Reconceptualising post-PhD research pathways

A model to create new postdoctoral positions and improve the quality of postdoctoral training in Australia

J Berman, S Juniper, T Pitman & C Thomson

University of Western Australia

Focusing on the developmental needs of early career postdoctoral fellows – the lifeblood of an internationally competitive research-intensive university – this paper suggests an inextricably linked, two pronged approach to improving research performance at Australian universities. The first is to reconceptualise post-PhD research pathways and in doing so conceive a mechanism for creating new postdoctoral positions; the second is to develop a coherent programme of policies, processes and practices in postdoctoral education and training. In this way, Australian universities will increase their success in attracting and retaining the brightest and best postdoctoral students from all over the world and thereby improve research performance.

Introduction: developments in researcher training in the US and UK

In 1998 the Graduate and Postdoctoral Education Committee of the Association of American Universities (AAU), recognising that postdoctoral students ('postdocs') have a crucial role in helping research intensive universities realise their full potential in research activity and accomplishments, made a series of recommendations for improving postdoctoral training (AAU, 2005). A key player in the drive for implementing the recommendations has been the National Postdoctoral Association (NPA, formed in 2003) which has 140 institutional members and represents over 40,000 postdocs. The AAU and the NPA have been working to re-establish the postdoc as a trainee, in transition between postdoctoral training and permanent employment. The definition of postdoc, as recommended by the AAU, is 'a recent doctoral graduate, in a temporary position, engaged in full-time research under the supervision of a faculty member, in preparation for an academic career' (AAU, 2005). They assert that during the three to five-year training period, frequently referred to as a 'transition to independence', postdocs should receive the advanced instruction needed to embark on a successful career.

As a consequence of the AAU's recommendations and NPA's activities, more attention has been given to postdoctoral training by the National Academies, the National Science Foundation (NSF), the National Institutes of Health (NIH) and other government and non profit organisations. Indeed, in mid 2007 the US Congress approved a new provision on postdoctoral mentoring as part of a larger bill reauthorising the NSF.

Developments in postdoctoral training in the US were echoed in the UK through the 1996 Research Careers Concordat between universities and funding agencies which agreed standards, expectations and responsibilities for the career management of researchers in universities on fixed term contracts. This initia-

tive was followed by the Roberts Report (2002) SET for Success, which focused on increasing the quantity and quality of science, engineering and technology experts as part of the Government's Productivity and Innovation Strategy. The findings of the report led to the Government's provision of 'Roberts money', which included funding for generic skills training both for postgraduates and postdocs, the creation of up to 200 Research Council UK (RCUK) Academic Fellowships to provide better career paths into academic positions, and the establishment of the UK Higher Education Research Development Group (UKHERD), a national network of professionals charged with developing research staff in UK Higher Education under the auspices of RCUK. The RCUK is currently developing a new national researcher development program that will run from 2008-2012 and aims by 2008 to incorporate a new Code of Practice for Researchers into the terms and conditions of Council grants. These UK developments are in the main compatible with the 2005 European Charter for Researchers and Code of Conduct for the Recruitment of Researchers.

In addition to investing in improving the training of postdoctoral researchers, there have also been moves in the UK and US to implement policies and practices to attract the best researchers from abroad. Australia's failure to respond to these developments will only further accelerate the 'brain drain' from this country.

As we have seen, the US model was predominantly bottom up – the grassroots National Postdoctoral Association pushed for the creation of university postdoctoral offices which then worked together with the NPA to lobby government and funding bodies to address postdoctoral issues. In contrast, the UK model was mainly top down - initiated from, and funded by government. No such plans appear imminent from either direction in the current Australian context. Indeed, besides an excellent and in-depth 2001 Department of Education, Training and Youth Affairs report (DETYA) (Thompson et al., 2001) on postdoctoral training and employment outcomes, there is a dearth of literature on the nature of postdoctoral training and issues relating to career researchers (Akerlind, 2005). This paper suggests that Australian universities should reconceptualise post-PhD research pathways and in doing so conceive a mechanism for creating new postdoctoral positions while concurrently implementing a coherent programme of policies, processes and practices in postdoctoral education and training. The outcomes would not only serve to improve research performance and productivity in Australian universities but also contribute to averting a potential increase in the 'brain drain' of our brightest and best to overseas universities. This is especially pressing in light of the anticipated difficulties in attracting and retaining sufficient numbers of quality academic staff in the coming decades.

Reconceptualising post-PhD research pathways

There has been a massive growth in the number of PhD enrolments over the past decade. In 2001 there were 147,035 domestic students enrolled in postgraduate studies in Australian universities. In 2006 this had risen to 177,229, an increase of 21 per cent (DEST, 2007). A wide variety of potential post-PhD research pathways exists. A recent report on the employment outcomes of PhD graduates from the Group of Eight major research universities (G08) universities revealed that after five to seven years only 30 per cent worked as university lecturers or tutors (Western et al., 2007). There are disciplinary differences, with researchers in the medical and biomedical sciences having relatively more opportunities for ongoing funding within the NHMRC fellowships scheme (Thompson et al., 2001) but this may be because there are relatively fewer academic positions available. The relatively low numbers of PhD graduates continuing in academia and the varied employment destinations of postgraduates (Graduate Careers Australia, 2005) has contributed to the current trend in research training to increasingly recognise the central value of the PhD for the acquisition and development of advanced generic/transferable skills relevant to both research and employment (CADDOGS, 2005). As in the UK and the US, the generic skills debate in Australia focuses on identification of key skills and attributes (taking into account disciplinary differences); whether there should be a compulsory coursework component in the PhD (which inevitably impacts on PhD completion times), as well as issues relating to assessment and the cost of delivery. Curiously, although there has been some discussion about which skills need to be achieved before entry to doctoral degrees and which are appropriate for development within the doctorate itself (Gilbert et al., 2004; CADDOGS, 2005, Cooper and Juniper, 2002), there has been virtual silence on the subject of generic skills training for postdocs.

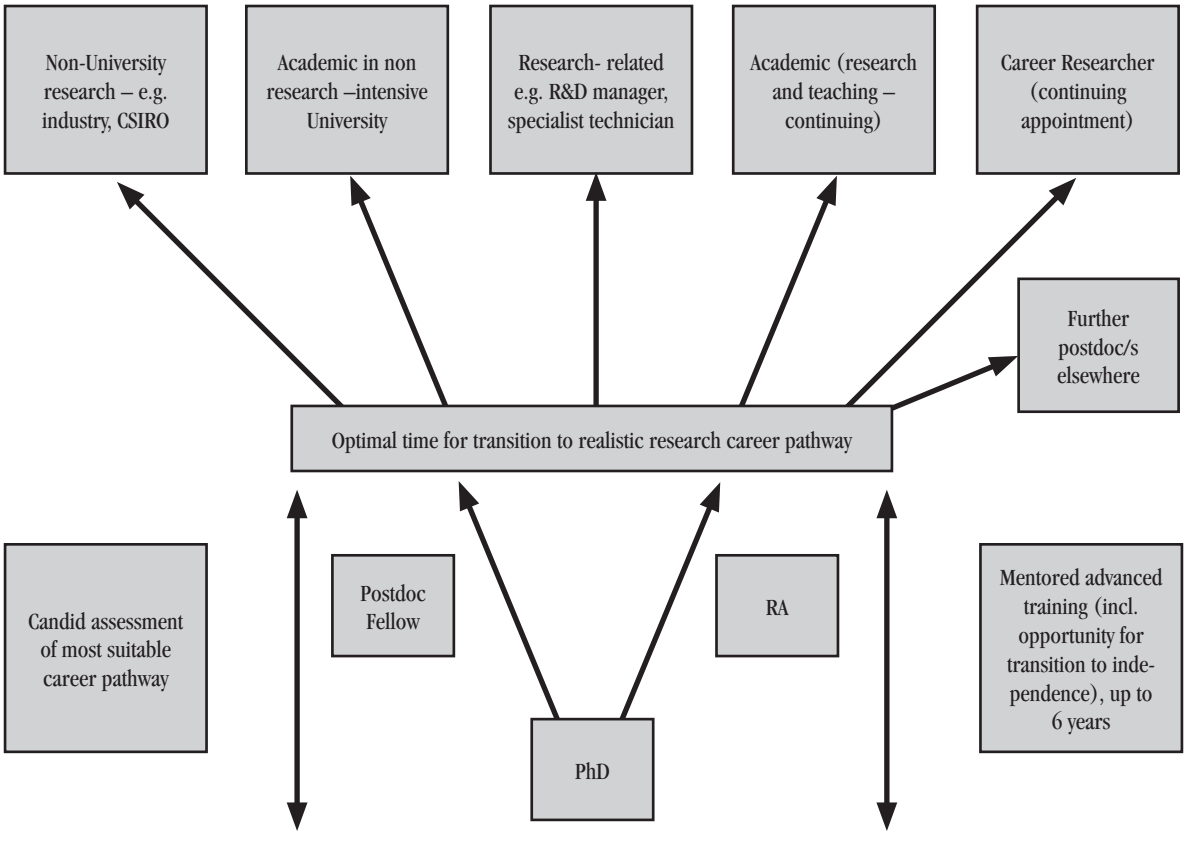
While research undertaken in Australia and the UK indicates that most postdocs aspire to a research only or an academic career, this is not always achievable

or optimal for the individual (Thompson et al. 2001; Akerlind, 2005). Postdoctoral training should therefore reflect and cater for a range of possible research career pathways. This paper suggests that universities should consider implementing tailored postdoctoral training based on the pathway that best matches each postdoc's particular interests, abilities and skill sets, as summarized in Figure 1. As indicated, it is suggested that all research appointments in the post-PhD phase should be referred to as postdoctoral. The exact nature of the postdoctoral appointment can be quite varied. For example the Australian Research Council (ARC) provides for a range of postdoctoral appointments, from research associates (RA) to senior fellows. Some postdocs are employed on another academic's grant on the basis of their experience and would have played little or no part in the formation and submission of the grant. However, others may have played an active role in the design and submission of the application to the funding body but were ineligible to be Chief Investigators due to funding body regulations.

The crucial issue is that all postdocs, whether Postdoctoral Fellows or Research Associates, should be equally recognised as being in a transitional period of advanced research training. During this advanced training period – which could, it is proposed, be up to six years - postdocs should be provided with skills and training to enhance their 'transition to independence'. In addition, a variety of career development and life skills workshops and seminars would offer postdocs opportunities to develop both transferable skills and to learn to support and manage their careers in sustainable ways. A protocol for the employment of postdoctoral researchers would ensure that team leaders provide postdocs with the time release necessary to take advantage of these opportunities.

Tailored mentoring is essential to the success of postdoctoral training. All postdocs should be mentored according to individual institutional mentoring guidelines, which could include advice that aspiring career researchers and academics would benefit from being mobile and clarification that there is no institutional

Figure 1: Reconceptualising post-PhD research pathways



obligation for employment beyond postdoc training. At the same time, postdocs would be expected to take responsibility for their career development and, as close as possible to recruitment, would be guided to design a career development plan with mutually agreed upon expectations, goals and milestones.

Universities should provide regular feedback on performance and a formal evaluation should take place at least annually (perhaps via an already existing professional development review processes). Discussion of the postdoc's most probable career pathway would be an important focus of these meetings as subsequent training and career development will be based on the pathway identified.

From the viewpoint of the institution, the longer [contract research staff] remain 'in limbo', hoping for a continuing position to arise, the greater an informal expectation is created that the university has an obligation towards them...

Throughout their period of mentored advanced training, postdocs would receive advice to help them best position themselves for a career path that matches their particular interests, abilities and skill sets. Some might desire to become career researchers or academics in research-intensive universities, some may choose research-related career paths - for example as a specialised technician, R&D manager or commercialisation manager, while others may prefer to work in a non-research intensive university or to research in a non-university environment such as in industry or public service. In addition there exist pathways in publicly funded, non-university research agencies, such as the Commonwealth Scientific and Industrial Research Organisation (CSIRO), Australia's national science agency and one of the largest and most diverse scientific institutions in the world.

After the period of mentored advanced training, a postdoc researcher aspiring to become a career researcher might, subject to performance, apply for a continuing position as a career researcher. Applicants for a continuing position as a career researcher would have to demonstrate a capacity for independent research. Institutions should be encouraged to explain exactly what constitutes 'independent research' as there is always an inherent danger of misunderstanding when subjective terms are applied. For example, the National Postdoctoral Association (NPA) in the US defines an independent researcher as one who '…enjoys independence of thought – the freedom to define the problems of interest and/or to choose or develop the interest and/or to choose or develop the best strategies and approaches to address that problem' *(www.nationalpostdoc.org)*. Furthermore postdocs should be able to demonstrate a likelihood of being predominantly self-funded in the future. This could be evidenced by track record, such as having won two or three consecutive research grants either in their own name (usually as funded fellows or Chief Investigators) or, where this is not possible due to funding rules, by having had a significant role in winning external funding for research and having played a key role in the ensuing projects. Career researchers would be expected to attract substantial revenue from publications, external research funding and the supervision of PhD students.

Reconceptualised post-PhD research pathways as a mechanism for creating new postdoctoral positions

At present in Australia there are many contract research staff who are working on projects for which funding was obtained by someone else. The roles they undertake – ranging from research duties (including project and laboratory management) to specialist technical support and course coordination – are vital for the functioning of their research teams and units. However, it is in neither the postdoc's nor the institution's interest that this arrangement continue indefinitely. From the viewpoint of postdocs, they face career uncertainty as they often move from short-term contract to short-term contract and frequently only succeed in remaining afloat by scraping together funding from a variety of sources. Their particular interests, abilities and skill sets may be better suited to, and better rewarded in alternative career paths.

From the viewpoint of the institution, the longer they remain 'in limbo', hoping for a continuing position to arise, the greater an informal expectation is created that the university has an obligation towards them – either by creating a continuing position or through loyalty offering a position rather than appointing on merit. Finally, these researchers are continuing to occupy positions which could be advertised in open competition, and allow high-quality completed postgraduates to gain valuable postdoctoral train-

ing necessary for their establishment as independent researchers. Two case studies, detailed below, further illustrate this point.

Case study A: the research associate in a science faculty of a research-intensive Australian university

The postdoc in this case is employed as a research associate on a large grant, has publications, helps to supervise a number of PhD students, performs essential work in the laboratory and contributes to the administrative management of the research group. Yet, according to the Head of School, she does not possess the skills required to make the transition to independent scientist. The postdoc has managed to remain on staff thus far in a number of short-term positions but there will not be funding via the team leader's grants forever. In the opinion of the Head of School, it is highly likely that at some stage the postdoc may have no choice but to make a career transition to industry or elsewhere. However, no-one is taking an active role in managing this process – it is assumed that the grant will run its course and the postdoc will only then accept that 'the writing is on the wall' and move on. This situation is potentially detrimental to the postdoc's career. It is almost certain that it is in the postdoc's best interests to be encouraged to apply elsewhere sooner, while she is relatively young.

Case study B: the postdoc in an arts faculty of a research-intensive Australian university

This postdoc has, for almost a decade, oscillated between providing teaching relief for academic staff who have research commitments and working as a research associate on successful research grants won by other staff. In the case of the former he is not necessarily seen as an expert in the teaching material, but rather as someone who understands the overall syllabus and administrative structure of the faculty. In the case of the latter he is primarily employed as the research associate because the team he works with feels a sense of loyalty and responsibility. This sense is increased with each new grant that is won. Unfortunately for the institution, the postdoc has become passive in the arrangement. He now has a sense of expectation that his work is acceptable and that it is easier for the faculty to use him for their teaching and research support than look elsewhere. The postdoc does not have the capacity to achieve an independent research career and has a track record which is unlikely to be competitive for an academic position. It is in the interests of the university to terminate the relationship with the postdoc; however it is equally true that the research team has a duty of care to counsel the postdoc and provide meaningful support to assist him in a transition to another career.

Contract research staff who are not successful in attracting funding in their own right play a key role by performing functions which are vital to the operations of their research team. This is true, but is it optimal? This paper recommends that research positions such as those described above be prioritised for new postdoctoral scholars with potential for independent research careers. They form the lifeblood of an internationally competitive research intensive university. Postdoctoral training positions are rare; resources must be maximised and opportunities not wasted.

Improving the quality of postdoctoral training

In order to improve the quality of postdoctoral training, Australian universities should consider appointing a Postdoctoral Coordinator with primary responsibility for postdoctoral affairs. This is a model which has proved successful elsewhere, for example in the US (Postdoctoral Fellows Focus Group, 2007; AAU, 1997; AAU, 2005; NPA, 2005) and has been advocated for adoption in Australia (Thompson et al., 2001). The coordinator provides a crucial link between researchers and the administration and devises strategies to increase postdoctoral productivity and creativity by removing potential barriers to success.

Standard postdoctoral policies and procedures should be implemented, including: a letter of appointment; a centralised appointment process to help identify, track and reach out to postdocs; a check in orientation for postdocs; a protocol for the employment of postdoctoral researchers to ensure that team leaders provide postdocs with the time release necessary to avail themselves of research and career development training; a standard set of benefits and practices, regardless of funding source or level; exit surveys and tracking of postdocs into their careers; a postdoc committee to liaise between administration and postdocs with the aim of enhancing the postdoc experience (including both postdocs and academic staff); a curriculum for postdoc training to assist the postdoc's transition to independence; mentoring according to institutional guidelines; and a regular annual or bian-

nual review of training progress (including feedback to postdocs and their mentors), undertaken by tenured professors who are not directly involved in or benefiting from the postdoc's research efforts.

Professional development, career development and life skills workshops and seminars which accommodate a range of possible career trajectories should be offered. Workshops could include:

- conflict management
- team work (including teams and the team process),
- communicating effectively
- networking
- interview techniques
- leadership qualities
- public speaking and presentation skills
- career planning and research employment opportunities in academia and industry as well as alternative careers (including transition advice and CV preparation and job searching skills)
- issues specific to international postdocs (visa delays, language barriers, cultural biases)
- managing a project and a laboratory
- building and maintaining sustainable relationships with industry
- grant writing
- building a track record in research
- mentor and mentee training
- research ethics, and
- PhD supervision.

This seminar series should be complemented with relevant resources, including career development resources, web based news service and links, a survival guide for international postdocs (including FAQs – Frequently Asked Questions), and online information about housing, childcare and immigration issues.

Social events for postdocs should be organised, including the establishment of a postdoctoral society for meeting other postdocs, networking and educational activities. Within limits, support for the families of postdocs could be provided in areas such as partner's employment, accommodation, and childcare/school.

A mentoring program for all postdocs should be implemented. In their 'Compact Between Postdoctoral Appointees and Their Mentors', the Association of American Medical Colleges (AAMC) Group on Graduate, Research, Education and Training (GREAT) asserts that 'effective mentoring is critical to postdoctoral training and requires that the primary mentor dedicate substantial time to ensure personal and professional development' (AAMC, 2006). Similarly, the "…critical role of supervisor mentoring, and professional socialisation beyond mere thesis supervision, in producing strong outcomes" is advocated by the Department of Education, Science and Training (DEST) (Western et al., 2007: 57). Mentoring schemes should include the following as prerequisites for success: top down support (senior administration) combined with bottom up assistance (active postdoc association); avoidance of possible conflicts of interests, with mentors being selected from outside the research group; a culture of willing mentors which is developed and nurtured; the use of individual development plans; and recognition by Promotions & Tenure committee of the crucial role of mentoring to the research endeavour. All of this requires the institution to inculcate a culture of mentoring. Some of the arguments for participating in a mentoring scheme would include pointing out that mentoring is an important part of faculty life since it contributes to the research community to which the mentor belongs; fulfils requirements of granting agencies; and develops and advances the next generation of investigators who will lead the research enterprise. It also makes an important and positive difference to a protégé, provides an impetus for reflections on one's own career, and it is exciting and rewarding to be involved in fostering the independence of new investigators.

Funding bodies should be lobbied to re-evaluate their policies regarding postdocs, and professional societies encouraged to collaborate in the development of innovative programs to meet better the needs of postdoctoral scholars. For example, lobbying of the National Institutes of Health in the US by the National Postdoctoral Association to support transitioning postdocs to scientific independence and to fund programs that promote the professional development of postdocs has led to the establishment of NIH and NSF definitions of a postdoc. Furthermore the NIH has instituted a 'Pathways to Independence Awards' and 'Guidelines for professional development on training grants'. For its part, the NSF Geosciences Directorate has produced 'Guidelines for Principal Investigators' concerning mentoring on research grants.

All of the above-mentioned measures are linked by an over-arching theme of expectation. Currently, in Australian universities, postdocs are set adrift with no clear direction on what is expected from them, outside of the direct and specific outcomes associated with the research they are conducting. Likewise, individuals working with the postdocs – most notably

the chief investigators and heads of school – are not exactly sure what their responsibilities are in respect of career guidance and professional development of the postdoc. Ideally, academics working with postdocs should, at the commencement of employment, make clear the range of possible research career pathways, realistic expectations for career advancement, and the support available to achieve identified goals.

Conclusion

Over the past decade, universities in the US and Europe have been investing heavily in addressing the developmental needs of early-career postdoctoral scholars. This paper suggests that universities in Australia adopt a similar framework to improve the quality of training and support provided to early career postdoctoral fellows. This will not only serve to improve research performance in Australia but will also avert a potential increase in the 'brain drain' of our brightest and best to overseas universities. This is especially pressing in light of the anticipated retirement, over the coming decade, of a large cohort of academics, not only in Australia but worldwide and the expected difficulties in attracting and retaining sufficient quality academic staff in the coming decades.

Dr Judith Berman is Senior Research Development Officer, Research Services, University of Western Australia.

Dr Sato Juniper is Manager, Graduate Research and Scholarships, Graduate Research and Scholarships Office, University of Western Australia.

Mr Tim Pitman is Research Development Officer, Research Services, University of Western Australia.

Dr Campbell Thomson is Director, Development and Research Services, University of Western Australia.

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