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24 July 2008

Secretary  
House Standing Committee on Industry, Science and Innovation  
House of Representatives  
PO Box 6021  
Parliament House  
Canberra ACT 2600

To the Secretary of the Committee,

On behalf of The University of Queensland, I make the attached submission to the House of Representatives Standing Committee on Industry, Science & Innovation Inquiry into research training and research workforce issues in Australian Universities. We are providing our Submission in written and in electronic form for the convenience of the Committee and the secretariat.

We are grateful to the Committee Secretary for the extension of time and hope that this has not caused any inconvenience.

The University does not require any part of this submission to be treated in confidence. Any further requests for information should be directed to:

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The University would, of course, be happy to provide further information at the request of the Committee, or to amplify any of the points in its submission or any others relating to the terms of reference of the Inquiry in a public hearing.

Regards,

Professor Alan Lawson  
**Pro-Vice-Chancellor (Research & Research Training)**

**The University of Queensland Response to the  
House of Representatives Standing Committee on Industry, Science & Innovation  
Inquiry into research training and research workforce issues in Australian universities**

**24 July 2008**

**Summary of Main Points**

1. Research higher degree candidates should be regarded as professional researchers.
2. Worldwide moves to reform and reorient the PhD should be acknowledged and reflected in Australian Government policy; Australian universities have been at the forefront of many of these reforms.
3. Research higher degree graduates:
  - Value their experience highly
  - Contribute impressively to Australia's research outcomes
  - Need more training in a range of professional skills
4. It should be acknowledged that a 4-year PhD would enable:
  - Broader training in generic skills
  - Deep and broad knowledge of the context of the discipline
  - Excellence of research outcomes
  - Appropriate dissemination of research outputs

This acknowledgement must be embedded in funding and other policy measures:

  - Two 6-month extensions of the APA and APA (I) should be permitted.
5. Scholarship stipends have fallen behind all comparators and need to be increased immediately by 30%.
  - Part-time APAs should be made tax-free.
6. The changing demographics and career destinations of research higher degree candidates should be recognised by institutions and government.
  - APA eligibility should be deregulated, so as to be consistent with academic judgment embodied in local selection criteria.
7. Research training must be provided in a high quality research environment and the full costs of research training must be funded. This should include:
  - The cost of research training.
  - The cost of research.
8. The quantum of RTS funds must keep pace with increases in research higher degree completions to retain the value of a research training place.
9. The full value of internationalising our research training system should be acknowledged. The ability of Australian universities to recruit and retain the best international graduates must be supported by:
  - Increased numbers of IPRS awards, each accompanied by an APA-equivalent stipend.
  - IPRS awards to be funded at the full cost of tuition fees.
  - Travel grants for Australian research candidates to engage in overseas research.
  - A reformed Endeavour scholarship program designed to maximise Australia's ability to recruit and fully fund the research training of the best graduate students from around the world.

## 1. Research higher degree candidates should be regarded as professional researchers.

Several unique characteristics distinguish research higher degree education from other kinds of training or higher education. Research higher degree education and training:

- necessarily includes the production of new knowledge, which is disseminated in scholarly articles, public forums, patents, and other forms of knowledge transfer; it is embodied in the thesis, which is usually publicly available.
- provides training in research techniques for research and innovation careers, by doing research. This includes large amounts of non-formal experiential learning, embedded learning, and skills acquisition. As Professor Jean Chambaz, President of the European Universities Association Council on Doctoral Education emphasised in a recent address in Adelaide, research training produces “double competence”:
  1. competence in a highly-specialised field
  2. generic competence in personal, managerial, and research skills and techniques.
- produces the producers of knowledge, disseminators of knowledge, users of knowledge, and consumers of knowledge.

As producers of research, research higher degree candidates must be recognised as part of the research workforce. UQ embedded this recognition in the early 1990s by moving the academic administration of research candidates from Student Administration into Research Administration under the direction of a Pro-Vice-Chancellor (Research) and Dean of Postgraduate Students.

Somewhat more recently, recognition of research higher degree candidates as research professionals has been articulated internationally. The European Commission’s 2005 *European Charter for Researchers* sets out following principle:

All researchers engaged in a research career should be recognised as professionals and be treated accordingly. This should commence at the beginning of their careers, namely at postgraduate level, and should include all levels, regardless of their classification at national level (e.g. employee, postgraduate student, doctoral candidate, postdoctoral fellow, civil servants). (page 16)  
[http://www.europa.eu/cracareers/pdf/am509774CEE\\_EN\\_E4.pdf](http://www.europa.eu/cracareers/pdf/am509774CEE_EN_E4.pdf)

## 2. Worldwide reforms of the PhD should be acknowledged and reflected in Australian Government policy; Australian universities have been at the forefront of many of these reforms.

It is important that those in the higher education sector as well as those beyond it recognise that dramatic changes in the nature of doctoral education in the UK and Australia in particular, in Europe more recently, and increasingly in China and North America. Research students are expected to:

- engage closely with not just one supervisor but with many researchers,
- be accountable and report on progress,
- plan and meet timelines,
- acquire – often in quite formal and certified ways – a range of transferrable skills.

PhD programs in many countries have been transformed in ways that would make them unrecognisable by those who gained their own PhDs as recently as 10 years ago. The changes include:

- high quality generic skills training (team-based and applied research, project management, interdisciplinary research, grant writing and management, people management, leadership and financial management etc), as well as
- extended academic coursework to develop disciplinary and interdisciplinary context
- period of research/study at another institution or in another country during the PhD

In Australia, the limits on funding to students and institutions have constrained these developments. For students and supervisors, there are tensions between:

- the acquisition of generic skills and the dedication to a cutting-edge research project;
- between industry or international experience and the production of an outstanding thesis.

The Australian PhD system is (in economic terms) very “efficient.” Australian PhD completion times and completion rates compare very favourably with international data [for an explanation of these terms, see Appendix 1]. Current data from UQ and the USA show the percentage of PhD candidates commencing in 1997 who had completed by 2007. A 10-year period is considered optimal for capturing candidates who have had interruptions due to unforeseen circumstances and/or have been enrolled part-time. The most recent figures are:

|   |       |
|---|-------|
| National Science Foundation Doctoral Completion Study (USA, 2008) | 56.7% |
| The University of Queensland PhD Cohort Analysis (2008)           | 69.0% |

### 3. The value of research training.

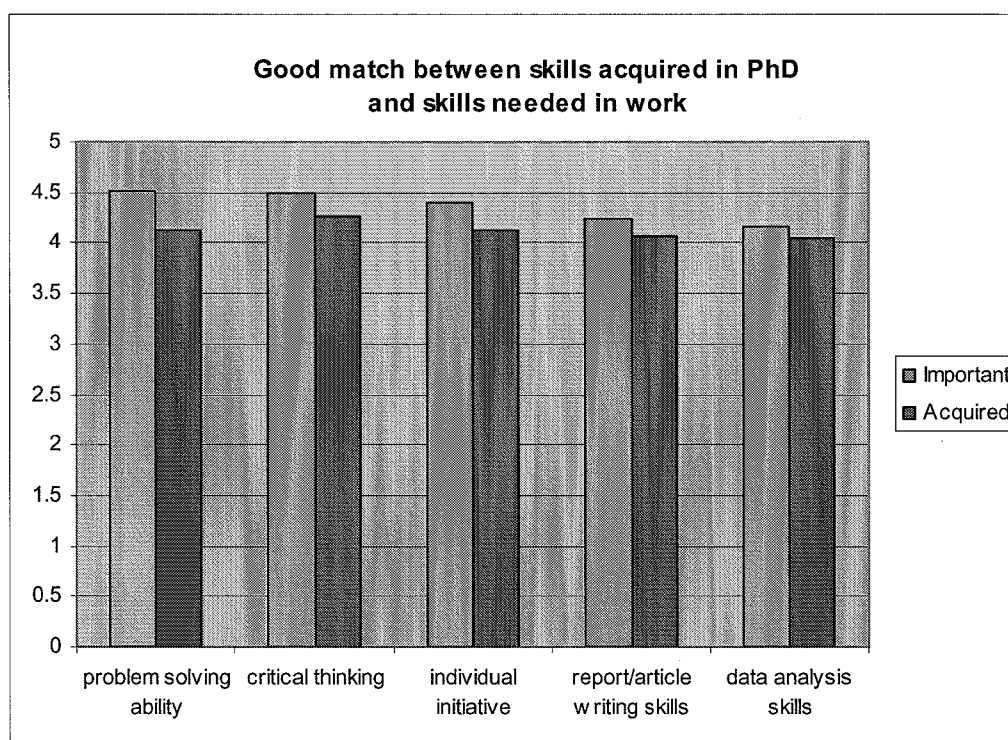
Research higher degree graduates:

- value their experience highly,
- contribute impressively to Australia’s research outcomes,
- need more training in some professional skills.

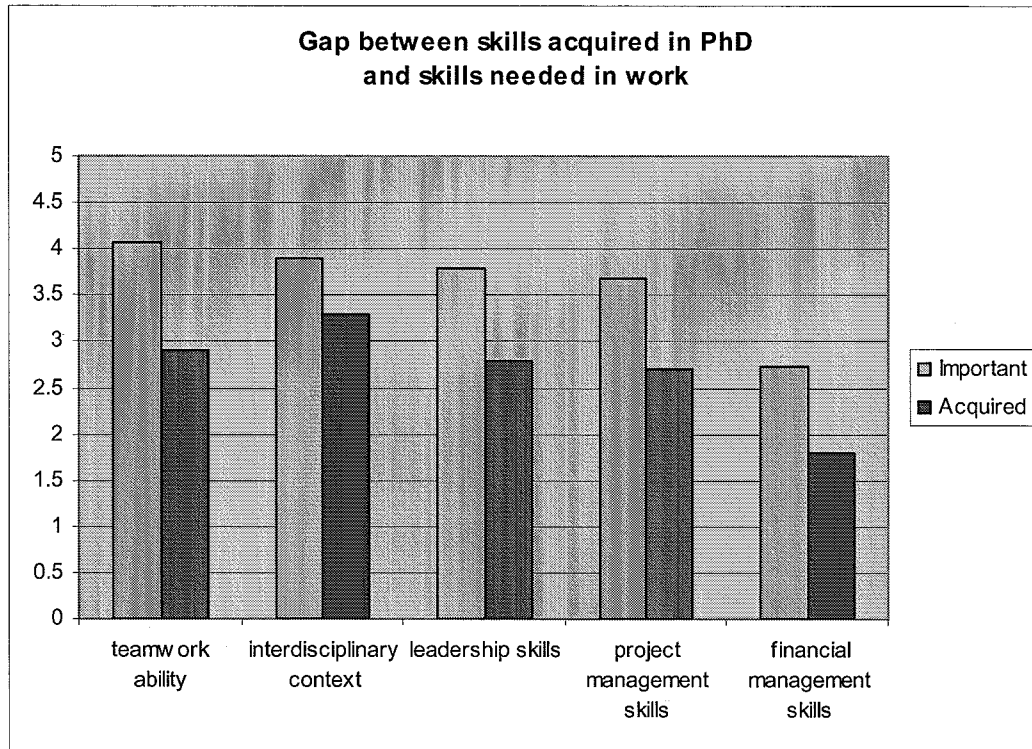
In 2006, the University of Queensland Social Science Research Centre surveyed all PhDs who graduated from Group of Eight Universities between 1999 and 2001. The objective was to gain insights from graduates 5 to 7 years after they had completed their degrees to allow for:

- mature reflection on the PhD experience
- the benefits and influences of the PhD training to be evaluated in the context of their subsequent careers;
- a post-PhD career path to be established.

Almost 2,000 respondents were asked whether PhD training was useful for their current or most recent work: for 79% of respondents it was very useful or useful: for 8% it was either minimally or not useful.



They also reported the extent to which they had gained certain abilities and skills during their PhD and to what extent these had been important in their post-PhD career [see Appendices 2, 3, 4].



So, while PhD graduates regard their PhD as very useful to their post-PhD career, there are some perceived gaps between what is needed post-PhD and what research training has provided.

- Involvement in team-based collaborative and interdisciplinary research
- Leadership
- Project and financial management skills.

Data from Exit Surveys of completing PhD students show that 80% of UQ PhD candidates have published from their research before submitting their thesis; almost all others have immediate plans to do so. UQ encourages candidates to include their publications directly in their theses. Knowledge transfer from the PhD process is very high. For further data on publications and other forms of research during and after candidature, see Appendix 5.

#### 4. It should be acknowledged that a 4-year PhD would enable:

- Broader training in generic skills
- Deep and broad knowledge of the context of the discipline
- Excellence of research outcomes
- Appropriate dissemination of research outputs.

A research higher degree thesis must describe the outcomes of original research. It is always subject to the kinds of events that are unforeseeable precisely because the cutting edge of knowledge is where the unpredictable and the unknowable are encountered. It is therefore impossible to prescribe the length of time that this will take, although it is possible to describe an expected duration.

In the UK and Australia in the mid-1990s, it was fashionable to assume that the appropriate PhD duration was 3 years. While some successful PhD outcomes are achieved in 3 years, it is not a standard that can be applied to all. When that fashionable assumption became embedded in policy and funding decisions, it had negative effects on the opportunities for:

- pursuing anything other than the thesis itself (preferably on a 'safe' topic);
- appropriate coursework to broaden the disciplinary knowledge of graduates;
- the deep acquisition of generic skills;
- disseminating the results of their work through publications and conferences,
- gaining industry and/or international experience.

The 4-year PhD duration must be embedded in funding and other policy measures. The University of Queensland recommends reforming the APA in a number of ways:

- Two 6-month extensions of an Australian Postgraduate Awards (APA) and APA (Industry) should be permitted, restoring the maximum duration to 4 years.

If research higher degree candidates are funded at an appropriate level for the appropriate duration of their degree, they will be much more likely to:

- complete their degree ON scholarship IN time.
- have a realistic opportunity to acquire appropriate generic skills in a research context.
- have time to disseminate the outcomes of their research.

Aligning APAs (currently 3 to 3.5 years) with funding for Research Training Scheme places at 4 years (max.) would enable institutions and candidates to meet these objectives.

Robust data from a large study conducted by Professor Sid Bourke at the University of Newcastle show that candidates who switch from full-time to part-time take statistically longer to complete than those who are either full-time throughout or part-time throughout. A decision to change from full-time to part-time is almost always a financial one: either a scholarship has run out, or the candidate's financial responsibilities (to a family, for example) can't be met by the scholarship.

UQ recommends two 6-month extensions (on academic grounds) be permitted to APA-holders, restoring its maximum duration to 4 years (as it was in the early 1990s).

#### 5. Scholarship stipends have fallen behind all comparators and need to be increased immediately by 30%.

As professional researchers, research higher degree candidates forego income and superannuation during the doctoral phase of their career: they should receive appropriate professional income support. Other than their enthusiasm for research and genuine interest in a particular topic (heart disease, the financial viability of the Australian superannuation system, making new materials from sugarcane), there is no incentive for a graduate to undertake research studies and become a professional researcher in a university, research organisation or industry.

| <u>After-tax starting salaries</u> |          |
|------------------------------------|----------|
| Fitness Instructor:                | \$24,700 |
| Flight attendant:                  | \$26,400 |
| Cleaner:                           | \$26,750 |
| APA stipend:                       | \$20,007 |

To attract the best and brightest, stipends must compete with average after-tax graduate salaries.

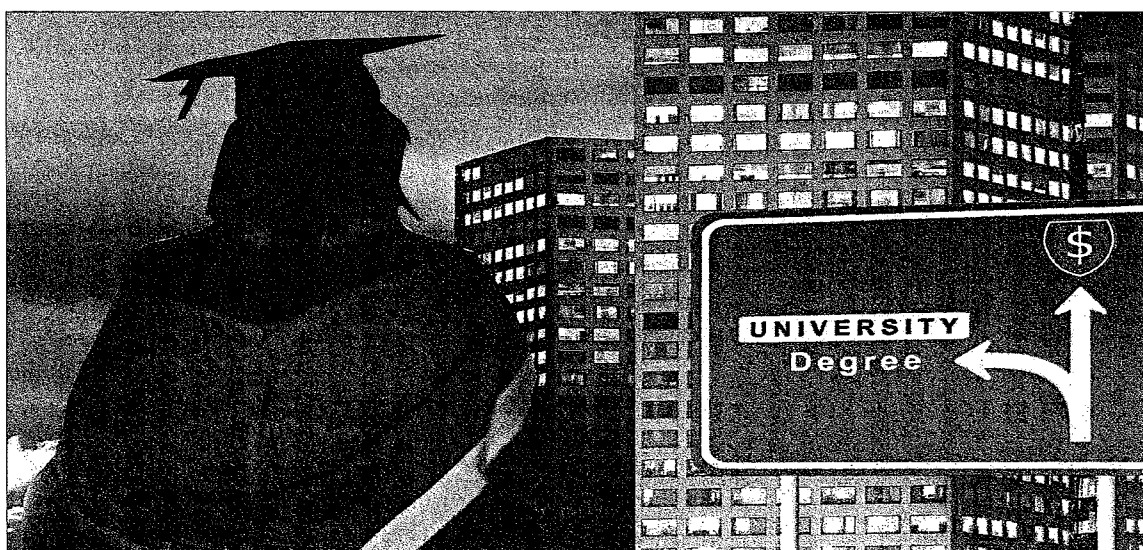


Photo-illustration: KARL HILZINGER

In many advanced economies (eg, Northern Europe), PhD students have salaries that fully support them for the duration of their research training. In 1992, an Australian Research Council Working Party's recommendation to increase the APA stipend was ignored. Had that recommendation been adopted, the APA stipend would now be \$26,250 instead of \$20,007. [For other recommendations from this report, see Appendix 6.]

UQ recommends that the APA stipend rate be increased immediately by 30% and that an appropriate indexation mechanism be devised and implemented.

This would lift the APA to \$26,000. After-tax starting salaries of pass degree graduates are:

|                    |          |
|--------------------|----------|
| law or social work | \$37,000 |
| chemical engineers | \$44,000 |
| dentists           | \$54,000 |

- **Part-time APAs should be tax-free.** Part-time APAs (which can only be taken up by those with significant carer responsibilities) are taxed. This is a major impediment to improving equity participation rates.

## 6. The changing demographics and career destinations of research higher degree candidates should be recognised by institutions and government.

The mean age for PhD candidates in Australia was 37 years in 2005 (34 years in 1999). At UQ, half of all PhD candidates are between 25 and 35 but the distribution of the rest is very broad. Data collected by Deans of Graduate Studies over the past 12 years show that:

- the median age of PhD candidates is rising;
- the honours degree is no longer the predominant entry pathway;
- women now constitute slightly more than 50% of candidates;
- international students are a growing proportion of the research higher degree population.
- 30% of UQ's research higher degree candidates are enrolled part-time.

Institutions have been adjusting their processes for recruitment and entry to meet the changing demographics. UQ accepts applications for admission and scholarship at any time, rather than setting annual application dates. UQ processes Admission & Scholarship Applications within a week to enable an immediate start.

Most universities have devised options for including generic training in research higher degree programs without any government funding, or any policy recognition that this adds to the workload for both candidate and institution. We have also learned to recognise the prior skills-acquisition by the large number of candidates who have a decade or more of experience *before* they start their PhD.

- **APA eligibility should be deregulated, so as to be consistent with academic judgment embodied in local selection criteria.**

The APA Guidelines insist that only applicants with First Class Honours (or equivalent) are eligible even though studies have shown that it is not a good predictor of research higher degree success. Students with research experience, whose intellectual curiosity and abilities are developing strongly are very likely to produce excellent postgraduate outcomes.

## 7. The full costs of research training must be funded. This must include:

- **The cost of research training.**

The career motivations of students and the expectations of employers are driving a greater emphasis on the formation of independent critical analysis and research skills alongside teamwork skills. Universities are broadening the professional development of students by offering:

- formal training in research methods, statistics, data analysis, ethics, writing and other presentation skills;
- workshops in time management, leadership, teamwork;

- collaborative research programs in which candidates work for a period in other research institutions (both in Australia and overseas) gaining valuable international experience, organisational, intercultural communication and teamwork skills;
- supervision training and monitoring, and supervisor panels for individual students.

A recent survey of Go8 PhD graduates found 47% employed outside the university sector 5-7 years after graduation. Studies of other institutions find a higher percentage outside universities. Doctoral graduates must be broadly prepared for work in a wide range of research-oriented occupations and organisations. Government policy accompanying the RTS (2000) urged universities to meet expectations of candidates and employers for a wider range of skills, but funding per research higher degree student has steadily declined.

The UK government has taken a very different path by establishing a generously-funded body called UKGrad. The level of visible activity is high but the program is very costly; delivered to a small proportion of the research students in the UK; separates research and transferrable skills training from the research environment. UQ does not recommend this approach.

- **Research training must be provided in a high quality research environment in which the cost of research can be fully funded.**

The provision of high quality research training depends on a university's:

- overall financial health;
- ability to attract and retain quality staff and students;
- quality and critical mass of its research effort; and
- capacity to provide access to infrastructure, resources and other support services
- access to external research funding, infrastructure and collaborators.

### **8. The quantum of funds in RTS must keep pace with increases in research higher degree completions to retain the value of a research training place.**

The money allocated to universities through the RTS has only ever funded the cost of “the enrolment” – basic staff costs, basic infrastructure. It does not fund the cost of the research which gives research training its meaning, or the generic skills training which gives it its career value.

Funding the full cost of research and research training is the pre-requisite for the development of Australia's research capacity.

RTS funding is grossly inadequate.

Actual domestic RHD load in 2000 (prior to the introduction of the RTS) - 24,860; by 2006, it had grown to 26,811. By contrast, the student load funded by the RTS has remained at 21,500.

The RTS funding allocation formula has 3 elements:

- numbers of research students completing their degrees – 50%;
- research income – 40%; and
- publications – 10%.

Since the introduction of the RTS, the university sector's research productivity has grown.

|                                       |        |
|---------------------------------------|--------|
| number of research degree completions | +25.7% |
| number of publications                | +64.1% |
| total research income                 | +73.1% |

The growth in RTS funding has not kept pace. +13.8%

Major productivity gains by universities and their research students have produced a fall in the funding per research student. Current Australian Government funding rates for research training bear no empirical relation to the actual costs of providing supervision, training, infrastructure, consumables and support services to students.



Moreover, the RTS differentiates between candidates in “high-cost” and “low-cost” disciplines by funding ‘high-cost’ candidates at 2.35 times the “price” of those in ‘low-cost’ disciplines – ignoring the actual cost of supervision, resources, infrastructure, etc. [For High Cost disciplines, see Appendix 7.] If the dollar value allocated by RTS to low cost disciplines was passed on by universities, research training in those disciplines would cease to be viable.

At the same time as domestic funding schemes fail to cover the full costs of research and research training for Australian students, most universities report very strong demand from top quality international students, alongside an inadequate number of scholarships.

**9. The full value of internationalising our research training system should be acknowledged. Internationalisation of our research training system must be based on enabling the global flow of research ideas, not on the narrow principle of cost recovery.**

Since 1987, legislation has prevented universities from using Commonwealth funds to educate anyone other than Australian citizens, Australian permanent residents, and New Zealand citizens. International best practice regards education as an investment in universities, communities and industries. Australian society, culture and the innovation system benefit from recruiting the best.

The Australian policy of full cost recovery is pricing us out of the international education market. International funding agencies now find it more economical to send PhD students to top universities in the USA, Canada, the UK, and Europe. We risk losing innovative talent, trade, goodwill, and international research links unless we reduce restrictions on the recruitment of internationally-educated researchers as graduate students, postdoctoral fellows and early career researchers who have received 10-20 years of education and training in other countries. The government of California acknowledges that its innovation system clusters around places where there are many PhD students and graduates. For spending patterns of international students, see Appendix 8.

- Travel grants for Australian research candidates to engage in overseas research.

UQ provides 75-80 Graduate School Research Travel Grants throughout the year to enable research candidates to spend time overseas on their research project. Unlike many other countries (Brazil, Germany, Denmark, Iran, Thailand, Chile, Vietnam, France), Australia has few national programs to support PhD students to gain international research experience

As others have already noted, there is evidence of a decline in the numbers of Domestic students enrolling in Research Higher Degrees in Australian universities and an increase in the numbers of international students. Between 2003 and 2007, UQ’s total RHD student numbers rose by just 1%: international student enrolments rose by 32.7%.

Scholarship programs must be rationalised to provide universities with more flexibility to attract the best students, both local and international. We need:

- Increased numbers of IPRS awards, each accompanied by an APA-equivalent stipend.
- IPRS awards to be funded at the full cost of tuition fees.

| Year       | No. of IPRS scholarships | No. of international RHD students |
|------------|--------------------------|-----------------------------------|
| 2000       | 300                      | 4,050                             |
| 2006       | 330                      | 8,981                             |
| % increase | +10%                     | +120%                             |

More importantly, there has been a remarkable increase in the quality of international RHD students applying to do their research training in Australia.

UQ calculates that IPRS now funds only 60% of average tuition costs. Because of delays in adjusting both funding and policy guidelines by DEST, most large universities:

- have large deficits in their IPRS accounts;
- have cross-subsidised this “government-funded” program; or
- have offered significantly fewer IPRS places than they are nominally awarded.

The 330 IPRS “scholarships” fund

- 60% of the tuition fee costs
- none of the direct research costs,
- none of the students’ living expenses

Being allocated one of these awards costs a University:

- \$25,000 per year – direct research costs of in some disciplines
- \$20,000 per year – living allowance scholarship provided by university (APAs cannot be awarded to International RHD Students)
- \$11,000 per year – average Tuition Fee shortfall

- **A reformed Endeavour scholarship program should maximise Australia’s ability to recruit and train of the best graduate students from around the world.**

The re-badging of many programs as “Endeavour Scholarships” has confused applicants, their governments, and Australian universities. Their objectives, funding, duration, and discipline focus vary widely; many are too short and underfunded so Universities heavily subsidise most of these government “funded” scholarships. For example, the Endeavour Postgraduate Awards (PhD):

- provide stipend and tuition fees for a maximum of 3 years, which is known to be an inadequate period. Universities subsidise the final 6-12 months.
- Cap tuition fee funding at \$20,000 per annum for both Masters and PhD programs, which might cover Humanities and Social Sciences tuition fees, but is below the tuition costs for STEM disciplines and totally inadequate for Veterinary Science or Medicine.

In conclusion -

- We have failed to regard research training as an investment in the future of Australia’s research and innovation systems, its economy, and its culture.
- We are falling behind our legitimate competitor nations in preparing a sophisticated innovation workforce.
- We risk losing a large international education export industry.

## APPENDICES

Appendix 1: An explanation of completion rates and completion times ...

Appendix 2: “Doctorates ailing on the world stage.” Mark Western and Alan Lawson. *The Australian (Higher Education Supplement)* 5 March 2008.

Appendix 3: HEIP Report Summary – *PhD Graduates 5 to 7 Years Out: Employment Outcomes, Job Attributes and the Quality of Research Training*. UQ Social Research Centre, 2007.

Appendix 4: Western, M.; Boreham, P.; Kubler, M.; Laffan, W.; Western, J.; Lawson, A.; Clague, D. 2007. *PhD Graduates 5 to 7 Years Out: Employment Outcomes, Job Attributes and the Quality of Research Training – Final Report*. Brisbane: University of Queensland Social Research Centre.

Appendix 5: Work output prior to submitting the PhD thesis and since submitting the PhD thesis. Table 18, *PhD Graduates 5 to 7 Years Out Report*.

Appendix 6: From ARC Working Party Report (Australian Research Council. *Postgraduate Support and Student Mobility: Working party report (September 1992)*. AGPS: Canberra.)

Appendix 7: High Cost Disciplines as defined by DEST for use in Research Training Scheme and Institutional Grant Scheme Allocations.

Appendix 8: Summary report from: Western, M. Laffan, W., Haynes, M., Chesters, J., Arts, D. (2005). *Final Report of the Survey of International Students’ Spending*. Commissioned Report Prepared for the Commonwealth Department of Education, Science and Training. The University of Queensland Social Research Centre.

## APPENDIX 1

### An Explanation of Completion Rates and Completion Times

Because there is a range of methodologies for measuring these, international comparisons are not always straightforward.

Completion Times. In North America, in particular, this is often called “time to degree”.

In Australia, “completion time” is generally agreed to refer to the number of months between commencement of the degree program and submission of the thesis for assessment. This period is adjusted for periods of:

- interruption (also called “intermission” or “suspension”), which are counted as zero; and
- periods of part-time enrolment, which are counted as 50%.

The differences between disciplines and universities are not great and the mean is usually calculated to be approximately three years and nine months of full-time equivalent (FTE) enrolment.

As pointed out elsewhere, this mean is affected by many factors:

- the range of research problems encountered in research
- the range of personal and employment-related circumstances encountered by graduate students

Completion rates refer to the percentage of a commencing cohort that has completed the degree for which they enrolled after a defined number of years. In Australia and the USA, the optimum period to measure is 10 years. This captures candidates who have had interruptions due to unforeseen circumstances and/or have been enrolled part-time throughout their candidature. The most recent figures are:

|   |       |
|---|-------|
| National Science Foundation Doctoral Completion Study (USA, 2008) | 56.7% |
| The University of Queensland Cohort Analysis (2008)               | 69.0% |

Some British universities measure the completion rates and time only of full-time candidates and/or exclude from calculation those who discontinue in the first year. This acknowledges that some candidates make an early (and probably positive) decision to pursue a different path.

# Doctorates ailing on the world stage

## Our PhD system needs attention, Mark Western and Alan Lawson write

HERE may be a lesson for us in an anecdote from a British academic colleague. He reports many selection committees in Britain are finding it increasingly difficult to hire PhD graduates from British universities because the field has been swamped by highly competent graduates from US universities. The North American system of extensive postgraduate coursework, comprehensive exams and a dissertation appears to be producing comparatively large numbers of high quality doctoral graduates with breadth and depth across the discipline and strong generic skills.

Many cannot find work in the US or do not want to, and British universities offer alternative attractive destinations. PhD graduates from British universities, who typically have much more limited postgraduate coursework, and whose doctoral experience consists primarily of an in-depth examination of a highly specific topic are less competitive.

The internationalisation of higher education suggested by this story also affects Australia. PhD graduates with Australian degrees compete in an international labour market for jobs here and overseas. And the competition is getting fiercer as the number of graduates increases. In 1996, Australian universities awarded just under 3000 PhDs. In 2006 the total was more than 5500, an 85 per cent increase, with more than half the students coming from Group of Eight universities. The US, in comparison, awarded 46,000 doctoral degrees in 1997-98, and 52,600 (a 14 per cent increase) in 2004-05. While the size of the US doctoral population greatly exceeds that of Australia, Australia's recent growth rates in PhD enrolments and awards have been large by international standards.

In an era of growing international competition to recruit students into PhD programs and place them afterwards, how good are Australian universities at delivering the kinds of outcomes graduates are looking for?

This is one of the questions behind a study we conducted in 2006 to examine the experiences of doctoral graduates from Go8 universities. We surveyed just under 2000 PhD graduates who were awarded their degrees between 1999 and 2001, asking them about their experiences of PhD education, their present circumstances and their evaluations of the usefulness of their degrees for employment and career progression.

Our sample contains more than one-third of all Go8 graduates in the cohort and just less than 20 per cent of all PhD graduates from

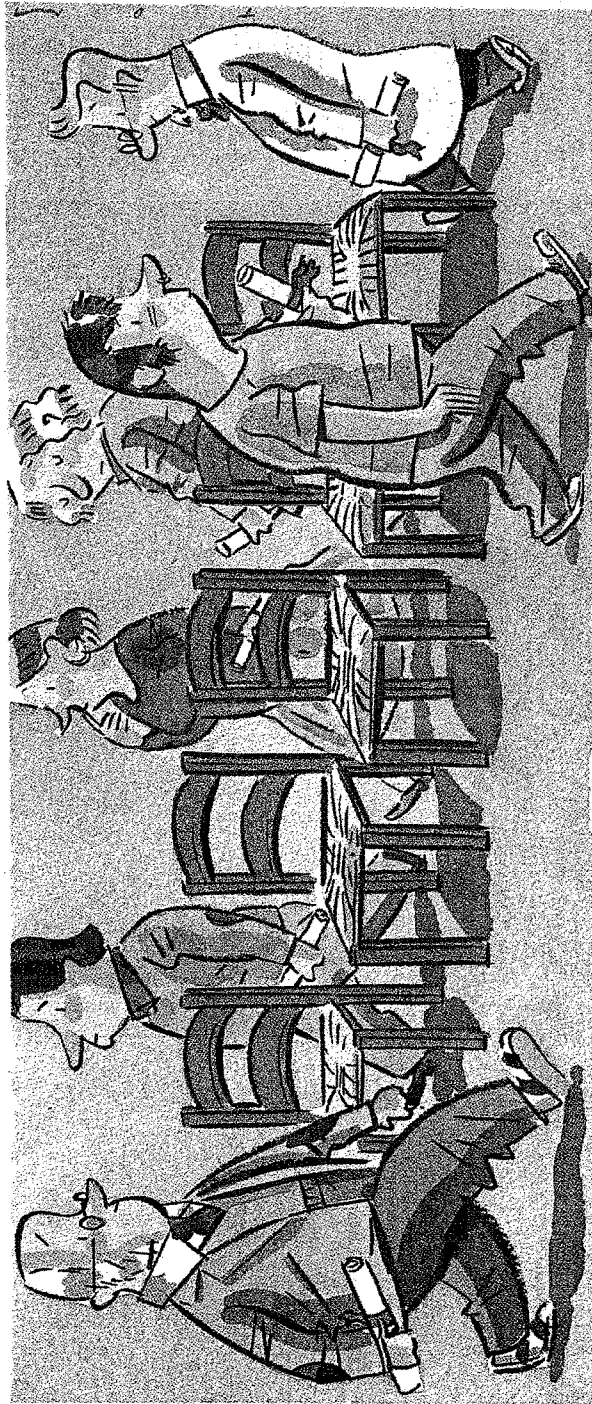


Illustration: Tom Jellat

Australian universities in this period. We focused on graduates who were five to seven years postdoctoral because we wanted them to have had time to settle into stable employment patterns and to be able to reflect on the quality and usefulness of their PhD degrees for the jobs they now had. The sample represents the Go8 and total populations of PhD graduates well in terms of age, sex, discipline and residency status during the PhD, suggesting that we can draw reliable conclusions about the Go8 population and perhaps about the graduating cohort as a whole.

We asked graduates to report on their reasons for beginning a PhD. Two clusters emerged very strongly. Intrinsic reasons such as personal satisfaction, interest in the thesis topic, research, and the discipline, were very strong drivers for all graduates, but especially for women and those in humanities, arts and social sciences. Instrumental reasons linked to career advancement such as improving pay, enabling a career change or for promotion, were also important across the disciplines, but especially for health sciences graduates.

Graduates also reported that their PhD produced very particular sets of skills and competences. Reassuringly, there was strong agreement across the sample that doing a PhD produced a broad skill set characteristic of

being a capable independent researcher. Critical thinking, problem solving, creativity, independent research skills, oral and written communication, initiative, data and evidence analysis skills all figured prominently. Graduates also reported they felt able to work at the frontiers of their disciplines acquiring up-to-date substantive and methodological knowledge and skills and the ability to contribute to scholarship and research. However, they were much less convinced that they acquired team-based and applied research skills during their PhDs. Skills such as project management, grant writing, team work, an ability to contribute to practice, or to work in an interdisciplinary context, assertiveness, leadership, and financial management were much less commonly acquired during the PhD.

Do these differences matter? It turns out they do. When asked about the skills and competences required to develop a career, PhD graduates nominated not only the skills that they reported acquiring during the PhD — independent analytic research skills, the capacity to contribute to knowledge — but also team-based and applied research skills, and they rated the importance of these skills sets almost equally highly. Indeed, our research shows unambiguously that graduates identify as clear deficits in their PhD training

an ability to work in teams, to work in an interdisciplinary context, to manage projects and budgets and to write grants. Graduates further report that knowledge of their thesis topic is the least important kind of knowledge for career development. Knowing how to analyse data and undertake research, broad disciplinary knowledge are all much more important for employment and career progression than knowledge relating to a thesis topic. These patterns hold across all disciplines.

Several other key findings are also important. When asked about the usefulness of their PhD for employment and a career, graduates were overwhelmingly positive, with just under 90 per cent describing it as either useful or very useful. However, even with these strong positive assessments there were systematic differences between graduates who felt the PhD was more useful and others. Graduates were more likely to rate the usefulness of the PhD highly if they were strongly motivated (either by intrinsic interest in the PhD or instrumental factors such as career advancement); were extensively mentored by supervisors with respect to professional relationship, publishing, finding employment and acquiring generic skills; worked in teams

interaction are not universal features of Australian PhD training. Nor are opportunities to learn how to manage large projects and budgets, work in teams, or collaborate with researchers in other disciplines.

Many Australian PhD candidates receive no formal training in research design, data analysis or methodology, and many rely on broad disciplinary knowledge acquired in their undergraduate degrees or through incidental reading during the PhD. There are some disciplinary differences: graduates in the humanities, arts and social sciences are least likely to participate in structured training and to acquire generic skills. But the Australian system of PhD training as a whole relies too heavily on the individual goodwill and energy of supervisors and students, and not enough on the institutionalisation of structured learning practices. With the introduction of the Research Training Scheme in 2001 and the reduction of funding to universities for PhD enrolments to four years on-course, Australian universities have been under increasing pressure to shorten PhD completion times, while enrolling larger numbers of students.

Coupled with the expansion of undergraduate education, the linking of university funding to student demand, and the consequent removal of prerequisites, double majors and honours programs, pathways into the PhD are also arguably less rigorous than they once were. The trends in Australia run counter to the trends overseas. In the US, the median time to complete a PhD has been increasing for 30 years and across all disciplines is now 7½ years of enrolment. This is largely a function of increasing formal requirements in the PhD program. In Britain at least one year of coursework is now required in many discipline areas so that four years is now the minimum practicable completion time; ordinarily, some funding councils penalise universities for enrolments that exceed four years.

Although Australian universities cannot implement North American-style graduate training they also cannot afford to ignore how the PhD is organised in other parts of the world: our graduates are competing for the same jobs. The tension between the demand for top-quality graduates and funding mechanisms that reward high quantity rapid completions has never been sharper.

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Tomorrow the University of NSW hosts a workshop under the title Go8 PhD Programs: Where Would We Like to Be in Five Years? On Friday UNSW is the venue for another PhD workshop, this one staged by the Council for the Humanities, Arts and Social Sciences.

## APPENDIX 5

**Table 18: Work output prior to submitting the PhD thesis and since submitting PhD thesis**

| Outputs                    | before PhD submission (n=1996) |               |        | since PhD submission (n=1996) |               |        |
|----------------------------|--------------------------------|---------------|--------|-------------------------------|---------------|--------|
|                            | One %                          | two or more % | median | One %                         | two or more % | median |
| Authored books             | 5                              | 3             | 0      | 10                            | 4             | 0      |
| Edited books               | 4                              | 2             | 0      | 7                             | 4             | 0      |
| Chapters in books          | 15                             | 11            | 0      | 17                            | 20            | 0      |
| Refereed articles          | 14                             | 61            | 2      | 8                             | 66            | 3      |
| Research/technical reports | 10                             | 31            | 0      | 7                             | 40            | 0      |
| Conference papers          | 9                              | 77            | 3      | 6                             | 69            | 4      |
| Patents                    | 3                              | 2             | 0      | 4                             | 4             | 0      |
| Software products          | 4                              | 2             | 0      | 4                             | 5             | 0      |
| Compositions               | 0.5                            | .5            | 0      | 0.3                           | 0.9           | 0      |
| Exhibitions                | 2                              | 3             | 0      | 1.1                           | 3             | 0      |
| Performances               | 0.4                            | 3             | 0      | 0.5                           | 2             | 0      |

Note: The output questions (D20a-D21k) generated a relatively large proportion of missing values. These were assumed to be 0 so that every proportion and median presented is based on the complete sample of 1996 respondents.

Most common forms of output before the PhD were refereed articles and conference papers which were produced by 75 and 85 percent of respondents respectively. The proportions are generally higher for the period after the PhD was submitted.

Western, M.; Boreham, P.; Kubler, M.; Laffan, W.; Western, J; Lawson, A.; Clague, D. University of Queensland Social Research Centre. 2007. *PhD Graduates 5 to 7 Years Out: Employment Outcomes, Job Attributes and the Quality of Research Training*. Brisbane: University of Queensland.

## APPENDIX 6

### EXCERPTS FROM 1992 ARC REPORT ON RESEARCH STUDENTS

“The stipend for students undertaking postgraduate research degrees should be restored to 56 per cent of the base rate of an ARC Research Associate’s salary

The level of stipends should be reviewed every three years to ensure parity with academic salaries generally, and with those of Research Associates in particular.

The government should ensure that the level of research infrastructure funding is adjusted to take account of the rate of growth in research higher degree work.

An annual research support grant should be paid to institutions in respect of each APRA holder at that institution, this grant to be set at \$1500 in the first instance.” (page vii)

#### LEVEL OF STIPENDS

“The level of stipends has long been a contentious issue.

Stipends, however, can also be viewed as payments for contribution to the national research effort, and there will always be competition between the institutions and the business and industrial community for the ‘best and brightest’ students. This competitive aspect applies regardless of the general labour market situation, and regard must be paid to it in determining levels of stipends.

APRA stipends have been reviewed annually, and in 1992 were adjusted under the standard supplementation arrangements for Higher Education Funding Act (HEFA) grants.

Currently stipends are reviewed annually and adjusted within the scope of the supplementation available under HEFA; this does not ensure parity with academic salaries on a year to year basis (as the recent adjustment has shown), but it does succeed in maintaining some degree of parity with costs over a longer period, and enabling postgraduate award costs to be held within budget. The working party endorses the objective of avoiding significant shortfalls in the level of stipends relative to academic salaries and suggests that this relativity be examined every three years.” (pages 3-4)

#### RESEARCH INFRASTRUCTURE IMPLICATIONS

“While APRA holders make a significant contribution to the higher education research effort, there is another aspect which has tended in the past to be overlooked. This is the pressure placed on institutions’ physical, financial and supervisory resources by the increase in numbers of postgraduate research students. Severe pressure on institutional resources leads to reduced quality of research higher degree work and lengthening of completion times. It is an issue which needs to be addressed.

One option would be to link a research support payment to the research awards, in a similar manner to research support grants associated with ARC fellowships. An annual grant of, say, \$1500, in respect of each APRA holder, would provide an initial level of assistance to institutions to assist with the additional research costs of postgraduate students, which are not reflected in the teaching cost related operating grant payable in respect of this load.” (page 5)

#### REFERENCE

Australian Research Council. 1992. *Postgraduate Support and Student Mobility: Working party report (September 1992)*. AGPS: Canberra.

## APPENDIX 7

### High Cost Disciplines as defined by DEST for use in RTS and IGS Allocations

| ASCED Title                                    | ASCED Code |
|--|------------|
| Physics and Astronomy                          | 0103       |
| Chemical Sciences                              | 0105       |
| Earth Sciences                                 | 0107       |
| Biological Sciences                            | 0109       |
| Pharmacology                                   | 019907     |
| Manufacturing Engineering                      | 030101     |
| Process and Resources Engineering              | 0303       |
| Automotive Engineering                         | 030501     |
| Mechanical Engineering                         | 030701     |
| Industrial Engineering                         | 030703     |
| Civil Engineering                              | 0309       |
| Geomatic Engineering                           | 0311       |
| Electrical Engineering                         | 031301     |
| Electronic Engineering                         | 031303     |
| Computer Engineering                           | 031305     |
| Communications Technologies                    | 031307     |
| Aerospace Engineering                          | 031501     |
| Maritime Engineering                           | 031701     |
| Environmental Engineering                      | 039901     |
| Biomedical Engineering                         | 039903     |
| Agriculture, Environmental and Related Studies | 05         |
| Medical Studies                                | 0601       |
| Pharmacy                                       | 060501     |
| Dentistry                                      | 060701     |
| Veterinary Studies                             | 061101     |
| Human Movement                                 | 069903     |
| Farm Management and Agribusiness               | 080321     |
| Psychology                                     | 090701     |

### Low Cost Categories

All other codes.



## Appendix 8: *Survey of International Students' Spending and their Research Output (2005).*

### A. Spending patterns

A major study on the spending patterns of international students in Australia was commissioned by the Commonwealth Department of Education, Science and Training in 2005. Some of its key findings include:

- International students studying at universities spend more than international students in any other education sector
- average total expenditure on all major items (excluding Tuition Fees) – housing, utilities, telephone, healthcare, food and groceries, alcohol and cigarettes, car costs, transport costs, entertainment and recreation, clothing, household goods, travel, course related expenses, other expenses – by University students with dependent children living with them (overwhelmingly, postgraduate students) was just over \$1004 per week.
- The report also highlighted that students' reported expenditure greatly exceeds their reported income, a fact that has been confirmed by DEST. International students typically bring savings with them and/or receive money from their families while they are here.
- The non-fee income while they are here is regarded as export income in the National Accounts.

### B. Research outputs

A 2006 study of just on 2000 PhD graduates from 1999-2001 highlighted the contribution that International PhD students make to the Australian knowledge economy and to the Smart State.

- International students reported greater involvement in organising conferences and interacting with visiting scholars than domestic students: both of these activities generate further income for the local economy;
- international PhD students produce more research and technical reports and exhibitions (leading to technology/knowledge transfer) than do Australian PhD students;
- international students reported higher proportions of research outputs since PhD submission in almost every category;
- international students are more likely to have undertaken their PhD as an independent contribution to a larger research program or as a team project than domestic students (who are more likely to work alone on their project); this also indicates a significant contribution to knowledge transfer.

In short, international graduates are more likely to convert their knowledge and skills into relevant research outputs in the first years after PhD submission.

Western, M. Laffan, W., Haynes, M., Chesters, J., Arts, D. (2005). *Final Report of the Survey of International Students' Spending*. Commissioned Report Prepared for the Commonwealth Department of Education, Science and Training. St. Lucia: The University of Queensland Social Research Centre.