

# SUBMISSION TO THE HOUSE OF REPRESENTATIVES COMMITTEE ON INDUSTRY, SCIENCE AND INNOVATION

## INQUIRY INTO RESEARCH TRAINING AND RESEARCH WORKFORCE ISSUES IN AUSTRALIAN UNIVERSITIES

### CONTENTS

	Page
Introduction	2
The contribution that Australian universities make to research in Australia	4
The challenges Australian universities face in training, recruiting and retaining high quality research graduates and staff	6
Attachment A: ARC National Competitive Grants Program	9

### SUBMISSION DETAILS

**Organisation:** Australian Research Council  
**Contact:** Professor Margaret Sheil  
Chief Executive Officer  
**Address (Postal):** GPO Box 2702, Canberra ACT 2601  
**Address (Location):** 8 Brindabella Circuit  
Brindabella Business Park  
Canberra Airport ACT 2609  
**Telephone contact:** (02) 6287 6600  
**Date:** May 2008

## INTRODUCTION

### This submission

1. On 23 April 2008, the Minister for Innovation, Industry, Science and Research asked the House of Representatives Standing Committee on Industry, Science and Innovation to inquire into and report on research training and research workforce issues in Australian universities.
2. The terms of reference for this inquiry cover a broad range of issues relating to (i) the contribution that Australian universities make to research in Australia; and (ii) the challenges Australian universities face in training, recruiting and retaining high quality research graduates and staff.
3. This submission provides brief comments on the terms of reference and outlines for the Committee the role of the Australian Research Council (ARC) in supporting research training and career development within Australia's innovation system. The submission includes information drawn from the ARC submission to the review of the National Innovation System (<http://www.innovation.gov.au/innovationreview/Pages/home.aspx>).

### The Australian Research Council

#### Overview

4. The ARC is a statutory authority within the Australian Government's Innovation, Industry, Science and Research portfolio. Its mission is to advance Australia's capacity for quality research to the economic, social and cultural benefit of the community.
5. The ARC provides advice to the Government on research matters and manages the National Competitive Grants Program (NCGP). Funding provided through the NCGP is a key part of the competitive arm of the dual funding model for higher education research.
6. Through the NCGP, the ARC supports the highest quality fundamental and applied research and research training across all disciplines with the exception of clinical medicine and dentistry. The NCGP supports two main streams of research funding – Discovery, under which funding is made available for investigator-initiated research and research fellowships, and Linkage, under which research projects, infrastructure, fellowships, centres and networks are funded jointly with partner organisations in the private sector, government or the community. Funding is allocated on the basis of a competitive peer review process using national and international research experts.
7. On 26 February 2008, the Minister for Innovation, Industry, Science and Research announced that a new *Excellence in Research for Australia* (ERA) initiative would be developed by the ARC in conjunction with the National Health and Medical Research Council (NHMRC) and the Department of Innovation, Industry, Science and Research (DIISR). ERA will assess research excellence within Australia's higher education institutions using a combination of metrics and expert review by committees comprising experienced, internationally-recognised experts.

## **Support for research training and career development**

8. One of the ARC's seven key objectives under its current strategic plan is to 'contribute to high-quality research training and foster career opportunities for Australia's best and brightest researchers' (*ARC Strategic Plan 2006-2008*).
9. Funding schemes under the NCGP place great emphasis on research training and career development in an environment of excellent research. Through these schemes the ARC:
  - funded directly (that is, through salary or stipend support provided to selected individuals) approximately 590 new awards and fellowships in 2008. The awards and fellowships on offer encompass every stage of a research career, from postgraduates through to senior researchers (see [Table 1](#)).
  - funded 1452 new research projects in 2008, involving 4219 researchers (excluding double counting) at Australian universities. This funding support enables the employment of additional research personnel and contributes significantly to the development of Australia's research capacity.
10. The ARC's investment in people is significant on a number of levels:
  - It provides incentive and reward to emerging and established researchers. Excellent researchers are a pre-requisite for excellent research, which in turn is almost invariably a necessary condition for that research to find applications generating community benefit.
  - It assists in retaining in Australia researchers of excellence and attracting to Australia foreign-trained or foreign-resident researchers who can complement and further develop research capability within Australia, and provide international linkages with Australian researchers and opportunities for future research collaboration.
  - Industry placements enable industry and other community partners to access more easily the skills of university-based researchers.
11. Additional details of the contribution of the ARC's funding schemes to research training and career development are provided in [Attachment A](#).

**Table 1: ARC awards and fellowships**

	Awards / Fellowship (Scheme)	
	Discovery	Linkage
Postgraduate		Australian Postgraduate Award Industry ( <i>Linkage Projects</i> )
Postdoctoral	Indigenous Researcher Fellowship ( <i>Discovery Indigenous Researcher Development</i> ) Australian Postdoctoral Fellowship ( <i>Discovery Projects</i> )	Australian Postdoctoral Fellowship Industry ( <i>Linkage Projects</i> ) ARC International Fellowship ( <i>Linkage International</i> )
Mid-career	Australian Research Fellowship ( <i>Discovery Projects</i> ) Queen Elizabeth II Fellowship ( <i>Discovery Projects</i> ) Future Fellowships (separate scheme – funding commencing in 2009)	ARC International Fellowship ( <i>Linkage International</i> )
Senior	Australian Professorial Fellowship ( <i>Discovery Projects</i> )	ARC International Fellowship ( <i>Linkage International</i> )
Other	Federation Fellowship (separate scheme)	

## THE CONTRIBUTION THAT AUSTRALIAN UNIVERSITIES MAKE TO RESEARCH IN AUSTRALIA

*The contribution of research training schemes to Australia's competitiveness in the areas of science, research and innovation.*

*The effectiveness of current Commonwealth research training schemes.*

*The adequacy of current research training schemes to support Australia's anticipated future requirements for tertiary-qualified professionals in a wide range of disciplines.*

12. Universities are major players in Australia's innovation system – both in performing research and training skilled personnel. The research conducted by higher education institutions represents over one quarter of all national research expenditure, approaching \$4.3 billion in 2004–05 (Australian Bureau of Statistics, *Research and Experimental Development Australia All Sector Summary 2004–05*).
13. Researchers in higher education are engaged across the spectrum of research – from pure basic, strategic basic, applied research and experimental development – but universities have a special responsibility for basic research, little of which is undertaken elsewhere in Australia.
14. The development of excellent researchers is perhaps the single most important objective of any innovation system. Without a skilled and diverse base of people, the other 'tools' of the research and innovation system (for example, infrastructure) would be sub-optimal and many of the other objectives for research and innovation would not achieve the desired national benefit outcomes.
15. The Australian Government provides a significant level of support for research training through a range of schemes including:
  - the Research Training Scheme – block grants, on a calendar year basis, to eligible higher education providers to support research training for students undertaking Doctorate and Masters degrees by research.
  - Australian Postgraduate Awards – financial support (including stipends) to domestic postgraduate students who undertake their higher degree at an eligible Australian higher education provider. The allocation of funding to participating providers is based on a formula that is reflective of the provider's overall research performance. In the 2008–09 Budget the Australian Government announced that an additional \$209 million would be made available over four years to double the number of Australian Postgraduate Awards by 2012.
  - International Postgraduate Research Scholarships – financial support (tuition fees and health cover costs) to enable international students to undertake a postgraduate research qualification in Australia.
  - ARC Australian Postgraduate Awards Industry (APAI)s – financial support (including stipends) for postgraduate study awarded under the *ARC Linkage Projects* scheme.
16. Other support for stipends and research costs is available from the Institutional Grants Scheme; a university's own resources; research project grants (for example, awarded through the *Discovery Projects* scheme); various research centres (including ARC Centres of Excellence and Cooperative Research Centres) and schemes administered by

other funding agencies. The NHMRC, for example, has a postgraduate scholarship scheme aimed at supporting outstanding Australian health and medical graduates early in their career so that they can be trained to conduct research that is internationally competitive and develop a capacity for original independent research.

17. The ARC APAs play an important role in the suite of support available in that they bring postgraduate researchers in the higher education sector together with end-users (in government, business or non-profit organisations). These linkages are important in ensuring that research training remains relevant to the needs of potential employers. Through the *Linkage Projects* scheme, APAs gain valuable experience in using their training and participating end-user organisations benefit from the involvement of highly trained research resources.
18. Final reports submitted by end-user organisations (called partner organisations under the *Linkage Projects* scheme) provide qualitative evidence of the value of the research training component of these awards, for example, '[The organisation] would be interested in seeking further collaborative projects...with PhD or post-doc appointments to support our joint science priorities'. A survey of partner organisations conducted in 2005–06 found that 88 per cent of partner organisation respondents felt that it was important that the *Linkage Projects* scheme provided access to 'highly skilled research personnel'.
19. The APAs will be strengthened by the Australian Government's recent announcement that the Awards, previously restricted to Australian citizens, would be opened up to the highest calibre postgraduate students irrespective of nationality. The international dimension of research training is becoming increasingly important with contacts established at an early stage of a career shown to be most important in the development of ongoing networks. The relationship of the ARC Photovoltaics Centres of Excellence with Suntech Power (headed by former PhD student and postdoctoral fellow) is an example.
20. Mismatches between the supply of and demand for research graduates within the labour market are likely to continue due to:
  - the lag in production; and
  - the rapid change in the relative importance of different fields of research.
21. One possible response could be the facilitation of increased participation by key employer groups in the process of formulating advice on research training. The Australian Government has recently initiated a consultation process on the establishment of Industry Innovation Councils which may assist in this regard (*Industry Innovation Councils – Consultations Underway*, 8 May 2008).
22. ARC selection criteria do not generally prioritise particular disciplines or types of work. The policy of supporting excellence in whatever discipline and whatever location it is found supports the development of a broad range of capability within Australia. It ensures that when new needs or opportunities are identified, a core of knowledge will be accessible.

## THE CHALLENGES AUSTRALIAN UNIVERSITIES FACE IN TRAINING, RECRUITING AND RETAINING HIGH QUALITY RESEARCH GRADUATES AND STAFF

*Factors for graduates that determine pursuit of a career in research.*

*Adequacy of training and support (including income support) available to research graduates in Australia.*

*Opportunities for career advancement for research graduates and staff.*

*Factors determining pursuit of research opportunities overseas.*

*Australia's ability to compete internationally for high quality researchers.*

*Whether Australia's academic workforce is ageing, and the impact this may have on Australia's research capacity.*

### Research as a career

23. The challenges in attracting the brightest people to a research career and keeping them there include salary levels, job security, career structure and the research environment. The ARC has observed the challenges confronted by many grant recipients in attracting postgraduate and postdoctoral researchers to their teams as qualified staff take up higher-paying, non-research positions in business.
24. Researchers lost to the profession early in their careers are less likely to return to it and the trend, if continued, will inevitably accentuate the already apparent ageing of the academic workforce in Australia. Resultant gaps in the academic workforce could become a major constraint on the retention and enhancement of Australia's research capability into the future.
25. Through its fellowship schemes the ARC:
  - supports researchers at various levels;
  - provides indexed salaries and stipends, the levels of which are monitored regularly; and
  - offers researchers some flexibility with regard to salary support, for example, providing options for those who want to work full-time and those who want to work part-time (in conjunction with teaching or other professional duties).
26. The ARC welcomes the opportunities that will become available under the *Future Fellowships* scheme including the provision for a period of the fellowship to be spent in a high quality research environment overseas. The aim of *Future Fellowships* is to attract and retain the best and brightest mid-career researchers.
27. Over a five-year period (2009–2013), *Future Fellowships* will offer four-year Fellowships of up to \$140,000 a year to 1,000 Australian and international top researchers in the middle of their career. In addition, each researcher's administering organisation will receive funding of up to \$50,000 per year to support related infrastructure, equipment, travel and relocation costs.
28. Competition among existing highly experienced and talented researchers for external funding support, such as that provided by the ARC, is fierce and international studies suggest that low success rates (for example, below 20 per cent) provide a disincentive to

new researchers entering the system. Within this highly competitive environment the ARC is concerned with researchers at all career levels.

29. In developing the NCGP, the ARC has given careful consideration to support mechanisms for early-career researchers. In addition to Fellowships, the ARC has incorporated specific measures for early-career researchers within the *Discovery Projects* program. Under these arrangements funds are identified from within the broader program allocation specifically for early-career researchers.

## Mobility

30. The phenomenon of ‘brain drain’ came to national prominence in the 1990s as working conditions and opportunities perceived to be unavailable within Australia attracted researchers overseas.
31. A more current term is ‘brain circulation’<sup>1</sup> with wide recognition that time spent in excellent research facilities overseas builds skills and cooperative linkages vital for a healthy research career. This is apparent in the Australian Government’s recent announcement that competition for Future Fellowships and APAs will be opened up to non-Australian citizens, and the foreshadowing of the same for other types of fellowships administered by the ARC.
32. It is, however, not enough to simply change eligibility restrictions – to create a strong research capability in the future however we must create an attractive environment in Australia to encourage Australian researchers to return or to attract other researchers of international standing.
33. The introduction of the ARC *Federation Fellowships* scheme in 2001 provided a direct and very visible focus on researchers of excellence, and on their value to Australian science and innovation. The ARC regards this as a means of rewarding researchers of excellence, accessing their skills for the benefit of their host institutions and those who work with and within those institutions, and inspiring others not only to achieve, but also to pursue careers in research.
34. The ARC Centres of Excellence play an important role in this regard including the three on-going Centres of Excellence the ARC currently co-funds with other government bodies (that is, National ICT Australia (NICTA), the Australian Stem Cell Centre (ASCC) and the Australian Centre for Plant Functional Genomics (ACPFG)). The ARC Centres of Excellence have international visibility and standing and are able to attract and retain researchers of the highest calibre, as they permit both depth and breadth of research activity and continuity of funding for up to five years (or longer subject to performance reviews and budget). All Centres have developed strong collaborations with university and other partners, and most achieve considerable funding leverage. NICTA, for example, has 289 research staff, and in collaboration with partner universities currently has 293 PhD scholarship students working across the Centre (with 49 PhD completions to date).

---

<sup>1</sup> ‘Brain circulation’ refers to the movement of researchers across international boundaries. This term is used by ARC Federation Fellow, Professor Graham Hugo (among others) who has gained international recognition for his work on researcher mobility. Professor Hugo’s findings suggest that, while Australia is currently a net importer of research talent, our advantage in this area is declining, with some disciplines showing net losses.

35. The ARC Centres of Excellence play a crucial and growing role in the national innovation system and the ARC believes that consideration should be given to expanding the support available for the scheme. There is considerable on-going support within the sector for maintaining a strong *ARC Centres of Excellence* scheme.
36. Preliminary findings from a review currently being undertaken by the ARC of *ARC Research Networks* indicate that this initiative to facilitate the development of collaborative links among researchers has been an effective complement to the direct funding of research and research facilities. The scheme has a flexible architecture which is highly productive in bridging both physical distance and disciplinary contradictions between researchers to produce new collaborative work. Networks complement Centres by connecting people who cannot be in the same place at the same time, and incubate prospective Centres, by mapping and sustaining emerging areas of research.



## ARC NATIONAL COMPETITIVE GRANTS PROGRAM

### INTRODUCTION

In 2007–08 the ARC administered a budget of approximately \$571.8 million for the National Competitive Grants Program (NCGP) – accounting for approximately 9 per cent of total Australian Government financial assistance for science and innovation (*Australian Government's 2008–09 Science and Innovation Budget Tables*). The budget for the NCGP will increase over the next few years due to a new budget measure announced in May 2008 for the implementation of a new *Future Fellowships* scheme.

By the operation of a range of funding schemes under the NCGP, the ARC aims to:

- maintain and build on existing research and research training;
- build the scale and focus of research and research training;
- encourage cross-disciplinary approaches to research and research training;
- facilitate collaborative approaches to research and research training; and
- support research and research training of national benefit, including in the National Research Priorities.

The NCGP supports two main streams of research funding – Discovery, under which funding is made available for investigator-initiated research and research fellowships, and Linkage, under which research projects, infrastructure, fellowships, centres and networks are funded jointly with partner organisations in the private sector, government or the community ([Table 1](#)).

**Table 1: Funding schemes under the NCGP**

Discovery	Linkage
Discovery Projects	Linkage Projects
Federation Fellowships	Linkage International
Discovery Indigenous Researchers Development	Linkage Infrastructure, Equipment and Facilities
Future Fellowships [to commence in 2009]	ARC Centres of Excellence
	Co-funded Centres of Excellence (1)
	ARC Research Networks
	Special Research Initiatives (2)
	Linkage Learned Academies Special Projects

(1) Australian Centre for Plant Functional Genomics, Australian Stem Cell Centre and National ICT Australia

(2) Includes funding in 2008 for the *Ageing Well*, *Ageing Productively* and *Thinking Systems* initiatives (co-funded with the NHMRC), the ARC Centre of Excellence for Policing and Security and the Australian and New Zealand Council for the Care of Animals in Research and Teaching (ANZCCART)

Most ARC funding through the NCGP is directed to the higher education sector although there are a number of exceptions where funding is also provided to researchers outside this sector.

## SUPPORT FOR RESEARCH TRAINING AND CAREER DEVELOPMENT

### Overview

As noted in the submission, the NCGP supports research training and career development across all its schemes through direct funding (that is, through salary or stipend support provided to selected individuals) and indirect funding (that is, through grants for research projects, infrastructure, centres and networks).

Since the NCGP commenced in 2002, the ARC has awarded 2584 Australian Postgraduate Awards Industry; 1026 postdoctoral fellowships; 275 mid-career fellowships; 185 senior fellowships and 158 Federation Fellowships. Details of the number of researchers and the awards and fellowships under which they were appointed are shown in [Table 2](#).

**Table 2: ARC awards and fellowships (2002 to 2008)**

Award <sup>1</sup>		Commencement funding year						
		2002	2003	2004	2005	2006	2007	2008
		(no.)	(no.)	(no.)	(no.)	(no.)	(no.)	(no.)
<b>Postgraduate awards</b>								
Australian Postgraduate Awards Industry	Applications	822	1 012	775	878	886	796	794
	Funded	397	461	426	389	304	295	312
	Success rate	48.3%	45.6%	55.0%	44.4%	34.3%	37.2%	39.3%
<b>Postdoctoral fellowships</b>								
Indigenous Researcher Fellowship	Applications	na	1	2	2	1	5	6
	Funded	na	1	1	2	1	2	5
	Success rate	na	100.0%	50.0%	100.0%	100.0%	40.0%	83.3%
Australian Postdoctoral Fellowship	Applications	449	579	489	570	679	726	676
	Funded	110	110	112	112	110	110	120
	Success rate	24.5%	19.0%	22.9%	19.6%	16.2%	15.2%	17.8%
Australian Postdoctoral Fellowship Industry	Applications	59	73	82	75	62	76	58
	Funded	27	32	46	33	30	32	30
	Success rate	45.8%	43.8%	56.1%	44.0%	48.4%	42.1%	51.7%
<b>Mid-career fellowships</b>								
Australian Research Fellowship / Queen Elizabeth II Fellowship	Applications	216	254	226	264	292	340	372
	Funded	30	31	33	32	33	58	58
	Success rate	13.9%	12.2%	14.6%	12.1%	11.3%	17.1%	15.6%
<b>Senior fellowships</b>								
Australian Professorial Fellowship	Applications	165	172	156	176	188	210	180
	Funded	23	25	24	23	25	29	28
	Success rate	13.9%	14.5%	15.4%	13.1%	13.3%	13.8%	15.6%
Linkage Industry Fellowship	Applications	-	-	6	7	4	2	5
	Funded	-	-	3	3	0	1	1
	Success rate	-	-	50.0%	42.9%	0	50.0%	20.0%
<b>Federation fellowships</b>								
Federation Fellowship <sup>(1)</sup>	Applications	268	97	143	188	163	129	157
	Funded	26	24	25	24	25	20	14
	Success rate	9.7%	24.7%	17.5%	12.8%	15.3%	15.5%	14.6%
<b>Other</b>								
ARC International Fellowship (ARCIF) <sup>(2)</sup>	Applications	22	22	23	46	79	80	76
	Funded	12	16	11	19	20	22	22
	Success rate	54.5%	72.7%	47.8%	41.3%	25.0%	27.5%	28.9%

<sup>(1)</sup> Two selection rounds were held for Federation Fellowships commencing in 2002: Round 1, which closed in June 2001, and a supplementary round, which closed in February 2002. These rounds have been aggregated under the 2002 first year of funding for the purpose of this table.

<sup>(2)</sup> ARCIFs are awarded at levels equivalent to those offered under the *Discovery Projects* scheme.

A more detailed description of the support provided through the individual schemes of the NCGP is provided below. Note the description excludes co-funded Centres of Excellence which make a significant contribution to research training and career development within Australia.

## **Discovery Projects**

### Description

The objectives of the *Discovery Projects* scheme, as stated in the Discovery Projects Funding Rules for Funding Commencing in 2009, are to:

- a. support excellent fundamental research by individuals and teams;
- b. enhance the scale and focus of research in the National Research Priorities;
- c. expand Australia's knowledge base and research capability;
- d. foster the international competitiveness of Australian research; and
- e. encourage research and research training in high-quality research environments.

The *Discovery Projects* scheme provides funding support for the salaries of fellowships as well as for project grants (which may support the salaries of research associates, technicians, laboratory attendants and postgraduate stipends as well as the costs of equipment, maintenance and travel).

### *Fellowships*

Four types of fellowships are available under the *Discovery Projects* scheme.

Australian Postdoctoral Fellowships (APD) are awarded to assist promising researchers early in their career to broaden their research experience. The fellowships are awarded to researchers who, at the time of the closing date for proposals, have completed their PhD or equivalent within the previous three years. The Fellowships are tenable at organisations both inside and outside the higher education sector including the CSIRO.

Funding for APDs may be awarded for three or four years. The four-year option requires the administering organisation to contribute 25 per cent of the fellow's salary, and enables the fellow to spend 25 per cent of her or his time on activities other than the funded project, such as teaching. Benefits may include salary (see [Table 3](#)), relocation allowance and teaching relief contribution.

Australian Research Fellowships (ARF) and Queen Elizabeth II (QEII) Fellowships are awarded to researchers who have less than eight years of postdoctoral research experience if they have not held either type of fellowship previously; or less than 13 years of postdoctoral research experience if they have held either type of fellowship previously. QEII Fellowships are tenable at organisations both inside and outside the higher education sector including the CSIRO.

Funding for ARFs and QEIIS may be awarded for five years. Benefits may include salary (see [Table 3](#)), relocation allowance and teaching relief contribution with two salary options available: a 100 per cent salary plus on-costs (available only if the candidate has not previously held an ARF/QEII) and a 50 per cent salary plus pro rata on-costs (available for

first and subsequent fellowships – the ARC contribution is matched by the administering organisation).

Australian Professorial Fellowships (APF) are awarded to outstanding researchers with proven international reputations to undertake research that is of major importance in its field and of significant benefit to Australia. Funding may be awarded for five years. Benefits may include salary (see [Table 3](#)), relocation allowance and teaching relief contribution.

**Table 3: ARC fellowship salaries (2008 levels of funding)**

Fellowship	Step/Option	Salary	28% on-costs	TOTAL
Australian Postdoctoral Fellowship; Australian Postdoctoral Fellowship Industry;	3 year, 100% option 4 year, 75/25% option	\$61,399 \$46,049	\$17,192 \$12,894	\$78,591 \$58,943
Indigenous Researcher Fellowship		\$61,399	\$17,192	\$78,591
Australian Research Fellowship / Queen Elizabeth II Fellowship	Step 1 – 100% option 50% option	\$77,008 \$38,504	\$21,562 \$10,781	\$98,570 \$49,285
Australian Research Fellowship / Queen Elizabeth II Fellowship	Step 2 – 100% option 50% option	\$91,578 \$45,789	\$25,642 \$12,821	\$117,219 \$58,609
Australian Professorial Fellowship	Step 1 – 100% option 50% option	\$106,146 \$53,073	\$29,721 \$14,860	\$135,867 \$67,933
Australian Professorial Fellowship	Step 2 – 100% option 50% option	\$122,797 \$61,398	\$34,383 \$17,191	\$157,180 \$78,590

In recently announced changes (*ARC Fellowships to become more international*, March 2008):

- all ARC fellowships will be opened to the best Australian and international researchers;
- restrictions on the use of ARC funds for travel for international collaborators will be removed; and
- enhanced international collaboration will be made a priority for all ARC fellowship schemes.

#### *Early-career researchers*

In developing the NCGP, the ARC gave careful consideration to possible support mechanisms for early-career researchers (ECRs). In addition to Fellowships, the ARC decided to incorporate specific measures for ECRs within the *Discovery Projects* scheme.

Under these arrangements a proportion of the *Discovery Projects* budget allocation (up to 15 per cent) is used each year to ensure that a substantial number of ECRs are funded. For this purpose, researchers who, at the closing date for proposals, have completed their PhD or equivalent within the previous five years are considered to be ECRs. The separate budget allocation is for ECR-only proposals; that is, proposals on which all investigators are ECRs. ECR-only proposals are assessed against the same criteria as other *Discovery Projects* proposals.

#### *Research personnel*

Project costs which may be supported under the *Discovery Projects* scheme include the costs of personnel (salaries and on-costs) such as research associates, technicians and laboratory attendants. While not granted directly to named applicants, projects costs are also able to be used to cover the costs of stipends for postgraduate research students.

## Selection outcomes

### Numbers of fellowships

**Table 4: Discovery Projects fellowships (2002 to 2008)**

	Funding commencement year						
	2002	2003	2004	2005	2006	2007	2008
<b>Fellowship applications</b>							
APD	449	579	489	570	679	726	676
ARF/QEII	216	254	226	264	292	340	372
APF	165	172	156	176	188	210	180
Total	830	1005	871	1010	1159	1276	1228
<b>Fellowship awards</b>							
APD	110	110	112	112	110	110	120
ARF/QEII	30	31	33	32	33	58	58
APF	23	25	24	23	25	29	28
Total	163	166	169	167	168	197	206
<b>Success rates</b>							
APD	24.5%	19.0%	22.9%	19.6%	16.2%	15.2%	17.8%
ARF/QEII	13.9%	12.2%	14.6%	12.1%	11.3%	17.1%	15.6%
APF	13.9%	14.5%	15.4%	13.1%	13.3%	13.8%	15.6%
Total	19.6%	16.5%	19.4%	16.5%	14.5%	15.4%	16.8%

**Table 5: Discovery Projects fellowships, flexible fellowship options (2004 to 2008)**

	Funding commencement year									
	2004		2005		2006		2007		2008	
	50 or 75%	100%	50 or 75%	100%	50 or 75%	100%	50 or 75%	100%	50 or 75%	100%
APD – Applications	59	430	65	505	73	606	119	607	125	350
APD – Awards	19	93	14	98	18	92	23	87	25	95
ARF – Applications	9	217	10	254	23	269	52	288	88	284
ARF – Awards	1	32	2	30	5	28	13	45	19	39
APF – Applications	106	12	64	112	62	126	107	103	120	60
APF – Awards	12	12	9	14	13	12	24	5	24	4

### Early-career researchers

**Table 6: Discovery Projects, early-career researchers (1) (2002 to 2008)**

	Funding commencement year						
	2002	2003	2004	2005	2006	2007	2008
Applications	645	861	663	747	860	869	742
Funded	161	162	138	171	155	127	128
Success rate	25.0%	18.8%	20.8%	22.9%	18.0%	14.6%	17.3%

(1) ECR-only applications (excludes ECRs in applications involving non-ECR participants)

### Research personnel

Data drawn from the budget page of *Discovery Projects* research applications indicate that personnel costs account for the largest proportion of all funds requested on successful

applications (approximately 80 per cent in 2008) with the costs of maintenance, travel and equipment making up the remainder.

Researchers are also asked on the application to estimate the number of postgraduate and honours students their proposed research will support. The 878 Discovery Projects proposals successful in receiving funding commencing in 2008, indicated that their research would support 1654 postgraduate students (comprising 1402 PhD and 252 masters students) and 1853 Honours students.

These figures have some limitations in that they reflect a researcher's intentions at the time of application and those intentions may change if a reduced level of funding is awarded. However, similar information is collected through final or annual reports, and these provide a more accurate estimate of personnel support by the Australian Government's investment in research through the ARC. Data extracted from final reports for the *ARC Annual Report 2006–07* indicated that, on average, each Discovery Project grant initially funded in 2003 supported five research personnel.

## **Discovery Indigenous Researchers Development**

### Description

The objectives of the *Discovery Indigenous Researchers Development* scheme, as stated in the Discovery Indigenous Researchers Development Funding Rules for Funding Commencing in 2009, are to:

- a. develop the research expertise of Indigenous Researchers who have not participated as a Chief Investigator on a project funded under any of the ARC's other funding schemes or previously been awarded an ARC Fellowship;
- b. support fundamental research and research training by Indigenous Australian individuals and teams;
- c. provide Indigenous Researchers with experience in the preparation of research funding Proposals; and
- d. expand Australia's knowledge base and research capability.

The *Discovery Indigenous Researchers Development* scheme provides salary support to Indigenous Australian researchers and postgraduate research students to develop research expertise and experience to a level that is competitive with applicants for mainstream funding. It also provides funding for research projects that may lead to an understanding of a particular subject or meet the requirements of higher research degrees.

To be eligible to apply, researchers must be of Australian Aboriginal or Torres Strait Islander descent for funding. It is strongly recommended that a Mentor (who does not need to be an Indigenous Australian) be associated with the proposal to provide specific expert advice on the subject of the research.

Applicants do not have to hold a PhD to apply, but must have completed a research degree or demonstrate equivalent research capacity and experience. Researchers who are enrolled in higher research degrees may apply for a grant to provide funding towards their degree. In this instance, it is strongly recommended that the student's supervisor (who does not need to be an Indigenous Australian) be associated with the proposal.

The Research Cadetship – Aboriginal and Torres Strait Islanders (RC-ATSI) was introduced into the scheme in 2002. The RC-ATSI provided a salary equivalent to the ARC Australian Postdoctoral Fellowship (see [Table 3](#) above). From 2007 on, the RC-ATSI was renamed the Indigenous Researcher Fellowship. An Indigenous Researcher Fellowship supports one or two years' employment on an approved project. Funding may include salary, on-costs and other research costs for a proposed project.

### Selection outcomes

#### *Number of grants and fellowships*

**Table 7: Discovery Indigenous Researchers Development (2002 to 2008)**

	Funding commencement year						
	2002	2003	2004	2005	2006	2007	2008
<b>Research grants</b>							
Applications	18	10	13	9	8	21	18
Awards	8	6	3	5	5	15	7
Success rate	44.4%	60.0%	23.1%	55.6%	62.5%	71.4%	38.9%
Total ARC funding (1)	\$271,752	\$224,354	\$224,140	\$464,932	\$481,821	\$1,038,114	\$1,120,648
<b>Indigenous Researcher Fellowship</b>							
No. of candidates	na	1	2	2	1	5	6
Awards	na	1	1	2	1	2	5

(1) Total ARC funding across the life of the research projects

## **Federation Fellowships**

### Description

The objectives of the *Federation Fellowships* scheme, as stated in the Federation Fellowships Funding Rules for Funding Commencing in 2008, are to:

- a. attract and retain outstanding researchers of international renown;
- b. build and strengthen world-class research capability in Australia;
- c. expand Australia's knowledge base by supporting ground-breaking, internationally competitive research;
- d. forge strong links among researchers, industry and the international research community; and
- e. support research that will result in economic, environmental, social or cultural benefits for Australia.

The *Federation Fellowships* scheme is open to applications from outstanding researchers of international renown. The scheme particularly encourages proposals involving Australian and non-Australian researchers currently working overseas by providing eligible Federation Fellows with Start-up Project Funding in addition to salary and salary-related (on-cost) support. Preference is given to early- to mid-career researchers who will play a leadership role in building Australia's internationally competitive research capacity.

Federation Fellowships have a standard tenure of five years. Benefits include salary (\$334,301 including 28 per cent on-costs) and relocation allowances. Start-up project funding

of up to \$500,000 may also be paid. Federation Fellowships are tenable at organisations both inside and outside the higher education sector including the CSIRO.

It is possible to apply for a second Federation Fellowship. In the most recent funding round (for funding commencing in 2008) those applying for a second Federation Fellowship had the option to request salary support of 50 per cent of the notional Federation Fellowship salary from the ARC, on the basis of matching funds being provided by the Administering Organisation, if successful.

### Selection outcomes

#### *Number of fellowships*

**Table 8: Federation Fellowships (1) (2002 to 2008)**

	Cohort / Year							
	1	2	3	4	5	6	7	8
	2002	2002	2003	2004	2005	2006	2007	2008
Applications	181	86	97	143	188	163	129	157
Fellowships awarded	15	11	24	25	24	25	20	14
Success rate	8.3%	12.8%	24.7%	17.5%	12.8%	15.3%	15.5%	14.6%

(1) Includes Fellowship offers declined subsequent to the Minister's announcement.

**Table 9: Federation Fellowships (1), attraction and retention (2002 to 2008)**

	Cohort / Year							
	1	2	3	4	5	6	7	8
	2002	2002	2003	2004	2005	2006	2007	2008
Expatriate Australians	6	3	6	10	4	5	1	1
Resident Australians	8	8	16	10	15	18	17	11
Foreign nationals	1	0	2	5	5	2	2	2
Total	15	11	24	25	24	25	20	14

(1) Includes Fellowship offers declined subsequent to the Minister's announcement.

### **Future Fellowships**

The Australian Government has announced the creation of a new scheme, *Future Fellowships*, to promote research in areas of critical national importance by giving world class researchers incentives to conduct their research in Australia. The aim of the *Future Fellowships* scheme is to attract and retain the best and brightest mid-career researchers.

At present many highly qualified mid-career researchers choose to work overseas to further their careers due to lack of opportunities in Australia. The *Future Fellowships* scheme addresses this problem and will significantly boost Australia's research and innovation capacity in areas of national importance.

Over a five-year period (2009–2013), *Future Fellowships* will offer four-year fellowships of up to \$140,000 a year to 1000 Australian and international top researchers in the middle of their career. In addition, each researcher's administering organisation will receive funding of up to \$50,000 per year to support related infrastructure, equipment, travel and relocation costs.



*Future Fellowships* will encourage proposals from researchers working in areas of national priority. Preference will be given to those researchers who can demonstrate a capacity to build collaboration across industry, research institutions or with other disciplines. Although international experience is important for Australian researchers, it is also important they have the opportunity to return home to continue their work. *Future Fellowships* will aim to encourage outstanding Australian researchers currently based overseas to return to Australia.

The ARC has recently released a Consultation Paper outlining the proposed administrative arrangements for the scheme. The deadline for submissions is 27 June 2008.

## **ARC Centres of Excellence<sup>2</sup>**

### Description

The objectives of the *ARC Centres of Excellence* scheme, as stated in the ARC Centres of Excellence Funding Rules for Funding Commencing in 2005, are to:

- undertake highly innovative research at the forefront of developments within areas of national importance, with a scale and a focus leading to outstanding international and national recognition;
- enhance the scale and focus of research in designated National Research Priorities.
- promote research that will enhance Australia's future economic, social and cultural wellbeing;
- link existing Australian research strengths and build new capacity for interdisciplinary, collaborative approaches to address the most challenging and significant research problems;
- build Australia's human capacity in a range of research areas by attracting, from within Australia and abroad, researchers of high international standing as well as the most promising research students;
- provide high-quality postgraduate and postdoctoral training environments for the next generation of researchers in innovative and internationally competitive research;
- offer Australian researchers access to world-class infrastructure and equipment, and to key research technologies;
- develop relationships and build new networks with major international Centres and research programs that help achieve global competitiveness and recognition for Australian research; and
- establish Centres of such repute in the wider community that they will serve as points of interaction among higher education institutions, Governments, industry and the private sector generally.

### *ARC Centre fellowships and awards*

Postdoctoral researchers can be employed using ARC funding assistance to an ARC Centre of Excellence. The funding rules indicate that the ARC will acknowledge the most outstanding of these postdoctoral researchers through the award of prestigious *ARC Centre Fellowships*. ARC Centres of Excellence have flexibility in the salaries offered to ARC Centre Fellows,

---

<sup>2</sup> Excluding co-funded Centres (Australian Centre for Plant Functional Genomics, Australian Stem Cell Centre, National ICT Australia, ARC/National Water Commission co-funded Centre for Groundwater Research and Training)

based on the minimum levels of the ARC notional salary rates for fellowships (see [Table 3](#) above).

In recognition of the importance of building the level of knowledge and expertise in Australia's population through postgraduate training in research areas of national importance, ARC Centres of Excellence are also able to offer *ARC Centre Postgraduate Awards* (APACs). Centres may set APAC stipends at a level above the standard stipend for Australian Postgraduate Awards. ARC funding for APAC stipends will be paid from the approved ARC Centre of Excellence budget.

### Selection outcomes

#### *Number of centres*

To date, selection rounds under the *ARC Centres of Excellence* scheme have been conducted for funding commencing in 2003 and 2005 (see [Table 10](#)). In 2006, a selection round was conducted under the *ARC Special Research Initiatives* scheme for an ARC Centre of Excellence in Policing and Security aimed at addressing the national research priority of *Safeguarding Australia*. Five proposals were received and the approved proposal led by Griffith University was awarded \$10 million over five years commencing in 2007.

**Table 10: ARC Centres of Excellence**

	Funding commencement year		
	2003	2005	2007
Applications	56	97	5
Centres	17	11	1
Success rate	30.4%	11.3%	20.0%
Total ARC funding (1)	\$136m	\$122m	\$10m

(1) Total ARC funding across the life of the Centres

### Support for research training

Research Centres funded by the ARC report each year against a range of performance indicators that cover the breadth of the Centres' activities, including research, training, commercialisation and linkages. This output data demonstrates the strong performance of ARC-funded Research Centres including with regard to research training activities (see [Table 11](#)).

**Table 11: ARC-funded Research Centres (1), research training outputs (2007)**

Type of output	2007 (no.)
Honours students enrolled	302
Honours students graduated	345
Masters students enrolled	166
Masters students graduated	44
PhD students enrolled	1218
PhD students graduated	234
Number of centres	36

(1) Including ARC Centres of Excellence and Special Research Centres (excluding co-funded Centres of Excellence)

## Linkage International

### Description

The objectives of the *Linkage International* scheme, as stated in the Linkage International Funding Rules for Funding Commencing in 2009

- a. build collaborations among researchers, research teams and/or research centres of excellence in Australia and overseas;
- b. generate opportunities for researchers to participate in leading-edge international research networks and strengthen their international research experience;
- c. build Australian research capability by enhancing existing and developing new collaborations among researchers;
- d. develop innovative modes of international collaboration; and
- e. foster participation in global innovation networks.

Under the scheme ARC International Fellowships are available for Australian researchers to work overseas and for international researchers to work in Australia for periods of up to 12 months. The Fellowships provide opportunities for Australian researchers to broaden their research experience and develop networks with international colleagues.

Funding may include salary and on-costs (see [Table 3](#) above) and travel-related costs associated with collaborative research projects.

### Selection outcomes

**Table 12: Linkage International fellowships (2002 to 2008)**

	Funding commencement year						
	2002	2003	2004	2005	2006	2007	2008
Applications	22	22	23	46	79	80	76
Fellowships awarded	12	16	11	19	20	22	22
Success rate	54.5%	72.7%	47.8%	41.3%	25.0%	27.5%	28.9%
Total ARC funding (1)	\$735,547	\$1,156,274	\$970,872	\$1,671,008	\$1,661,290	\$1,764,581	\$2,000,000

(1) Total ARC funding across the life of the fellowships

## Linkage Projects

### Description

The objectives of the *Linkage Projects* scheme, as stated in the Linkage Projects Funding Rules for Funding Commencing in 2009, are to:

- a. encourage and develop long-term strategic research alliances between higher education organisations and other organisations, including within industry and end-users, in order to apply advanced knowledge to problems and/or to provide opportunities to obtain national economic, social or cultural benefits;
- b. support collaborative research on issues of benefit to regional and rural communities;
- c. enhance the scale and focus of research in National Research Priorities;

- d. foster opportunities for postdoctoral researchers to pursue internationally competitive research in collaboration with organisations outside the higher education sector, targeting those who have demonstrated a clear commitment to high quality research;
- e. provide outcome-oriented research training to prepare high calibre postgraduate research students; and
- f. produce a national pool of world-class researchers to meet the needs of the broader Australian innovation system.

The *Linkage Projects* scheme provides funding support for postgraduate stipends and the salaries of fellowships as well as for project grants (which may support the salaries of research associates, technicians, laboratory attendants and postgraduate stipends as well as the costs of equipment, maintenance and travel).

#### *Awards and fellowships*

The *Linkage Projects* scheme provides support for Australian Postgraduate Awards Industry (APAI), Australian Postdoctoral Fellowships Industry (APDI) and Linkage Industry Fellowships (LIF).

APAI provide support for postgraduate research students studying towards Masters and PhD degrees, and assist to produce a highly skilled and flexible pool of researchers capable of moving between the higher education sector and other sectors to meet the needs of the broader Australian innovation system. In recently announced changes (*ARC Fellowships to become more international*, March 2008), APAI can now be awarded to the highest calibre postgraduate students irrespective of nationality.

APAI stipends (\$26,140 per year) may be awarded for a period of up to three years with provision under certain conditions for an additional six months' support from the ARC for PhD students. If a Proposal seeks APAI funding for less than the three-year maximum, including for a Master's degree, there is no provision for an additional six months' stipend.

APDI provide opportunities for postdoctoral researchers to pursue internationally competitive research in collaboration with organisations outside the higher education sector. Funding may be for three years and benefits include salary, on-costs and associated costs.

LIF provide support for costs associated with short-term transfers between universities and their partner organisations. Benefits may include salary and salary-related on-costs at the rate of 28 per cent, up to a maximum of \$200,000 over the duration of the fellowship.

#### *Research personnel*

Project costs which may be supported under the *Linkage Projects* scheme include the costs of personnel (salaries and on-costs) such as research associates, technicians and laboratory attendants. While not granted directly to named applicants, projects costs are also able to be used to cover the costs of stipends for postgraduate research students.

## Selection outcomes

### *Number of awards and fellowships*

**Table 13: Linkage Projects awards and fellowships (2002 to 2008)**

Award / Fellowship		Funding commencement year						
		2002	2003	2004	2005	2006	2007	2008
Australian Postgraduate Awards Industry	Applications	822	1 012	775	878	886	796	794
	Funded	397	461	426	389	304	295	312
	Success rate	48.3%	45.6%	55.0%	44.3%	34.3%	37.1%	39.3%
Australian Postdoctoral Fellowships Industry	Applications	59	73	82	75	62	76	58
	Funded	27	32	46	33	30	32	30
	Success rate	45.8%	43.8%	56.1%	44.0%	48.4%	42.1%	51.7%
Linkage Industry Fellowships (1)	Applications	-	-	6	7	4	2	5
	Funded	-	-	3	3	0	1	1
	Success rate	-	-	50.0%	42.9%	0	50.0%	20.0%

(1) Linkage Industry Fellowships were introduced for funding commencing in 2004.

### *Research personnel*

Data drawn from the budget page of *Linkage Projects* applications indicate that personnel costs account for the largest proportion of all funds requested on successful applications (approximately 84 per cent in 2008).

## **ARC Research Networks**

### Objectives

The *ARC Research Networks* scheme builds on investments in excellent research undertaken by individual investigators and small teams to:

- enhance the scale and focus of their research;
- encourage more inter-disciplinary approaches to research; and
- facilitate collaborative and innovative approaches to planning and undertaking research.

Without duplicating established coordination bodies and mechanisms, the networks aim to encourage and support:

- open exchange of information and sharing of resources;
- development and implementation of coherent and integrated research plans among researchers working independently and in small teams on topics of common interest;
- efforts to nurture the careers of young investigators and research students by promoting a sense of community, collaboration and strong, effective mentoring, and encouraging them to shape the future direction of the research fields; and
- links with actual and potential end users, and with the broader community, especially in respect of the development of research plans, the absorption of international and national know-how, and the adoption of new discoveries made by researchers in the Network.

Research networks support the following research costs:

- personnel salaries and on-costs, including the Network convenor, research associates, professional officers, technicians, laboratory attendants, administrators, organisations etc, and specialist professional staff located within major facilities and other appropriate settings
- development or purchase of shared research resources that would not be eligible for funding by other ARC schemes including social surveys, software tools and databases
- activities bringing people together including workshops and similar meetings, planning coordination and outreach activities and travel and accommodation.

### Selection outcomes

#### *Number of networks*

To date, one selection round has been conducted under the *ARC Research Networks* scheme. Funding to successful networks commenced in 2004–05 and was awarded for five years. The scheme is currently being reviewed.

**Table 14: ARC Research Networks**

	2004–05
Applications	84
Awards	24
Success rate	28.6%
Total funding (1)	\$42 m

(1) Total funding across the life of the networks (including funding from NHMRC for five co-funded networks)

### Support for research training

In a submission to the review of the National Innovation System made by the ARC/NHMRC Research Networks, representatives of the currently funded Networks reported that the Networks had supported the career development of many PhD students and early-career researchers and assisted ‘to fill a “postdoctoral vacuum” in the context of an ageing research workforce’. In addition the Networks have supported ‘master classes, methods workshops, and ECR-led conferences, and provided mentoring from the best researchers (nationally and internationally) in the relevant fields’.

## **Linkage Infrastructure, Equipment and Facilities**

### Description

The *Linkage Infrastructure, Equipment and Facilities* (LIEF) scheme fosters collaboration through its support of the cooperative use of national and international research facilities. The scheme provides funding for large-scale cooperative initiatives so that expensive infrastructure, equipment and facilities can be shared by researchers in partnered organisations. However, the ARC may fund single-organisation proposals in some circumstances.

The objectives of the LIEF scheme, as stated in the Linkage Infrastructure, Equipment and Facilities Funding Rules for Funding Commencing in 2009, are to:

- a. encourage Eligible Organisations to develop collaborative arrangements in the higher education sector and with other organisations outside the sector in order to develop research infrastructure;
- b. support large-scale cooperative initiatives thereby allowing expensive infrastructure, equipment and facilities to be shared;
- c. enhance support for areas of research strength; and
- d. ensure that researchers in fields of recognised research potential have access to the support necessary to carry out high-quality research.

Under the scheme, applicants may seek funding for:

- infrastructure, equipment and facility purchases, construction and installation;
- major computing/data facilities, animal houses, herbaria and experimental farms;
- salaries directly associated with creating and installing infrastructure, equipment or facilities;
- consortium membership costs, travel to the facility and secretariat costs in the case of Australia's participation in the use of significant international-scale research facilities; and
- library and research information infrastructure (non-capital aspects only) to support specific research projects.

The LIEF scheme funds up to a maximum of 75 per cent of the direct cost of purchasing infrastructure, equipment or creating a facility. At a minimum, the administering, collaborating and partner organisations must provide 25 per cent cash contribution. Funding is normally for one year only. However, applications for multiple years of funding will be considered in case of subscriptions to major international facilities.

### Selection outcomes

#### *Number of grants*

**Table 15: Linkage Infrastructure, Equipment and Facilities (2002 to 2008)**

	Funding commencement year						
	2002	2003	2004	2005	2006	2007	2008
Applications	127	121	146	159	168	165	155
Awards	70	78	75	78	83	73	74
Success rate	55.1%	64.5%	51.4%	49.1%	49.4%	44.2%	47.7%
Total ARC funding	\$24.2m	\$27.7m	\$28.2m	\$30.4m	\$37.3m	\$27.6m	\$34.9m

### Support for research training

Recipients of funding under the LIEF scheme are required to report (in their final reports) on access and utilisation of their particular infrastructure item (including access by students and postdoctoral fellow). This information is considered by the ARC (in its assessment of the performance of the project) but, due to the diverse nature of the items funded and the limitations of the ARC's final report form, it cannot be readily consolidated for reporting purposes.

As noted above, the LIEF scheme provides support for subscriptions to international facilities. One such facility is the Gemini Observatory – an international partnership of seven countries (Argentina, Australia, Brazil, Canada, Chile, the United Kingdom and the United States) that has built two identical 8-meter telescopes in Hawaii (Gemini North) and central Chile (Gemini South). Together the telescopes provide full coverage of both hemispheres of the sky. Australia has a 6.2 per cent share of time on the two telescopes.

Access to the Gemini Observatory enables Australian astronomers and importantly, their students, to maintain their high profile in astronomy. To date, applications for time on the telescopes have involved researchers at all levels including students, postdoctoral fellows and faculty members.

## **Outcomes of the ARC's investment in research training and career development**

### Background

The ARC conducts a range of evaluation activities both internal and external to the organisation. They include (in broad terms):

- commissioned studies of ARC's overall performance;
- evaluation and/or review of particular ARC schemes; and
- evaluation of the outcomes of individual projects within the ARC's schemes (through the examination of progress and final reports).

### Commissioned studies

As part of its evaluation program the ARC has sought, through commissioned studies, to establish the returns on its investment in research as well as the excellence of ARC-funded research (as determined through bibliometric analysis).

#### *Return on investment in ARC-funded research*

In 2003 the ARC commissioned a study to examine the return on investment to the Commonwealth, and through it to the Australian community, of research funded by the ARC (*A Wealth of Knowledge: The return on investment from ARC-funded research*, The Allen Consulting Group, September 2003). The study found that the ARC's activities generate benefits in six areas, one of which was improving the skills base.

The study found that the ARC contributes to the quality of the higher education sector through a number of ways, including providing: direct funding for students; funding for improving research training; funding improved research facilities; funding for research projects that involve numerous students; and funding to attract and retain leading academics within the system.

It identified five categories of students who benefit to some degree from the funding activities of the ARC, namely

- research postgraduate students directly funded by the ARC through APAIs and through the funding of stipends as part of project funding;
- research postgraduates who work on projects or facilities funded by the ARC;



- research postgraduate students who, while not directly involved in ARC-funded projects, benefit from the generally higher-quality research infrastructure and environment within the Australian higher education sector due to ARC funding;
- non-research postgraduates whose education experience is improved by the fact that the Australian higher education sector has a strong research component to which the ARC is an important contributor; and
- undergraduate students whose educational experience is improved by the fact that the Australian higher education sector has a strong research component – to which the ARC is an important contributor.

### *Bibliometric analysis*

Also in 2003, the ARC commissioned a study to assess the performance of publications attributable to ARC-funded research in attracting citations in the wider international research literature, to compare that performance with the impact of publications arising from elsewhere in the Australian research system, and to benchmark it against world performance (*ARC-supported research: the impact of journal publication output 1996–2000*, Linda Butler, 2004).

The study found that, in comparison to both Australian and world benchmarks, the performance of publications arising from ARC-funded research was very strong, that is, it exceeded the world and Australian rate by approximately 25 per cent. The ARC grant schemes producing the highest impact publications were the then Special Research Centres, the Australian Research Fellowships and the Queen Elizabeth II Fellowships.

The ARC has recently commissioned the Research Evaluation and Policy Project Unit at The Australian National University to provide an update to the previous evaluation. The study, which will cover the period 2001–2005, is expected to be completed by July 2008.

### Evaluation of ARC schemes

A review of the *Federation Fellowships* scheme was conducted in 2006–07. A review of the *ARC Research Networks* scheme commenced in the first half of 2008. The review will consider a range of issues including (i) the degree of success of the scheme in achieving its objectives; (ii) the main factors that have allowed ARC and ARC/NHMRC Research Networks to achieve the objectives of the scheme; and (iii) the value of the outcomes of the scheme.

### Other

Analysis of case-studies remains one means of quantifying the benefits arising from the application of research findings from individual ARC-funded projects. In 2008, the ARC has introduced the *Graeme Clark Research Outcomes Forum* to showcase the outcomes achieved by Federation Fellows and researchers in ARC Centres. The Forum will take place on 18 June 2008 at Parliament House in Canberra.

Those applying to participate in the forum were asked to describe their research in terms of six possible outcome areas:

1. economic (generating wealth; creating employment in sustainable and/or new industries);

2. social (improving equity and quality of life; reducing social risk);
3. cultural (improved understanding of other peoples and ourselves, our region and our world);
4. environmental (protecting or restoring the environment; sustainable development);
5. policy and administration (improving decision making and governance); and/or
6. scientific advancement (understanding ourselves and nature).

Among the presenters at the Forum will be the following Federation Fellows:

- Professor Hilary Charlesworth, Director of the Centre for International Governance and Justice at The Australian National University;
- Professor Hugh Durrant-Whyte, Director of the ARC Centre of Excellence for Autonomous Systems at The University of Sydney;
- Professor Matthew England, Co-Director of the Climate Change Research Centre at The University of New South Wales;
- Professor Graham Goodwin, Director of the ARC Centre for Complex Dynamic Systems and Control at The University of Newcastle;
- Professor Paul Haddad, Director of the Australian Centre for Research on Separation Science at the University of Tasmania;
- Professor Terry Hughes, Director of the ARC Centre of Excellence for Coral Reef Studies at James Cook University;
- Professor Keith Nugent, Director of the ARC Centre of Excellence for Coherent X-ray Science at The University of Melbourne;
- Professor John Ralston, Director of the Ian Wark Research Institute at the University of South Australia;
- Professor Mark Randolph from the Centre for Offshore Foundation Systems at The University of Western Australia;
- Professor Michelle Simmons, Program Manager in the ARC Centre of Excellence for Quantum Computer Technology at The University of New South Wales; and
- Professor Stephen Simpson, Behaviour and Physiology Research Group Leader, School of Biological Sciences at The University of Sydney.