to satisfy curiosity/to know and to communicate ideas/change thinking were each strongly correlated with positive beliefs about the role of research in an academics life.[25] Academics with these desires were also concurrently more involved in research.[26]

> ...it's the sort of quest for knowledge, the quest for knowing, the thirst to find out about things…I still find it every bit as exciting as I did at the beginning—in some ways perhaps more exciting.

Enjoyment in meeting the challenges of research is a strong motivator for current involvement in research[27]—'There is a part of me that really enjoys, it is the part of me that is a bit of detective'—and is related to positive beliefs about the importance of the role of research in an academic's life.[28]

> I'm really interested in just what is going on down there, what the triggers are … finding out how it's all working. It's very difficult to say, 'well I've achieved my goal', because as soon as you've achieved one little aspect, it only opens all the new questions for the next thing and so you move on to the next logical step.

In contrast, institutional expectations and pressure to do research was not nearly as strongly correlated with involvement in research as the intrinsic motivators discussed above[29] and importantly, did not lead to academics' having positive beliefs about the role of research in their life. Nor did the necessity of a research record for promotion relate to an academic's level of current involvement in research or their beliefs about the role of research in their life. While an academic imperative to undertake research may initiate a

---

25 r=.49 and r=.40 respectively, p<.001.

26 r=.18, p=.002 and r=.21, p<.001, respectively.

27 r=.29, p<.001

28 r=.49, p<.001

29 r=.11, p=.03

research experience for some, unless the neophyte researcher discovers something more personally satisfying in doing research so that it becomes motivating in itself, they will neither happily nor productively persist.

> …they get told just to do research, and in my view that is not an early career researcher, that is someone who has been caught. Because research develops because the person is wanting to do it, it's curiosity driven…you're wanting to ask questions…

Networking and Becoming Known

> You can't afford to be introverted, in other words just stay in the four walls here, you have to get out there and particularly internationally. That would be the most important single key to success I believe…it allows you to benchmark yourself.

Frequency of interaction with colleagues (not necessarily in the immediate working environment) was found by Pelz & Andrews (1976) to be a strong predictor of research productivity. An academic commented on the 'incredible impact of the network', yet just 36.0 per cent of academics surveyed reported regular contact with other researchers with whom they could share their research interests; academics on short term contracts experienced more difficulty in building networks than those on longer term contracts or tenurable/tenured positions.[30] Networking through personal contacts was associated with current involvement in research by both the recent PhD graduates and the academics surveyed.[31]

Some supervisors had played a role in building networks by introducing their research students to scholars of international repute (32.0%), but most graduates (73.0%) claimed, in any case, to have made personal contact with scholars from outside the university during their candidature—students in the social sciences/humanities more so than those in the sciences.[32] Where supervisors do encourage collegial contacts, they can be a powerful source of contacts which lead to further research opportunities. In the words of one of Australia's leading astronomers:

> So as a student I had contact with top scientists from all over the world. I later discovered that my fellow students at other institutions never had this kind of exposure … [My supervisor] would invite us to his home for dinner for example. So that was great. The atmosphere was great because it was very hands on research, lots of discussion of problems.

---

30 $F=3.40$, $df=4,263$, $p=.01$

31 Recent PhD graduates: $r=.19$, $p=.004$; early career academics: $r=.16$, $p=.004$.

32 $\chi^2=11.80$, $df=2$, $p=.001$

Postgraduate students have been advised by their own representatives as to the critical importance of building networks if they wish to pursue a research career (Wassmann 1994). Heads of departments and successful researchers, too, have generally commented on the need to become known by potential examiners, reviewers and assessors, taking an instrumentalist view of the value of conferences, for example: 'I send all my PhD students to any conferences that I can...because I say to them that it is critical for getting a job'.

> The most important reason for going to conferences is to get known, give a paper so people know what you look like, talk to people so you've got referees you can use.

Although most academics surveyed stated that they received some departmental encouragement and support to attend conferences, this did not mean that students or staff were always funded to go, and some department heads reported that 'it is much more difficult now than it was some years ago to fund staff to go to conferences, and certainly to fund postgraduates to go'. Personal factors can also inhibit conference travel: 'I can manage most aspects of the research process except getting to conferences because of my special childcare problems'. Experiencing encouragement and support to go to conferences was positively correlated with the level of current involvement in research.[33]

'The Visibility is in the Publications'

Along with conferences, publishing is a prime means by which academic researchers become known. But as well, an academic's experience in research, or 'track record', is typically assessed by reference to their publication record. Applications for larger grants available to established researchers from sources both within and external to universities are reviewed not only on the quality of the proposed research, but also on the demonstrated capacity of the researcher to successfully complete the research and pass on the benefits to the broader academic community—evidenced by their having produced publications as a result of previous funding. Thus, anyone wishing to launch a research career must build up a significant record of scholarly achievement through the publication of books and/or refereed articles in reputable scholarly journals.

In the period during and immediately following the completion of the PhD, 90.4 per cent of the 208 PhD graduates had disseminated the results of their PhD research outside the university in some way (Table 2.2). As many as 71.7 per cent reported publishing at least one thesis-based article in an internationally recognised journal, while 55.8 per cent had published more than one. Those in the sciences typically published jointly while solo articles

---

[33] r=.17, p=.002

were more often written by those in the social sciences and humanities, reflecting the structure of their research environment and disciplinary traditions in publishing. Eighty-five respondents (40.8%) also had work prepared or submitted but yet to be published—more commonly among the social sciences and humanities than the sciences. Involvement in research and/or success in obtaining grants did not appear to be related to publication output (as indicated here) at this stage.

*Table 2.2 Dissemination of PhD Research**

Form of dissemination	***N***	***%***
published as sole author	75	39.9
published as first author	119	63.3
published as co-author (not first)	65	34.6
presented at local conferences	113	60.1
presented at national conferences	140	74.5
presented at international conferences	110	58.8

* *Number and percent responding to each item independently of the others.*

Early career academics were asked to indicate the number of publications in which they had some input, from 1990 until now, and the number for which they were responsible as sole or first author. Each type of publication was then weighted, to create a publication index.[34] The index for the total number of publications for the five year period and the publications for which the respondent was sole or first author was then calculated.

Total publication output over the five years was greatest by post doctoral fellows, rating a mean publication index of 18.8—even higher than that of level D/E lecturers at 14.5, and very much higher than that of lecturers at lower levels, particularly level A (rating just 4.2) which is the teaching and research position that parallels a postdoctoral fellowship.[35] Publication output as solo or first author followed much the same pattern: postdoctoral fellows and professors each had primary responsibility for half their total publications, and lecturers at levels A–C produced approximately two-thirds of their total as solo for first authors. Differences in output were less marked in relation to the term of the appointment held, especially for those publications for which the respondent had most responsibility. Publication

---

[34] Publication index = (authored books *3) + (edited books * 2) + chapters + refereed articles + (non-refereed articles or reports * .5) + (fully published conference papers * .5) + patents.

[35] F=14.04, df=4,262, p<.001

rates were not significantly different for full and part time employed. Gender, however, was an important factor. Males had a significantly higher total publication index than females, also for publications in which they were solo or first author.[36] Success in publishing was positively correlated with feelings of confidence about doing/completing research.[37]

There were disciplinary differences in research output reported by the academics surveyed, with regard to both volume (Table 2.3) and type (cf. Hill & Murphy 1994). Physicists produced the most refereed articles and patents, and presented the most conference papers. Engineers produced the most published conference papers and frequently also produced refereed articles, whilst historians produced the most books, and chapters in books. Historians who have produced articles rather than books may not be regarded favourably within their discipline, even though they may not have been in a position which facilitated the production of a book:

> I wrote articles, articles, articles [rather than a book] because I always had the feeling that anything bigger I'd never get finished because God knows which child would break an arm next week.

Social workers produced the most non refereed articles and frequently also produced books. Psychologists tend to produce mainly chapters in books and refereed articles, whilst nurses tend to write chapters in books and present conference papers. Clearly, there is not one traditional or standard track record by which to judge early career academics. In those disciplines with a more applied, professionally based focus (i.e. especially social work and nursing), the primary mode of publication may differ from those traditionally regarded as being suitable for inclusion within a grant application. Those in these disciplines also indicated greater problems than others in actually getting work published.[38]

Table 2.3 Disciplinary Differences in Research Output Over Five Years

Discipline	***Total publications*1***	***First/solo author*2***
physics	11.5	6.2
engineering	11.6	7.3
psychology	7.4	4.5
history	8.1	4.5
nursing/health	7.1	4.4
social work	9.5	7.4

**Figures given are means of publications indices for each discipline*

36 Total publication index: males—10.39, females—7.06; t=3.25, p=.001. Solo/first author index: males—6.82, females—4.16, t=3.61, p<.001.

37 Total publications: r=.27, p<.001; first authored publications: r=.22, p<.001.

38 F=5.42, df=5,263, p<.001

1. *F=2.63 df=5,281 p=.024*
2. *F=2.62 df=5,280 p=.025*

An academic's volume of publication was not correlated with their ratings of teaching load, administrative load, time release from teaching or administration, departmental ethos or environment, or security of employment. But not surprisingly, all of the more personally motivated aspects of research activity—involvement, networking and publishing—are significantly interrelated.

Overview: The Making of an Academic Researcher

A number of problems beset the new PhD graduate who is to embark on an academic research career. An initial and not insignificant challenge is to secure employment in an appropriate academic position, and to begin to establish a program of research and develop a research profile. This is facilitated by relatively long-term appointments, the commitment of departmental staff to research and/or the availability of a mentor, opportunities and support to attend conferences, and development and maintenance of professional networks. In addition to fierce competition for academic positions and limited funds for travel, particular problems are experienced by new academics adjusting to the demands of teaching, and by postdoctoral research fellows and early career academics with child/family commitments. We have identified the existence of two critical periods in the establishment and pursuit of a successful research career. For the early career academic, secure, non-exploitative employment in one's field of expertise is crucial. For the 'mid-life' teaching and research academic at around Level C, particularly one who has not had the opportunity to establish a clear research profile through postdoctoral experience, time for research and a balance with teaching/curriculum and administrative loads can prove an elusive goal.

Profiles of successful researchers emphasise the importance of not only the opportunity for research but also the personal motivation, commitment and dedication to undertake and tenaciously pursue research questions. For those who persist, once appointed to an academic position, it is likely that the promising early career researcher will progress incrementally in becoming known, getting published and, eventually, in being promoted. What, then, are the possibilities and realities for the funding of research projects proposed by early career researchers?

3

Funding an Emerging Academic Research Career

The early career researcher, having gained secure employment in an academic position and established a research program and profile, must then procure funding to sustain their research and support their profile. Many respondents spoke of the circular relationship between winning grants, and maintaining a research program and profile:

> To get a research grant you need publications and a permanent full time job in academia, but, of course, to be published and get a permanent full time job in academia you need a grant to conduct some substantial research.

Of central concern to the project was the issue of how early career researchers gain access to funding for their research, the sources they can access, how much funding they need to maintain their research and how funding failure impacts on the development of their career as an academic researcher. A head of department expressed the concern of many when he said: 'I'm faced with the younger people here who don't get any grants at all'.

University Funding for Early Career Researchers

All public universities in Australia provide funds from their recurrent budgets to support and develop the research activities of their academic staff, although to varying degrees. Most have centrally organised granting schemes, others work through their faculties, some do both, but all see it as their responsibility to ensure that academics get a start in research funding. How they move beyond the starting point, and the level of support they afford is where the variation occurs.

Centrally funded and administered schemes differ, but can be grouped into the following types:

- Grants for *new researchers* are targeted to staff with limited project experience, usually identified through their not having had previous grants and having minimum publication records.
- Grants for *developing researchers* are generally accessible to those with a wider background but are designed to meet the needs of those who have built up some experience but who have not yet established a track record.
- Grants for *established researchers* require evidence of previous successful projects and/or a substantial publication record.

- Grants for *new staff* are limited to those recently appointed to a particular university.
- Grants for *new directions* are available to new, developing or established researchers who are starting out in a research field new to them and/or to the university.
- *Time release awards* allocate funds to provide staff with time to pursue research or publication, usually in the form of payment for relief staff. Those academics completing research higher degrees are often targeted in these schemes.
- *Career interruption* schemes make grants available to staff who have been away from academia or who have otherwise been prevented from undertaking research for a period of time.
- *Supplementary/top-up* grants provide funds to supplement concurrently held external grants.
- *Travel* grants facilitate attendance at conferences or support research exchanges. (Note: these are centrally funded schemes, they do not include the funding which is provided almost universally at faculty or departmental level.)
- Grants are made to support the development of *research centres* (primarily for infrastructure).
- *Infrastructure* grants are provided to subsidise costs of equipment and facilities.
- *Collaborative* grants encourage cooperation across universities, or between universities and industry, as distinct from supporting teams within a university.

Grants for Early Career Researchers

Those centrally funded schemes likely to be of most relevance to beginning academic researchers are grants for new researchers and new staff. Other schemes which could also be considered to support early career researchers are those for new directions and for career interruption. Together these are generally referred to as 'seed grants' of one form or another. Time release schemes may also support relatively new researchers, particularly where they provide release time to complete a PhD thesis. Fellowships are usually designated for those early in their career (within 3–5 years post doctorate), but these typically require stepping aside from normal academic duties for the duration. Grants for developing researchers fill the gap between small seeding grants and those which require something more of an established track record. Staff in this category would still be considered very much 'early career' by external funding bodies.

Most universities in Australia offer support in one form or another to beginning researchers and/or to those who might otherwise fit the

description of early career (Table 3.1). The amounts offered to individual researchers or research teams through these schemes varied from $500 to $50 000. Most grants for beginning researchers were around $5 000, with Group A universities offering consistently larger amounts and Group D universities generally offering smaller amounts. Many universities limit the

Table 3.1 University Funded Grants Schemes for Early Career Researchers (1995)

Type of scheme	***University type***			
	Group A *N=7*	***Group B*** *N=11**	***Group C*** *N=7**	***Group D*** *N=8**
Seed grants for new researchers/new staff and/or new directions (singly or combined)	adel mon qld syd unsw	anu flin grif lat murd unc wgong	curt ntu uts vut	acu cqu csu ecu scu uws
Career interruption only or new + career interruption	adel melb qld	flin murd		canb
Developing researchers, or new and developing researchers combined	melb mon qld	anu flin jcu macq murd unc une wgong	swin	cqu csu scu usq uws
Time release	adel melb	anu flin lat macq une wgong	swin rmit unisa	acu uws
Fellowships	melb qld syd unsw	jcu macq	ntu rmit swin uts	
Devolved faculty schemes—grants primarily or totally allocated through faculties.	uwa unsw melb	deak	unisa	

* *UTasmania did not provide information, QUT and Ballarat were undergoing reorganisation.*

number of years over which a staff member may apply for seed grants—some to as few as two years, which is an insufficient period for a fledgling researcher to establish a track record in published research.

Grants for More Experienced Researchers

Schemes which are likely to be accessed primarily by those who are or are becoming more established include supplementary grants, collaborative grants, infrastructure grants and grants to research centres, as well as those designated specifically for established researchers. Travel grants, while generally open to all categories of researchers, are not likely to be particularly accessible to new researchers as they usually require that the recipient be presenting a paper at an international conference or have established overseas research links. Schemes for established researchers within the university are typically so designated in a relative sense: they are generally for those researchers who have acquired, or at least have started to acquire, a reasonable track record but who may still be having difficulty crossing the final hurdle to access external funds. In some cases, they may have unexpectedly missed out on external funds for a year and need to keep their projects running. These grants may be particularly vital for taking early career researchers, particularly those who are 'still on shaky ground, career-wise', through a final period of growth to external funding success.

The older established universities are placing more emphasis in their internal funding schemes on new staff, career interruption and collaborative schemes. The newer universities (Group D), while not neglecting the needs of beginning researchers, also provide extensive assistance to those early career researchers who are becoming more established, and who perhaps have the potential to develop into successful bidders for external funds (Table 3.2). This difference in focus in the newer universities could be consequent upon the greater difficulty faced by their emerging researchers in accessing external funds (including ARC small grants).

Table 3.2 University Funded Grants Schemes for More Established Researchers (1995)

Type of scheme	***University type***			
	Group A *N=6**	***Group B*** *N=10**	***Group C*** *N=7**	***Group D*** *N=8**
Established researchers only, or developing and established researchers combined.	mon qld syd unsw	jcu macq murd	ntu swin unisa uts	acu cqu csu ecu scu usq uws
Travel	mon qld syd unsw	macq murd unc		acu canb uws-n
Supplementary/top up	adel qld	jcu macq	ntu	csu scu
Collaborative	adel melb mon qld syd unsw	anu grif jcu lat macq wgong	ntu rmit swin	
Research centres		grif murd wgong	ntu swin unisa	acu cqu scu uws
Infrastructure	adel melb syd unsw	grif	ntu rmit unisa	

* *UTasmania did not provide information, QUT and Ballarat were undergoing reorganisation. UWA and Deakin allocate entirely through faculties.*

Faculty and Departmental Dollars for Early Career Researchers

Support available for early career researchers at the departmental, faculty, or school level[39] varied across disciplines and university types. Departments can also be expected to support research by providing adequate equipment

[39] The particular level varied according to the academic structure of the university. The term 'department' will be used in the discussion below to indicate the unit of organisation within the university with which staff were most closely identified.

and facilities; some also provide support in the form of direct funding, and most make some contribution toward conference travel. Department heads made mention of the following specific sources and types of financial and infrastructural support (additional to that from university wide schemes) which could be available to new and/or other researchers:

- faculty seed funds for new research
- faculty grants for research 'novices'
- departmental 'start-up' funds for new staff (up to $20 000 in some science departments)
- equipment 'automatically supplied to new staff', e.g. work station, software
- laboratories set up specifically for new staff
- funds from consultancies
- departmental advance on moneys due from university scheme
- research quantum earnings allocated to researchers
- funds and equipment available through centres and groups
- small annual flat-rate allocations to all staff undertaking research
- infrastructure money for holders of competitive grants
- paid study leave to carry out research
- paid leave to complete higher degrees
- funds to help thesis write-up, e.g. for clerical assistance
- funds to pay a research assistant to help with grant applications
- departmental money to provide interim support for projects which failed to obtain other funding
- travel money for field research, including overseas
- financial assistance to attend/present at conferences
- payment for teaching relief to allow staff block time for research, including write-up period after returning from study leave
- payment of costs of courses.

Disciplines able to generate funds from consultancies and those which were able to access funds from industry sources more generally had an enhanced ability to siphon such funds in the direction of new researchers. Some departments relied on such funds to 'keep the wolf away from the door' and in one case where the department's facilities were 'poor, very poor, worse than the third world', it was *only* consultancy money which kept them afloat. Cooperative research centres, where they existed, constituted a strong source of financial support—including infrastructure—for researchers attached to them. In a less positive sense though, their semi-independent status sometimes meant that they received infrastructure money while the department did not. Thus, if new staff were not able to attach themselves to

such a centre, they were unlikely to be able to access the resources held in such centres. As centres reach the end of their life and are closed down, moreover, researchers may be left with nowhere to go.

In the departments surveyed, physicists were most likely to report the availability of adequate equipment, adequate facilities and access to consumables, whilst academics in social work departments reported the worst.[40] Some departments offer these as a matter of course:

> I make sure that people have the infrastructure and facilities they need to win in the limits of our resources which are pretty good and so I try and tell people to keep buying new computers and new lasers and all the sort of equipment that they need.

Other departments offer adequate support in response to demonstrations of worth:

> So, you know, our attitude is that if people are prepared, if they're prepared to put in the work then we as a department are prepared to put in the work as well to support them.

Certainly, failure to provide adequate equipment will limit the level of current involvement in research:[41]

> There were very few funds available in the lab, and so, in fact, my research productivity in the first three, four years I was here was very slight, it really was, simply because I walked into a lab that was four walls and I had to equip it and that meant a battle with all the other people in the department to get money.

Departmental incentives to undertake research and to apply for funding, and financial reward systems for researchers all had a positive impact on the level of research activity by academics[42] and also, to a lesser extent, on positive beliefs about the prospects for research in their field in Australia.[43]

> The department has also put in place financial incentives over the last 5–6 years to encourage research. Funds are made available for travel, equipment etc, and staff are informed of this and invited to apply. The provision of such funds flags expectations on the part of the department.

---

40 Discipline based differences in availability within departments of—equipment: $p=.02$; facilities: $p=.03$; consumables: $p<.01$.

41 $r=.14$, $p=.01$

42 Involvement in research and departmental—incentives to research: $r=.21$, $p<.001$; incentives to apply for funding: $r=.16$, $p<.004$; rewards for research: $r=.24$, $p<.001$.

43 Belief about prospects for research and departmental—incentives to research: $r=.17$, $p<.003$; incentives to apply for funding: $r=.09$, $p<.07$; rewards for research: $r=.15$, $p<.006$.

> There is 'a pool of money' set aside every year out of the school's grants. Sums of up to $1000 can be given to enabling attendance at conferences. The awarding of this money depends on one's research output (based on the previous year's publications), and on how many grant applications one has put in.

Historians were more often provided with incentives to apply for funding than were academics in other disciplines[44]—perhaps because many historians are prepared to continue researching without external funding (in which case they do not bring flow-on benefits to the faculty).

Thus new departments sometimes made considerable resources available to new researchers, as part of the push to raise their overall research profile, though of course, many were unable to do so. As will be noted below, where early career researchers perceived they had higher departmental support, both financial and managerial, the rate at which they applied to internal funding schemes was higher and they were more successful in gaining funding from those schemes for their research.

Early Career Academics' Experience of Accessing University Funded Schemes

Of the total of 413 early career academics surveyed (117 of the 1993 PhD cohort currently employed as academics and 296 early career academics from six target disciplines), 206 reported having made 375 applications to university internal grants schemes in the period 1993 to 1995. Whether they applied or not was related to the extent to which academics perceived research to be expected in their employment, and to the extent of their involvement in research[45]—although to a lesser degree than one might have expected.

The results of 266 applications were known by 158 applicants, with these applications having achieved 76.3 per cent success overall. Where an internal grant had been reported as the first source of funding sought for a project, 173 out of 225 applications were successful (76.8%). On their second attempt to gain funding for a project, 26 of the 33 applications for internal funding were successful (78.8%), and four of the eight respondents who sought internal funding at a third or later attempt were successful. Differences in application rates and rates of success were extremely marginal in relation to gender, and a little less so in relation to age. Differences in rates of success were noticeably greater in relation to the discipline of the applicant (Table 3.3).

---

44 $F=9.33$, $df=5,275$, $p<.001$

45 Whether applied by—expectation to do research: $\chi^2=10.24$, $df=3$, $p=.02$;
—involvement in research: $\chi^2=7.81$, $df=2$, $p=.02$.

Table 3.3 Application Rates and Success with Internal Funding Schemes by Selected Groups of Academics

Academic group		***Applicants***		***Applications***	
	N	***N***	***% of group***	***Rate[1]***	***% success[2]***
Gender					
Males	200	78	39.0	1.6	70.3
Females	202	80	39.6	2.0	73.6
Age					
Under 40	191	68	35.6	1.8	69.9
40 or over	204	89	43.6	1.7	74.5
Discipline[3]					
Physical sci.	41	11	26.8	1.4	94.4
Applied sci.	70	31	44.3	1.5	66.7
Biological sci.	13	4	30.8	2.3	22.2
Health science	19	8	42.1	1.6	69.2
Nursing	89	43	48.3	1.9	70.4
Social science	125	52	41.6	1.9	74.8
Humanities	18	3	16.7	1.3	100.0
Total[4]	**413**	**206**	**49.9**	**1.8**	**76.3**

1 *Mean number per applicant in group*

2 *For those who recorded results only*

3 *One survey covered all disciplines, while the other targeted six; thus figures for some areas could be combined, but not for others Physical sciences are identified by FORC 01, 02, 03; applied sciences by FORC 04, 05, 06, 07, 09; and biological sciences by FORC 08.*

4 *All applicants including those for whom results are not known*

The mode of application was not a significant factor in success rates for internal grants schemes: 157 who applied as solo researchers were 77.9 per cent successful, the 42 applying in a team with a successful researcher achieved 76.2 per cent success and 75.0 per cent of the 61 project teams comprising all new researchers were successful. Five respondents were involved in internal research grants in which they were not named as an investigator, three of which were funded.

Neither applying for, nor being successful in winning internal grants was associated with ratings of aspects of the PhD research environment, PhD supervision, or publication output (either as a result of undertaking doctoral studies, or whilst an academic). The extent to which departmental incentives/support schemes were available for research, and whether the

respondent considered a research record to be a necessity for promotion were both related to the likelihood of making application for internal grants.[46] Success in winning internal grants was related to ratings of the extent of managerial support/encouragement for research, departmental incentives/support for research, a strong departmental research ethos, encouragement to attend conferences, opportunity for research skills development and the availability of adequate equipment for research.

Lack of success was associated with the experiencing of difficulties caused by inadequate infrastructure, including lack of administrative support for research. Reports of problems in understanding university funding procedures, and difficulties in convincing grant assessment panels of the value of their research and of the merit of their research plan were also more common among those who were unsuccessful. It would appear that making application for and succeeding in winning internal grants had more to do with structural, extrinsically motivating factors than with an intrinsic desire to do research.

An internal grant provides an opportunity for its recipient to undertake a (usually small) project which can serve as the basis for publications or other research output. In one evaluation of the benefits of having had an internal grant, recipients reported a number of benefits (other than publications and conference papers) flowing from internally funded research.[47] These included gains in methodological and research management skills as well as substantive knowledge; personal growth, achievement and/or enjoyment through doing the research; gaining recognition and/or extending collegial networks; and the establishment of a new direction in their research. Indeed, the very act of receiving a grant acted as a stimulus to many. While almost all recipients reported more benefits than costs from having their grant, some also felt a sense of disappointment or dissatisfaction with what they had achieved from their project, and a few suggested that undertaking their project had impacted on their teaching effectiveness. Significantly, for a number of people the awarding of an internal grant lead directly to success in obtaining either supplementary or follow-on funding from an external source for the research being undertaken—in some cases simply because the awarding of a grant by the university lent credibility to the researcher and their work.

To varying degrees, all universities are providing support centrally and/or through their faculties and departments for their academic staff who are endeavouring to establish a research focus to their career. Seed funding can provide a first experience of working on a funded project (or in some cases, any project) for beginning researchers, or an opportunity to build an area of expertise for early career researchers who are seeking to establish

---

46 All associations reported in this and the next paragraph were significant at $p<.001$.

47 Bazeley 1994, UWS Macarthur, unpublished data.

themselves either in a new setting or in a new area of investigation. In some departments, departmental support has come to be 'almost seen as the right of those who are new'.

Half of the early career academics surveyed had applied for support for their research from internal sources, with approximately three-quarters of their applications being successful. Many of those applying for and succeeding in winning internal grants appear to be prompted largely by environmental factors, with the level of support (in various forms) in their department being critical. Internal grants provide a means by which an early career researcher can gain experience and advance their research to the point where they can apply for external funds, especially in those universities with schemes which cater for those who have moved beyond the 'beginner' stage. A significant number of academics, however, do not access these schemes, some not undertaking further research at all, others moving directly from undertaking postgraduate research to seeking and gaining external funding.

External Funding for Early Career Researchers

Universities' primary purpose in providing internal support is to 'groom' their academics so that they can become successful in winning external funding—funding which brings significant benefits to the researchers and the universities beyond just the dollars provided for each specific project. Experience shows that a number of those who are supported by internal funds will not successfully make the transition. Realistically, what opportunities are there for early career researchers 'out there' in the competitive marketplace, and under what circumstances will they succeed?

External Grant Opportunities for Early Career Researchers

Some 180 funding schemes were considered from the point of view of their selection criteria for grant applicants. Just five external funding schemes specifically targeting early career researchers were identified, other than those sponsored by disciplinary or professional associations; all were for health related research. Two Commonwealth funded schemes contributed to the Commonwealth Competitive Grants Index, another was sponsored by an Association and two by Foundations.

A further 50 schemes did not specifically require the researcher to indicate a track record in previous grants and/or publications, although for some agencies such a profile would undoubtably assist in winning support under the scheme. A number of these were Commonwealth Competitive Grants, some were other State and Commonwealth Government Departmental Schemes, the majority were Foundations and Trusts. Some, such as some of the primary industry bodies, appeared to place as much emphasis on the track record of the institution as on that of the individual researcher, while

giving primary emphasis to the project. Thus, for example, the Research Office of an Agricultural College reported that, following amalgamation with a more esteemed institution, the College's researchers suddenly became more successful in gaining grants from the primary industry bodies.

Early career academics who were surveyed had accessed many of the schemes which had been identified as not specifically requiring a track record—Government schemes (both State and Commonwealth) more so than the Foundations. Approximately 50 other sources (primarily public sector) were also listed as providing funding to those surveyed (note that those available in the biological sciences and other specific disciplines were likely to be under-represented because of the nature of the sample). Some researchers had undertaken contract research for government departments; others had accessed industry sources. The latter were, of course, more available to those in the applied areas, such as engineering and nursing, than to those working in basic research. Nurses, for example, appeared to have access to a wide range of sources including, especially, professional associations, State registration boards, hospital authorities and trusts, and a number of different departmental funding schemes—but not to competitive grant funds.

The ARC Small Grants Scheme, while being open to researchers at all levels of experience and development, is seen by many as being of particular relevance to early career researchers in that it bridges the gap between university schemes and the large grants scheme. Funding guidelines are similar to those for the large grants scheme, but with limits on annual allocations for individual projects of $30 000 in the experimental and applied sciences, and $20 000 in the theoretical sciences, mathematics, social sciences and humanities. The scheme is administered on a competitive basis within universities, with each university being allocated $50 000 in base funding plus an amount based on large grant earnings for the previous two years. Approximately 23 per cent of moneys made available through ARC individual project grants schemes (i.e. large and small grants) is allocated through the institutions for small grants.

PhD Graduates' and Early Career Academics' Experience of Accessing External Funds

Applications to external bodies for the funding of their research over the period 1993–95 were submitted by 63.2 per cent of university based survey respondents (i.e. 261 of the 413 academics) and by 27.5 per cent of PhD graduates in other employment, primarily those employed by government. The proportion submitting applications was similar for men and women, and for those under or over 40 years of age. In addition, the number of applications reported to be submitted by each applicant was similar for both genders and both age groups, at around 3.1 applications for each applicant.

At the first attempt to gain external funding for a project, the largest numbers of applications were made to the ARC Large Grant and other Commonwealth Competitive Schemes (164 and 132 applications respectively). Applicants were persistent in attempting to win funds from Commonwealth Competitive Schemes, but nevertheless increasingly shifted to State Government, foundations/charities and other (e.g. overseas) funding sources, as they made further attempts to gain funding for their projects (Table 3.4).

Table 3.4 Sources of External Funding to Which Applications for Specific Projects Were Made at Different Attempts (N)

Source of funds	***First attempt***	***Second attempt***	***Third attempt***	***Fourth attempt***	***Total***
Small ARC	105	15	5	2	127
Large ARC	164	21	7	2	194
C'wealth Competitive	132	16	7	3	158
C'wealth government	74	5	2	1	82
State government	73	3	1	5	82
Commercial	41	8	1	0	48
Foundations etc	49	8	2	3	62
Other*	45	6	1	4	56
Total	**683**	**80**	**26**	**20**	**809**

* *Primarily overseas*

> I applied for internal seeding University Grants to fund my work 5 years in a row, up to $5,000. I consulted with everyone, asked everyone's advice—they all said it looked fine... I prayed, networked, congratulated and supported other people. Result—no funds forthcoming. I asked for larger sums of money, again consulting everyone and dutifully taking their advice about 'direction' on board. Result—no funds forthcoming. I applied for Government Grants, walking drafts through the system consulting everyone. Result—no funding. The National Brain Injury Foundation was looking for a consultant to review slow track rehabilitation services. I rang them up. Result—I got the job—$5,000.

Results were known for 658 of the applications. Just over half (51.5%) of these applications were reported as successful. Success rates varied considerably by funding source, and also by whether the applicant was the only named investigator (Table 3.5). The most beneficial arrangement varied with the source approached. With the clear exception of ARC large grants, those applying as solo researchers were generally as likely to be funded as they were if they applied in a team with another researcher. Clearly ARC large grants were the most difficult for these researchers to access, yet more

applications had been made for these grants than to any other source. Applicants had been markedly more successful in applying for ARC small grants.

Table 3.5 Numbers of Applications[1] to Different Sources and Success Rates for Different Investigator Groupings

	Named on own—solo investigator		***Named with successful researcher***		***Named with other new researcher***		***Applied in another's name***		***Total external applications***	
Source of funds	*N*	*%²*	*N*	*%²*	*N*	*%²*	*N*	*%²*	*N*	*%²*
Small ARC	60	67.4	33	60.7	21	11.8	5	100.0	119	57.6
Large ARC	62	11.1	92	34.3	21	18.8	7	50.0	183	25.3
C C G	47	64.1	53	37.7	45	38.5	6	33.3	151	45.7
C'wealth gov't	33	63.3	24	57.1	22	80.0	1	100.0	81	67.1
State gov't	31	74.2	25	58.3	27	73.1	0	n/a	81	72.2
Commercial	23	47.6	15	53.3	4	25.0	2	0.0	43	51.3
Foundations etc	23	52.2	19	66.7	14	72.7	0	n/a	57	60.4
Other[3]	22	65.0	20	65.0	7	83.3	4	50.0	55	67.3
Total	**296**	**66.8**	**281**	**48.4**	**161**	**49.6**	**25**	**59.1**	**770**	**51.5**

1 Whether result known or not

2 For those for whom results are known, percentage of applications which were successful.

3 Primarily overseas

Women were marginally more successful than men in their applications for external funding; 71.1 per cent of female respondents who had made any applications at all were successful with at least one application, and over all 55.9 per cent of their applications were successful; 66.4 per cent of male respondents who applied were successful with at least one application and over all 48.3 per cent of their applications were successful. Applicants aged 40 or over tended to be more successful than those younger than 40 (over 40, 53.0 per cent success; under 40, 48.7 per cent success).

Of recent PhD graduates, those in the applied sciences were the most successful in gaining funding for at least one of their applications, followed by biological sciences, health sciences and humanities. Applicants from the physical sciences and social science were less likely to have been successful in obtaining at least some external funding. Individual applications in the applied sciences also had the greatest success rate, followed by those in the social sciences, health science, humanities, biological and physical sciences (Table 3.6).

Table 3.6 Numbers of Respondents Applying/Applications Made and Success Rates for Different Discipline Groupings (PhD Survey Only)

Discipline group		***Applicants***		***Applications***	
	N	***N***	***%[1]***	***N***	***%[2]***
Physical science	32	12	50.0	29	41.4
Applied science	33	16	81.3	49	61.2
Biological science	27	13	76.9	49	49.0
Health science	33	20	75.0	108	54.6
Social science	47	22	54.5	81	59.3
Humanities	28	13	69.2	58	50.0

1 Per cent of applicants with at least one successful application.

2 Per cent of applications which were successful.

The relative difficulty experienced in obtaining funding for physical sciences is clearly related to the limited range of funding bodies available for that area. Physicists generally applied to granting bodies with low percentage success rates, primarily small and large ARC grants (31.9% of all applications at a rate of 2.4 applications per applicant and 36.2% of all applications at a rate of 2.1 applications per applicant, respectively) and other Commonwealth competitive grants (21.7% of applications), and hence had the lowest overall success rate in winning funding amongst the academics surveyed (Table 3.7). Historians also applied primarily to the ARC for funds, both large and small (41.1% and 24.1% of their applications respectively), but at a lower rate (1.4 and 1.3 applications per applicant respectively) and with a higher success rate. In contrast, nurses and social workers applied to a wide range of funding sources, Commonwealth and State governments in particular, and hence enjoyed a higher overall success rate in gaining funding.

Applying for external funding was associated[48] with a personal commitment to and enjoyment in meeting the challenges of research;* having networks* and links with colleagues,* industry and the community,* both locally and internationally;* having overseas research experience.* In addition, for those without a PhD, applying was associated with the amount of recognition they had received for their research achievements and with their confidence in their ability with research. Those without a PhD were hampered in applying for external funding by uncertainty about research design, methodology, and budget preparation; lack of knowledge about potential sources of funds* and lack of knowledge of funding procedures and expectations; lack of faith in the proposal assessment system; not keeping up with developments in their field; lack of confidence;* and family commitments. Those with a PhD were

48 In the next two paragraphs, $p<.05$ for all reported associations; and for those marked *, $p<.001$.

Table 3.7 Numbers of Applications to Different Sources (N) and Success Rates (%) for Different Disciplines (Academic Survey Only)

	Physics N=25[1]		***Engineering N=55[1]***		***Psychology N=60[1]***		***History N=24[1]***		***Nursing N=89[1]***		***Social Work N=32[1]***	
Source of funds	*N*	*%*	*N*	*%*	*N*	*%*	*N*	*%*	*N*	*%*	*N*	*%*
Small ARC	22	40.9	24	45.8	20	45.0	7	71.4	7	42.9	6	50.0
Large ARC	25	20.0	58	19.0	25	16.0	12	25.0	5	20.0	8	12.5
C C G	15	20.0	20	35.0	24	29.2	1	100.0	40	30.0	9	55.6
C'wealth gov't	0	n/a	8	50.0	4	50.0	5	20.0	36	69.4	14	64.3
State gov't	2	100.0	10	60.0	7	85.7	0	n/a	39	66.7	8	75.0
Commercial	1	0.0	1	100.0	5	40.0	1	100.0	7	57.1	2	0.0
Foundations etc	1	0.0	1	100.0	5	40.0	2	100.0	18	38.9	7	57.1
Other[2]	3	100.0	14	35.7	9	77.8	1	0.0	5	60.0	4	100.0
Total	**69**	**31.9**	**149**	**34.2**	**95**	**40.0**	**29**	**44.8**	**157**	**51.6**	**58**	**55.2**

1 Total number of respondents in discipline.

2 Primarily overseas.

significantly more likely to apply for external funding than those without a PhD* (72.1 per cent compared with 53.5 per cent) and felt hampered only by difficulties in preparing a research budget and by lack of a track record.

Success in applying for external funding was associated with having a stronger track record;* greater knowledge of funding agencies and what they expect; understanding of university procedures regarding funding;* and ability to convince assessors and funding panels of the value of the research* and the merit of the research plan.* Although making applications was associated with personal commitment, enjoyment and having more extensive networks, these did not impact on success once the application was made. In contrast with the situation regarding internal funding, departmental environment did not impact upon academics' likelihood of applying for external funding, nor upon their rate of success.

The apparent success with which academics reported obtaining grants (other than large ARC) was not matched by the overall tenor of their comments. Academics' comments about seeking external funding for their research made for depressing reading, but even more depressing were comments from those not in academic employment. A graduate in the latter situation, for example, reported 'private enterprise employers such as mine are not willing to financially support research that can't be oncosted to clients', and several referred to the isolation they experienced as researchers in private industry: 'Once you are off campus you are lost'. There was reference to the impact of recession on private sector spending on research, and to drought impacting on investment in agricultural research. Researchers not on the regular staff of universities were often barred from applying for funding:

> We are literally left in limbo, a neglected group… If they allow it to go on like this we will just be thrown in the wastepaper basket, and never be sustained in our research endeavours.

Researchers expressed frustration with time taken in fruitlessly applying to small private sector schemes, as with time spent on making applications generally. It is to be hoped that the academic respondent who described and expressed 'immense application and faith', having worked with salvaged materials to develop a project independent of funding until it was sufficiently refined to possibly attract support, will not be disappointed.

A researcher attached to a CRC noted some disadvantages of such a position: 'CRC funding seems to preclude funding from other bodies. Very goal-directed research, often under commercial secrecy, means very few publications.' A successful engineering researcher noted, with regard to CRCs:

> Too much money's going into projects that—because they have to be, to have industry involvement and so on are not aimed to be productive of generic knowledge so to speak—tend to be solving problems that are only of interest to those companies that are involved…

Although there is a tendency always for those with 'gripes' to be more inclined to express them, some managed to be just a little more positive:

> I have been fortunate to obtain funding. However, sometimes the resources I win have to be 'shared' with other projects (not necessarily my own, but colleagues'). This is perhaps not a bad thing though.

Strategies Employed by Early Career Researchers to Gain Funding

Applications to external funding bodies by early career academic researchers were submitted independently in 38.8 per cent of cases, closely followed by 36.8 per cent submitted in association with an already successful researcher; 21.1 per cent of applications were made by a team of new researchers, and 3.3 per cent of applications submitted by early career academics were sponsored by a more established researcher. The practice of submitting proposals entirely through an established researcher (in the expectation of being able to participate as a paid research assistant) is of concern. A graduate unable to obtain academic employment wrote:

> Financial backing to a sole researcher is not available…a major concern I have regarding research is the fact that funding is provided to institutions rather than individuals. On many occasions I have been encouraged to apply for funding by people already well entrenched in academia, who are 'more than happy' to put themselves down as main researcher. They call this 'support' for research. This situation means: I can fill out the application—which in itself is a rigorous exercise—conduct the research, and write up the report. The academic who was

> 'happy to sign' as chief researcher then puts his/her name on it, some as first author, and thus gains credit for work they have not contributed to … I consider this to be an unethical but widespread practice.

'Working with a successful researcher' was widely regarded as the most effective strategy new researchers could adopt for winning grants, although this strategy could at times involve the exploitation or devaluing of the early career researcher, even when they were of the same academic status. Next most popular as a strategy was the scattergun approach: 'apply for everything—reapply if necessary'; thirdly, 'publishing as much as possible'; and then, applying to less traditional sources—industrial groups, overseas companies, the military, etc. Other suggestions included needing to 'include methodologies currently in favour', 'gaining experience on assessment committees', or alternatively, 'no particular strategies, just hard slog!' More than one reported making use of others' reject equipment and liaising to share lab space to overcome a lack of funding until their project was sufficiently advanced to gain support. A few noted that great care in preparing 'clear, concise and complete' grant applications was important, and one researcher described how her (successful) application for an ARC grant had taken 80 per cent of her time for six weeks 'dotting all the "i"s and crossing all the "t"s'. Care in choosing referees was also crucial, and several mentioned being disadvantaged by not having built up networks in their field (with a history for some of isolation from peers and scholars back to the period of their PhD candidature).

There was no overriding pattern in the relationship between particular strategies and success of applications: much depended on the funding body involved, and perhaps on the situation of the researcher. It is clear, however, that early career academics who apply on a solo investigator basis to the ARC large grant scheme cannot expect a high degree of success in gaining funding; prospects are somewhat better for those applying with a successful researcher, but even so, still lie below the success rate which might be expected from other schemes (cf. Table 3.5)

Sources of Assistance

When recent PhD graduates were asked about sources of assistance in applying for grants, they most frequently nominated the Research Office in their university, though some indicated that they had less than satisfactory service from this quarter.

> Lack of structure at my uni to 'bounce the application off', lack of anyone who could read my applications and comment on appropriateness of format/overall presentation. Research Office can help but they are so busy I don't feel they want me to bother them.

The provision of grantsmanship workshops and seminars conducted at a broader level by their universities were often valued by new applicants,

although they were avoided by some: 'well if you go to those meetings it's about showing your ignorance, so I don't go'.

At the departmental level, some had been helped by their senior colleagues or PhD supervisors, others by colleagues. In one of the departments included in the case studies the contribution of the professor in this regard was noted with warmth:

> He goes around saying to people, 'what about applying for this grant'. He said that to me once and I said, 'well, I've already got a grant' and he said, 'well you can get another one'. I've actually got two now.

Although many of the heads of departments who were interviewed spoke of their role as a mentor assisting with staff members' grant applications, some saw this as meaning that they be incorporated into the application:

> The professor's job is to provide mentoring; this has been in place for 30 years. It involves not only revising applications, but also being willing to be named as co-investigator—'lending weight' to an application.

Where staff had to rely on a circulated list of grants, the lists 'tend to be filed fairly quickly in the recycle bin' and they 'wouldn't know how to go about applying [for grants] or which one to go for'. It would seem that a personal approach is the only effective way to encourage and assist newer researchers to access funding schemes.

Despite the rhetoric of heads of departments regarding the level of assistance provided in making submissions, there was a tone of frustration in the responses of the considerable number of early career academics who reported 'no one and nothing' had helped them gain funding. Several early career researchers also reported difficulties in seeking assistance from senior staff with grant applications because 'most staff are so busy and the climate so competitive'. This occurred particularly in newer departments where the few senior academics were still establishing their own reputations. Even in older institutions and departments there were perceptions of 'senior staff seeing junior staff as competitors for a diminishing pool of funding'.

Early Career Researchers and the ARC Large Grants Scheme

The concern which prompted this study arose from a perception by various discipline review panels that new and/or young investigators could not gain support for their research through the ARC large grants scheme. Experienced researchers, for example, generally felt that 'it is harder to get grants and it is harder to get started' now than it was a decade or two ago. Concerns regarding the funding situation of academic women—many of whom fall into the category of 'returning' researchers—have also been expressed in such publications as the recent National Tertiary Education

Union report which claims there is 'an unequal distribution of resources which affects women more adversely than men' (Castleman, Allen, Bastalich & Wright 1995, p.23). Frustrated early career investigators, too, have raised concerns about the ways in which decisions are made regarding who is to receive funding, especially as it impacts on them as a distinct group. From the analysis above it has become evident that this scheme presents more formidable barriers than others in terms of difficulty of access by early career researchers. It is instructive to consider the available details regarding the personal characteristics and research 'track records' of applicants to and recipients of support under this scheme, in order to identify who succeeds in and who misses out on funding at this level. These details were studied in the context of concerns and comments from 'young' investigators (some of which were reinforced by more mature investigators), to determine the nature and extent of the problems as they were both perceived and experienced by this group.

Information regarding age, gender and institutional sponsor was available for the first named investigator for the whole population of grants applied for and allocated, for both 1995 and 1996. In addition, for the 1995 round of grants, there were 488 applications involving 750 investigators available to be examined in more detail in the six disciplines (or, in the case of physics and engineering, sub-discipline areas) being considered. The success rate for this sample of grants was 22.7 per cent—comparable with the success rate overall for 1995 of 22.3 per cent. A majority of the 488 projects—279, or 57.2 per cent—had just one chief investigator, 154 (31.6%) had two, 53 (10.9%) had three, one four (.2%) and one five (.2%). Minor differences between discipline groups were not significant, nor did the number of chief investigators involved in a project relate significantly to its being funded.

Applicant Demographics: Trends and Success Rates

Age as a Factor

Applicants to the ARC Large Grants Scheme range in age from those in their twenties to septuagenarians. The widespread impression is that a very large proportion of grants are going to researchers over 50 years of age, and that things are much harder now for those under 40 than they used to be. These perceptions are paralleled by the implicit assumption that the early career researchers now experiencing difficulties in an arena where 'more people are competing for less ARC funds' are those who are young: 'There are younger members of our staff here…who have found it very difficult to get going with grants'.

The extent to which those in different age groups apply for grants, and their success in doing so, is shown for all first named chief investigators for both 1995 and 1996 grants rounds in Table 3.8. Clearly a minority of sole or first-named applicants are under 40 years of age. It is not possible, however, to determine to what extent this is reflective of the academic population,

particularly those with completed research qualifications. Although the median age band both for all applicants and for successful applicants in both years was 40–49 years, first-named applicants overall were significantly older in 1996 than they were for 1995, and successful applicants in 1996 also were somewhat more likely to be over 50 years of age than were successful applicants in 1995.[49] For both years there was a consistent pattern of lower than mean success rates for first named applicants in all age bands below 50 years, and higher than mean rates for those 50 years and older. Differences in success rates for those under or over 50 were significant for 1996,[50] but not in 1995.

Table 3.8 Age of Solo or First Named Applicants and Awardees for 1995 and 1996 Large Grants

	1995				***1996***			
	Applicants		***Successfuls***		***Applicants***		***Successfuls***	
Age (yrs)	***N***	***%***	***N***	***%***	***N***	***%***	***N***	***%***
20–29	34	1.3	5	.9	12	0.4	1	0.1
30–39	694	26.6	131	23.9	696	24.6	145	21.7
40–49	1027	39.4	219	39.9	1054	37.2	239	35.8
50–59	694	26.6	158	28.8	854	30.2	233	34.9
60–69	149	5.7	35	6.4	192	6.8	46	6.9
70+	7	0.3	1	.2	16	0.6	3	0.4
Total	**2605** [1]	**100.0**	**549** [1]	**100.0**	**2824** [2]	**100.0**	**667**	**100.0**

Source; DEET, Research Branch.

1 Created using 87% of requests and 84% of successfuls.

2 99.7% of requests: 8 unsuccessful applicants did not give their age.

In the DEET data available for 1996, there was a noticeably lower proportion of applicants in the 30–39 age band in social sciences and humanities than for other disciplines, while chemical sciences had the highest proportion of applicants in this younger age group. Older applicants (over 50 years) were least obvious among those applying to the sub-panel dealing with electrical engineering and computer science.

The mean year of birth for all investigators (N=742) for the 1995 grants (N=488) examined in detail, whether successful or unsuccessful in gaining

49 All applicants: χ^2=27.57, df=5, p<.001; successful applicants: χ^2=6.09, df=1, p=.01.

50 χ^2=8.13, df=1, p=.004.

funding (the difference amounted to three days!), was late 1947, i.e. they were 46 years of age when they applied, and 47 when they began their projects in 1995. Historians, averaging 50 years of age at application time, were significantly older than applicants from the other four disciplines,[51] however those who were successful were not markedly older than others. Among those who were successful in obtaining funding, the physicists, at 43 years when they began in 1995, were significantly younger than those from other disciplines.[52]

Thus, when solo or first named team investigators are considered, those who are under 50 are less likely to be successful, yet when all investigators are considered, age is not a factor in success. This confirms the conclusion above that younger applicants (with a teaching and research background), if they wish to be successful in winning ARC large grant funding, need to apply with a more experienced researcher.

Gender: Where are the Women?

Although 'early career' males and females apply to external agencies more broadly at a similar rate, the same is not true of academics applying to the ARC. Even allowing for the lower proportion of females in university employment across the system generally (at 31.2%), females are underrepresented among applicants (Table 3.9)—a fact recognised by the ARC. At least one department head noted that his female members of staff may be successful at obtaining ARC small grants, but that ‘they don’t go anywhere near the ARC large grants, they’re not in that league’.

Table 3.9 Gender of Solo or First Named Applicants and Awardees for 1995 and 1996 Large Grants

	1995				***1996***			
	Applicants		***Successfuls***		***Applicants***		***Successfuls***	
Gender	***N***	***%***	***N***	***%***	***N***	***%***	***N***	***%***
Male	2125	86.1	451	87.7	2391	85.2	569	85.7
Female	344	13.9	63	12.3	415	14.8	95	14.3
Total	**2469** [1]	**100.0**	**514** [1]	**100.0**	**2806**[2]	**100.0**	**664**	**100.0**

Source; DEET, Research Branch.

1 Created using 82% of requests and 78% of successfuls.

2 99% of applicants provided gender identification.

51 F=9.02, df=4,737, p<.001 .

52 F=3.60, df=4,172, p=.008.

The proportion of female applicants in the physical, chemical and earth sciences and in engineering is particularly low, although this is perhaps reflective only of the lower proportion of female academics in these disciplines. Those females who apply are generally as successful as males, although the rates vary for different disciplines (and quite possibly, year by year): for the 1996 round, for example, females were disproportionately successful in physical sciences and maths (53.8% compared to 24.6% males) and in general engineering (52.9% compared to 20.8%), and less successful in chemical sciences (15.4% for females, 24.2% for males) and humanities (19.7% for females, males at 27.7%).

In the sub-sample of disciplines studied from the 1995 round, less than two per cent of all applicants in physics and engineering were female, 29.9 per cent of those in history were female, 32.3 per cent of those in psychology and 62.5 per cent of those in social/health studies. Overall, 21.5 per cent of female applicants were funded, and 23.7 per cent of males, with no significant differences across disciplines. In projects with two or more investigators, 17.1 per cent of first named female investigators were successful, while 26.0 per cent of second or third named females were part of a successful team; 23.7 per cent and 23.4 per cent of males were similarly successful. Females therefore are more successful if they apply in a team lead by other researchers, whereas the same is not true for male investigators.

Institutional Sponsor

There is a widely held perception in the 'new' universities that they are disadvantaged by their institutional affiliation when they apply for large grant funding. Some who have been successful in previous appointments find they are no longer able to attract ARC support when they move to a newer university: ‘I missed my initial grant last year for the first time, the second time in 20 years. I came here and missed my grant.’ Staff at post-1987 universities apply at a much lower rate than their peers in established universities, and those who apply for large ARC grants are, indeed, less successful overall than those peers (including when levels of appointment are held equivalent) (Table 3.10): the reason is not immediately obvious, though the comparative lack of research facilities is likely to be of some influence (NBEET 1993a), and perhaps staff members’ lack of established networks as well (in 1995 just 4 of 48 discipline panel members were from post-87 universities, for example).

Table 3.10 Success of Large Grant Applications Submitted Through Different Universities for 1995 and 1996

	1995[1]		***1996***[2]	
University type	***N requests***	***%funded***	***N requests***	***%funded***
Group A	1560	25.8	1489	26.7
Group B	999	20.1	896	21.9
Group C	274	11.3	276	17.4
Group D	109	13.8	128	12.5
Total	**2292**	**22.1**	**2789**	**23.6**

1 $\chi^2=37.83, df=3, p<.001$

2 $\chi^2=24.22, df=3, p<.001$

In Summary: Where is the Competitive Pressure Being Felt?

It would appear from these figures that some groups of academics are significantly less likely to apply for ARC funding than their numbers in academia would warrant. These groups include those under 40 years of age, women, and academics from new universities. While these groups are not exclusively made up of early career researchers, early career researchers are likely to be found in each of these in larger proportion than elsewhere in academia. Applicants in these groups *may* be more likely to have applied as the non-leading member of a team, but not in sufficient numbers to explain their absence from these figures. It is more likely that increasing competition for funding is ensuring that all but the secure (i.e. the established ARC researchers) and the extraordinarily resilient are discouraged from applying, and it is the early career researcher who is most likely to feel that making an application is a fruitless exercise.

The impact of this strong competition for grants is far more noticeable at the level of applications than in differential success rates for various groups. While there is a trend in some grant years to greater success for those who are over 50, of much more significance is the fact that few researchers under 40 are applying, and that this number may be declining. Similarly, women who apply are, overall, as successful as men, but the majority are not even making the attempt. On the other hand, those in new universities are both less likely to make an application and less likely to be successful when they do. For some in these various categories there may well be less capacity to undertake excellent research, and they do well not to apply. Others are held back by their place in the system—employment issues are hindering their advance and hence their being in a position to make application, rather than lack of research ability. While the data presented above confirms the assumption that certain groups of academics are disadvantaged when it comes to accessing ARC large grants, there is no clear pattern of a problem

existing, at least with respect to age and gender, at the level where grants are allocated. A problem is clearly evident, however, at the level of application, where issues such as the would be applicant's qualifications, self-confidence, opportunity and expectations of success serve to limit the likelihood of their applying and testing the system.

Assessment of Applications for ARC Large Grants

There is a widely held perception among the academic community—particularly by those who have been excluded, but also by some who are well 'in'—that the ARC is a 'closed shop' or somewhat exclusive 'club', with the processes of gaining entry and maintaining membership typically regarded as having a 'lottery' element to them. Much of the genesis of such perceptions lies in the mystique surrounding the systems of assessment used to determine who wins grants. The lack of information available to the average academic regarding the details and rationale for the processes used to assess and review applications exacerbates the problem. Early career researchers express many of the same concerns as more established researchers, but face added difficulties in being less well known to the academic community, in having less knowledge of the academic community (from the point of view of knowing for whom they should be writing and whom to nominate as assessors), and in their being possibly more likely than their more established peers to be undertaking innovative and/or multidisciplinary research—research which 'falls between the cracks' (being less entrenched within the traditional disciplinary structures). An examination of the review and selection process and its impact on the perceptions and the fate of early career researchers is therefore apposite.

It was the choice of assessors which most often gave rise to complaint by applicants (and the description of the process as a lottery), particularly by unsuccessful applicants (Over 1995a,b; Wood et al. 1992). The competence of the chosen assessors to judge the quality of the proposal was seen as a major issue. Inconsistency between assessors and discrepancies between the ratings and comments provided by individual assessors lends support to these perceptions—as in this more extreme example:

> … one assessor's report, damning the application. This one report starts with its author stating that he/she was not competent to judge the proposal …From their comments it is obvious that they do not understand the proposal. The report ends by saying the proposal is far too ambitious for post-doctoral research. (One wonders when one is 'allowed' to do ambitious leading edge research?) [The proposal was then submitted as a large grant application in another researcher's name, with the original applicant as research assistant.] All three assessors were extremely supportive of the project, which was exactly the same as the postdoctoral application…

Each application for an ARC large grant which is considered to be competitive by the members of the relevant sub-discipline panel[53] at their meeting in April (usually 70 to 80 per cent of the total) is sent to five assessors. Typically one of the referees nominated by the applicant is chosen,[54] and four are selected either from among those known to expert panel members through the professional associations and their scholarly publications, or through a category code matching process from a database held by DEET.[55] If assessors respond in time with an indication that they are unable to assess the application, a replacement is chosen. Assessors are asked to make written comment, to rate specified aspects of the project[56] and the track record of each investigator on a seven point scale, and to assign percentile rankings to the quality of the project and the quality of the researcher or research team to conduct the project. Applicants are given an opportunity in July to make a one page response to the assessors' reports received for their project. Panels meet again to consider the assessors' reports and the applicant's response to them, assign a final (single) rating for the application, and thence determine which projects will be funded.

Some adjustment by the panels to the ratings given by individual assessors can be considered necessary in scoring projects and applicants—maybe in the light of applicant's responses, or allowing for differing academic traditions (e.g. on opposite sides of the Atlantic). Marked discrepancies between ratings on specific aspects of the project or the researchers and the summary percentile rankings given by assessors and/or failure to give consideration where mitigating circumstances are indicated are also seen as a reason for modification of scores. Panels are required to justify any adjustment of more than 10 percentile points to a rating given by an assessor. A final score for the project is determined for which 50 per cent weighting is derived from the quality of the project, and 50 per cent from the quality of the researcher or research team.[57]

---

53 The nine sub-discipline panels each comprise a number of prominent academic researchers, usually of professorial rank, serving in a voluntary capacity.

54 Panel chairs noted that in a surprising number of cases, nominated assessors responded that they were unable to provide an assessment, and that of those who did, quite often they were among the more harsh of the assessments.

55 This has since been successfully replaced with a database using keywords for matching applications with assessors.

56 The dimensions of the project to be rated are: the originality of the project; soundness of planning/methodology; scientific/theoretical/technological merit; and potential.

57 Several chairs of sub-panels lamented the imposition of a standard approach across all disciplines to this issue, indicating that they had previously had the option of giving more weight to the quality of the project in making their choices.It is likely to make little difference, however, given the assessors' scores for the two factors are highly correlated (r=.85).

Of the 488 projects analysed which were submitted for funding in 1995, 175 were either considered by the discipline panels at their first meeting in 1994 to be sufficiently uncompetitive to be retained for further consideration, or were unsuccessful in attracting any response from assessors. Thus 313 applications had assessor ratings, of which 111 were eventually successful and 202 unsuccessful. Successful applicants received at least two assessors' reports, and all applicants whose projects were sent for assessment (whether successful or unsuccessful) received an average of 3.9 assessments of the quality of their project and 3.8 assessments of the quality of the researcher/team. For this sample of applications, the mean percentile rating assigned by assessors for the quality of the project was 88.8 per cent for the 111 successful projects, just 10.6 per cent higher than that of the 202 unsuccessful projects. The mean assessors' rating for the quality of successful researchers was 90.4 per cent, 9.1 per cent higher than for their unsuccessful competitors. Assessors' ratings for the quality of the project and of the research team were highly correlated (.85), suggesting that a unique factor was primarily responsible for both. Although they were the primary basis for the final rating given by the panel, there was significant overlap in the distribution of assessor ratings for successful and unsuccessful applications (as much as 20 per cent), confirming that assessor ratings were taken as advisory rather than absolute by the panels.

It was beyond the scope of this study to evaluate the quality of the project, or the assessments of that quality. The evaluation of 'track record', as a basis for ratings of the quality of the researcher or research team is, however, a critical issue for early career researchers: this aspect was therefore considered in some detail. In the case of a team project, a seven-point rating is initially made separately for each investigator, then a combined percentile rating is given. In so far as the assessment of track record relies on a record of independent research, it poses a problem for early career researchers:

> We have experience (most of us have recent international experience) and we welcome proposal review as it now stands BUT on a level playing field! We are discriminated against by ARC policy which has prohibitive in built bias with such things as proposal ratings based on 'proven or long and outstanding research record', 'established research laboratories' and 'international reputation' and ratings systems with tick the boxes to rank proposals and individuals in percentiles! Percentiles relative to what? Nowhere on the forms or in directions to referees does it say 'rank this individual relative to your experience of individuals in a similar position and stage of career'.[58]

---

58 In fact, the current version of instructions to assessors does, although there is some doubt as to the care with which some assessors read and act on the instructions.

All but one of the nine sub-panel chairs indicated that, for applications being considered 'at the margins' of funding,[59] they would prefer to give priority consideration to those who might be considered 'early career'. Their difficulty in doing so was that, unless the person included with their publication list a brief explanation as to why it was less extensive than might otherwise be considered desirable, was obviously young, or was known to one of the panel members as being early career or having had a career interruption, there was no way of knowing that the person should not be considered simply on the basis of their published record.

The quality of track record required for an applicant to be successful in gaining ARC large grant funding was therefore examined, with a view to determining when a researcher might be considered adequately experienced to warrant funding and no longer in need of special consideration as being early career. This involved a consideration of applicants' previous success in gaining ARC and other support for their various projects, and a review of their research output in the form of publications, these generally being the only indicators of track record available to assessors and panels (other than personal knowledge acquired through scholarly networks) at that time.[60]

Previous funding

The record of funding received by applicants over the past three years was examined on a project team basis (the application form does not ask individual team members to differentiate, although some investigators did provide individual information). Only 4.1 per cent of researchers/teams had not had funding during the previous three years for any projects; 79.8 per cent had been successful during the previous three years with ARC or NH&MRC funding for this or their other projects, 51.3 per cent had other external funding and 55.2 per cent had internal university funding for their previous research. Among the disciplines studied, physicists were most likely to have had previous ARC support, followed by engineers and psychologists, with historians least likely to have had either ARC or other external funding for their work (Table 3.11).

Applicants who have had previous ARC or NH&MRC funding are significantly more likely to gain funding for their current project (particularly if it was for the same project), while those who have had other external funding in the absence of ARC funding have a reduced probability

---

59 All panel chairs indicated that they had little difficulty in determining the best and the worst of the applications, and that the major part of their time was taken up by the 30–40 applications 'at the margin'—applications which were all well deserving of funding but from which just a few had to be selected for support. This is the point at which priority ratings and the potential benefits of the research come into play in determining which will make the grade.

60 Applicants are now invited to present a range of scholarly achievements in the light of the opportunities they have experienced.

of success (Table 3.12). Previous support, however, is no guarantee of continuing support.[61] New researchers with new projects (typically, early career researchers) face an up front barrier in obtaining funding in that there is an understandable bias toward continuing funding for previously supported projects—particularly in the basic sciences where it is most common to find projects and teams which are built up over many years and which may take many more than three years to come to fruition. It may be quite difficult, therefore, for someone who may have had previous support as part of a team to move to a position where they attempt to gain support independently of that team, and for a different project, yet this is the path an early career researcher must take, if they are to become independently established.

*Table 3.11 All Sources of Support During Previous Three Years for Any of the Investigators' Projects, for 1995 Applications in Selected Disciplines**

Source of support	***Physics***	***Eng'g***	***Psych***	***History***	***SS/Hth***
no previous support	0.0	2.6	2.8	11.8	8.7
internal funds	60.4	43.7	59.9	57.9	69.5
ARC/NH&MRC	95.9	88.7	75.4	53.9	65.2
other external funds	53.1	49.3	57.7	35.8	60.8

* *Column percentages add to more than 100 because researchers may have had funds from more than one source*

*Table 3.12 Previous Sources of Funding for 1995 Applicants in Relation to Success in their Current Application**

Support for all other projects	***total N***	***funded N***	***%funded***
no other funded projects	20	3	15.0
internal University funding only	26	5	19.2
other external funding only	20	1	5.0
ARC/NHMRC funding only	100	25	25.0
internal + ARC funding	92	32	34.8
other external + ARC funding	79	24	30.4
internal + other external funding	33	1	3.0
internal + external + ARC	118	20	24.2
Total projects	**488**	**111**	**22.7**

* $\chi^2=24.51$, $df=7$, $p=.001$

[61] 26.0 per cent of those with previous ARC/NH&MRC funding were successful, compared to 10.1 percent of those with no previous funding; $\chi^2=11.30$, $df=1$, $p<.001$

Applicants who had obtained other sources of external support for their projects appeared to have a diminished chance of success (with regard to their current projects, this included even those who had also previously been funded by the ARC).[62] When panel chairs were asked about this, two principal reasons were offered by those who agreed this was the case:

- Those who are extensively supported from other external sources might be considered to be less in need of ARC funding.
- Much of what is funded by other external sources might be regarded as 'consultancy' or 'development', rather than 'research'. It is therefore questionable that it constitutes a legitimate research activity resulting in the advancement of knowledge rather than merely the application of that knowledge. Thus reports which are provided as a result of such funding are considered of little value to the academic community (and therefore of little value as an indicator of one's ability to conduct worthwhile research) unless they are able to be widely disseminated or, preferably, converted into scholarly publications which will contribute to the development of the discipline.

Early career academics quite often access alternative sources of funding for their initial research endeavours, thus this may be experienced as an additional problem if they have not retained intellectual property rights and established a program of scholarly publication from that research in addition to providing reports to the funding agencies.

Publications

Published output is almost undisputed among academics as a primary indicator of research capacity. Although some difficulties were encountered in quantifying publications for this analysis,[63] it was found that successful ARC applicants in general had been solo or first author for more books and more articles and chapters in the previous two years than were unsuccessful applicants; both groups reported similar numbers of conference papers.[64] The number of publications as solo or first author from the previous five year period which were marked as being relevant to the current proposal was

---

62 Across all projects: χ^2=5.50, df=1, p=.02.

63 Applicants were asked to record only refereed journal articles, but not all complied with this request. While the assessors and panel members are able to judge the status of particular publication media in their field, this was not possible for this data collection. It is therefore likely that there was a differential quality in the articles recorded by successful and unsuccessful applicants which is not reflected in the crude counts used here. Similarly, there was no means to assess the quality or impact of listed books. Furthermore, as applicants are asked only to list refereed publications and books, the inclusion of conference papers may reflect the lack of a more substantial publishing record.

64 Books: t=2.92, p=.004; articles: t=3.77, p<.001; conference papers: t=1.62, p=.1; relevant publications: t=2.15, p=.03.

also somewhat higher for successful than for unsuccessful applicants across the disciplines studied.

Successful historians produced significantly more books as solo or first author in the previous two years than successful investigators in physics, engineering or psychology, reflecting well known disciplinary differences in publication patterns (Becher 1987, Hill & Murphy 1994). Differences in the number of articles/book chapters published by those in different disciplines were not significant (presumably because in this data set the greater tendency to publish articles in the sciences was counterbalanced by the higher rate of book chapter as a mode of publication for the social sciences/humanities). Successful engineers (particularly civil engineers) were more likely to report presentation of papers than successful physicists, psychologists or historians (Table 3.13).

*Table 3.13 Publication 'Track Records' of 1995 Large Grant Applicants in Selected Disciplines**

	Number of applicants		***Books (for 2 yrs)***		***Articles/ Chapters (for 2 yrs)***		***Conf'enc epapers (for 2 yrs)***		***Relevant public'ns (for 5 yrs)***	
Discipline	***S[1]***	***U[1]***	***S[2]***	***U***	***S[3]***	***U***	***S[4]***	***U***	***S[3]***	***U***
Physics	37	110	.08	.03	5.08	3.47	.81	1.02	2.78	3.33
Engineering	51	182	.24	.11	4.73	2.84	2.84	3.74	4.27	3.20
Psychology	48	174	.33	.15	4.93	3.06	.91	.94	3.25	2.03
History	28	80	1.39	.91	3.82	3.99	.36	.64	3.50	2.37
Social/health	10	30	.90	.47	3.40	3.00	1.70	1.87	3.50	2.77
Total	**174**	**576**	**.46**	**.23**	**4.64**	**3.19**	**1.41**	**1.85**	**3.51**	**2.73**

* *Mean number for which the applicant was solo or first author*

1 *Successful and Unsuccessful applicants respectively*

2 *F=13.03, df=4,168, p<.001*

3 *Differences between disciplines NS.*

4 *F=6.40, df=4,169, p<.001*

From the data analysed here, it can be surmised that ARC applicants must expect to produce a book every four years as well as two or more articles per year as solo or first named author (or equivalent), if they hope to be successful in their application. This level of publishing is significantly higher than that achieved by all but a minority of academics, and can pose particular problems for early career researchers (especially those without a maturing group of postgraduate students available to work with them on their research projects):

> Projects abandoned as ARC deemed I hadn't published enough. This was after international experts had expressed interest in my work and had agreed to supervise my project.

Researchers attempting to prove their research capacity in academic forums with this heavy reliance on traditional forms of publishing are then at a disadvantage if they have had a less traditional background in, for example, industrial research and development or community consultation. The emergence of electronic publishing as a significant genre in some disciplines needs to be addressed, as well, as an issue likely to pertain to early career researchers more than to those who are more established (and traditional?) in their patterns of dissemination.

Academic Reputation: On the 'Coat Tails' of a Successful Researcher

The accepted route for gaining a profile of involvement in successful ARC research is to attach oneself to an eminent researcher as a member of his or her investigative team, or to seek the imprimatur of a professor for one's own application by including such a person as a named co-investigator. Indeed, in our surveys, early career academics were more likely to report being funded if they applied in tandem with a successful researcher than when they applied by themselves or with other early career researchers. From a head of department:

> There is an established tradition whereby senior people encourage younger researchers by taking them into their projects.

But from the perspective of more junior researchers:

> For a genuine dynamic research environment, Australia needs the 'young career researcher' to have the opportunity to genuinely branch out and initiate new research directions (particularly when they have recently come back with first hand knowledge of research directions internationally) rather than be forced to collaborate or continue a 20 year old research direction of existing staff at the institution in question.

The plea of a number of early career researchers, then, was to be assessed for their research potential in relation to their peers:

> When comparing the merit of researchers, look at respective positions and funds available. Compare apples with apples. Clearly a professor with substantial resources will produce *a lot* more papers (through students and research staff) than an equally competent lecturer with no funding. How can one grade all applicants on a single scale in this situation? Re-scale the grade obtained from the reviewers to the *standard expected* from an applicant holding a particular position. Only then apply cut-off procedures.

How beneficial is it, then, to be a professor—or to be associated with one—when applying for a grant? To what extent are early career researchers being assessed in relation to their peers, or their stage of career, and to what extent are they being given the benefit of the doubt, even if only 'at the margins'?

The Significance of Professorial Appointment

Academic status (level of appointment) could be determined for 733 applicants. Applicants were generally distributed across levels B-E (or equivalent) in academic status, but the general likelihood of actual success in being funded—as would be expected, given competence based appointments—was significantly higher for those at professorial level (Level E) than for those at any other level (Table 3.14). This trend to greater success among applicants of professorial status, although still present, was somewhat less apparent in physics than in the other four disciplines.

Table 3.14 Proportion of 1995 Investigators (All Applicants and Successful Applicants) at Various Levels of Appointment[1]

	All Applicants		***Successful Applicants***	
Academic status	***N***	***%***[2]	***N***	***%***[2]
Level A	16	2.2	4	2.3
Level B	192	26.2	30	17.3
Level C	213	29.1	43	24.9
Level D	161	22.0	33	19.1
Level E	151	20.6	63	36.4
Total	**733**	**100.0**	**173**	**100.0**

1 $\chi^2=36.53$, $df=4$, $p<.001$

2 Column per cent.

The relationship between academic status and the likelihood of success in obtaining large grant funding was even more clearly established through a separate analysis of solo and team applications. Both professorial status and being in a research-only position had a strong relationship to success in winning funding. Research fellows and readers were, generally speaking, more likely to be successful than teaching and research academics at an equivalent level when applying as solo investigators, though all were eclipsed by the success of professors (Table 3.15). Similarly, in team projects, the addition of a professor to a team was associated with a twofold increase in the likelihood of success (Table 3.16), and teams which included a research fellow (at any level) or reader were additionally advantaged. Interestingly also, the role of the professor within the investigative team had a significant relationship with the likelihood of success for their application

(Table 3.17); teams where the highest status person was listed first had a greater likelihood of being successful.

Table 3.15 Success in Funding for Solo 1995 Investigators at Various Levels of Appointment

	All solo investigators (CIs)		***Research only solo investigators (PDF, RF, SRF, Reader)***		***Other solo investigators***	
Status	***total N***	***%success***	***total N***	***%success***	***total N***	***%success***
Level A	3	33.3	3	33.3	0	0.0
Level B	66	13.6	10	20.0	56	12.5
Level C	85	16.5	4	0.0	81	17.3
Level D	67	16.4	25	28.0	42	9.5
Level E	56	51.8	n/a	n/a	56	51.8
Total	**277**	**23.1**	**42**	**23.8**	**235**	**23.0**

Table 3.16 Structure of 1995 Project Teams and Success of Application (Applications with Two or More CIs Only)

Team composition	***All teams***		***Teams with research only member***		***Teams without research only member***	
Academic status	***tot.N***	***%suc.***	***tot.N***	***%suc.***	***tot.N***	***%suc.***
A-C only	61	9.8	17	23.5	44	4.5
includes Level D	57	17.5	21	23.8	36	13.9
includes Level E	87	34.5	17	52.9	70	30.0
Total	**205**	**22.3**	**55**	**32.7**	**150**	**18.7**

Table 3.17 Position of Most Senior Investigator and Success of Application (1995 Applications with Two or More CIs Only)

	CI1 is highest level of appt. on team			***CI1 is not highest level of appt. on team***		
Highest is:	***total N***	***N succ.***	***%success***	***total N***	***N succ.***	***%success***
Level B	16	1	6.3	1	0	0.0

Level C	32	5	15.6	11	0	0.0
Level D	31	7	22.6	28	4	14.3
Level E	47	20	42.6	34	8	23.5
Total	**126**	**33**	**26.2**	**74**	**12**	**16.2**

The data in these tables strongly suggest that anyone other than a full professor (Level E) is at a severe disadvantage when it comes to being successful with an application for ARC large grant funding, with the partial exception of those in research only positions. On current trends, those in lecturing positions below the level of professor would do well to attach themselves to a reputable professor, and to have the professor listed as the first named chief investigator, if they wish to be more certain of obtaining funding. This in turn may beg the question of whose research the project is about, who is doing the work, and who will thereby gain in reputation.

Further analysis was conducted to ascertain whether the greater success of those of professorial status was, as might be expected, a function of their greater experience and scholarly output as evidenced in their having a superior publication record. Alternatively, research professors are likely to be known within their own academic community, so that those making assessments might simply assume they would be maintaining a quality record of research achievement. Perhaps then, the degree to which an applicant's reported publications were taken into consideration when assessors assigned their rating of the capacity of the researcher to undertake the project was not necessarily standardised or disinterested—as suggested by a member of a discipline panel:

> …if you look at the assessor's reports in terms of you know, how they rate track record—I mean, you might as well give it away. If there's a correlation between what's on the paper and what people actually report, I'd be very surprised. I looked at it. I've got about, you know, God knows how many assessors' reports there but you know, my heart fell when I looked at them and I thought, I know that person must have 30+ including three books and this person's got 4 and this assessor's given that person a higher rating than that. I mean, what do you do? It's just ludicrous … The assessors never agree, well they do agree sometimes, that's not strictly true, but the notion that peer review is somehow constraining and does away with all the favouritism is absolute nonsense.

The assessment of the quality of researcher as determined by both assessors and panels was therefore reviewed. For this analysis, solo investigator projects only for the five discipline groups for 1995 were considered. Separate counts of books, articles/chapters and publications marked as relevant to the proposal were used as measures of publication output (as above). Having had ARC funding for any project in the past three years was used as an indication of a researcher's track record in research grants or projects. Academic status was dichotomised, as professor or other.

The extent to which the researcher's publication output and grants record as compared to their academic status could predict the mean rating for the quality of the researcher given by assessors was determined. Both academic status and publications (specifically, books and number of relevant publications) made significant independent contributions to the rating for the researcher (Table 3.18). Academic status alone could account for 15.6 per cent of the variance in the mean assessor ratings of the researcher, publications without academic status accounted for 13.1 per cent. Having had previous ARC grants did not contribute at all when combined with these other variables. Together the measures of track record and the academic status of the researcher accounted for 23.6 per cent of the variance in mean ratings given by assessors, thus academic status added 10.5 per cent to the explanation of the variance of mean ratings after accounting for the contribution of track record.

Table 3.18 Total and Relative Contribution of Academic Status and Track Record to Assessor Ratings for Quality of the Researcher, 1995

Variable	***b***	***SE***	***β***	***t***	***p(t)***
Academic status	6.05	1.29	.33	4.68	<.001
Books	1.87	.13	.17	2.57	.01
Articles	.14	.16	.07	.91	.36
Relevant publications	.34	.15	.18	2.30	.02
Previous ARC grants	.06	1.54	.00	.04	.97

R^2=23.6, F=10.22, df=5,165, p<.001

Similarly, the significance of the contribution of academic status to the determination (by the panels) of overall success or failure of a grant application was considered. Discriminant function analysis (Tabachnick & Fidell, 1989) was conducted firstly for all 1995 solo applications in the selected disciplines (N=273), to predict their assignment to one of three groups: removal prior to assessment, removal after assessment, or success. Predictors were publication output measures, whether or not the researcher had had previous ARC grants and the academic status of the researcher.

Two discriminant functions were calculated which together correctly classified 51.3 per cent of applications into one of the three groups.[65] The two functions together accounted for 14.5 per cent of the variance in

[65] 39.2% of group 1, 66.7% of group 2 and 44.4% of group 3 were correctly classified. The majority of those in group 1 which were incorrect were classified in group 2, and *vice versa.* For combined functions χ^2=54.35, df=10, p<.001; after removal of first function, χ^2=12.40, df=4, p=.01. The two functions accounted for 78% and 22%, respectively, of between group variability.

outcome, the second one alone accounted for 4.5 per cent. The first function maximally separated group 3 (successful applicants) from groups 1 and 2 (applicants declared unsuccessful at first and later culls, respectively). The second function provided some discrimination between groups 1 and 2, with group 3 falling between these two groups.[66] Academic status was the primary predictor loading on the first discriminant function, i.e. that which distinguishes successful applications from those which are unsuccessful (at any time). Having had previous ARC grants loaded more than other predictors on the second discriminant function.[67] The results suggest that, for applications which are deficient in some other way (i.e. which will ultimately be unsuccessful), those which are from researchers who have had previous ARC funding are more likely to be sent for assessment than are those which are not. For those which are ultimately going to be successful (for whatever reason), the researcher's having had previous ARC grants is of considerably less importance. Retention of these two predictors only (academic status and previous ARC grants, and dropping publication counts) resulted in no loss of power in discriminating between groups.[68]

A further analysis was conducted of just those solo applications for which there were assessor reports. Mean assessor ratings were added to the set of variables used to discriminate between 64 successful and 108 unsuccessful applications, success having been determined by the panels after reviewing all assessor reports and responses from researchers. With mean assessor ratings of both the project and the researcher, and academic status as predictors, the discriminant function was able to differentiate and correctly identify 76.2 per cent of applicants as being successful or unsuccessful, and account for 40.9 per cent of the variance in groups.[69] Predictors based on track record (i.e. publication output and previous ARC grants) did not add to the predictive power of the function once assessors' ratings were included. This would be expected in that they should have been fully accounted for by the assessors in their ratings. Academic status did however add significantly to the predictive power of the function, even though it was already strongly associated with assessors' ratings. This suggests academic status is

---

66 *Group centroids:*

	Function 1	Function 2
Group 1—first cull	-.37	-.22
Group 2—final cull	-.12	.26
Group 3—successful	.73	-.09

67 First discriminant function pooled within-groups correlations with: academic status=.83; previous ARC grants=.51. Second discriminant function pooled within-groups correlation with: previous ARC grants= .77.

68 With two predictors only, group classification was 50.9% correct. For combined functions: χ^2=46.62, df=4, p<.001; for the second function alone: χ^2=10.04, df=1, p<.002.

69 82.8% of 64 successful applicants and 72.2% of 108 unsuccessful applicants were correctly classified: χ^2=88.69, df=3, p<.001.

influencing the assessors' ratings, their ratings are the primary influence on the panels, but academic status is then having some additional influence on the panels.[70]

Thus when external assessors and panels are evaluating the relative capacity of an investigator to undertake excellent research, it would appear that the academic status of the applicant is impacting on the assessments by both, independently of the applicant's track record in grants and publications. This suggests that anyone other than a professor is at considerable disadvantage in seeking ARC funding, and has significant implications for strategies early career researchers might feel they need to adopt, to become successful in gaining funding.

Younger Researchers in Teams

While early career researchers can only increase their likelihood of success through linking up with an experienced researcher when applying for an ARC large grant, some experienced researchers have become wary of including newer researchers on their applications after losing grants (or hearing of others who have lost grants) when they have included junior researchers:

> …that's not even easy because when projects are assessed, the forms assess all of the major researchers on it and so if you put one researcher who's unknown or got no publications or what have you, you get a high mark for the first couple and then a terrible mark for the third one and that's enough to sink it. You know, you can't afford to have bad marks anywhere. And so people are unwilling to let younger people put their names on things, so the best they can hope to do is get involved in the research, but not have their names on the grant applications.

The majority of panels report that they work on the assumption that a research team is as good as its best researcher, while others (most notably in the physical sciences) are more inclined to assess the individual expertise of each team member in relation to the contribution he or she is supposed to be making to the team.

Senior researchers have also become more cautious about including junior researchers on their applications since the number of new applications that can be made in any year has been restricted to two:

> Restricting the number of applications might be a deterrent. If you've got the choice of putting in two applications with experienced researchers and you're likely to get the money, or putting one in with someone you're mentoring, then you will make the choice if you want

---

70 Standardised canonical discriminant function coefficients for each predictor: mean assessors' rating of the project=.89; academic status=.34.

> the money and forgetting the mentoring. So I think that might be a problem.

At times, too, questions might be asked about the quality of the mentoring process which is assumed to be occurring, especially where the senior researcher is carrying a large number of projects along with other responsibilities:

> I have my own research department where I have to continue to achieve international excellence so that we keep getting our ARC money and there my main role is to coordinate and to make sure, we run a very large [piece of equipment] and while I've got excellent people helping me do it, every so often I have to go in there and just make sure everybody knows what the ball game is. I also in that same context have to be seen by them to continue to be an active researcher. That's very difficult in my position because I'm short in other directions. I have a couple of students to help me, I always have a couple of graduate students to help me …

> I have a small ARC with someone…but I don't ever do anything on it but my name's there as a mentor and once a year I sign the piece of paper and if I had time I'd take part in the research—I know what it's about.

Among the 742 investigators for whom age was known, a greater proportion of those under 40 were involved in team projects than was the case for those 40 and older: 70.5 per cent in contrast to 60.3 per cent[71] (62.9 per cent of all investigators were in teams). A check of comparative success rates found that solo investigators under 40 years of age were just as likely to be successful as those under 40 who were part of teams, and teams which included an investigator who was under 40 were just as likely to be successful as teams of comparable structure which did not. Perhaps only those (under 40) who were confident of their own record of achievement applied as solo researchers, while those who were less so joined with a team in order to achieve success. In any case, there was no apparent disadvantage to senior investigators if they included a younger researcher in their team.

The Review Process: Communication with Applicants

The ARC has, over its years of operation, done much to improve the feedback provided to applicants. Applicants are now given copies of all assessors' reports, and provided with an opportunity to respond to them. While this move has been appreciated, many called for the reintroduction of interviews of applicants—dropped from 1994 as a cost saving measure—as a means of allowing applicants to demonstrate to panel members their

---

71 χ^2=6.34, df=1, p=.01.

ability to defend their work, their care in budgeting, and their level of commitment to their project. All but one of the discipline sub-panel chairs, too, expressed a desire to see interviews reintroduced in some form, suggesting that:

> …we still get to situations where we would still like to ask the applicant certain questions that were not covered in their response to the assessors' comments, and also I think the interview gives panel members a better feeling for just how committed and enthusiastic applicants are about their projects and proposals, and gives them a feel for the departments and so on in which they're working, their research environment—which you can't get from just the application.

The removal of the interview round has, perhaps, added to the 'facelessness' of the review process, and exacerbated misperceptions about it. Its replacement by a series of institutional visits commencing in 1995, while valuable, would appear to meet a different need in that each university is visited just once in two years and not necessarily at the critical time when a marginal applicant needs to impress panel members with their enthusiasm, care and skill. Given that the cost of interviews was a major reason for their cessation, it was suggested by some of the panel chairs that teleconferencing or videoconferencing might provide a viable alternative to the more expensive personal visits.[72]

While those who receive assessors' reports are given some indication as to how their applications might be improved—or, at least, where they were perceived to be deficient, little is offered to those whose applications are deemed by the panels at their initial review to be below the necessary standard, typically being given the standard response that, 'While of a good standard, the application was not competitive in comparison with other proposals submitted'. Early career researchers (who are likely to be over represented amongst those whose applications are removed before assessment) are especially in need of clear guidance as to where their applications fall short:

> In 1993 the research project was not funded—but had a score of 6.0 when the cut off was 6.1. In 1994 and 1995 the panel rejected it before it went out to the referees. If they could clearly tell me what criterion they used to throw it out, I would be able to work out where I am going wrong. But unfortunately it seems the ARC will not be doing that. It begs certain questions.

The processes established by the ARC are designed to ascertain, in the fairest way possible, the excellence of any proposal for research. That some bias may creep in at any stage in that process is to some extent an inevitable feature of any human system, with its likelihood reduced to the extent that

---

72 From 1996, panels will be able to add their comments or questions when assessors' reports are sent to applicants for response.

the processes involved are transparent and regularly evaluated. The analyses here suggest that early career researchers have genuine basis for feeling that they are unlikely to find support through the ARC, and possibly even that they are unjustly discriminated against by the established researchers who conduct the business of the ARC.

Early Career Researchers and the ARC Small Grants Scheme

ARC small grant funds are administered by the universities: each is allocated annual base funding of $50 000, with an additional amount calculated on the basis of their large grant earnings over the previous two years. Small grants are seen as having a dual purpose:

- they are an entry point to ARC funding more generally, providing a valuable bridge between university internally funded granting schemes and ARC large grants for those who are developing either a research area or their own track record in research; and
- they provide adequate funding for many projects in those disciplines which do not require large inputs of equipment or other resources, for example in the social sciences and humanities.

As was evident in the examination of sources of external funding sought and won by early career researchers (above), ARC small grants are frequently targeted by them and are found to be much more accessible than are large grants.

Because the small grants are administered through universities rather than centrally, little information is available (at present) to allow an evaluation of the means by which they are allocated, or the characteristics of the researchers who apply or to whom they are awarded. Some information was able to be gleaned from the spreadsheets listing all successful projects and their investigators, and a partial analysis of gender data, supplied for the first time for 1995, was also possible.

Universities were asked to tabulate the gender distribution of successful and unsuccessful grants for the first time in 1995, listing the number of grants and amount of money requested by and allocated to single males or all male groups, single females or all female groups, and mixed gender groups.[73] Just

---

73 It is strongly recommended that in future years information is requested for individuals (preferably by requesting gender identification next to all names on the spreadsheets recording all successful and unsuccessful applications). With the system used in 1995 it was not possible to determine actual numbers of male and females involved: male and female teams may have been of different sizes, and more particularly, it is likely that mixed teams included more males than females. For the analysis reported here, the latter were pro-rated 50:50, male:female.

eight of the 36 universities managed to provide that information in a complete and consistent format, making analysis in this area problematic. Some reported applicants as a number of individuals and allocations as number of grants, and some provided amounts but not numbers of allocations for each gender—all of which served to render the analysis somewhat incomplete and meant that the main conclusions had to be based on dollar requests and allocations rather than numbers of grants or people[74] and that the calculation of an index for gender bias had to be based on comparative proportions rather than actual counts. A clear pattern across the system emerged, none the less, which suggests that the grant allocation system is relatively free from gender bias, but which further suggests that the known bias in the pattern of employment of females in universities has an impact in the area of small grant applications. Females can generally expect to be successful at a rate which is only marginally less than the rate at which they apply (with a few universities providing notable exceptions) but, more significantly, females are making far fewer requests than their numbers in the system would lead one to expect: thus they are also being allocated less than their numbers would apparently demand (Table 3.19).

Table 3.19 ARC Small Grant Requests and Allocations Apportioned to Female Academics for Initial Awards in 1995[1]

	Requests ($)		***Allocations ($)***		***Staff[2]***	***Index[3]***
University	***Total***	***%fem***	***Total***	***%fem***	***%fem***	
Group A	43,092,273	17.4	13,657,360	16.1	29.7	.54
Group B	22,373,657	18.1	5,420,121	17.3	30.2	.57
Group C	6,605,075	20.1	1,072,625	17.2	33.2	.52
Group D	3,175,124	25.1	623,712	26.2	37.8	.69
Total	**75,246,129**	**18.1**	**20,773,818**	**16.8**	**31.5**	**.53**

1 *Source: DEET Research Branch. Initial and renewal applications only, does not include second or third year funding on multi-year grants*

2 *Source: DEET. Does not include casuals.*

3 *Ratio of percentage of dollars awarded to females to percentage of females on staff: an index of 1 indicates a lack of gender bias. Three universities with more than $250 000 available to distribute rated an index of .30 or less, i.e. the percentage of dollars awarded to their female staff was less than a third of the percentage of staff who were female.*

From the spreadsheet listing of successful applicants (made available by DEET Research Branch) for the past three years, it was possible to gain

74 The margin of percentage difference between the proportion of grants requested by females and the proportion of dollars requested by females for *most* universities was in the order of one or two points only, and probably reflects a gender bias in the disciplines of those applying.

some insight into the seniority of successful applicants by estimating the proportion of grants going to professors, associate professors, those with a doctorate, and those without academic title[75] (undertaken for the first named researcher only, but a perusal of second and third named investigators suggests that the first are representative of the whole). This estimate of the distribution of academic status indicates that, across all disciplines and universities, 16 per cent of small grants were allocated to professors, 15 per cent to associate professors, 65 per cent to other academics with a doctorate, and 5 per cent to lecturers without a doctorate (those listed as Mr or Ms). ARC small grants are thus being accessed to a greater degree by those of lower academic status than were large grants, although the number might still be considered somewhat disproportionate (for example, professors comprised 4.6 per cent of academics only in the universities surveyed by the NTEU).

> I have worked at [three Victorian] Universities in the last decade and I have never been encouraged to apply for a grant of any kind while I was at these institutions. Instead, I encountered an academic culture in which the permanent senior staff viewed funding as their preserve, to be fiercely guarded against incursions from junior and part time staff…The culture within each of these universities was clearly disbursing funds on the basis of seniority rather than results. The professors and senior lecturers always seemed to get priority when it came to getting a slice of the university's own funding pie, despite the fact that—apart from doing occasional book reviews—they hadn't published anything in years. Meanwhile, the junior academics, who were really getting on with research and were also in genuine need of funding due to low pay, were passed over year in, year out.

While it is quite legitimate and acceptable for those of senior (established) researcher status to be accessing small grant funds, for example, for research which does not require large amounts of money (and indeed frees large grant funds for other researchers), the practice whereby a particular chief investigator may simultaneously hold a number of both large and small ARC grants can be argued to be indicative of an allocation process which unnecessarily excludes early career researchers from the latter source of funds. By combining the list of small grant awards for one year (1994) with those for successful applicants for large grants for a three year period (1992–94, available in the target disciplines only), the number of people who held more than one small grant concurrently was estimated as well as the number who held small grants concurrently with large grants (in each case, as first named chief investigator).[76] Table 3.20 gives an (under)estimate of the

---

75 This assumes that all those with professorial titles have been so recorded on the spreadsheets: there is no way of verifying this assumption.

76 For the purpose of this estimate, large grants were assumed to run for three years. Note that this will provide a significant underestimate of multiple allocation in that

extent of this practice. Given that first named investigators only were considered, it is safe to assume that for all investigators *at least* 20 per cent of small grants are held by investigators who also concurrently hold large grants, with additional numbers holding more than one small grant, with or without a large grant.

Table 3.20 Concurrent Allocations of Small and Large Grants to the Same Solo or First-Named Chief Investigator for 1994 in Six Discipline Groups[1]

	Total N		***1 SG only***		***2 SG only***		***SG + LG***	
University	***CI1***	***grants***	***N***	***%***[2]	***N***	***%***[2]	***N***[3]	***%***[2]
Group A	196	213	149	76.0	8	4.1	39	20.0
Group B	107	112	85	79.4	3	2.8	19	17.8
Group C	21	22	19	90.5	1	4.8	1	4.8
Group D	16	16	14	87.5	0	0.0	2	12.5
Total	**340**	**363**	**267**	**78.5**	**12**	**3.5**	**61**	**17.9**

1 *Source: DEET Research Branch, using small grants data from 1994 and large grants data from 1992–1994. The construction of the spreadsheets made it particularly difficult to consider data for more than the first named investigator, thus the true proportion holding concurrent grants is underestimated.*

2 *Per cent of investigators (CI1).*

3 *In this sample, eleven recipients of small grants held at least two large grants as CI1 at the same time. Ten held a large grant as CI1 and two or more small grants as CI1 concurrently.*

Because they win less large grant funding, academics in newer universities are also comparatively disadvantaged with regard to access to ARC small grant funding (Table 3.21). The large grants 'success rate' may be quite high for an individual university, but even then the numbers involved and therefore the dollars earned are likely to be much smaller than for equivalent sized older universities. While it can be assumed that there are less research-active staff (at least at a reasonably advanced level) overall in the newer universities, it is also in these universities that many new researchers find their initial academic appointments, i.e. researchers who are at the early career stage. The $50 000 base funding provided to each university goes some way to redressing the imbalance (to little effect in the very large new universities, such as UWS and Edith Cowan); there is a need therefore to reconsider the basis on which small grant allocations are made to universities.

Finally, the reported practice in some larger universities of allocating small grant funding to faculties for distribution on the basis of their having 'earned'

many first named investigators hold other grants as second or third named investigators.

that amount is somewhat disturbing. The consequences of such a practice are twofold:

- Those departments who are best supplied with large grant funds will also receive larger amounts of small grant funds for which they could be presumed to have less need than less well-endowed departments.
- It has been noted that, across the system, the proportion of funding going to social sciences and humanities is typically greater in the small grants scheme than for large grants, because the number of projects in those fields which can be initiated and maintained with only small amounts of funding is greater. Researchers in social sciences and humanities are therefore disadvantaged by such a practice in that it reduces small grants success rates in those disciplines to levels markedly below those in the sciences (for example, as low as 10 per cent in one major university even when allocations were held to approximately $10 000).

Table 3.21 Allocations of 1995 Small Grant Funds to University Groups in Relation to Academic Staff Numbers

University	***$ Allocated (1995)***	***Staff (1994)***[1]	***$/staff***
Group A	15 389 000	11 697	1 316
Group B	7 675 000	8 945	858
Group C	1 462 000	4 956	295
Group D	897 000	3 819	235
Total	**25 423 000**	**29 417**	**864**

1 Excluding casuals. 1994 is the year in which applications are submitted and decisions made re allocations for 1995.

The Impact of Funding Failure

> It's a bit like, well, I think it's as devastating at my end as it is at the other end, because at my end you're expected to get it. And I think at my end it's very much like miscarriages. You know, when your wife has a miscarriage suddenly she finds out that all the people in the street have had miscarriages. And when you miss a grant you find out, these people who've got one, they've missed three, they've gone for four and they don't tell you about the other three until you miss out. For the young people I think it's atrocious. It's absolutely atrocious.

Impact on Projects

Sixty-three of the 266 applications for internal university funding were unsuccessful. Of the 52 applicants who failed at the first attempt to gain any funding for their project, 17.3 percent submitted the application again or elsewhere, in a continuing attempt to gain funding, 15.4 per cent started anyway and 67.3 per cent abandoned the project. Of the seven who failed at the second attempt, four abandoned the project, two submitted again, whilst the one remaining project started anyway. Four applications failed at the third attempt, two were submitted again or elsewhere and the other two were abandoned.

Many of those applying internally indicated that funding was only partial. Some early career researchers noted that they had submitted a careful costing for an internal grant only to find themselves offered as little as half of this, in some cases rendering the project 'non-viable' or leaving the researcher to demonstrate a capacity for magic 'by showing how the project can be carried out with half a set of equipment!'

From the total of 327 unsuccessful applications submitted for external funding by the 413 academics surveyed, 62.7 per cent of the projects were abandoned, 16.5 per cent were submitted again or submitted elsewhere, and 20.8 percent started anyway. Those submitted to the more prestigious sources (Commonwealth competitive grants, including ARC) were somewhat more likely to be resubmitted and submissions to government departments (especially State governments) were least likely to be started anyway (Table 3.22). In the latter case it is probable they were more often submissions in response to a specific contract research opportunity.

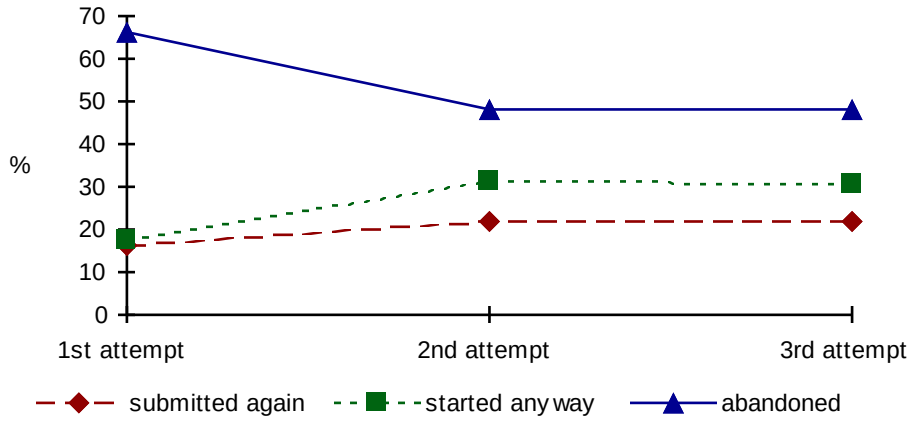
Table 3.22 Action Following Each Failure to Gain Funding for a Project

	Total	***Submitted again/elsewhere***	***Started anyway***	***Abandoned***
Source of funds	***N***	***%***	***%***	***%***
Internal university	63	20.6	14.3	65.1
Small ARC	42	23.8	19.1	57.1
Large ARC	112	17.9	25.9	56.2
C'wealth Comp.	70	17.1	21.4	61.5
C'wealth gov't	24	12.5	12.5	75.0
State gov't	22	13.6	4.6	81.8
Commercial	19	10.5	26.3	63.2
Foundations etc	21	9.5	19.1	71.4
Other (o'seas)	17	11.8	17.7	70.5
Total	**390**	**17.2**	**19.7**	**63.1**

A large proportion of applications which failed to secure external funding at the first attempt (N=273) resulted in the applicant abandoning the project (65.9%), 16.1 per cent submitted again or elsewhere, and 18.0 percent started the project anyway. An increased proportion of applications for projects which failed to be funded at the second attempt (N=35) were resubmitted or started anyway, others were abandoned. Projects which failed to secure funding at the third or later attempt (N=19) were also started anyway or submitted again at an increased level, rather than abandoned. It would appear that people who are committed to their project to the extent that they do not abandon it after an initial funding failure will continue to search for funding, and/or will start on the project anyway, albeit sometimes in a condensed form (Figure 3.1).

> If I get it, I get it, if I don't, and I'm interested in that project, I just go ahead and do it. Because of that, I must say, it's impossible to do any big project, you can only do a small one, you know, half a day a week type thing.

Figure 3.1 Changing Pattern of Response to Successive Funding Failures (Both Internal and External)



Impact on People

The majority of large grant applicants from four universities surveyed by Wood et al. (1992) following failure in the 1991 round indicated their intention to apply again for large grant funds. Sixty-nine per cent of a sample of applicants from three Victorian universities who had been unsuccessful in obtaining a large grant for 1994 had actually applied again the following year, although not necessarily for the same project; many others (successfully) sought small grant funding for the year in which they failed, while others sought funding from alternative sources (Over 1995b). These proportions are somewhat higher than those for our sample of early

career researchers, suggesting that early career researchers, more than established academics, are disheartened by funding failure of this type.

> I think people also feel a bit burnt out…they've all tried so hard and they seem to get hit on the head all the time…I suppose after a while people don't want to keep trying.

Those who failed to obtain external funding tended to perceive prospects for developing a research career in Australia more negatively than others (Table 3.23). Academics who had applied for external funding and failed also expressed greater lack of faith in the proposal assessment system[77] and reported significantly greater levels of burnout after repeated failure to get funding[78] than did those who were successful. Failure to secure internal funding, however, did not have the same negative impacts.

Table 3.23 Success in Funding and Beliefs about Prospects for Research

	N	*Belief about prospects for research**	
		good	***poor***
Academics			
all	232	59.5	40.5
Internal applicants			
successful	75	70.7	29.3
unsuccessful	27	77.8	22.2
External applicants			
successful	95	69.5	30.5
unsuccessful	36	30.6	69.4

* *Row %*

Sixteen of the 61 persons who responded to the media advertisement stated that they were either prevented from or limited in doing research by the lack of availability of funding. Nine complained that they were prevented or limited in research by their lack of eligibility for funding, e.g. by not being employed. Eight complained that they were hampered by both lack of eligibility to apply and lack of availability of funding.

For some graduates, the result of ineligibility to apply for funding, or failure to secure funding (particularly to cover salaries), was an overall feeling of uncertainty and frustration:

---

[77] Mean ratings: unsuccessful—3.5, successful—2.9; t=2.22, p=.03.

[78] Mean ratings: unsuccessful—2.7, successful—1.9; t=3.78, p<.001.

> You cannot get a grant to continue your research and have no prospects of getting one, all this despite being a highly trained professional with an international reputation in your field. I just want to get on and conduct some serious sustained research, to do what I have been trained to do and enrich the intellectual and cultural life of this country in the process. I could be hard at it right now, but I'm still marking time, trying to make ends meet. In my opinion research has now returned to the Victorian [era] where the only people who are able to pursue their research interests are those with a private income or who are supported by someone else. This is not a situation which is either desirable, healthy or equitable.

Failure to secure funding can result in a sense of 'waste'; wasted time preparing unsuccessful applications, wasted research when projects are abandoned or become obsolete:

> I have applied for funding of one project only. This project was well prepared and the project leader was well recognised by other researchers in the field. However, the applications to both funding bodies were unsuccessful. Given the many hours required to prepare a Fellowship application, I am not prepared to apply again for external funding of my work, unless I am certain of employment for an initial period of time, say 2 years, under an existing grant while I apply for other funding.

For others, the experience results in feelings of despondency, inadequacy, or self-doubt. From a recent PhD graduate:

> Presently, I am in a state of 'learned helplessness'. I remain enthusiastic about doing research, but find it difficult to get the funds... Because I haven't been published sufficiently, I am not seen as a research viability. I put a lot of effort into preparing lectures. I never give the same lecture twice... Many of my colleagues advise me that this is a waste of time. However I think it's a form of avoidance behaviour because it provides me with some form of intellectual gratification. Now I have developed a new pathology which is a chronic fear of negative appraisal.

And from a successful researcher / Head of Department:

> I've never really recovered from one bad [assessor's] report I had, recovered emotionally from a time when someone chose to say of me things like, oh, you know, disparaging things like 'an inveterate conference goer'.

Experienced researchers do, however, emphasise the importance of resilience in the face of knockbacks:

> My first foray into external funding was actually brought about by what I considered to be unfair treatment in the consideration of an

> internal grant application.... The actual proposal, in a different form, ended up being funded by the NH&MRC. That was a very powerful learning experience because it demonstrated to me... that I was more competitive in an external environment than I had imagined... I'd had a previously unsuccessful NH&MRC application... and that absolutely deterred me for a year or two.
>
> I haven't taken too much notice of rejections because I talked to somebody at Monash who said, 'Oh well, I allow an article to get rejected five times before I change it'.

—willingness to accept criticism:

> I can think of at least three, four occasions where suggestions by reviewers actually led to improvements in the design of studies or introduced entirely new experiments which I thought was very good, very well conceived. I mean, I have to add that not all my applications were successful. Arguments that came there were to a large extent reasonable, and in a way that I could accept them.

—and perseverance:

> I think a lot of people think 'Oh nobody else gets rejected, you know I've been rejected, this is the worst thing that's ever happened to me. This is my opus magnum.' And I think it takes a lot of building up of self confidence and so don't look at the comments for two weeks and then you sort of be brave, look at them, then go back and have another go. But perseverance. And that's the sort of thing that I have done myself.

Early career researchers express the positive reinforcement which flows from success:

> I have applied for a large grant from the ARC. I have just got through the first round of that—I am feeling—I know it is a lottery but it is nice to have got through the first round, you feel like it was worth the effort of putting the grant proposal together.

How Much Funding Do Early Career Researchers Need?

The ARC has adopted a policy, guided by its Chair, of maintaining the level of funding to successful applicants which is deemed necessary to ensure research of international standard, rather than to compromise standards in an attempt to spread the funding over more projects. That amount is currently set at around $50,000 per year, and as a consequence, the proportion of applicants to the scheme who succeed in gaining support has been reduced. Stokes (1993) argues that this policy still ensures that the needs of Australia's productive researchers are being met, in that just one-sixth of Australia's researchers are responsible for two-thirds of research output (i.e.

publications), and between the ARC and the NH&MRC, approximately one-sixth of Australia's academics are being supported in their research. Apart from not allowing for multiple holding of grants, his analysis begs the question of whether more of Australia's academics would be more productive if they were successful in obtaining research funding. Added pressure will come as more of those in new universities and new disciplines obtain research qualifications and respond further to the expectation that they will build a research profile, while at the same time managers are increasingly insisting that new staff must have a research profile already established at the time of recruitment.

Project Funding Levels in the ARC Large Grants Scheme

The minimum level of project funding allocated through the ARC Large Grants Scheme is currently $30 000 for experimental and applied sciences and $20 000 for theoretical physics, mathematics, social sciences and humanities. Applications which fall below funding level once an appropriate budget for them has been determined are automatically rejected, with the recommendation that they be submitted to the small grants scheme.

Overall funding allocated for the 1995 projects which were examined averaged $51 099 for the first year, $45 594 for the second, and $40 256 for the third—$136 949 in total. Funding requested for Year 1 amounted to an average of $78 059 for funded projects and $63 919 for unfunded projects; for Year 2, requests were for $68 988 (funded projects) and $48 376 (unfunded) and for Year 3, average amounts requested were $63 546 (funded projects) and $41 213 (unfunded). The total amount requested of the system therefore tends to decline over the currency of the projects. Those who were successful in their application had requested, on average, 37.3 per cent more funding than those who were not.[79]

Physicists (in particular) and engineers asked for significantly more money to support their projects than those in social sciences and humanities—a factor which has been recognised in the lower limits on funding set by the ARC for social science and humanities grants. Amounts awarded also differed across disciplines.[80] The proportion of requested funding which was allocated was common across disciplines at around 68.4 per cent (Table 3.24).

Table 3.24 Proportion of Requested Funding Allocated for Successful 1995 Grants

---

79 $t=4.21$, $p<.001$

80 Requests: $F=22.80$, $df=4,483$, $p<.001$; Allocations: $F=6.95$, $df=4,105$, $p<.001$

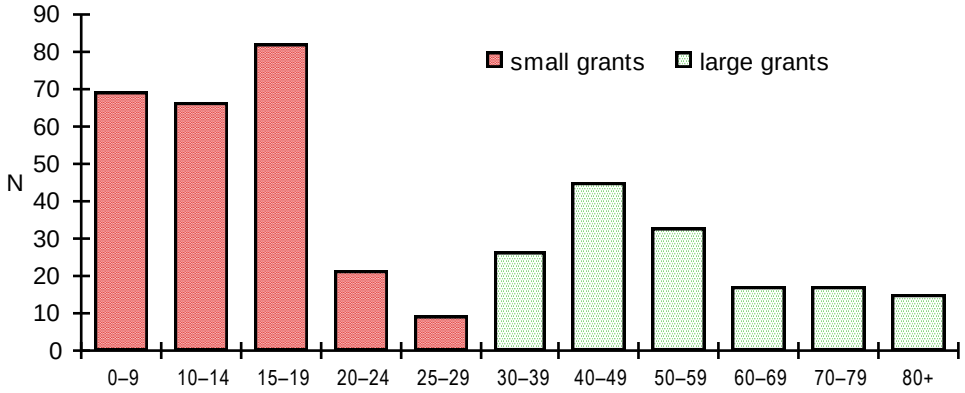
Discipline	*No: all*	*$requested: all projects*	*$requested: funded app.*	*$allocated: funded app.*	*req/alloc.%: funded app.*
Physics	96	233 394	318 315	196 330	64.6
Engineering	151	181 963	207 395	141 500	69.7
Psychology	142	130 194	169 877	114 353	68.3
History	76	127 784	158 763	93 211	70.1
SocS/Health	23	135 912	185 563	135 540	70.4
Total	**488**	**165 638**	**207 207**	**136 949**	**68.4**

Given that the average funding awarded is around 70 per cent of budget, it can be expected that an applicant will need to be seeking up to 50 per cent over the large grant minimum limits to ensure that their grant does not fall below funding level after panel review. In effect, this means that no one can request funds in the region from the small grant limits to almost 50 per cent above—a region of funding which is particularly relevant to early career researchers who have moved beyond the initial phases of their investigations and who wish to become more established. Approximately 2.4 per cent of applications in the six disciplines studied for the years 1992–1994 were unsuccessful because they fell 'below funding level'.

Project Funding Levels in the ARC Small Grants Scheme

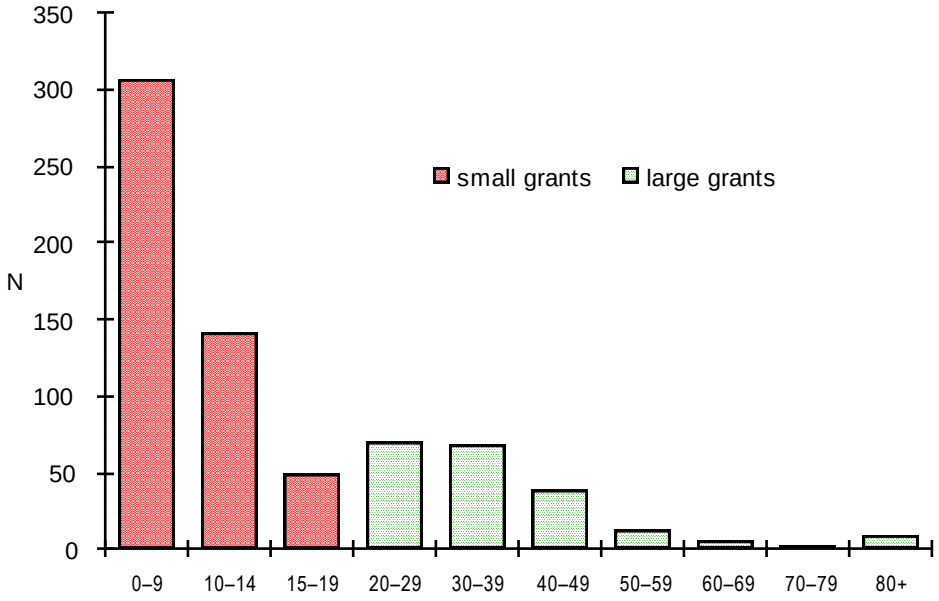
Although the upper limits of small grants are set at $20 000 and $30 000, the average size of grant allocated is much smaller, at $12 118 across all disciplines in 1995. Allocations ranged from $12 613 in Group A universities to $10 193 in Group D. There is therefore a significant gap between the upper limits of most ARC small grant awards and the lower limits of a large grant award. A view of allocations under both schemes together in two diverse sample disciplines illustrates the nature of the gap (Figures 3.2 and 3.3): fewer grants are funded in the region of the cut-off between the two schemes. This pattern is especially evident in the sciences.

*Figure 3.2 Allocations of Large and Small Grants of Various Amounts in Engineering**



* *Source: DEET Research Branch, 1995*

*Figure 3.3 Allocations of Large and Small Grants of Various Amounts in Social Science and Humanities**



* *Source: DEET Research Branch, 1995*

Estimates of Need by Early Career Researchers

Early career academics were asked to estimate the amount of annual funding they would need to maintain their research program, in the following categories: money needed for equipment now, and then for equipment per year; money for consumables and travel; and, money for personnel. Estimates of need in all categories varied enormously by discipline (as would be expected): engineering had the highest annual cost and history the lowest (Table 3.25).

Table 3.25 Financial Needs of Early Career Academics by Discipline

Discipline*	***N***	***Equipment $ now***	***Equipment $ per year***	***Consumables $ per year***	***Personnel $ per year***	***Total $ per year***
Physics	22	22 286	13 262	5 786	30 143	49 191
Engineering	55	46 404	14 598	7 221	31 078	52 019
Psychology	60	6 075	1 805	2 783	16 030	20 573
History	24	1 088	206	3 959	5 412	9 575
Nursing	89	5 025	3 820	3 452	17 670	24 962
Social work	32	4 711	2 103	2 789	14 368	19 260

* *All disciplinary differences are significant at p<.001.*

The estimated needs for funding would appear to put a large proportion of early career researchers into that grey area between the maximum allowable (or achievable) under a small grant, and the minimum amount needed for a large grant request, especially in the social sciences and humanities areas.

Overview

Early career academics experience two crucial periods when attempting to access grants to fund a research program. The first period occurs when the researcher is commencing their career. Many universities and departments in Australia offer financial, structural and managerial support in one form or another to beginning researchers and/or to those who might otherwise fit the description of early career. The availability of such support encourages application for and successful receipt of internal funding. Failure to secure such funding does not diminish a researcher's beliefs in the potential for a research career.

Early career academics wishing to procure external funding at this beginning stage can do so, on their own, from many government, industry and community bodies. Academics in those disciplines which have access to such funds clearly experience much success at this level. However, when accessing non–academic based external funding the academic must take care to ensure that the research outcomes are evidenced in a scholarly contribution to their track record if they wish to gain the benefits of increased status for the future. Rather than securing alternate funding, or

even as well as, the best strategy for early career academics wishing to procure large ARC funding is to attach themselves to an established researcher of not less than professorial status, thus solving the problem of their relative anonymity in the academic community.

Those early career academics in new universities, and those undertaking innovative and/or multidisciplinary research, or research in a limited field, often lack access to appropriate established researchers. This restricts opportunities for a collaborative entry into the funding cycle. Women have particular difficulties applying for funding due, in part, to their more limited access to secure, uninterrupted employment. However, women who do apply are as successful at gaining funding as their male colleagues. Unfortunately lack of success in gaining external funding at this stage can have a catastrophic effect upon the researcher's beliefs about their future career prospects.

A second, and more difficult hurdle confronts the academic when they wish to graduate to being independently funded by the ARC from a position of either dependency on an established researcher, or independent research funded by other agencies. This time typically occurs when the researcher has either exhausted internal university funding sources or the demands of their work has moved beyond the funding limits of such schemes. Such a progression is not guaranteed. Although too established to continue to qualify for internal support, the researcher is still a novice according to ARC criteria. Researchers and projects which have not had previous ARC support are less likely to secure ARC funding, whilst those who have been successfully funded by other external sources may be considered to lack legitimacy. Achieving a record of independent publishing sufficient enough to secure large ARC funds can pose particular problems at this stage for those who have previously attached themselves to large research teams, and those who have followed alternate career/funding paths. Individual persistence, commitment and resilience, rather than university departmental support, are needed to overcome this hurdle.

Entry to the funding cycle via the ARC small grants scheme, whilst proving a relatively successful avenue for independent early career academics, becomes problematic for researchers in disciplines which require larger levels of funding. Conversely, those in disciplines which require only lower levels of funding are often unable access small ARC funds due to the lack of flow on benefits from large ARC funds. This situation is replicated in the new universities where the relative absence of large ARC funding limits access to small ARC funds, ironically in universities which have a higher proportion of academics who can potentially be defined as early career. In the more established universities the early career academics may have to openly compete with established researchers for access to small ARC funds.

Overall, the beginning researcher is relatively well catered for by internal university schemes for all disciplines and by external funding bodies

(excluding ARC) for more applied disciplines. Access is equitable and levels of success are relatively high. The greater problem exists for those researchers who are ready to 'go it alone' in basic research. The shift to independent research may require funding at a level which is available through neither the small nor the large ARC schemes and the researcher's track record may not conform to expectations. Although these researchers are characterised by a determination and commitment to research, support and recognition needs to be given to their needs at this crucial stage of their career.

4

Defining 'Early Career' in Research

The various ARC discipline review panels had referred to the older age of grant recipients as the prime indicator giving rise to their concern about difficulties faced by early investigators, but the introduction of proactive strategies to ensure that the needs of promising early career researchers are met requires that one can identify the target population. Given the variety and complexity of paths to a research career, this is not a simple task. Set any cross-disciplinary group of academics, such as a University Research Committee, the task of determining eligibility for an 'early career' award, and an argument is sure to erupt! Early in the project, we were criticised by a young(ish) physicist for daring to imply in our media advertisement that 'early career' included only those who had been awarded their PhD since 1990. At the same time, some of those in the newer or professionally oriented disciplines such as nursing and social work were challenging our criterion of having a PhD as a starting point to a research career: some failed to see its relevance in a practice oriented discipline, others had many years of research and professional experience before undertaking PhD studies. Thus there were actively researching professors and/or heads of schools who could be classified as early career, if the principal criterion was the recency of obtaining a research qualification.

Criteria for Grants Targeted to 'New Researchers'

To start the search for an operational definition of 'early career', we examined the criteria set by various granting bodies who offer support to 'new researchers' of various kinds. This included both those internal to the universities and external funding agencies.

Criteria Set by University Granting Schemes

Almost all universities in Australia offer financial support to beginning or early career academics, variously defined, through their internally funded research granting schemes. Many avoid defining the terms used, such as 'new researcher', preferring to leave it to the researcher to justify inclusion, and/or relying on local knowledge of the systems and people involved. As a starting point to developing criteria for defining 'early career', we reviewed current practice within those universities which elaborated their terms.

Where eligibility was restricted to those who might be considered 'beginning' or ‘early career’ researchers, the criteria fell into four groups covering research qualifications, research experience, career establishment

and publication record. Applicants applying for seed grants, grants for new researchers or grants for new staff in various universities might therefore be requested to meet one or more of the following criteria:

- Research qualifications:
  - without a postgraduate research degree;
  - within 5 years post PhD;
  - within 5 years of the most recent higher degree;
  - within 5 years of the first postgraduate degree.
- Research experience:
  - no external competitive grant funding;
  - no grants in last 3-5 years;
  - no previous grant over $10 000/$15 000;
  - no substantial grant/contract in past 3 years;
  - no external competitive grant funding in past 3 years;
  - no external peer-reviewed grants as chief investigator in past 3 years;
  - new research area/initiative;
  - re-directing research;
  - researching in areas without a strong research tradition, such as nursing, tourism.
- Career establishment:
  - within the first 5 years of establishing a research career;
  - new to academia, e.g. within 3, 4 or 5 years of first appointment;
  - re-establishing a research career after a break (related to the demands of family or, in some cases, teaching or administration);
  - preparatory research leading to external grant application;
  - new research group (less than two years old);
  - below professorial level.
- Publication record:
  - sparse/no/minimum publication record;
  - without competitive publication record, i.e. sufficient for large grant;
  - research will serve to establish publication record.

To gain an idea of those attributes which signify that one may have moved beyond early career, the application criteria set by those universities which offered grants designated specifically and only as being for experienced researchers were considered. Grants offered for established researchers typically provided larger amounts of funding, so that those accessing them were presumed to need greater experience and skills in research and in project management than for smaller grants. Criteria included:

- substantial publication record for previous 5 years;
- having 5-10 publications in previous 5 years;
- proven record of performance with earlier grants;
- must also be applying for external funds;

- have submitted ARC large grant application;
- narrowly missed funding in the ARC large grants scheme;
- success in previous grants (including small);
- proven research performance within faculty;
- have research degree; and/or
- postdoctoral groups only.

The application of criteria with rigid numerical limits in determining who can receive internally funded grants can be seen to be counterproductive to the purpose of the university in awarding them. It would not be desirable, for example, to stifle achievement by rewarding limited performance, e.g. no more than 5 publications; to encourage switching from one field to another to establish a new direction; or, to cut off researchers by applying a 2 or 3 year limit on applications for funding just as their work is about to bear fruit (as some universities do). A definition of early career, then, may require some flexibility if it is to be career enhancing rather than limiting.

Criteria Set by External Funding Agencies

Only five granting agencies were identified which specifically designated some granting schemes as being available just for early career researchers; all were health related. Researchers who might apply to these bodies were typically defined by what they were not, for example:

- have not previously held an external, competitive, health related research grant;
- have not previously submitted to the NH&MRC;
- young/new researchers not successful in obtaining NH&MRC grants;
- never having been a first principal investigator on a successful NH&MRC grant or other grant worth $20 000 or more; and/or
- clinical researchers in the first two years of employment.

One agency specifically indicated that a research and publication record was not required. One of the five sought information concerning the track record of a sponsor and the sponsoring organisation. Other than the obvious issue of relevance of the proposed project to the goals of the agency, qualities sought in applications by some or all of the five included:

- sufficient methodological rigour that an outcome can reasonably be expected;
- theoretical and methodological innovation; and/or
- incorporation of those who will benefit from the project into the research process.

Reaching a Consensus on Attributes

From the criteria set by university committees and others one can draw conclusions about some attributes which they appear to assume are necessary for researchers to be able to compete effectively for externally funded competitive grants:

- an applicant will require not only a research degree (probably a doctorate), but as much as 5 years of postdoctoral experience;
- it takes up to 5 years of internal support before someone is likely to become competitive externally;
- experience must be demonstrated specifically in the area of research for which application is being made;
- there are periods during one's academic career where research will not be a first priority, or alternatively, when one must make a change in one's research direction: a lead time is then needed to re-establish oneself in research.

A comprehensive definition of early career, based on the experience encapsulated in university internal granting guidelines in particular, but reinforced by other viewpoints, is therefore likely to include references to any or all of:

- level and recency of research qualifications;
- level and recency of academic appointment;
- recency and/or continuity of research experience/activity;
- extent of publication record;
- previous grant history; and/or
- career purpose in seeking the grant.

While there is a strong level of agreement about these elements, the task of arriving at a consensus about a definition is enormously complicated by the variety of levels and combinations in which these elements can be found. There is no agreed weighting which can be attached to any one element, and indeed, if there were, it would likely vary from discipline to discipline.

Early Career from the Researcher's Perspective

Academics surveyed were asked to identify themselves as being either 'early career' or 'established' with regard to research, and to indicate why they had

identified that way. As was intended in setting selection guidelines for the sample, the majority of those surveyed (84%) did regard themselves as early career rather than established. The reasons given, in order of frequency, were focused around:

- lack of experience, competence and/or confidence to undertake independent projects; still defining interests, establishing niche (42.6%);
- not yet completed or only recently completed PhD, typically in the last year or two (25.2%);
- limited numbers of publications, or lack of a monograph (18.5%);
- newly appointed to a university, including change from CAE (5.1%);
- lack of previous grants (3.1%).

The 16 per cent of respondents who regarded themselves as 'experienced' (almost all of whom were considered still 'early' by the project team) typically did so on the basis of their having publications (rationale given ranging from a single publication to 'extensive' publications) or, to a lesser extent, because they had been researching for many years or involved in a large project. A number of these latter respondents had recently acquired PhD qualifications—described by one, for example, as being to 'top off' what he had been doing for many years.

Where explicit criteria were provided by those describing themselves as 'early', they were therefore found to be generally consistent with those typically employed by university grants committees for 'new researchers', i.e. based on qualifications, publications, period of employment in a university and/or experience gained through having previous grants. The first and largest group of descriptive classifications, referring to lack of experience, competence and/or confidence to undertake independent projects, did not suggest anything which is easily observed or quantified for use as a criterion. Anyone so describing themselves would nevertheless be unlikely to be applying to external funding agencies for a research grant—even one designated for 'early investigators': they were more likely to be still undertaking a research degree, or at most, applying for internal university funds for 'new researchers'. There was no need therefore to attempt to operationalise this category.

It was clear from both the negotiating process with departments when attempting to delineate the sample for the survey, and from the some of the responses received, that there is a significant group of academics in our universities who are at a far more preliminary stage in research development than those who were the subject of concern for the various ARC discipline review panels. These might be more appropriately referred to as 'beginning researchers' rather than 'early career'. It was also apparent, from the survey responses received, that there are those who might well be termed 'stagnant', being those who were qualified some time ago and who have undertaken research projects in the past, but who are not currently doing anything more

than 'dabbling', despite having no less (current) opportunity to do so than their colleagues. They are definable (and able to be distinguished from 'promising' early career researchers) in that they have not produced research publications, despite having had a PhD for 10 years or more and a record of earlier (usually internal) grants and/or much earlier publications. 'Stagnant' researchers are particularly likely to cite teaching loads, administrative loads and/or a college background as a factor in their lack of performance (note: this is not to say that all those who indicated these as problems are in this category). Pressured to apply for grants under the 'academic imperative' of performance based funding or promotion which is now being applied, such researchers can pose a particular risk to granting schemes by producing a credible application but with little performance to follow.

Early Career from the Perspective of ARC Funding

The kinds of researchers who would be categorised as early career by university schemes, by and large, are not awarded ARC small grants and do not even apply for ARC large grants. In terms of what could be discerned from the application forms, those characteristics which distinguish between successful and unsuccessful applicants (other than the quality of their research proposal and output) therefore provide points for consideration for a working definition of 'early career' which are appropriate at the level of the ARC. Some further pointers come from responses of surveyed early career researchers who had applied to ARC for funds. These are outlined below:

- The data presented earlier strongly suggested that anyone other than a professor (including even those at associate professor level) is less likely to be successful when it comes to applying for ARC funding, with the partial exception of those in research only positions. Anyone in a regular (teaching and research) Level A, B, C or D academic appointment might therefore be considered to be 'early career', in ARC terms.
- With only rare exceptions, ARC large grants were awarded only to those with a doctorate. Similarly, a small proportion only of ARC small grants went to applicants without a doctorate (assuming those listed as professors or associate professors, by and large, have doctorates).
- Age, of itself, is not an appropriate criterion. Those under 50 may be disadvantaged, although this varies from year to year. If more of those at younger ages (e.g. under 40) were to apply as sole researchers or team leaders, this conclusion may change also. At most, one might set an upper limit of 50 on those who might be defined as 'early career' for ARC large grants—hardly what most would think of as young!
- Women were not disadvantaged in terms of their relative success (despite a severe gender bias in the constitution of discipline panels), although they were less likely to apply in the first place.

- The majority of ARC applicants have had ARC funding in the past, at least through small grants or as part of a larger team: this gives them no assurance, however, of continued support beyond the first stage in the assessment process.
- Early career researchers typically are successful in applying to the ARC only if they 'piggy-back' onto a successful researcher. Under these conditions, they are not always able to work in their own area of research, to build on their own experience and initiatives and/or establish new/innovative directions in research.

These points lead to the conclusion that, in ARC Large Grant terms, anyone who is under 50 years of age, who is not a professor and who has not previously won a large grant as sole, senior or first-named chief investigator might be eligible for consideration as an early career researcher.

Setting Criteria for a Definition of Early Career

Some of the difficulties inherent in being definitive arise from the variety of settings in which the definition may need to be applied. The definition most appropriate for the ARC large grants scheme, for example, is likely to allow inclusion of some applicants who would be too advanced to fulfil the criteria, say, for a university 'early career' research award. Criteria which might be considered are discussed, and a compromise definition derived for the current purpose.

Qualification as a Criterion

The doctorate is clearly the established (necessary but not sufficient) basis for a promising research career, and there is little point in seeking high level research funding without a doctoral qualification, even in those fields (such as social studies) where more emphasis at the grass roots university level is likely to be on experience, excellence and relevance in practice rather than on more theoretically oriented research. Those without a doctorate (or an extensive reputation built through publishing) are therefore likely to be regarded as beginners, not yet the concern of the ARC. Whereas it was possible in the past to gain recognition as an established researcher through publications alone (especially in the humanities), an early career researcher would be unlikely to do so in the current environment where there is a surfeit of PhD graduates seeking to find their niche, make their mark and gain competitive funding.

The relevance of the recency with which the qualification was gained is a more complex issue. Disciplinary differences in research traditions and in opportunities play a role, as does the issue of whether the PhD was undertaken as a starting point in a research career, or to 'top off' many years experience in undertaking research (e.g. in industry, or the community), in

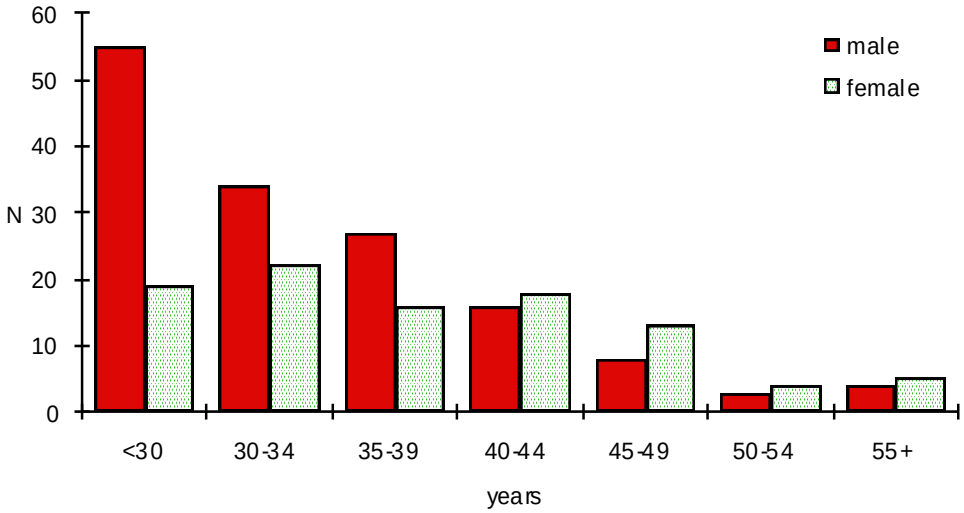
order to gain academic credibility. While five years after qualification might seem a reasonable period in which to establish a research profile in the context of a 'normal' academic career, this is unlikely to be sufficient where there has been a significant history of short term fellowships and contracts in different sites, or a career break, such as that experienced by those taking industry employment or by women of child-bearing age. Furthermore, a profile developed (from 'scratch') over five years only, in any discipline, is unlikely to be sufficient to win ARC large grant funding (though it may be well regarded in other circles). Thus, those for whom undertaking a PhD marked the start of their academic career (i.e. it preceded any full time employment as an academic), could often be considered to be early career for more than five years after obtaining that qualification, but if commencing and gaining the PhD occurred some years after a period of employment as an academic, the period allowable may well be less.

Age as a Criterion

The term 'young' is typically used interchangeably with 'new' in attempting to describe those in need of special consideration, yet it was notable that age was almost never used as an explicit criterion either by granting bodies or by researchers to describe 'early career'. But as one of the recent PhD graduates, commenting on the lack of encouragement she had received, remarked: 'Although I'm a new researcher I'm quite elderly and people have high expectations about previous research and publications'.

If the award of PhD is but the starting point of a research career, then an examination of the ages at which these academics gained their PhD clearly demonstrates the inappropriateness of age as a criterion—particularly for female academics. The mean age of the 143 male academics at completion of their PhD was 33.2 years, but the 97 females were significantly older at a mean age of 38.3 years (Figure 4.1).

Figure 4.1 Age at Completion of PhD for a Sample of Male and Female Early Career Academic Researchers



Prior to commencing their PhD candidature, 62.3 per cent of the group of recent PhD graduates surveyed (including those not working as academics) had worked full time and 26.6 per cent had worked part time, with just 10.7 per cent having progressed directly through university study without regular employment. The majority (81.5%) of academics surveyed had worked on a full-time or long term basis other than as a university academic at some stage in their career path. This was particularly so for those in nursing (95.4%) and social work (90.6%), but less so for engineering (64.7%) and physics (65.0%). For only a small proportion of academics, therefore, is it to be expected that being early career as an academic will mean being young.

The mean number of years between completion of undergraduate study and the commencement of PhD studies for those responding to the survey of early career academics was 9.8 years, a figure which varied significantly by discipline, with those in the 'pure' science of physics being more likely to go straight through to an academic career and those in social work standing out as being much older when undertaking PhD studies (Table 4.1). Indeed, many of those who were surveyed in nursing (especially)[81] and social work would have undertaken even their initial degrees as mature age students.

Table 4.1 Average Lapse of Years Between Completion of First Degree and Commencement of PhD Candidature for Each of Six Discipline Groups

---

81 It is likely that the age of commencement of PhD studies for nursing will reduce as those currently employed as nursing academics complete the upgrading of their qualifications and/or are replaced by those whose initial qualification to become a nurse was a bachelor degree rather than hospital based training. Several heads of departments in new discplines from former CAEs spoke of their insistence, now, that new staff must already have a research track record to qualify for positions. This will also contribute to reducing the overall age levels at which academics obtain their PhDs.

Discipline	*N*	*Years*
Physics	22	3.3
Engineering	49	6.6
Psychology	54	8.0
History	22	7.4
Nursing/health	61	9.1
Social work	26	14.2
Total	**234**	**9.8**

Those who graduate with PhD and commence a research career in their mid-twenties are therefore very much in a minority in the academic community. To have acquired a PhD early on and to have gone straight into an academic career has been described as a typically male career path:

> In some ways it's a very male career because I had a PhD at 25 and sort of a lectureship at 26, so in many ways it looks like a real male career … so I had the PhD and the job before I had children.

The interaction of age distribution with gender and discipline in academic researchers is a further compounding factor. Those who have commenced PhD studies and/or an academic career later in life might well be considered to have a promising research career ahead despite being older, particularly if they are working in the humanities or social sciences, and should not be dismissed because of age. Similarly, someone who is young is likely to be early career, but if they have gone straight from school to university to academic research and a series of research fellowships, may not necessarily be so. As a general conclusion, then, age is an inappropriate criterion to use in defining early career, although it will always need to be considered in so far as it has a significant interaction with other criteria (especially in association with discipline). If a limit is to be applied, it should be seen more as a recognition that there is a shorter future ahead, rather than that there has been a longer past.

Gender as a Criterion

Within the grants allocations systems generally there is no evidence at all of a pattern of bias against women, although it does appear to exist in a small number of universities. The apparent disadvantage experienced by women appears to be more to do with their employment status, their disciplinary background, and sometimes their lack of personal confidence. These factors influence the extent to which they apply for grants, rather than their success once an application has been made. Even with regard to giving consideration for family responsibilities and career interruption, there was evidence that men as well as women were affected by these issues, though to a lesser extent. Gender does interact with other factors, for example as shown above, the age at which one qualifies with PhD, also with publication output. Thus,

while it is not a criterion on its own, a cognisance of it may moderate consideration of other criteria.

Period of Employment in an Academic Research Setting as a Criterion

Most universities make special allowance in their internal granting schemes for staff who have been recently appointed. It is widely recognised that time is needed to establish oneself as an academic researcher, even if the PhD has already been completed, and maybe even after a research career in industry. In some fields, a shift from one university to another is sufficient to retard research output, until a new research field is established.

A 'five year program' from first appointment as an academic appears to have achieved wide consensus as a minimum to become sufficiently established to hope to be able to even start to successfully tackle external competitive grants. One researcher who had moved beyond this period, observing the behaviour of some less experienced colleagues, described it thus:

> If you have an idea, you gain modest [internal] support for it. That has output, then you might go for a small ARC university support. You have outputs from that and then you can go more externally, for instance large ARC or RADGAC or NH&MRC. This is a five year program, it is not possible to do it in less than that. People are too impatient. They set themselves tasks that have a high risk of failure. They fail and then they become demoralised.

Those who are within a few years of that five year period may therefore be justifiably considered early career (particularly in ARC terms). The actual number of years might be moderated by their level of experience more generally when they started their academic appointment. It might also be moderated if that period has involved a number of short term appointments in different locations, and there has been less than, say, two or three years spent in the current location. It should not be moderated on whether it was part time or full time employment, unless the part time status was such that it prohibited access to research resources in the place of employment.

Are 'Postdocs' Early Career?

Those employed in research only positions in universities, at all levels from postdoctoral fellow to research fellow, senior research fellow and reader, are clearly more successful than teaching-and-research academics at equivalent levels of appointment when it comes to gaining ARC funding for research, and those from research fellow up are more successful than academics in general. Postdoctoral fellows who were surveyed were found to have greater publication output than early career teaching and research academics at all levels of appointment, including professors: therefore as a group, they clearly do not have a problem in presenting a convincing track record. Those on research fellowships do, however, experience significant insecurity of

appointment, particularly at the postdoctoral level. Some postdoctoral fellows go on to a second, third or even a fourth fellowship at that level in order to maintain their research career. At the postdoctoral fellowship level also, in the sciences especially, it is quite possible that the fellow has not yet initiated his or her own direction in research.

As a consequence of their relative insecurity and lack of independence, it was considered that postdoctoral fellows should still be considered 'early career', to a maximum of five years as fellows in any setting(s) where they can undertake consistent research, but that those who have been research fellows and senior research fellows should not.

The Issue of Career Interruption

The issue of career interruption is a difficult one to monitor and for which to determine criteria. What should be allowed as reasons for interruption? There is little argument with the claims of those (usually women) who have taken time out to have children and/or to raise their family. Those who have taken time out to work in non-academic settings may have a legitimate claim, though there may be a reasonable expectation that they could have been building their research profile in that other position, albeit at a reduced rate and for some with the problem that their work is not allowed to be published. As a recent PhD graduate noted:

> Without wishing to appear immodest I am a very successful scientist [having recently been the sole recipient of a $156 000 research grant from the UK] and was trained at the community's expense but I am being forced out of the system. And people wonder why women don't choose careers in science!! Research science offers men very few prospects in the long term; it offers women virtually none if they wish to actively parent.

Where difficulties are more likely to arise is when an academic wishes to claim interruption to their research career because they have spent time with a strong teaching focus (either by choice or by necessity); they have been filling a special administrative role (such as head of department); or they have been establishing new curricula or courses. It was notable from our surveys that some who carried these kinds of loads still managed to pursue their research, although sometimes at a reduced level (referred to by one discipline panel chair as 'retarded' researchers).

Those who wish to claim the latter reasons, or for that matter any reason as career interruption, would need to establish that they had a career which was interrupted, that is, that they were actively establishing (or had established) a research profile before their career was interrupted. If this is not the case, e.g. they had just completed their PhD, then they are in a similar position to any other new researcher, with allowances being made only with respect to their date of qualification, except that they will need to spend perhaps a year catching up with developments in their field. If they were actively

researching prior to the interruption, it should be possible to demonstrate that was so, for example by providing evidence of a track record over, say, a five year period which either precedes a just terminated interruption, or which spans a more recent interruption. Following the interruption, it might be expected that the researcher would need a year to re-acquaint themselves with their field, in which case no publications might be expected to result from that period. In either case, it will be necessary to allow for publication delays when considering which five year period to assess. If it is more than five years since the interruption occurred, the researcher is in no worse position that any other academic commencing a career five years ago. Those who claim career interruption, therefore, need simply be asked (a) the period of interruption, (b) the reason for it, and (c) to provide a profile of their research output resulting from their most recent five year period of research activity, whenever that was.

Academic Status as a Criterion

It is to be expected that those employed at Level A in an academic setting should be regarded as early career. Their actual situation with regard to opportunities to research and publish vary enormously across the system. Some are on three year appointments or longer and are given 'honeymoon' periods to allow them time to develop their teaching while maintaining their research. Others are employed on short term contracts and are fully exploited for their capacity to carry a full teaching load with no real expectation that they will maintain or build their research profile—'we just treat it as a purely temporary position'. Those at the more senior levels of appointment, at Level C or D, face a different situation: more mature as teachers, they typically carry the principal burden for curriculum and course design and administration in their departments. Those who seek to build or maintain a research profile under these circumstances may also deserve special consideration.

From the point of view of who is successful in gaining ARC large grants, it is clearly not reasonable to exclude anyone from being categorised as early career on the basis of an appointment below that of professor or its equivalent, unless that appointment is research only (such as Research Fellow or Reader).

Institutional Base as a Consideration

Academics from former CAEs are inclined to cite their years in a teaching only institution as reason to be considered as early career in terms of research. Given the period that has (in most cases) elapsed since amalgamation into the university sector, it can be argued that these academics have had as long in a university environment as any younger/newer appointees and, indeed, those who have been there since

CAE days should find teaching less onerous in terms of required preparation time than new appointees. Their universities are, however, quite strongly disadvantaged in availability of research infrastructure including research equipment, space and library resources, by comparison with more traditional universities (NBEET 1993). In addition, their postgraduate research students are severely disadvantaged in terms of resources likely to be available to them, limiting the contribution they might make to the research development of the institution (Gallagher 1993). Over time, with the increased and proportionally higher application of discretionary funds to meeting research infrastructure needs in the newer universities, this situation might be improved, although the imbalance is never likely to be fully overcome in that a research base is needed to earn research funding which will allow for the improvement of the research base (through the 'flow-on' benefits which come from research earnings). The distribution of large and small grant incomes per staff member in different university groupings is clear illustration that the odds are against those in the newer institutions.

Thus, while *former* involvement in a teaching only institution is not a relevant factor in determining whether someone qualifies as early career, it may well be relevant to give some consideration to their institutional base if they are *currently* employed in a former teaching only institution. Indeed, those who can rise above disadvantage to come near to those who achieve excellence from a more privileged base could be considered likely to achieve with at least equal excellence, given equivalent support.

The Research Track Record as a Criterion

Publications

Rather than take a prolific record of research output as an indicator that a researcher should no longer be viewed as early career—which, as has been suggested above, may serve to penalise a promising early career researcher—it would be more beneficial to consider the track record as a measure of the level of motivation of the researcher and their capacity to complete research to the point of dissemination. It was clear from the responses of the 1993 PhD graduates, that most candidates will publish in some form during or soon after completion of their PhD. If any allowance is to be made for those who might be early career, it should perhaps be for the type of output that is recorded. In the early years of an academic career, it is likely that a researcher will approach local rather than international journals, and that they will focus more on conference presentations than on refereed articles. Those who have come to academia from other employment may have produced reports or patents rather than books and articles, while some of those coming from industry or who have been involved in a CRC face the difficulty that their work is 'commercial in confidence'.

Previous Grants

The usual assumption of internal granting bodies is that those who have had external funding of more than a few thousand dollars are no longer early career. In contrast, our analysis of ARC large grant applicants demonstrated the extent to which all applicants, including those who are unsuccessful, have a record of previous funding. Those without a previous history of ARC funding were significantly less successful in attracting new funding; many of those with previous funding were also unsuccessful. How then should this aspect of track record be considered, in determining whether an applicant can be considered 'early career'?

Given that the accepted approach to gaining a track record in winning grants is to 'piggy back' onto a successful professor or research team, researchers who are endeavouring to establish their own niche in research, to branch out on their own path, may have a record of previous involvement in grants. This does not, however, necessarily mean that they have been directing their own research program, or that they are not early career. Thus, rather than assume that anyone with a record of attaining external funding is not early career, consideration needs to be given to the circumstances under which that funding was obtained. Clearly, if the funding was won as a solo researcher, or as leader of a research team, it should discount any consideration of being early career. Furthermore, if the project for which new funding is being sought is closely related to, or a simple extension of that which was done before, it should be assumed that the researcher is not early career as they have had time to build expertise and a reputation in that particular topic. If the funding was obtained only as a junior member of a team, then it is quite likely that the researcher could be considered to be early career when they submit an application as solo researcher or leader of a research team on a topic which might be related but which is not the same. The particular difficulty in applying such a criterion is in assessing who is leader of the research team: from the information available it might be necessary to deduce this from (a) whether the researcher in question was the most senior person on the team, in terms of academic appointment, (b) their position in the list of chief investigators, and (c) their position in lists of publications resulting from the earlier project.

The Need for a Track Record

If an early career researcher is applying for significant external funding, such as that provided through large ARC grants, it is reasonable to expect that they need to demonstrate having managed previous funding (albeit a small amount) and having produced an outcome from it before being considered eligible to manage a large grant. Thus a track record should still be expected of an early career researcher, but with some moderating consideration given to the nature of that track record.

Assessing Early Career Status

Given what has gone before, it is possible to detail a set of questions which need to be asked if early career status is to be assessed. Almost no piece of information on its own is sufficient to qualify someone as early career. In assessing status for any particular researcher, therefore, discipline panels may need to take a number of factors into account to moderate their judgements, for example, in the light of considerations outlined above. Disciplinary differences in the extent to which certain considerations might apply, for example, may be particularly relevant.

Information Which is Needed

In the light of the discussion above, it is possible to outline information which it would be useful to obtain to ascertain early career status. Almost none is critical in itself, but each is needed in order to moderate the information contained in the others. To give a fairly extreme example, a 50 year old female senior faculty member in Nursing is likely to be of a quite different status in research career terms from a 50 year old male senior faculty member in the Physics department of a pre-1987 university.

The information for each individual investigator involved in a project necessary to ascertain early career status is:

- Research qualification.
- Year in which research qualification was obtained.
- Current place of employment (institutional base).
- Current position, including year and level of appointment.
- Year of first non-casual appointment to an academic institution or research organisation.
- Year of first appointment to other than a casual position in current place of employment.
- Significant periods of absence from a research environment after qualification with PhD— with the period or periods specified by year, and considered not relevant if terminated more than five years ago.
- Number, duration and type of research fellowships which have been held.
- Grants held during past five years, or, where career interruption is being claimed, during the most recent five years of research activity.
- Research output during the past five years, or, where career interruption is being claimed, during or resulting from the most recent five years of research activity.

Additional useful information includes

- Age;
- Gender;

- Discipline.

It would also be appropriate to allow for a brief open-response account of why early career status is being claimed and/or reasons for lack of publications. This could be limited to, say, five lines of text. It can be evaluated in the light of the quantitative information provided above.

Arriving at a Definition

A brief but comprehensive definition which incorporates the majority of the considerations outlined above can be written as:

> *An early career researcher is one who is currently within their first five years of academic or other research-related employment allowing uninterrupted, stable research development following completion of their postgraduate research training.*

5

In Conclusion: Issues and Strategies

There are a number of critical points, or milestones, in the career development of an aspiring academic researcher. Having graduated with PhD (and perhaps with postdoctoral experience), the first major challenge is to secure an academic appointment, particularly one which offers a sufficient degree of security to make it possible to consider undertaking (and being funded for) research, i.e. with a minimum three year contract. The second critical point—perhaps less a point and more a season—follows almost immediately, the stage when the relatively new academic has to grapple with the need to continue their research and build up a research profile while at the same time coping with the demands of their new role as teacher. For many this season may have a second turning, as they gain promotion to the 'middle ranks' and once again have to deal with the heavily competing demands of a combined teaching, research and administrative role. The final critical development occurs at the point when the fledgling researcher wins competitive external funding in their own right—probably after having had to survive the pain of earlier rejection. It is the latter development with which this study has been most concerned. It is with this development in mind that the recommendations to follow are framed.

The Locus of Concern: Beginner, Early Career or Mid Career?

The original title for this project was 'Early Career Academics: Getting Started in Research'. As we progressed into and through the project, however, it became clear that those we would normally consider to be 'beginning researchers'—academics without wide experience, confidence or a track record in research who were endeavouring to 'get started'—were not the most appropriate focus for our concern. There were two reasons for this. Beginning researchers are, by and large, reasonably well catered for within their universities, and the universities see it as their responsibility to ensure that new academics are given a start in funded research. Secondly, those who might in any way be considered 'beginners' would find no place at all in the Australian Research Council project grants funding schemes, at either large or small grants level. The demand for excellence, and the level of competition even at small grants level are such that only those with proven research capacity need apply.

The locus of concern for the ARC is therefore at a later level of career development: it is with those academic researchers who can demonstrate potential through their innovative thinking and thorough project design, but whose track record of grants and of publications which have come from

grants is limited or non-conventional by comparison with those who have been 'in the system' for many years. In the current environment such researchers may range from those recently completing a postdoctoral fellowship, to those who have been academics for many years but who have only recently gained research qualifications or support to conduct research. While there is funding available for beginners (at least, for those who are in moderately secure academic positions), and while there is funding accessible to those who have already achieved excellence, there is a significant gap in basic research funding for those who are 'mid-life'. This category includes those whose needs fall in the range between small and large ARC grants or at the lower levels of large grants; often those at middle levels of academic appointment; those with some, but not extensive, independent research experience; and those with publications or other research output, but not major monographs or a series of refereed articles in prestigious journals. These people might be termed 'early career' only in the sense that they are not yet established in their research career—not because they are limited in research experience.

Strategies of Benefit to Early Career Researchers, for Implementation by the Australian Research Council

Several of the discipline-based grants outcomes review panels recommended the establishment of a funding scheme for early career researchers, separate from the current large and small grants schemes. Such a scheme would be intermediate between the large and small schemes in terms of funding levels, and would be centrally administered while being restricted to those who could claim early career status. We do not support this recommendation. The establishment of such a scheme would draw resources from other schemes provided through the ARC, thereby adding pressure to them. Alternatively, if more money were to be made available for such a scheme, it could be deployed to equal advantage through the current large and small grant schemes, given some of the modifications suggested below. The creation of another scheme would provide little benefit when balanced against the inevitable increase in administrative costs.

The primary concern of the ARC Research Grants Committee through its individual project grants schemes is to fund research on the basis of its excellence: the development of research careers is the primary responsibility of the Research Training and Careers Committee, and are the subject of separate schemes. They are therefore of secondary concern in the context of project grants. Clearly research which is of the highest quality must have priority for funding, regardless of the career stage of the researcher involved. To set aside an amount in a targeted fund for those who are early career would be a denial of this principle and the potential benefit flowing to the Australian community from it. This is not to say that there is nothing which can be done to assist those who are early career in their endeavour to obtain

quality research funding for their work, and indeed, steps should be taken to ensure that early career researchers are provided with the encouragement and resources needed to ensure their continuing contribution to the advancement of knowledge and innovation. As was suggested by those reviewing grants outcomes in inorganic chemistry:

> It is generally accepted that the most creative period of an investigator's professional career is at the beginning of his or her independent research. While ideas generated then often do not come to fruition until years later, the first few years are crucial. Thus, the opportunity to pursue independent thought, rather than to be forced to collaborate with an established group, is essential to eventual development of these new researchers who must provide the intellectual leadership in the future (NBEET 1995a, p.31).

Recommended strategies which can be applied by the ARC for the direct or indirect benefit of early career researchers seeking independent funding are described here. Further comment is made on some issues which have arisen during the project which are outside the realm of the ARC, but which call for action at university level.

The Gathering and Disclosure of Career Related Information for ARC Large Grants Applicants

The ability to give any special consideration to early career researchers requires that information be available which can identify those who might qualify as early career. At present some demographic (career related) information is requested on the first page of the application form; information relating to the applicant's track record is gathered as part of the form (previous grants) or is attached to it (publication record); and some applicants add a brief explanatory paragraph to the publication list to explain why their track record may appear deficient. If information such as that suggested at the end of the previous chapter were gathered, panels and others wanting to make some allowances for early career researchers would no longer have to depend solely on an age-based assessment, personal knowledge of the applicant, or a spontaneously provided additional paragraph.

At the other end of the spectrum, there is the possibility that even the very limited information which is provided to assessors and panels may be having some unwarranted influence on their perception of the competence of the researcher/team to carry out the research, particularly information relating to the academic status of the researcher. While it is likely that panel members and at least some of the selected assessors will know in any case whether a particular applicant is a professor or not, how old they are, and so on, steps should be taken to remove as much potential for prejudgment as possible. It could be argued that the applicant's demographic details should not be known to reviewers at all, in that they have nothing to do with their

capacity to conduct research. It is suggested, therefore, that any data which is collected which may moderate the rating of an applicant on any basis other than their ability to write a sound proposal and their track record in projects and publications should be on a removable page. There are then three alternative courses of action which might be considered (or subjected to experimental evaluation).

- The first option is that the information not be made available to either assessors or panel members, but that an independent administrator would (a) determine whether the applicant should be considered early career or not (with that summary determination then being conveyed to panels at the appropriate time, i.e. when they are making their final determinations 'at the margins'); and (b) use the information for evaluative purposes, to assist in reviewing where the grant moneys are going for each panel.
- Alternatively, the page of demographic information could be removed before the application is forwarded to assessors, and held by the panels. Early career status could be determined by the relevant discipline panel, preferably at its initial meeting, i.e. independently of having assessor's reports. This assumes that it is most appropriate for the panel to make this decision and then moderate the rating of the researcher or team by the assessors because they can apply a common standard across all within their discipline.
- The third option is to provide the full range of information to assessors, asking them to take it into consideration and rate the researchers in relation to those of comparable position when they are making their assessment of the capacity of the researchers to undertake the project.

Whichever option is selected, an evaluation of the trends in decision making should be monitored, using the information garnered.

Recommendation 1

That additional career-related demographic data be collected for all ARC Large Grant Scheme applicants, in a form which can be detached from the project application, to be used to assist in both the making of and the evaluation of allocations under the Scheme.

'Early Career' as a Priority Area in the Large Grants Scheme

It was suggested by a number of those interviewed that the interests of early career researchers applying to the ARC Large Grants Scheme might best be served by making 'early career' a priority area. In this way, the ARC can still fulfil its charter of funding excellent research, but those early career researchers who are 'at the margin' when the funding cut-off point is being determined within discipline panels might be given some advantage over more established researchers with equivalent ratings. Chairs of all but one of the discipline sub-panels have reported that the panels prefer to work in this

way anyway, although often they have difficulty in determining whether an applicant is early career (as indicated above). Also, the fact that such discretion exists and is exercised is not generally known to those who are early career applicants, so that their perception that they suffer particular disadvantage in the assessment and review process is left unchecked. There are advantages to be had, therefore, in making such a practice explicit, both in terms of public relations, and in ensuring some equity through the development of standardised procedures for gathering necessary information and making such determinations.

Establishing early career as a priority area necessitates resolution of two issues:

- defining who might be eligible for the priority area, i.e. who is early career, and whether all investigators have to be early career; and
- ensuring adequate experience is available to the researchers to ensure completion of the project.

A definition of early career has been given at the close of the preceding chapter, along with the information needed to assess early career status. If an application coming from a team is to be considered within an early career priority area, then each investigator on the team would need to be considered early career since there should be no disadvantage to early career researchers who submit in partnership with someone more senior. Early career researchers have typically been advised to include someone senior on their application not only to enhance its acceptability to the funding agency, but to ensure that they have an experienced mentor available to guide them during the conduct of the project. Early career researchers seeking priority area status should be encouraged but not required to include a senior researcher as an associate investigator on their application, in the expectation that, in filling that role, he or she will provide guidance when and as needed, without having to be deeply involved in the project.

In order to be assessed as being of early career status it will be essential to provide the necessary demographic details, as outlined above. Applicants should also be asked to complete a brief statement (maximum five lines) as to why they should be considered early career. A determination as to the legitimacy of the claim can then be made by an independent administrator or by the panels (as outlined above).

Recommendation 2

That 'early career' be designated a priority area under the ARC Large Grants Scheme. To be eligible for consideration as early career, all chief investigators must meet the criteria which determine that status, though a more senior researcher may be included in the role of associate investigator.

Career Interruption as a Special Case

Researchers who, for whatever reason, find their career interrupted may need some special consideration as they attempt to resume their research activity. Career interruption may occur near the beginning of a research career, e.g. immediately following completion of a PhD, or after a research profile has been established. In either case, the applicant's capacity for research, as indicated by their profile of research activity and achievement, needs to be considered in relation to the opportunity they had to undertake research. Career interruption could be indicated by a researcher using the same format as that recommended for determining early career status, i.e. by giving a reason for being considered as a case of career interruption in the box on the demographic information sheet. Where consideration as having experienced career interruption is considered justified, then an allowance should be made in the listing of publications, grants and other information used to assess the quality of the researchers to include publications resulting from the most recent five years of research activity, rather than just those published within the last (chronological) five years.

Recommendation 3

Applicants who have experienced career interruption during the past five years may make a claim for special consideration, and that consideration should take the form of having their research record assessed for their most recent five years of research activity.

Postdoctoral Fellowships

The ten per cent increase (from 50 to 55) in postdoctoral fellowships available for 1996 in no way meets the demand of frustrated PhD graduates for opportunities to continue their research. At the same time, while researchers initially welcome the opportunity to continue in concentrated research employment such as is provided by postdoctoral fellowships, three problems were commonly reported:

- there is no security of employment beyond the period of the fellowship, with consequent uncertainty affecting both opportunity for development and commitment to the project during the final year of the fellowship;
- the recipient may be disadvantaged in seeking employment as an academic following a fellowship, due to lack of teaching or other broadening experience;
- working on a single project (particularly one which was not the initiative of the fellow) impacts on the stimulation and motivation of the researcher, such that they may be lead to relinquish the fellowship.

Postdoctoral fellowships, as presently designed, contribute to the separation of research and teaching functions within the university context, while academics are under increasing pressure to perform well in both roles. At an equivalent level of appointment, there is an enormous gulf in the employment and ongoing research experience between postdoctoral fellows and level A academics (as evidenced in Chapter 2, above), which may not be beneficial for the eventual development of the Australian research community. The comments of Marceau and Preston (1995, pp.57,58) are pertinent:

> …a considerable proportion of the candidates successful in the ARC [Fellowships] Scheme had managed to pursue research-only careers for quite extended periods … in many cases participants in the central areas of the Fellowship Scheme had had little of the close contact with the broad teaching and research academic community which would have come from a previous career as a university teacher. While it is clear that the Fellows make a significant contribution to the research system, this lack of close connection raises questions about the extent of the contribution which many Fellows make to the rest of the higher education system in Australia.

Productivity of researchers has been found to be as great or greater if 25 per cent of their time is spent on activities other than their research projects, e.g. on teaching or administration, than it is if 100 per cent of their time is spent on a single project (Bland & Schmitz 1986; Pelz & Andrews 1976; Watkins 1992). Our analysis found that, at an earlier stage of development, PhD graduates were more likely to continue in research if they were involved in other projects while undertaking their PhD research. We also note that the majority of full time PhD candidates were engaged as tutors or demonstrators while undertaking their research, with such involvement in teaching having no apparent negative consequences for their research. It is therefore strongly suggested that limited engagement in other activities will not necessarily detract from the possible achievements of a dedicated researcher. Indeed, involvement in teaching is seen by many to actually contribute to one's research development.

A combination of providing a special opportunity to undertake research with some other duties could, it is argued, overcome some of the difficulties experienced by postdoctoral fellows, as outlined above. Part funding by university departments would mean that more fellowships could be offered. A closer liaison with the other functions of a department, school or faculty may, furthermore, assist the fellow to become integrated into the life of the department and assist in the integration of teaching and research in the department more generally. It would also provide the fellow with experience which will assist in his or her gaining continuing employment within the higher education system, and with the early, gradual acquisition of teaching skills the enormous stress so often experienced by a new academic landed with a full teaching load would be reduced.

Recommendation 4

Postdoctoral fellowships should be offered by the ARC on a 75:25 funding basis (ARC: 75%; host: 25%), with the fellow expected to spend 25 per cent of their time, either throughout the period of the fellowship or in regular block periods during it, on teaching or other duties not directly associated with their main project.

Balancing the Needs of Established and Early Career Researchers in a Limited Funding Environment

If the access of early career researchers to grants is increased, this will necessarily lead to a reduction in the availability of grants for established researchers. Established researchers, in turn, argue that they have both students and research staff who are dependent on their capacity to attract grants, and/or that the staff maintained by their grants are necessary to make effective use of the considerable infrastructure which may have been established for their projects. The capacity of a researcher to be closely involved in a number of large projects while also undertaking other duties associated, for example, with the role of professor, must however be questioned: it appeared for at least some of those we interviewed that their involvement could be regarded as quite superficial. One is led to ask: if the grants income is needed to support a large research laboratory or group, why is it not possible for some members of that research community, other than its leader, to win the funding in their own right? Scientists, in particular, can chalk up many years of research experience before they ever have the opportunity or need to prepare a grant application; or (where they have been preparing applications for submission by their team leader) to submit a grant application in their own name.

A number of both senior and early career researchers with whom we held discussions recommended that investigators should be allowed just one large grant, in order that research support might be more equitably distributed, diversity might be increased, and early career researchers—who are typically more 'hands on' in the research they do than are high profile team leaders—might be more likely to gain support. At present the number of large grants which can be held concurrently is limited to three, with a maximum of two initial applications being allowed in any one year. There is no limit on the number of small grants which may be held, or on the number which may be held concurrently with large grants. Researchers with a number of large grants can, and do, receive small grant funding as well. A further reduction in the number of large grants allowed to be held concurrently must increase opportunities for others, including early career researchers, to be awarded grants. There is no reason why an established researcher and/or active team

leader cannot mentor his or her junior researchers and 'lend weight' to their proposals by being included as an associate investigator, but that would be a decision (and risk) for the early career researcher to make. A move to further reduce the number of grants which can be held concurrently would therefore not necessarily reduce the quality of proposals being considered for funding, nor deprive effective research groups of the funding they need to maintain their program of research.

With the improvement of the databases held by DEET, it should now be quite possible to include small grants within the limitations imposed on the number of total grants allocated. (This could be monitored at university level, but may need supplementary monitoring at DEET.) Small grants are designed to provide funding (a) for projects which simply do not require large amounts of funding, (b) for pilot projects through which a researcher may be establishing a new direction, or (c) for those who do not yet have the experience to apply successfully for a large grant. Early career researchers do not need to include an established researcher as a chief investigator in order to successfully compete for a small grant. This being the case, there is no apparent reason why those who hold a number of large grants should also need to hold small grants, except where they might be wanting to experiment with a new direction for their research.

Recommendation 5

That an investigator be limited to holding a maximum of two ARC large grants, and three ARC project grants of any kind, at any one time.

Project Involvement by Chief Investigators

It has become very apparent that in many cases there is considerable discrepancy between the role of chief investigator as stated on an application form to the ARC, and their role in practice. The number of days' involvement in the current and other projects as stated on the form gives little indication of the true level of activity. While there is always the opportunity of stating an ideal rather than reality, it may be more effective to ask that the role of each chief investigator, associate investigator, attached students and other assistants be spelt out (briefly) as part of the application (for the latter, this should currently be part of the budget justification, in any case). At the very least the requirement to specify roles in the project may prompt more careful consideration of what involvement there may be, and whether the stated level of involvement will be possible.

Recommendation 6

A statement of the extent of involvement and actual role in the research should be included for each person or position outlined within a grant application.

Overlap of Large and Small Grant Limits

The 'gap' which has been shown to exist between large and small grant allocations can mean that applicants to the Large Grants scheme are encouraged to expand their projects (possibly beyond the level with which they might be comfortable) and apply for a larger amount of funding in order to ensure that they do not fall below the funding limit. If they are successful, this unnecessarily limits the amount available to other researchers. It has also been noted (in Chapter 3, above) that many early career researchers' need for funding to maintain their research profile falls at about the boundary between large and small grant funding—an area which is marked by an absence of allocations.

Early career researchers in some universities (and even in some disciplines in large universities) are unable to access ARC funds because the small grant funding available is very limited. Some softening of the line between large and small grants would give those with limited access to ARC small grant funds (and/or access to limited levels of project funding—as occurs in some of these universities/faculties) the opportunity of applying to the large grants scheme without having to unnecessarily boost the size of their project. Those in universities with more adequate funding, meanwhile, would find it easier and more expeditious to access ARC small grant funds.

It may be considered that, if the recommendations below are adopted, it will be necessary to raise the cut-off points between large and small grants. If this were to occur, then there would need to be an associated increase in the proportion of project grant funding allocated to the small grants scheme in proportion to the number of allocations made in the region being shifted.

Recommendation 7

That projects submitted on or about the lower limit for ARC large grant funding be allowed to remain in consideration for funding;

AND/OR

That the lower limit for large grant allocations be set at $10 000 below the upper limit for small grant allocations.

The Basis for Small Grant Allocations to Universities

At present, small grant funds are allocated to universities on the basis (primarily) of their large grant earnings, on the assumption that large grant allocations provide an indication of the strength of the research community (and hence possible demand) in any institution. This assumption may not be valid, however, particularly if one considers the fact that some disciplines simply do not require high level funding. In the humanities, for example, the needs of many experienced researchers could be met if adequate allocations were made only through the Small Grants Scheme.

If ARC small grant funding is to be seen (in part at least) as a 'way in' for early career researchers who have not previously had large grant funding, it is particularly relevant that it be available to those researchers who are not yet able to access large grant funding. Because of the circular nature of small and large grant funding (small grants give you the profile to win large grants which are necessary to earn small grant funds) the situation at present is very much one of the 'big get bigger and the small get nowhere', potentially at both university and disciplinary level.

Recommendation 8

That alternative options for allocation of small grant funds to universities be considered, to take into account total academic staff numbers and the developing research profile of institutions. (It is assumed this will be a matter of priority for the Review of the Small Grants Scheme to take place in 1996, hence detailed options are not developed here.)

Feedback to Researchers

One of the greatest sources of discontent among researchers, and early career researchers in particular, is the lack of guidance they receive as to why their application failed, particularly if it was removed from further consideration at the first panel review. It would be helpful if specific review comments could be provided to researchers based on the panel's deliberations, especially to those who do not receive assessors' reports.

Recommendation 9

Feedback from panel deliberations regarding details of their proposed projects should be provided to (early career) researchers, to benefit their future applications.

Improved Interaction with Researchers

It is recognised that interviewing of all applicants, or even just of those investigators whose applications lie 'at the margin', is an expensive exercise, in terms of both time and money. The removal of the interview round has meant, however, that panel members are unable to question applicants to clarify issues arising from their applications, or to assess further their level of competence and/or enthusiasm for their research. There is a strong sense, moreover, of disaffection from the ARC among researchers which is exacerbated by lack of discourse in the process of grant allocation. Face-to-face contact gives researchers a sense of having had 'their day in court', of being heard.

Panel Chairs and early career researchers alike have argued for the reintroduction of interviews, particularly for applicants 'at the margins' and for those who are early career. Those who are early career are less likely to be known to the panel members, hence the additional importance of personal contact for that group. It has been suggested that teleconferencing or videoconferencing could provide a cost-effective substitute for travel around each state. It was noted that a program of biennial institutional visits was commenced in 1995, but that, while valuable, these meet a quite different need from interviews with applicants who are under consideration for award of a grant.

Recommendation 11

That teleconferencing or videoconferencing be used to facilitate interviews with early career (and other marginally placed) applicants by panel members.

Other Issues of Concern to Early Career Researchers

Provision of a High-Level Alternative to the Research-Based Doctorate

The introduction of the professional doctorate, such as EdD and DPsych, is a relatively recent innovation in Australian universities. These degrees provide an alternative qualification for those not seeking to extend their career as researchers, a qualification which nevertheless indicates their depth of knowledge, their capacity for critical thinking, their capacity for professionally oriented scholarship. There are a number of reasons why the professional doctorate may provide a worthwhile alternative to the PhD:

- A significant proportion of those graduating with PhD are not continuing their engagement with research, either because they are unable to obtain employment which facilitates continued research or because they have no desire to continue in research. Some of these undertook the degree only because it was expected for their position;

some find it necessary to develop alternative practice-oriented expertise in order to gain employment.

- Provision of a professional doctorate recognises the need for some practitioners and or academics to have a high-level academic qualification without their necessarily wanting to become skilled at the leading edge of a narrow field. Those choosing to contribute a strong teaching focus in universities, for example, may find it more useful to have a broader understanding of their discipline, but at a level of sophisitcation well beyond that afforded by lesser degree studies.
- Given the financial situation or the universities and the various research agencies, it is just not possible for every academic to be actively working on funded research. It is hypocritical, under such circumstances, to continue to expect all academics to conduct externally funded research, and to reward only those who do so.

Incorporation of a research component in a professional doctorate, albeit at a reduced level, would ensure that graduates have an understanding of the research process, are familiar with the research literature, are able to critically evaluate that literature, are able to serve as 'research advocates' (Magoon & Holland 1986), and, should they want at a later stage, are then able to develop their capacity for independent research. It is therefore recommended that universities, in consultation with professional bodies, consider making professional doctorates a more readily available option for those wishing to undertake higher degree studies.

Facilitating Research Opportunities for Those Without Permanent Academic Employment

Those researchers who are unable to find suitable secure academic employment face considerable difficulties accessing funds to maintain a research program. Rather than permit the loss of researchers from the broader academic community, academic institutions should be encouraged to explore and implement means of allowing researchers to become affiliated on a voluntary basis with ongoing research teams. By so doing, a researcher can engage in work which will assist them to maintain a research profile and build collegial networks, and which may support their access to external funding bodies. Encouragement of such practices would have considerable benefits both to the researcher, who would be able to continue in a supported program of research, and the institutions, which would gain the benefits of increased Quantum earnings as well as the expertise of the researcher.

Employment Conditions For Level A Academics

Early career academics on short term contracts face considerable difficulties in developing and maintaining research productivity in the face of teaching

and administrative demands. In order to sufficiently establish themselves as both researchers and teachers it is essential that Level A academics be employed on a minimum three year contract with a reduced teaching load in the first year. In addition, they should receive professional development in the teaching of adult learners, and nurturing in an environment with mentors to support both their teaching and their research.

Reducing the Pressures on Funding

There are demands that all academics seek to build up their research profile to the extent where they are successful in attracting extensive and/or prestigious external funds. This academic imperative to undertake research is placing unwelcome pressure on those who don't really want to undertake major research or who don't need major funding for their research. A number of academics reported, for example, that they applied for large grant funds only because they needed to have major grants income on their *CV* if they were to gain promotion. Rip (1993, pp.10–11) argues:

> … it is not only a matter of money. … obtaining these grants was necessary to be qualified as a good scientist. An Australian Research Council dollar, it has been said, is worth three times as much as other dollars, because it is a high status dollar (and when used to assess status, and confer credibility, will have a multiplier effect). Thus, an integral part of the reward system of science is being threatened when there is not enough money to fund all the 'good' proposals.

Greater pressure on funding bodies is one inevitable consequence.

The calculation of the Research Quantum, for example, rewards those who can convince someone to pay for them to conduct research more than for significant, relevant and/or creative output from research. Furthermore, although the Quantum is designed to calculate at least part of the research operating budgets of universities—and therefore those whose research is expensive will also need more of it—it has become a competition in itself, so that even if the work of a researcher does not require large sums, and they don't need to earn Quantum dollars, they are seen to be a lesser academic if they don't do so. Similarly, those academics capable of acquiring ARC large grant funds are also pressured to gain funding at the highest level possible so that their institution can gain maximum ARC small grant funds and other benefits. Those whose research does not require major capital funding, or indeed any funding at all, are in a sense seen to be less productive and as a consequence are encouraged to creatively require and acquire money.

There is a need, then, for an alternative way of recognising and rewarding significant research output so that those who require funding need only

apply for what is needed to support their project, and not be motivated by the need to gain flow-on benefits for their institution. Greater access to ARC and other funding by early career researchers genuinely in need of it may then ensue, to the benefit of all.

In Conclusion

Ultimately, there arises a conflict between the expressed needs of the research elite to maintain their position, to continue to contribute research ideas, and/or to lead a team of active researchers, and the desire they express to encourage those who are early career. Unless significant funding is added to the system, research leaders must be increasingly prepared to bask in the reflected glory of the success of their proteges, rather than seek that which comes more obviously from their own achievements. Without such a change in perspective—encouraged perhaps by a change in reward systems, to recognise them for the achievements by others that they have made possible—early career researchers are unlikely to improve their access to that funding which is available and will continue to feel and express the frustration that comes from having their potential to make a contribution deferred, blocked or dissipated.

References

Becher, T. 1989, *Academic Tribes and Territories: Intellectual Enquiry and the Cultures of Disciplines*, Open University Press, Milton Keynes.

—— 1987, 'Disciplinary discourse', *Studies in Higher Education*, vol. 12, pp. 261–274.

Biglan, A. 1973, 'The characteristics of subject matter in different academic areas', *Journal of Applied Psychology*, vol. 57, no. 3, pp. 195–203.

Bland, C. J. & Schmitz, C. C. 1986, 'Characteristics of the successful researcher and implications for faculty development', *Journal of Medical Education*, vol. 61, no. 1, pp. 22–31.

Bourke, P. & Butler, L. 1995, *International Links in Higher Education Research*, National Board of Employment, Education and Training, Commissioned Report No.37, Australian Government Publishing Service, Canberra.

Brennan, M. H. 1993, 'Excellence and relevance - two sides of the same coin', in Wood, F. Q. & Meek, V. L. (eds.) *Research Grants Management and Funding*, Bibliotech, Canberra.

Castleman, T., Allen, M., Bastalich, W. & Wright, P. 1995, *Limited Access: Women's Disadvantage in Higher Education Employment*, National Tertiary Education Union, Melbourne.

Dawkins, J. S. 1989, *Research for Australia: Higher Education's Contributions*, Australian Government Publishing Service, Canberra.

Denzin, N. 1970, *The Research Act*, Aldine, Chicago.

Finn, R. 1995, 'Discouraged job-seekers cite crisis in science career advice',*The Scientist*, vol. 9, p. 1.

Gallagher, M. 1993, 'Getting value for money from the investment in university research', in Wood, F. Q. & Meek, V. L. (eds.) *Research Grants Management and Funding*, Bibliotech, Canberra.

Getty, C., Long, M. & Perry, L. 1994, *Postgraduate Destination Survey 1993*, Graduate Careers Council of Australia Ltd., Parkville, Vic.

Harman, G. & Wood, F. 1990, 'Academics and their work under Dawkins: A study of five NSW Universities', *Australian Educational Researcher*, vol. 17, no. 2, pp. 53–74.

Hill, S. & Murphy, P. 1994, *Quantitative Indicators of Australian Academic Research*, Australian Government Publishing Service, Canberra.

Innes, J. 1995, 'Fixed term contracts or short sighted policy', *Australian & New Zealand Physicist*, vol. 32, no. 5, pp. 83–85.

Johnston, R. 1993, 'Effects of resource concentration on research performance', in Wood, F. Q. & Meek, V. L. (eds.) *Research Grants Management and Funding*, Bibliotech, Canberra.

Kyvik, S. Productivity differences in scientific publishing, paper presented to Programme on Institutional Management in Higher Education, Seminar on Human Resources and Staff Development, Technical University of Vienna, Austria, 10–12 May, 1995.

Magoon, T. M. & Holland, J. L. 1984, 'Research training and supervision', in Brown, S. D. & Lent, R. W. (eds) *Handbook of Counseling Psychology*, Wiley, New York.

Main, A. 1993, *The Development of Preparation Courses for New Academic Staff*, Australian Government Publishing Service, Canberra.

Marceau, J. & Preston, H. in press,*Taking the Lead: the ARC Fellowships Scheme in Australia*, NBEET Commissioned Report, Australian Government Publishing Service, Canberra.

Miles, M. B. & Huberman, A. M. 1994, *Qualitative Data Analysis: An Expanded Sourcebook*, Sage, Thousand Oaks, CA.

NBEET 1993a, *Higher Education Research Infratructure*, Australian Government Publishing Service, Canberra.

NBEET 1993b, Review of Grants Outcomes 7, *Condensed Matter Physics*, Australian Government Publishing Service, Canberra.

NBEET 1993c, Review of Grants Outcomes 9, *Mathematical Sciences*, Australian Government Publishing Service, Canberra.

NBEET 1993d, Review of Grants Outcomes 8, *Materials and Chemical Engineering*, Australian Government Publishing Service, Canberra.

NBEET 1993e, Review of Grants Outcomes 10, *Organic Chemistry*, Australian Government Publishing Service, Canberra.

NBEET 1993f, Review of Grants Outcomes 11, *Fluid Mechanics*, Australian Government Publishing Service, Canberra.

NBEET 1993g, Review of Grants Outcomes 12, *Molecular Biology*, Australian Government Publishing Service, Canberra.

NBEET 1994a, *The Strategic Role of Academic Research*, Australian Government Publishing Service, Canberra.

NBEET 1994b, Review of Grants Outcomes 14, *Psychology*, Australian Government Publishing Service, Canberra.

NBEET 1995a, Review of Grants Outcomes 16, *Inorganic Chemistry*, Australian Government Publishing Service, Canberra.

NBEET 1995b, Review of Grants Outcomes 18, *Computer Science*, Australian Government Publishing Service, Canberra.

O'Neill, G. 1991, 'The real lure of science', *Search*, vol. 22, no. 2, pp. 40–42.

Over, R. 1995a, 'The Australian Research Council Large Grants Scheme: problems, concerns and recommendations for change', *Australian Universities Review*, vol. 38, no. 1, pp. 32–36.

—— 1995b, 'Perceptions of the Australian Research Council Large Grants Scheme', *Australian Educational Researcher*, accepted for publication.

Owen, J. M. 1993, *Program Evaluation: Forms and Approaches*, Allen & Unwin, Sydney.

Pelz, D. C. & Andrews, F. M. 1976, *Scientists in Organisations*, Institute for Social Research, University of Michigan, Ann Arbor.

Ramsden, P. & Moses, I. 1992, 'Associations between research and teaching in Australian higher education', *Higher Education*, vol. 23, pp. 273–295.

Reeves, H. 1991, *The Hour of Our Delight: Cosmic Evolution, Order and Complexity*, W. H. Freeman, New York.

Rip, A. 1993, 'The republic of science in the 1990s', in Wood, F. Q. & Meek, V. L. (eds.) *Research Grants Management and Funding*, Bibliotech, Canberra.

Stoecker, J. L. 1993, 'The Biglan classification revisited', *Research in Higher Education*, vol. 34, pp. 451–464.

Stokes, T. 1993, 'The ARC at five: A view from the inside', in Wood, F. Q. & Meek, V. L. (eds.) *Research Grants Management and Funding*, Bibliotech, Canberra.

Tabachnick, B. G. & Fidell, L. S. 1989, *Using Multivariate Statistics*, Harper Collins, New York.

Wassmann, F. 1994, 'Higher degree careers: The 15 plus SPF (Strategic Planning Factor)', paper presented at the Higher Degree Careers Seminar, University of New South Wales.

Watkins, C. E. 1992, 'Early professionals in counseling psychology: The academic setting', *Counseling Psychologist*, vol. 20, no. 1, pp. 47–52.

Wood, F. Q. 1990, 'Factors influencing research performance of university academic staff', *Higher Education*, vol. 19, pp. 81–100.

Wood, F. Q., Meek, V. L. & Harman, G. 1992, 'The research grant application process. Learning from failure?', *Higher Education*, vol. 24, pp.1–23.

Appendix 1

Methodology for a Study of Early Career Researchers

A framework for data collection and analysis

Inevitably, in a study such as this, there is not a neat, simple design solution. Rather data must be gathered in diverse ways from diverse sources, then synthesised to reach valid conclusions. It can be argued that the very diversity of these data sources adds strength to the conclusions drawn (Denzin 1970). Overall, the study design was that of a 'front end' evaluation, that is, an evaluation for the purpose of program development (Owen 1993). Such evaluation typically involves needs assessment, a synthesis of research on the topic, and a review of exemplary practice. It permits an evaluation of the discrepancies between the desired goal of having schemes which foster the development of promising early career researchers and the reality which is faced by early career researchers, the canvassing of potential solutions, and where possible an assessment of these against data which is available or obtainable in the short term in order to reach a consensus among key players regarding directions for action.

Data sources

An inventory of the data that was needed to answer the questions posed by the project brief was developed, and potential sources explored. Data, in various forms, was obtained from the following:

Documentary sources:

- University funded schemes to support researchers
- Government and other agencies with research granting schemes
- ARC large grant applications
- ARC institutional grants (Small Grants Scheme) statistical returns
- Background material from the scholarly literature.

Surveys and interviews:

- PhD graduates of 1993
- Early career academics/researchers
- Successful/established researchers
- Heads of departments in universities
- Pro/Deputy Vice-Chancellors (Research)
- Chairs of ARC Discipline Sub-panels
- Submissions from university staff, research fellows and the general public.

Approach to the Analysis and Presentation of Data

Data arising from each source was approached within an open and exploratory framework in an attempt simply to hear what was being said from the perspective of those saying it. It was then evaluated within the context of the whole. The presentation of data has been organised by topic rather than by source and, wherever possible, evidence has been sought and presented from multiple sources as the basis for argument and recommendations.

Statistical analysis of data has been employed wherever possible and appropriate, particularly for data from structured surveys and that extracted from ARC large grant application forms. Inferential tests used and the basis for inferring significance of results are reported. Descriptive qualitative data was tabulated (using text) in matrix format on spreadsheet, as a basis for data reduction and analysis. Text-based material from all sources was entered into a computer database and the content indexed as a basis for both retrieval and analysis.

Computer Programs Used in Analysis of Data

Quantitative data, e.g. from pre-structured surveys, was analysed with the assistance of SPSS v6.1. Excel 5 was used as a spreadsheet for data reduction and analysis. QSR NUD•IST was used for the management and analysis of text based data, e.g. from letters, email, notes from conversations, additional comments with questionnaires and verbatim interview transcripts.

The Target Population

Early career academic researchers were assumed, for the purpose of sample selection, to comprise at least the following types:

- young graduates who move directly into an academic/research career - typically as level A academics or postdoctoral fellows;
- newly graduated people with previous work experience, moving into an academic/research career in a traditional university discipline;
- academics with strong applied professional backgrounds in disciplines which are new to the academy and which therefore have neither a strong research tradition nor an established body of researchers: some in these disciplines may have no wish to become researchers, however there are those who are keen to make the attempt and prepared to expend considerable energy doing so, often at quite a late stage in their overall career; and
- academics with non-university experience moving back into the university, or those who were employed within the former CAE sector, who may or may not have research qualifications, but who lack recent academic research experience.

Each of these types of academics has the potential to develop a distinguished research career. Each, however, faces different constraints and may need strategies with different emphases.

The academic research environment provided the context for the study, with the concern being to view the future of those with a 'promising' research career, rather than all academics. In this context, therefore, the award of PhD was considered to provide the educational basis for a research career.

Disciplinary and Institutional Differences in Research Activity as a Basis for Sampling and Analysis

Disciplinary Differences

It has been argued that disciplinary differences are stronger than institutional differences in influencing the professional attitudes and behaviour of university faculty (Stoecker 1993); the notion of academic tribes, each, for example, with a distinct language and publishing patterns deriving from different characteristics of disciplinary knowledge, has been advanced by Becher (1987; 1989). Using Biglan's (1973) classification scheme for academic disciplines, based on multidimensional scaling, Stoecker (1993) confirmed that dimensions of disciplinary differences were related also to sources of funding for research (federal, state, private). The dimensions by which disciplines were classified were 'hard-soft', 'pure-applied', 'life-nonlife'. Stoecker was able to successfully classify two of the newer professional disciplines (nursing and dentistry) which had been introduced to universities since Biglan's original work—eight others of the newer professional disciplines eluded classification.

All documentary analyses, surveys and interviews were based on a sample of disciplines which provided a cross section of discipline types (unless

otherwise stated). The disciplines which were included, and where they stand in the Biglan classification scheme, are:

Physics	(science - hard, pure, nonlife);
Engineering	(science - hard, applied, nonlife);
History	(humanities - soft, pure, nonlife);
Psychology	(social science - soft, pure, life);
Social work	(professional - soft, applied, life);
Nursing	(professional - soft, applied, life).

Both nursing and social work were inlcuded (rather than one) because of the relatively recent advent of extensive research activity in those disciplines, so that there are few applications to the ARC in either discipline. While social work has been based within the tertiary sector for many years, nursing has become so relatively recently (around 1985 in most States).

Institutional Differences

Studies in Australia conducted shortly after the introduction in 1987 of the unified national system of higher education revealed continuing, clear, institutionally based differences in the activities in which academics were engaged (Harman & Wood 1989), with, for example, significant differences in publication patterns related to institutional type even when disciplinary differences in those types were statistically controlled (Ramsden & Moses 1992). Cognisance of both disciplinary and institutional differences in research related activity therefore informed both data collection and analysis in this study.

Universities were classified into four major groups: 'older' well-established research universities (Group A), other pre-1987 universities (Group B), former institutes of technology now post-1987 universities (Group C), and former colleges of advanced education also now post-1987 universities (Group D). University classifications used in the study are listed in Appendix 2. Where it was feasible to study only a sample of institutions, those selected were stratified to represent the four groups.

Strategies for Data Collection

Media Advertising

Following the receipt of an enthusiastic response to early limited advertising of the study through university staff media, it was decided to place an advertisement in the Higher Education section of *The Australian*, inviting would-be researchers to contact the project team with their experiences of attempting to develop a research career. In all, in response to these

advertisements, some 61 people wrote, telephoned, faxed or emailed the project office with their submissions, stories and concerns. Where possible these were recorded verbatim, otherwise, notes were taken of each conversation.

Demographic data for this sample is incomplete, however some details were able to be determined. Thirty-four of those responding were based in universities (several in non-academic positions), 10 were unemployed, 8 were in industry, government or community positions. They were equally likely to be male (32) or female (28), and under or over 40 years of age. They were qualified in social science (14), humanities (13), physics (6), engineering (6), medicine and health science (5), biological science (5), other applied sciences (5) and chemistry (4). The majority (75.4%) had PhD qualifications.

Analysis of University Funded Granting Schemes for Early Career Researchers

Information regarding internally funded schemes for the support of staff undertaking research was sought from the Research Office of each university. In many cases, applicants' guidelines for schemes were provided to the project team. The information was tabulated on spreadsheet according to the type of scheme being offered, with identification of the target group(s) for the scheme, the level of support being offered and the conditions applying to participation in the scheme. Data was provided by all but one of the universities, however, in one internal support was completely devolved to faculty level, and in another 2 internal schemes were being completely restructured, so no details could be provided.

Once an initial tabulation was made, information relevant to each university was sent back to the Research Office for checking and confirmation, along with an outline of the categories being used for the analysis and a request for clarification of terms used by them such as 'new researcher', 'new staff'. Seeing the information organised in this format resulted in the provision of considerable additional material which was then incorporated into the matrices.

Within each type of scheme, data was then organised by university type, according to the four-group classification being used in this study. In order to provide context to better assess the level of support being offered, additional data relating to the number of staff in each university was obtained, and the level of ARC funded institutional grants support (i.e. small grants and 'Mechanism A' infrastructure grants) for each university was noted.

Data from this review of schemes contributed to an understanding of the types and levels of support being offered early career researchers (and

others) within the universities, who was being excluded from that support, and to the development of a set of criteria for 'early career'.

Analysis of Externally Funded Grant Opportunities for Early Career Researchers

Granting bodies were approached or their literature was appraised in an attempt to determine the selection criteria employed in assessing applicants for funding in any schemes they were offering. Information for 180 schemes from departments, agencies and other granting bodies was entered into a database which allowed sorting according to a number of criteria. Grant sources were classified into broad discipline areas, and then categorised (as accurately as could be determined) to indicate their accessibility to different groups of researchers, thus:

- targeted to early career researchers
- open to early career researchers
- special researcher requirements
- requires experienced researcher(s).

Granting schemes were then also coded with regard to more specific selection criteria. These were grouped under two broad categories - those applying to the institution of the applicant, and those applying to the applicants themselves. The categorisation and coding allowed for an identification of those sources which might well be accessible to early career researchers, i.e. (in this case) those who do not have an established track record. This listing of granting bodies was then able to be checked against lists of external grant sources where early career researchers (from the surveys) had found success with their applications, as verification that indeed they were potentially open to applications from early career researchers. In addition, the review of selection criteria for the various granting schemes provided additional resource material for a discussion of a definition of and criteria for an early career researcher.

Analysis of Data Contained Within ARC Large Grant Application Forms

Information about the applicants to the Australian Research Council's Individual Grants Scheme (generally referred to as 'Large Grants') was extracted from applications submitted in 1994 (for 1995 funding). Applications both successful and unsuccessful, in nine fields of research covering the six broad discipline areas for this study were perused in some detail; in all, 488 projects involving 750 investigators. One hundred and eleven of the 488 projects considered were allocated funding: 96 for three years, 10 for two years and 5 for one year. The overall success rate for these applications was 22.7%, with no significant differences in the likelihood of

being funded occurring between discipline groups. Additional data relating to the age, gender and institutional affiliation of all applicants to the scheme was made available by the Research Branch, DEET, for both 1995 and 1996 rounds of funding.

The nine fields of research included in the detailed analysis were:

0202 theoretical and condensed matter physics

0203 atomic, molecular, nuclear, plasma and particle physics

0701 mechanical engineering

0704 civil engineering

1112 psychology

1202 history

1008 public health

1009 health services

1108 social studies.

For most analyses, these were combined into the five discipline areas of physics, engineering, psychology, history and social/health studies (health was combined with social studies as there was only one application in each of the two health fields).

Data, which were extracted from the applications for each chief investigator separately wherever possible, included:

- field of research code
- brief title of the project
- whether funded or not funded
- amount requested by year and amount awarded by year
- the university/agency to administer the grant
- number of chief investigators
- position in the list of chief investigators (e.g. 1st, 2nd or 3rd)
- the institutional affiliation of each chief investigator
- level of appointment of each chief investigator
- year of birth
- highest research qualification
- gender
- number of days/month to be spent on this project
- number of days/month to be spent on all projects
- support for this project during past/current three years (ignoring requests for next year), summarised as none, support from internal

University sources, support from ARC/NHMRC, support from other external sources - or a combination of these

- support for all other projects during past/current three years (ignoring requests for next year), coded in similar fashion to the above
- whether the project was previously supported as an ARC small grant
- number of books written in previous 2 years in which the relevant person was solo or senior author
- number of articles or chapters written in previous 2 years as solo or senior author
- number of papers presented/published and reports written in previous 2 years as solo or senior author (not including book reviews)
- number of publications written in previous 5 years as solo or senior author, marked with an asterisk (or equivalent) to indicate they were relevant to this proposal
- assessors' ratings given to the project (up to five)
- assessors' ratings given to the researcher or research team (up to five).

Data were analysed primarily on a project basis as this was the way in which the applications were presented and assessed, however some more personal details were able to be considered on an individual investigator basis.

Financial and Gender Analysis of ARC Small Grant Scheme Applicants

University Research Offices were asked to submit to DEET, for the first time in 1994, a count of the number of ARC small grant applications received and allocations made to

- single males or all male groups,
- single females or all female groups, and
- mixed gender groups.

No standard format for returns was provided, consequently the data submitted by each university were various in format and content. Some provided counts of individuals, others of grants (some even used a different basis for reporting applications and allocations). Some provided separate reports of renewal applications, others included these with initial applications. Some provided counts only for applications, not for allocations.

A common format spreadsheet was developed and completed as far as was possible from the data received. A number of decisions were made in order to make some analysis possible:

- Renewal grants were combined with initial grants as both involved a decision to allocate which was not automatic in the current year. Multi-year grants involving a decision to continue funding for a second or third year (as distinct from the initial year of funding for a multi-year application) were not considered in this analysis.
- Percentages were used (usually of females as a percentage of the whole) as a basis for comparison, so that data based on counts of individuals and counts of grants could both be used (though they could not then be combined to give overviews across university types).
- Data for mixed gender groups (both financial and counts) was split and assigned evenly to females and males. This is likely to have slightly biased the data in favour of females, in that females are less rather than equally or more likely to be part of groups involving three or more investigators.

The percentage of applications and allocations made to females as a proportion of the whole was then calculated for each university, considering both counts of grants, and the amounts of money involved. The proportion of tenured and fixed term contract staff which was female for each university in 1994 (i.e. excluding casual staff, which are disproportionately female) was added to the analysis, as a basis for comparative assessment of the grants data.

Survey of 1993 PhD Graduates

A four page questionnaire (Appendix 3) was developed which sought information on the research training experience of the graduate as preparation for a research career, whether they were still engaged in research (and/or wanted to be), their current work environment, and their experience in obtaining funding for research. Questions were largely in prestructured format, although respondents were invited to add further comment and/or to record their willingness to be interviewed. Questions were derived on the basis of preliminary interviewing of recent graduates, and were extensively pilot tested and revised before being finalised.

The survey, presented as a single folded A3 sheet under a covering letter from Professor Max Brennan as Chair of the ARC, was sent to a cohort of 423 PhD graduates of the Universities of Sydney (165), Western Sydney (2), Wollongong (43) and South Australia (2), Monash (152), Murdoch (28) and Flinders (23) Universities, and Queensland University of Technology (8). Names of graduates were supplied by the Universities, so that covering letters could be individually addressed to each. In most cases the Universities were responsible for posting out of the surveys, and in some cases they provided an additional covering letter. A significant proportion (at least 20%) were sent to overseas addressees. Graduates located in Australia who did not reply on first mailing were sent a second copy of the survey form with a covering letter from the project leader, again through the

Universities concerned. Reply paid envelopes (valid in Australia only) were provided on both occasions.

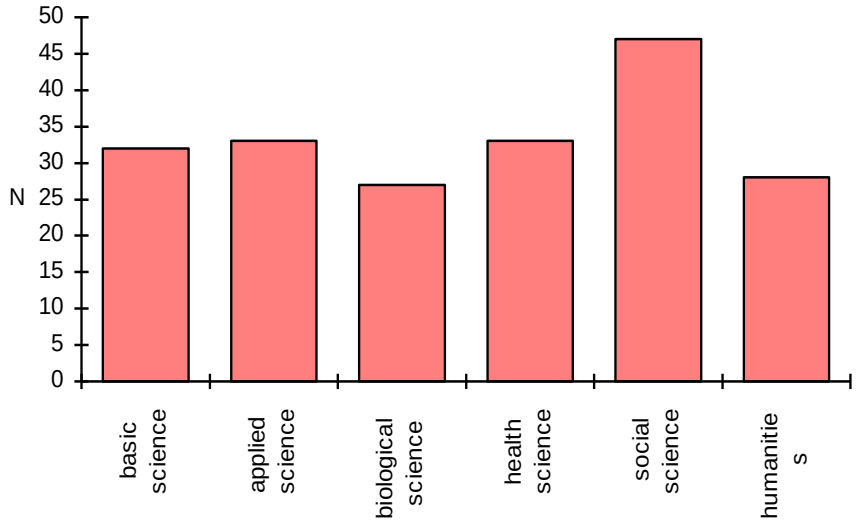
A considerable number of the sample were no longer at the address held by their university, with a consequent impact on return rates: some letters were returned to sender, others can be assumed to have been destroyed. Responses were obtained from 208 graduates: 190 from those with Australian addresses (a few of whom had since moved overseas and whose letters were forwarded) and 18 from those with overseas addresses. The response rate for the entire sample was therefore 49.2 per cent; for those sent to (presumed) Australian addresses the response was 55.4 per cent, but for those known to be addressed overseas, just 22.5 per cent were completed and returned.

Respondents to this survey undertook their PhD studies at

Sydney University	78
Monash University	71
Flinders University	11
Murdoch University	22
Wollongong University	20
Queensland University of Technology	3
University of South Australia	2
University of Western Sydney	1

Few of the post-1987 universities commenced training PhD students until the 1990s, hence the small number of 1993 graduates from those universities. The majority of those who responded were male (60.2%), were permanent residents of Australia (95.1%) and spoke English as their primary language (85.8%). They ranged in age from 27 to 69 years, with a mean age of 38.4 years, 62.6% were under 40. The disciplines in which they undertook their PhD research were classified within the Australian Bureau of Statistics' twelve broad fields of research. Small numbers in the various science disciplines meant that these categories were reduced to three groups: physical (physics, chemistry, mathematics), applied (engineering, earth sciences), and biological sciences. Almost all those graduating in health sciences were in clinical medicine rather than other branches of health studies (they were therefore combined with other science disciplines for some analyses, rather than with humanities/social science). Figure A.1, showing the distribution of the sample across the discipline groups, demonstrates a higher number of respondents from health, social sciences and humanities than from pure, applied and biological sciences.

Figure A.1 Distribution of the Sample of 208 PhD Graduates Across Disciplines



Survey of Early Career Academics

Designed in a similar style to that for PhD graduates, a questionnaire sent to 'early career' academics sought to assess their background in research, their enthusiasm for research and to what extent it was a priority for them, their perceptions of their research environment (both structural and collegial), their strategies for and success in gaining funding for research, their assessment of those things which had assisted their research development, and their perception of the relative importance of factors potentially hindering their research development (Appendix 4). Responses to questions were almost entirely pre-structured, however respondents were encouraged to add comments and/or to volunteer for interview on the issues raised. Extensive pilot testing was undertaken to ensure the appropriateness and adequacy of the questions and their alternative responses.

It was felt that an individualised approach to each relevant academic would increase the likelihood of response to the survey. Each questionnaire was prefaced by an individually addressed covering letter from Professor Max Brennan and sent in an individually addressed envelope to their departmental address. This necessitated an approach to the head of each department from which the sample was to be drawn with a request to identify for us those on their staff who might be appropriate to include in the survey. Criteria suggested to them for identification of potential survey

respondents were based on the categories outlined above as 'the target population' for the study.

Universities from which the sample was drawn were stratified to include each of the four university types and to cover a range of locations (city/rural, different states) and structures (centralised/split campus). These were Sydney, Queensland and Monash Universities (Group A), Wollongong, Murdoch, James Cook and Flinders Universities (Group B), Victoria and Queensland Universities of Technology and University of South Australia (Group C), and Edith Cowan University and the University of Western Sydney (Group D). Departments approached within these universities were those most closely related to the disciplines forming the focus of this study, i.e. those in which one might expect to find academics researching in physics, engineering, psychology, history, nursing or social work. Departments were found to be more traditionally defined in Group A and B universities than in C or D; across the system, social work, more than any other, was likely to be in a combined department (usually with related human services/sociological disciplines). In all, academic staff from 73 departments were included in the sample for this aspect of the study.

Difficulties were experienced in identifying members of the sample:

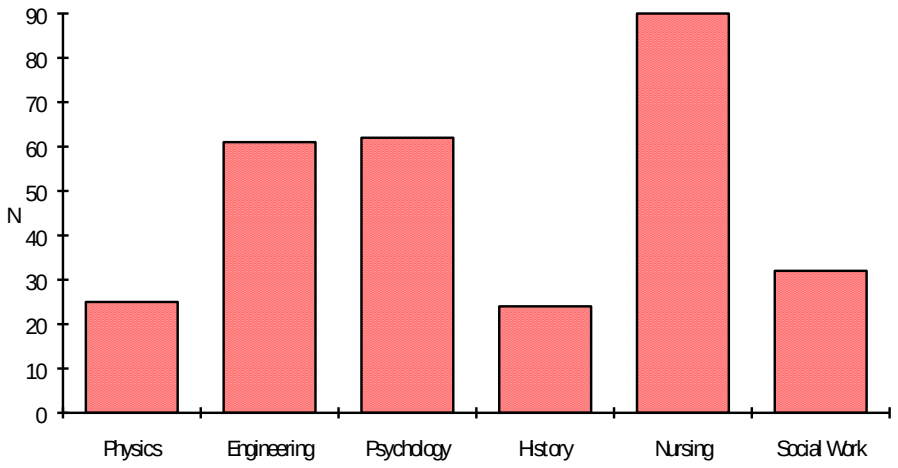
- There were differences between universities and departments as to whom they considered to be members of staff, some including only full-time tenured staff, others initially including even very part-time casual tutors and demonstrators. Where the latter were included, it was decided to limit them to those who were employed on an ongoing and regular basis with at least a .5 equivalent load (e.g. 6 hours/week face to face contact).
- Some departments appeared to have difficulty listing who their staff were (particularly where amalgamations were relatively recent). Master lists obtained from Human Resources Departments and or university phone directories (neither of which were necessarily comprehensive or up to date) sometimes helped.
- A number of department heads insisted on having members volunteer to participate in the study (with an indefinite definition of what that might involve) before they would forward their names, rather than allow them to choose whether to respond once they saw the questionnaire and its covering letter. This meant that we had no idea of the number in those departments who met the criteria.
- Some departments (particularly those in history and physics) had experienced no changes in academic staff, or perhaps only one, in the past several years.

Additional copies of the questionnaire, letters and reply envelopes were supplied to heads of all departments, along with lists of those staff in their department to whom a copy had already been sent, 'in case' they thought of others for whom it might be relevant once they saw the questions. This

process was facilitated by having interviewed many of the heads of departments in the time between the initial approach to identify the sample, and the sending out of the questionnaires. Follow-up letters, with an additional copy of the questionnaire, were sent to those who had not responded within two weeks of original mailing.

Given that it was not possible to definitively enumerate the sample, a true response rate cannot be determined. Individually addressed questionnaires were sent to 422 academics in 70 of the 73 departments. Responses were received from 264 of these (62.6%), including three who had removed the identification number and who did not identify their university. An additional 32 responses came from those supplementary to the initial sample (i.e. as distributed by the heads of departments), making 296 reponses in all. The difficulty experienced in finding early career academics in the more traditional (and contracting) disciplines of physics and history is apparent from the relatively small sample sizes in those disciplines (Figure A.2). As a result of difficulties in sampling, results from the questionnaire were used more analytically than descriptively, i.e. to analyse relationships between variables rather than estimate total population descriptors.

Figure A.2 Distribution of Sample of 296 Early Career Academics Across Disciplines



Respondents ranged in age from 26 to 60 years, with a mean of 41.2 years: 56.6 per cent were over 40. They included 141 males (47.8%) and 154 females (52.2%). Forty of the respondents were in Level A positions, 145 at Level B, 63 at Level C, 29 were Level D/E, and 9 were in research only positions. Six in non-academic positions (research assistant, professional officer) were excluded from academic analyses; level of appointment was unkown for two respondents. Forty-nine per cent of respondents had completed their PhD, a further 36 per cent were near completion.

Many of the respondents indicated willingness to be interviewed by supplying a name and phone number, others wrote letters in addition to

returning their questionnaire. Those contacted were interviewed regarding their experiences in attempting to develop their research career, and in particular, regarding the impact that their experiences in seeking funding had on their research activity and their development, including the impact of funding failure. Where possible, interviews were taperecorded and transcribed verbatim.

Interviews with Heads of Departments

In order to gain a better understanding of the broader context in which early career academics work and might seek to establish a research career, interviews were conducted with heads of some of those departments from which early career academics were drawn for surveying, i.e. (or the nearest equivalent, if any). In all, 52 interviews were conducted either in person (primarily) or by telephone, with heads (or in a few cases, chairs of research committees) of most relevant departments in the Universities of Sydney, Queensland, Western Sydney, Wollongong and South Australia, Monash and Flinders Universities, and Victoria and Queensland Universities of Technology. All those approached for interview responded.

Questions asked of the heads of departments were semi-structured, and broadly covered:

- the importance of research in the culture of the department, e.g. expectations of staff to be doing research, opportunities for staff to present/share their research, the research productivity of the department, the relationship between teaching and research in the department;
- the nature and focus of the research different members of staff are doing, whether it is largely team based, loosely collaborative or solo, and principal sources of funding;
- the extent to which the head acts as a role model for research;
- how the head of department saw his or her role in terms of fostering research, including structural, financial and collegial strategies being adopted to support new academics and their awareness of problems being faced by them; and
- their situation with regard to budgets, facilities and equipment for research.

Some information from these interviews, primarily that describing the departmental environments in which they work, was analysed using a matrix format (in the style of Miles & Huberman, 1994). Data reduction to facilitate analysis was undertaken on both a university type basis and a discipline basis. In addition the interview material was added to the pool of qualitative data which contributed to an understanding of needs and difficulties of early career researchers, and possible strategies to assist the careers of promising researchers.

Interviews with Successful Researchers

Researchers (N=30) who had been successful for some time in attracting ARC or other funds for their research were interviewed with a view to identifying patterns in the development of a successful research career, and to tap their wisdom regarding accessing grant funds, drawn particularly from their experience of the ARC. Interviews were loosely structured with questions about what lead them to their current position (as a successful researcher), their strategies for winning grants, their thoughts about the current funding situation, and whether they had any suggestions about how to structure or change funding systems (if they needed to be changed) to assist new researchers. Researchers for these interviews were identified by general reputation, through their heads of department or through the Research Office of their institutions. All who were approached agreed to be interviewed.

Other Contributions

Additional contributions to understanding the issues came from discussions with Pro and Deputy Vice-Chancellors (Research), members of the project steering committee, and Chairs of ARC discipline panels and sub-panels.

Appendix 2

University Classifications and Abbreviations

Group A

Adelaide University	adel
Monash University	mon
The University of Queensland	qld
The University of Sydney	syd
The University of Melbourne	melb
University of New South Wales	unsw
University of Western Australia	uwa

Group B

Australian National University	anu
Deakin University	deak
Flinders University	flin
Griffith University	grif
James Cook University	jcu
LaTrobe University	lat
Macquarie University	macq
Murdoch University	murd
University of Newcastle	unc
University of New England	une
University of Tasmania	tas
Wollongong University	wgong

Group C

Curtin University of Technology	curt
Northern Territory University	ntu
Royal Melbourne Institute of Technology	rmit
Swinburne University of Technology	swin
Queensland University of Technology	qut
University of South Australia	unisa
University of Technology Sydney	uts
Victoria University of Technology	vut

Group D

Australian Catholic University	acu
Central Queensland University	cqu
Charles Sturt University	csu
Edith Cowan University	ecu
Southern Cross University	scu
University of Ballarat	ball
University of Canberra	canb
University of Southern Queensland	usq
University of Western Sydney	uws

Appendix 3

Survey of 1993 PhD Graduates

Appendix 4

Survey of Early Career Academics