



COMMONWEALTH OF AUSTRALIA

Official Committee Hansard

**HOUSE OF
REPRESENTATIVES**

STANDING COMMITTEE ON INDUSTRY, SCIENCE AND
INNOVATION

Reference: Research training and workforce issues in Australian universities

WEDNESDAY, 25 JUNE 2008

CANBERRA

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HOUSE OF REPRESENTATIVES
STANDING COMMITTEE ON INDUSTRY, SCIENCE AND INNOVATION

Wednesday, 25 June 2008

Members: Ms Vamvakinou (*Chair*), Fran Bailey (*Deputy Chair*), Mr Bidgood, Mr Champion, Mr Cheeseman, Dr Jensen, Mr Johnson, Mr Ramsey, Ms Rishworth, Mr Symon

Members in attendance: Fran Bailey, Mr Bidgood, Mr Champion, Mr Cheeseman, Dr Jensen, Mr Ramsey, Ms Rishworth and Mr Symon

Terms of reference for the inquiry:

To inquire into and report on:

1. The contribution that Australian universities make to research in Australia, including:
 - The contribution of research training programs to Australia's competitiveness in the areas of science, research and innovation;
 - The effectiveness of current Commonwealth research training schemes; and
 - The adequacy of current research training schemes to support Australia's anticipated future requirements for tertiary-qualified professionals in a wide range of disciplines.
2. The challenges Australian universities face in training, recruiting and retaining high quality research graduates and staff, including, but not limited to:
 - Adequacy of training and support (including income support) available to research graduates in Australia;
 - Factors for graduates that determine pursuit of a career in research;
 - 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; and
 - Whether Australia's academic workforce is ageing, and the impact this may have on Australia's research capacity.

WITNESSES

MARSDEN, Mr Lennard, Chief Operating Officer, Australian Research Council 12

PAYNE, Mr Tim, Deputy Executive Director, Group of Eight Ltd 1

SHEIL, Professor Margaret, Chief Executive Officer, Australian Research Council 12

**THOMAS, Professor Mandy, Pro Vice-Chancellor (Research), PVC Research, Australian
National University, representing Group of Eight Ltd 1**

Committee met at 10.03 am**PAYNE, Mr Tim, Deputy Executive Director, Group of Eight Ltd****THOMAS, Professor Mandy, Pro Vice-Chancellor (Research), PVC Research, Australian National University, representing Group of Eight Ltd**

ACTING CHAIR (Fran Bailey)—I declare open this public hearing for the inquiry into research training in Australia being conducted by the House of Representatives Standing Committee on Industry, Science and Innovation. The inquiry arises from a request to this committee by Senator Kim Carr, the federal Minister for Innovation, Industry, Science and Research. Written submissions were called for and 90 have been received to date. The committee is now conducting a program of public hearings and inspections and this hearing is the second for the inquiry.

I welcome the representatives of the Group of Eight. Although the committee does not require you to give evidence under oath, I should advise you that these hearings are formal proceedings of the parliament. Consequently, they warrant the same respect as proceedings of the House itself. It is customary to remind witnesses that the giving of false or misleading evidence is a serious matter and may be regarded as contempt of parliament. We thank you very much for making your very detailed submission and we now invite you to make a brief opening statement before we proceed to questions.

Prof. Thomas—The Group of Eight conducts the bulk of research in Australia and the bulk of research training, which is why we have a particular interest in research training in Australia. The international context is important to state at the beginning. The nature of a PhD is changing around the world. The increase in professional training and development within PhDs in the US, Europe and the UK is developing rapidly. The numbers of domestic students applying and being recruited into PhD programs in the US, UK and Europe is in decline and there is much more competition for talent around the globe for PhD graduates and bright PhD applicants.

In this context Australia is not being competitive in the sense of, firstly, not having enough PhD trained graduates per thousand of our labour force—it is one of the lowest in the OECD. We have the shortest PhDs in the OECD, which is a positive thing in relation to being able to attract international students who do not want to undertake eight-year PhDs in the US and who prefer to undertake a shorter PhD here. However, there is great pressure on Australian universities to provide much more intensive graduate training within the PhD and more course work around disciplinary fields within the PhD in order to have highly skilled, trained graduates. This means that the pressure to increase the length of the PhD is growing. The average length of a PhD in Australia is now 4.7 years; in the US it is over eight 8½ years.

The decline in Australia of domestic enrolments in PhDs has been significant since 2005. Increasingly it is a case that we will need to recruit international PhD students more vigorously than before now. Only about 17 per cent of our PhD enrolments are international students compared with much higher numbers in the US and the UK. Until recently it was very difficult for international PhD students to stay in Australia after their PhD. There is still a lot of inflexibility around allowing those students to stay beyond a PhD and take advantage of the

training that we have given them, considering that we attract some of the brightest international students, particularly to the Group of Eight universities.

The key issue for us is funding the full cost of research. If we do not significantly increase the funding for research in Australia there will be a decline in the quality of research training. Graduate students need the best quality labs, the best support structures for PhD training; they need high quality professional development programs and they need trained academic staff and infrastructure to support their PhD training. We do not fund the full cost of research and this is the most urgent issue for us.

While we are gratified to see the increase in the number of PhD scholarships for domestic students—1,000 over the next five years—it is the value of the PhD scholarship, which has not increased in over a decade, that is of concern to us in that we cannot attract students to do PhDs when there is so much competition for those students in sectors such as the resource and financial sectors, for example. The value of the PhD scholarship needs to increase and also the length of time—the duration of the PhD scholarship—from 3½ years to at least four years because of the increased focus on professional development.

More than 50 per cent of students now go on to sectors outside the academic realm after their PhD graduation. This is the trend all over the world. It means that the trained PhD graduate can stimulate knowledge economies, and it is quite clear that, in many countries of the world, there is recognition of the value of PhD trained graduates in business, in government and in other organisations.

While we recognise that universities are training people not just to be academics, we also have a significant problem in the ageing of the academic workforce. If we go along with this trend of having the same number of PhD graduates—or a dropping number over the coming years as is predicted if we maintain the present trend of a decline in domestic student enrolments—we will not have enough PhD trained graduates to support our academic workforce as well as the competitiveness of our economy for those people entering industry.

One way to address this is to increase the number of international students and the flexibility around their visa conditions. There are not enough scholarships for international PhD students. There is not enough support for them via funding, and not just for the full cost of research—an increase in the research training scheme funding will also be necessary to encourage universities to find value in enrolling international PhD students.

One thing we are also concerned with in the Group of Eight is the lack of detailed data around PhD graduates—their destinations, what fields they are in, which areas we have shortages in. It is difficult to get to the bottom of the detail around what is needed in precise areas. One of the potential benefits of getting more data is to analyse, for example, what fields we have more of a decline in than others. Anecdotally, it appears that we have a decline in areas like mathematics, physics and chemistry, as well as engineering, which are really fundamental to the future of science in Australia. This is true in the US and Europe as well—the decline in PhDs in these particular fields. There has been a growth in PhDs in other fields such as education. While that is important, we need to differentiate more carefully which fields we are losing PhD graduates from and which fields are growing.

I will pass you on now to Tim Payne who will speak about what the Group of Eight has been doing in relation to PhD training.

Mr Payne—Part of my role in the Group of Eight office is, as well as engaging in policy development, to look at collaboration across the Group of Eight universities to see where we can improve quality and efficiency in PhD training as a whole. I will tell you about a few little projects that we have had running that may be of interest to the committee.

The first one relates to getting a better handle on the data. It has been referred to in some other submissions to the committee, and it is the study of PhD outcomes from Group of Eight universities that was funded by the former DEST, now DIISR. It looked at outcomes of PhD graduates from 1999 and 2000 across the Group of Eight. The purpose of that study was to look at the quality and relevance of the training, to look at areas for improvement and to see where those graduates are going. It provides for the first time a good dataset about the outcomes and where those students are heading. The plan is to keep that as a longitudinal study. It has good coverage across the Group of Eight but it does not cover all universities, so it is a study the committee might like to look at, to examine the potential for doing that sort of work more broadly. But it does have good coverage at the moment.

The second project we are looking at, in collaboration across the Group of Eight, involves mechanisms to improve the quality of every aspect of the PhD training that is provided. It is in response to the outcomes from that study but also from a recognition that the nature of the people doing PhDs is changing. The traditional pathway from undergraduate to honours and then into a PhD is less and less the case. People are coming to a PhD much later in life and with different skills and different patterns of studying. There are a lot more part-time students—I think it is now up to 25 per cent—so universities are looking at different ways to assess admission to PhD programs. You can no longer just rely on honours. Also, with a greater number of people coming from overseas, you have to look at alternative mechanisms for assessing.

In other countries, there are various tests used to assess the suitability of candidates. These are not widely used in Australia, or I do not think they are used at the moment. So there is consideration of whether that might be a pathway. There are also things that we can do in relation to supervision: how do we improve the quality of supervision; how do we improve the quality of the experience through mobility? Obviously, there are costs involved for our students to go overseas or even to spend time at another university in Australia. There is the cost issue and also some simple regulation issues that could be sorted out to make that mobility more feasible. We are looking at that and then we are looking at the mechanisms for assessment. How do we actually determine quality differentials? What is a good quality outcome from a PhD? We are looking at the mechanisms to test that.

Another project that we have which may become applicable to the PhD but which at this stage is targeted at early- and mid-career researchers involves professional development that targets future research leaders. We have the issue of the ageing academic workforce and we are looking at ways of bringing on the next generation of people to fill those leadership roles. This project is about generic training in leadership, financial and project management and all the other sorts of core skills that researchers need to have now. That program has been funded under the former government's Workplace Productivity Program, but part of the thinking is that, if it is a success, aspects of it can be brought back into the PhD, across the Group of Eight, and potentially

licensed out to other institutions for a nominal fee to improve that generic training. One of the issues that came out of the study of graduate outcomes from the University of Queensland was the identification of some weaknesses in the training in those areas and that these were areas in which they would like to have more training for when they go into their professional careers outside the university sector. They are a few of the things that we are doing.

ACTING CHAIR—Thank you very much. Mr Payne, I am particularly interested in your reference to the lack of data. I wonder whether you can assist the committee by telling us what sort of data the Group of Eight would have in relation to the collaboration that exists between members of the Group of Eight and overseas institutions. Also, do you have any data that relates to movement between industry and the Group of Eight?

Mr Payne—We do not have that at our fingertips but one of the projects that we are looking at collaborating across the Group of Eight is to get much better data. I think it is possible to get the committee good data on that sort of stuff but it will require requests to individual institutions. We do not hold it as a group at the moment.

ACTING CHAIR—We could follow that up with you.

Mr SYMON—Professor Thomas, I have a question about funding rates for research, which you touched on and which is referred to in your submission at chapter 14, Adding to Australia's Capacity. Do you have any idea of the differential between what you now receive in funding and what the actual costs are and, if not, would that require a full-blown study? Or are you losing out on that package?

Prof. Thomas—It requires a full study; we do not have the details.

Mr SYMON—Not even the slightest idea?

Mr Payne—Within some institutions there is some and we have referred to them in our innovation review submission. There has been some activity based costing work done at Monash University. Across the board the funding shortfall is up to 30 per cent, but it goes a lot higher than that in some fields. At this stage, that is the only activity based costing that we are aware of. Generally, Mandy is correct: there is not an across-the-board understanding of that, but the Department of Innovation, Science and Industry is, I understand, looking at that in the context of an innovation review.

Dr JENSEN—I have got a whole lot of points and I will try and put them into a two-part question. The first one relates to the length of the PhDs and scholarships. I know the problem you have. I was lucky in that I completed my PhD in 3¼ years, but in my day there was the ability to extend your scholarship for a period of six months. I do not know what the status is with that at the moment, but one of the concerns I would have with a blanket increase in the length of the scholarship is that I know that in some cases supervisors are pretty slow with getting your written work back to you. To give them even more elasticity, if you will, in terms of the length of time that it takes them to respond to a PhD student is an area of concern. How do you actually prevent extending a supervision period under which a student has a scholarship? That is one point? The other point gets to something that is very dear to my heart as an ex-

scientist and that is, in your view, how do you go about attracting more people into the hard sciences and mathematics?

Prof. Thomas—In response to the first question, the average time for a PhD in Australia is 4.7 years. There are very few students completing a PhD in under three years. Presently, people are given three-year scholarships with a possibility of extending to six months extra. What we propose is that they be given a three-year scholarship with a possibility of extending to a year extra, but with some evaluation of where they are at the time of the three-year limit so that there would be some evaluation of each student's needs and capacities and the supervision issues in order to assist them in the process.

Dr JENSEN—I think the supervision issue is an important one to address as well.

Prof. Thomas—Increasing the quality of supervision and all of the professional development within a PhD go hand in hand because not only do students need a whole lot of other training in order to be knowledge workers but the supervision is still of a concern across Australia and a lot of training is inadequate. A lot of universities do not have significant numbers of staff with PhDs. There are a lot of universities that have fewer than 50 per cent of their academic staff with PhDs, so we also recommend that PhD training be focused in areas of research strength where there is a very strong research culture and which we can provide, for example, in the Group of Eight universities.

Dr JENSEN—What about the issue of the hard sciences and maths?

Prof. Thomas—That is something that reaches back into childhood, not just at universities. Clearly that shift towards better training of teachers in science is a start.

ACTING CHAIR—That is something that has already emerged.

Prof. Thomas—That is right. But to address the urgent problem we have, getting PhD students in those fields from overseas is clearly an advantage because we do not have to train them as undergraduates. It is actually a cost saving in a sense if we are able to keep them in Australia. One of the things we could do is to look at what areas we have skill shortages in, such as mathematics and physics, and focus our international PhD scholarships in those areas of need—engineering is another example—so that we could rapidly get trained people as well as focusing on school staff and education.

Mr Payne—I would like to add, in relation to the supervision issue, that the funding model at the moment is heavily weighted on completions as the driver of the model. The other drivers are research income and publications.

ACTING CHAIR—It is an outcome, isn't it?

Mr Payne—It is just basically on completion. There is no quality indicator in completion whatsoever. What they do in some other countries is to link the allocation of the places for PhDs more closely to competitive research funding that the supervisors may receive, so you have to drive your completion to get your next lot of funding. But because it is linked to high-quality research, there is a bit more of a quality driver in there as well.

In relation to the hard sciences and getting people into engineering and mathematics, the PhD is at the end of that process but, perhaps, with the shortage of maths and science teachers, particularly in some types of schools, maybe there are things that can be done to link universities more, through the governments looking at the compact funding model. Maybe there are more possibilities there for outreach and early identification of talented students or professional development for schoolteachers through appropriate negotiations with universities, so that you then bring those kids in and show them more about mathematics. There are some schools that really are struggling to get good quality maths and science teachers.

Ms RISHWORTH—I wanted to follow up on one of the points Dennis made. You were talking about targeting international students and keeping them here in Australia after they have finished their PhDs, and you alluded to some flexibility. Could you expand on what flexibilities you are talking about, what you would like to see happen and what you think would keep some of those graduates here in Australia.

Prof. Thomas—Firstly, they are not allowed to do a PhD part-time, so they cannot easily work and contribute to industry while they are here. If, for example, we got a lot of students from overseas wanting to do PhDs in engineering, if they were working while they were doing PhDs they could benefit our industry and, at the same time, gain training for their PhDs. That is one flexibility.

Another is the support for families. As Tim mentioned, many people undertaking PhDs are older than they were 10 years or two decades ago, so many now have families. If they are coming from overseas, they wish to bring their families, in quite a few instances, and there is not the support for them. For example, in some states and territories, the children of international students have to pay large fees to attend public schools in Australia—up to \$20,000 a year for each of their children to attend a public school. In the ACT, that is the case. That is a disincentive to some of the best students who wish to undertake PhDs and who have families. It also would be a benefit in the longer term not only for their positive experience of Australia but for engaging with international research networks. One of the great benefits of having more international students is that research is much more internationally collaborative. By creating those links, if we have given them a very positive, high-quality experience, we will benefit research into the future even if they return to their country because we will have direct connections with the research cultures in the countries that they return to.

Ms RISHWORTH—What about keeping them here after their PhD?

Prof. Thomas—The immigration laws changed last year to allow them to stay for a period of, I think, one or two years—I am not exactly sure of that.

ACTING CHAIR—It is two years.

Prof. Thomas—It would be helpful to allow their families to stay as well, and to again focus in on areas that we have particular need for, where we could possibly provide postdoctoral fellowships for international students. The fact that we are under-resourced in terms of the full cost of research in Australia means that there are really not enough fellowships for domestic students, let alone for international students. So, at the moment, there are not enough jobs in

research for those people to stay in the country. It is not a visa issue as much as it is an issue of making it appealing and attractive for them to stay beyond the PhD.

Mr RAMSEY—I apologise for coming in a little late; I hope I have not missed too much. Tim, you spoke about assessing suitability for PhDs. I think I will just ask the first part of the question and see what you answer to that. I wonder what you mean by suitability. Are you talking about the project or are you talking about the person? What constitutes a failure, in your mind?

Mr Payne—Mandy might have more to say on that, but I think we are talking about the quality of the student and the potential to complete work that is required to make an original contribution to knowledge development at PhD level. It is the highest level of qualification.

Mr RAMSEY—In that case, we were talking in an earlier hearing about the failure rate or the failure of completion of PhDs, and it was identified that one of the main reasons for failure is that someone gets poached by industry before they actually complete their PhD and then they go off into a life in science or whatever they are doing in the industry. It is that, in your mind, a failure when someone is poached out of the system before they can complete? And does that make that type of person, who may well be attracted by a buck and wanting to get on with life, a high risk to you that you would then assess as, ‘No, we do not want those people in there’? Looking at your figures here, it would suggest to me that we just do not have enough. There are some figures quoted there. You know them better than I do.

Mr Payne—I would say that that is not a failure, but it is a failure under the current funding model because you do not get your completion funding. Obviously, that person is qualified to go into that PhD and has got a certain way through it, and you would expect that they will have learnt something that is useful to them in their career. But I think we are talking more about: how do we get the best people into the PhD, in terms of the assessment for admission.

Mr RAMSEY—You need to be very careful, then, in retrospect about how you are assessing those. You do not say that that person is a failure because they did not complete, because they went on to do something else. That is still a positive outcome.

Mr Payne—Yes.

Mr CHEESEMAN—I have a couple of questions that I would like to put to you. We have had quite a bit of mixed evidence presented to us relating to some of the challenges of applicants choosing to do their PhD part time. From your perspective, what are some of the barriers that might exist at the moment to students being able to undertake their PhDs on a part-time basis, particularly given your observation that a lot more people are coming in mid-career? Naturally, they would have other cost pressures that younger students may not, like mortgages and those sorts of things. I would just be interested in your observations of that. Then I have another question that I will follow up with.

Prof. Thomas—One thing that is quite clear from the evidence from the Group of Eight is that, when students are well resourced for their PhDs, they complete faster. So whether they are part-time or full-time students, if they are properly resourced in terms of not just their scholarship but the infrastructure—their lab space, their offices, all of those things—they are

more likely to complete faster and have a better quality outcome. That means if we have more flexibility in offering part-time fellowships, we also need to provide the proper resourcing for them. It is difficult, as you can imagine, in many lab situations where there is team based research and a PhD student is part of a larger project. To come in and out as a part-time student is difficult for the continuity of a project. In other fields where PhD students are more solo researchers, such as in the humanities and social sciences, part time is much easier. It is harder in the sciences when it is team based.

Mr CHEESEMAN—All right. My follow-up question will not be surprising to anyone here, I think. We have had lots of people suggesting that, one way or another, governments need to invest more money in PhD students. What about the private sector? It occurs to me, of course, that the private sector does have capacity to invest in the knowledge of the nation, particularly through individuals in research and the like. What are your observations, at the moment, of barriers, perhaps, for the private sector to invest in that sort of knowledge, through these sorts of PhDs and the like?

Prof. Thomas—This relates to the previous question in that industry could be encouraged much more to take on PhD students and complete their training. It is not a loss that they leave to industry; it is a gain for industry and a gain for the economy if PhD students that are still undergoing a PhD move to industry. But, if the industry could support the completion of their PhD, then you get some research outcomes and finality to an investment in somebody's training. You also have the capacity to move that person backwards and forwards between universities and industry.

Clearly, the Australian Research Council's Linkage Projects scheme has been very valuable in supporting PhD students that can move back and forward between industries and universities. It would be very useful to have a study of what has happened to the people that have undertaken PhDs through the Linkage Projects scheme to see if that has enhanced that flow through the knowledge transfer to industry, because clearly it is much lower in Australia than in many other countries in the world, particularly Scandinavian countries. We have seen the figures with a very high movement of PhD graduates to industry.

Mr CHEESEMAN—What do they do that we are not that enables that flow in and out of the private sector in those Scandinavian countries? Are there two or three things you might point us to?

Prof. Thomas—An example would be a program the UK introduced recently which is to provide industry with some funding for the first year of a postdoctoral fellowship, or at least the first year of work in industry, where the government would pay 50 per cent of their salary. It would encourage industry to take on PhD graduates and at the same time after a year they would see the benefits, hopefully, of having such a person in their midst. By seeing the benefits they would encourage them to increase the numbers in the future. Some financial support to industry to take on PhD students as well, not just the graduates, would be very helpful.

ACTING CHAIR—Any other incentives that you are aware of? For example, taxation treatment? Industry obviously is looking for some sort of incentive.

Mr Payne—I am not aware of the specifics, but there is already pretty strong support from quite a bit of industry in Australia and many of the PhD scholarships in our institutions involve some sort of a top-up, which will often be sourced from an industry partner.

ACTING CHAIR—Do you have any data to let us know just how much that top-up is worth?

Mr Payne—If you are trying to get PhDs—in engineering, for example—to make the package competitive you have to top it up a fair bit. For example, I know that PhD scholarships in the financial markets area in Sydney are around \$50,000 tax free as opposed to the \$20,000 that comes from the Australian Postgraduate Award. I cannot actually confirm exactly where that top-up comes from, but obviously the people that they are identifying there would walk into jobs on \$100,000 or whatever in the financial markets industry. To make it more competitive there is a top-up provided to them.

ACTING CHAIR—You have referred to the changing nature of PhDs. In also identifying your lack of data about predicting, if you like, areas of need where you are going to need this level of academic research for the future, what do you see as the ideal future for PhD study? Given that there is quite a body of evidence already before us looking at the funding over the length of study, are this mobility and the international collaboration going to be the key elements of what a PhD will have to look like in the future?

Prof. Thomas—If Australian PhDs are competitive globally, they need to match some of the training that is happening in Europe and in the US, for example. If people are going to look at our graduates, they need to see that they have training that is equivalent to what is being offered elsewhere. The sorts of things that we are talking about are all of the professional development skills—for example, leadership, financial management, public speaking, all of those sorts of things—in addition to things that would assist industry, like commercialisation skills. There is now a commercialisation scholarship, but these could be increased where it was routine to obtain commercialisation training.

ACTING CHAIR—Sorry to interrupt you, but is this commercialisation of particular research?

Prof. Thomas—That is right—where they learn throughout the PhD how to not just commercialise their own research but engage with industry if they later go on to other research. In addition, almost all European universities are now allowing all PhD students to have some mobility during their PhD, with three to six months in another university within Europe or the US. That is becoming routine as part of quality training, not just to get exposure to a different system but, again, to increase the networks of international collaboration, which is the name of the game for the future of research. Of course Australia's distance from the US or Europe makes it very much more expensive to send people over there, but some support for that mobility is going to be important in the future.

Mr Payne—I think the capacity of the sector to really deliver on that professional component when they are now trying to cram a PhD into three to 3½ years is limited. I think one of the key solutions there is the alignment of the funding support for the student with the funding support to the institution, which is currently four years. There is a gap at the moment—funding for three to 3½ years for the student under the APA scholarship, the Australian Postgraduate Award, even

though I think that covers only 20 per cent of all PhD students, with institutions funded for the four years. Extending it out would give us much more capacity to incorporate those other elements into the training.

ACTING CHAIR—You mentioned the importance of attracting that level of PhD student into the hard sciences, and obviously we are looking at the base funding mechanism. What sort of incentives do you think would be required to increase the interest? Given that we have got the problem back in the primary schools and we have to get better maths and science teachers, we do still have a percentage of people coming through our secondary school system into our tertiary institutions. Have you thought about this? Have you got some ideas as to what sorts of incentives you think might work?

Mr Payne—Once again, coming back to the PhD study out of the University of Queensland, it looked at reasons for people choosing to do a PhD. While the financial one was partly there, it was not the main one; it is the intrinsic interest in the subject area and that desire for knowledge that is the key driver. So whatever we can do to instil interest in knowledge creation or that sort of research career is the first thing.

ACTING CHAIR—So you would not consider weighting financial incentives in key areas in which there is a shortage of academic research and in which we as a nation are going to need expertise for the future? I do not want to put words in your mouth.

Mr Payne—I think that is worth considering, but I do not know that it is going to be the only solution. There are things you could do, for example, for remission of their undergraduate HECS liabilities. That could provide an incentive into certain areas. They do not have to pay HECS at the PhD level under the funding model at the moment, but they would still have a substantial debt in some fields from their undergraduate degree. That is one thing you could do. Increasing the stipend would be another. But, really, capturing the interest early is the critical factor.

Dr JENSEN—I think what Professor Thomas had to say has significant merit. Bringing teachers into university, maybe not for specific professional development but for making them aware of some of the advances and exciting science that are going on in different areas, could be useful. I remember one of the things that blew me away when I was in year 12—and this, of course, was before it all became popular—was hearing about superconductors. You have got these things where a current basically has no resistance. It is something that blows the mind. Fortunately, I had a teacher who was aware of these things that were not well-known areas at the time. I think what you say, Professor Thomas, has merit. Can you go further into that?

Prof. Thomas—I think, also, the PhD could be much more attractive if international mobility was highlighted as being part of a PhD. People would know that, if they were achieving a lot while they were undertaking a PhD, they could have some international engagement.

ACTING CHAIR—It is another pathway.

Prof. Thomas—That is right. We could also focus on exposing people to pathways in industry. If they had more experience in industry or government while they were doing a PhD, they could go on secondment to government departments and industry—again, it would need to be financially supported. As I said earlier, the ARC Linkage Projects scheme is clearly very

beneficial in enabling students to get that experience with industry partners earlier, but it would need expansion to support more exposure that would benefit industry, as well as the economy, ultimately.

I believe it would attract more students to PhDs if they knew that they could go into schools and teach for some of the time, they could go into government and get experience that way and they could go to international companies and to other universities around the world as part of their training. We are really creating an extraordinarily talented group of people who will be the leaders of the future, and giving them that exposure can benefit not just them personally but also society in general.

Mr Payne—It might also be worth talking to Mandy at a later point about the ANU college initiative and how ANU is trying to link into the school sector. Not all of those students go on to do PhDs, but it is about giving them exposure.

ACTING CHAIR—Could you send us that?

Mr Payne—With developments in information technology and the broadband rollout, there is potential for some great things to happen in terms of how universities interact in schools.

Prof. Thomas—Another program that is helpful is to give the brightest and best undergraduate students, when they enter university, the promise of a PhD scholarship at the end of their undergraduate training. We have started offering students in their first year of undergraduate training, who have started through something called our Bachelor of Philosophy Program at the Australian National University, the promise of a PhD scholarship when they finish because those students have to get a 99 UAI or above and they are given research training in their undergraduate degree. They are already exposed to research environments while they are undergraduates to stimulate that interest. Most of them are in science. We think saying, ‘You’ve got a career in research,’ right from the beginning, is an incentive in itself.

ACTING CHAIR—Are there any further points that you wanted to make to us?

Mr Payne—I have one more point, and it comes back to the international student issue. At the moment, we do face declining high-quality demand in Australia from domestic students, although the data is a bit patchy, but very high demand from international students, and the scholarship mechanisms are a bit all over the place. There are now, with the split of the departments, some international scholarships that are in DIISR. Some, under the endeavour scheme, are still back in the department, targeted at different things. Some of them are very short term; they do not necessarily cover the costs of the student to come. So I think, if the committee is able to look at how that all fits together or even to recommend that something happen to look at that, that would be really worth while.

ACTING CHAIR—Thank you very much, indeed.

[10.50 am]

MARSDEN, Mr Lennard, Chief Operating Officer, Australian Research Council

SHEIL, Professor Margaret, Chief Executive Officer, Australian Research Council

ACTING CHAIR—It gives me great pleasure to be able to call the representatives of the Australian Research Council to give evidence. Although the committee does not require you to give evidence under oath, I should advise you that these hearings are formal proceedings of the parliament. Consequently they warrant the same respect as proceedings of the House itself. It is customary to remind witnesses that giving false or misleading evidence is a serious matter and may be regarded as a contempt of the parliament. We thank you very much for your submission—a very detailed submission. I invite you to make some brief opening remarks before we ask you some questions.

Prof. Sheil—I am happy to just go straight into questions unless you particularly wanted me to make some opening remarks. In addition to the formal submission, I believe we have also submitted to the secretariat a submission from our College of Experts which is a 77-member cohort of academic experts that came through last evening. It is not necessarily the views of the ARC, but it is submitted by a collection of 77 very distinguished academics. We have coordinated that submission on their behalf and submitted it to you.

ACTING CHAIRMAN—Mr Marsden did you want to make any opening remarks?

Mr Marsden—No, thank you.

ACTING CHAIR—If I could open up the batting—as I said, it is a very detailed submission and we thank you very much for it. We are particularly interested in looking at how the system is operating and what recommendations we can make to government to make the system work better. Regarding the Federation Fellowships, would you just put some more flesh on the bones of that system for us, please.

Prof. Sheil—The Federation Fellowships or the Future Fellowships or both?

ACTING CHAIR—Both.

Prof. Sheil—We have essentially a triangular structure of fellowships. We start at the immediate postdoctoral level, which is what we call the APDs—Australian Postdoctoral Fellowships. Then we have a series of mid-range fellowships, which are Australian Research Fellowships, QEIIs and Australian Professorial Fellowships. Then the Federation Fellowships sit over the top as the elite scheme.

Coming into that, from this next financial year, will be the Future Fellowships scheme, which is a midcareer scheme of 200 fellows a year for four years, over the next five years. That will sit above the APD level. So it will be above the postdoctoral level and below the Federation Fellow level. It will be in the middle of that triangle. The Future Fellowships will have a slightly

different remit to all our other fellowships, in that they are going to be broader than just the universities. Public institutions such as the CSIRO, ANSTO, AIMS, and the medical research institutes will be eligible to apply. That is one major difference. The other is that there will be a strong element of collaboration, so we will be looking for coordinated collaboration and strategic proposals, alongside good people. We are in the consultation phase with that at the moment. We have a paper out for consultation and we are running through a whole series of consultation sessions and getting feedback before finalising the details of that scheme.

ACTING CHAIR—Will the collaboration extend to industry?

Prof. Sheil—Absolutely—we are looking for people that can bridge sectors, institutions and also into industry.

ACTING CHAIR—In this initial phase are you seeking to identify, for example within industry, to match up areas of shortage within specific areas?

Prof. Sheil—We would not necessarily go and seek the applications. It is application-driven; through institutions, applicants apply to us.

ACTING CHAIR—I understand that. I was just wondering if there are any pressures, even subtle ones, on you to be directing this into areas. You probably heard some of the previous evidence, and you would be aware that there are areas where there is a shortage of academic research.

Prof. Sheil—It is very much about building capacity into Australia's universities and publicly funded institutions. The institutions will be doing some of that. Because we want them to demonstrate a long term commitment to the Future Fellows post their fellowship, as part of their strategic planning they will be looking to align people into areas where there are shortages. The fact that they will be open to international applicants will help with that, because they will be able to target areas where there is not necessarily the skill base within Australia.

The other thing I could say is that we do not have a strong fellowship element in our Linkage Projects scheme. The ARC is broadly divided into Discovery and Linkage Projects. Discovery is the basic research and the fellowships. Linkage is the collaboration with industry and other end users and also internationally. Over a period of time, when we have consulted on aspects of the Linkage Projects scheme, people have been looking for a stronger fellowship element to that scheme. That will be taken up by the Future Fellows.

Mr SYMON—From the ARC's point of view, is there more that can be done to negate the competition from industry that is taking away people that may then go into a research stream?

Prof. Sheil—The majority of that happens in areas where it is difficult to attract students or in the professional streams such as engineering or IT. It does not happen so much in science—there is a different issue in science, which is getting people into science at the beginning. I do not think it is competition from industry that is taking people out of science PhDs. I think it is an entry level issue there. Certainly, in the case of engineering and IT, attracting domestic students into those areas is difficult—there is no question about that.

Mr SYMON—Would there be a funding program, or other assistance, that might make it easier for those students to be attracted and stay in?

Prof. Sheil—The one thing that we have done in that respect—this does not help with domestic supply, but it does help with overall supply—is to open up the Australian Postgraduate Award Industry, APA(I), to international students. We did that because we were getting very strong messages back from across the sector that it was difficult to attract domestic students into those areas. They are collaborations with industry, so there is quite often but not solely—because there is a strong social sciences element—a lot of demand from the professional areas of engineering and IT. That is the only thing we have been able to do in the short term.

As to the question of how attractive you would have to make a scholarship to compete against the mining industry in WA, a very big gap exists there. As Mandy, Professor Thomas, said earlier, it is a lot about engaging students in the excitement and demonstrating to them the less obvious benefits of a PhD, such as international collaboration, the flexibility to pursue your interest to make a difference, and to potentially have a commercial outcome that you could exploit and turn into an interesting business. They are the sorts of things that get those students into PhDs other than salary. But, having said that, I think additional salary would help. The gap is getting bigger, I guess, as the salaries get higher in the private sector.

Ms RISHWORTH—My question is also about attracting people to a PhD. We heard from previous witnesses about the honours year and how it is treated—you pay HECS. A lot of people do honours as a second best if they do not get the job they are after, or whatever the case might be. I was wondering how you saw the honours year in terms of getting people excited about going on and following it up with their PhD?

Prof. Sheil—I can answer that, but not with my ARC hat on but rather as a former academic and also as someone who has spent a lot of time in a university trying to attract students into research degrees. There is no question that a good honours experience has a big influence on the decision for students to engage in a PhD. At the University of Wollongong, for example, we instituted an honours scholarship, partly to offset the HECS in the honours year so as to try and attract better students into honours in the areas of research that we were trying to exploit.

I think our statistics showed—and this is anecdotal because I have not got the data in front of me—that, once we got students into honours, there was a high chance of their going on. It involved getting them into honours through the sorts of programs that Professor Thomas talked about. We have those programs at the University of Wollongong. The University of Sydney has advanced science programs that engage students early in research by giving them good summer experiences in research. The issue is about getting the really bright students aware of research as a career.

Dr JENSEN—I have a question about ARC Centres of Excellence. I am on the advisory board of the ARC Centre of Excellence in Antimatter-Matter Studies, and what I see there leads me to wonder whether you are looking at extending that program, although maybe not under that name. If I were a student, something like that would excite me. It is where you have very clear collaboration between your PhD students and researchers nationally and where you have linkages with multiple disciplinary areas within many universities and, indeed, even with people coming from overseas. Are you looking at extending that program at all, maybe under some

other name? Also, I can see a way in which you could feed through some of the honour students into small projects that they might do in third or fourth year.

Prof. Sheil—There are two questions there. The Centres of Excellence program is ongoing, and so we propose to run another round, opening early 2009 and starting 1 July 2010, within our current budget envelope. I think the data that we provided in the submission shows the numbers that are attracted to centres of excellence. All the anecdotal evidence is that these centres provide outstanding areas of training and research opportunities for students. That was the first question. I have forgotten your second one, I am sorry.

Dr JENSEN—Basically, feeding through with getting undergrads a little bit involved in the process and the exciting aspect of multidisciplinary research; sort of seeing the excitement that can be involved.

Prof. Sheil—The other aspect is we do ask our centres to report on their outreach activities. I have not done a detailed analysis of each annual report, but there would be a range of activities that each centre undertakes in providing third-year training opportunities, providing honours opportunities and outreach kind of public lectures, all that sort of thing. We see that and we ask them to engage in that as much as they can within their resources.

Dr JENSEN—The antimatter research one is mainly outreach in terms of education, going into schools and all that sort of thing, which I think is great, but I am thinking that more use of third and fourth year students would be a good thing.

Prof. Sheil—The other thing you find is that, when there is a strong research centre like that, that often drives back into the undergraduate program. Again drawing on an example from the University of Wollongong, the Centre of Excellence for Electromaterials Science developed in collaboration with the undergraduate teaching programs a nanotechnology degree that then fed back into them. So they provide intellectual input into those sorts of programs and provide supervision at the third and fourth year levels, and there are many examples of that throughout the Centre of Excellence program.

Mr RAMSEY—You make reference, obviously, to salary levels—that comes up every time at these hearings—but also to career structure as being an impediment to researchers and academics. Where do you see the bottlenecks there in the structure?

Prof. Sheil—There has been a bottleneck at the mid-career level, so it will be interesting to see what impact the 200 Future Fellowships has on that, whether that shifts where the bottleneck is. Certainly, it is healthy to have some turnover, and to have people moving from where they did their PhD to take a postdoc somewhere else is a good thing. But, particularly in the social sciences and humanities, there has often been a lack of opportunity to go on from that postdoctoral level, to put in that kind of concerted effort you need to take your career forward.

Mr RAMSEY—So what is typically happening to those people? What do they do when they hit that?

Prof. Sheil—In science it is a little different, because they do end up in centres of excellence and working in larger teams, so there are, in some ways, more opportunities. In some of the

other areas, they end up teaching, they end up in the public service, they end up in a whole range of different places—which is not necessarily a bad thing.

Mr RAMSEY—So this is at completion of doctorate? Is that where we are talking about or is it further along?

Prof. Sheil—It is very discipline specific and it is also dependent on whether you have opportunities to travel overseas. It is sometimes at the post-PhD level, at completion of doctorate. In science, it is more often at the end of the APD level, but there are opportunities in terms of research teams. In the social sciences and humanities, the line is a bit blurrier, because they often end up taking teaching positions, more so than straight research positions. But if they do that for a long enough period, or they leave that too long, they do not get the research runs on the board that they need to be competitive for an academic position, so that is where you get some loss as well.

Mr RAMSEY—So what is the solution?

Prof. Sheil—Some of it is about providing opportunities for re-entry and saying that it is a good thing for people with a PhD and a research background to spend some time in government or in industry, but we would like to get them back sometimes. Again, that is something we have put into the proposed guidelines of the Future Fellowships to take into account less traditional academic career paths. I do not know whether I have exactly answered your question.

Mr RAMSEY—I am just trying to understand.

Prof. Sheil—Yes.

Mr RAMSEY—It is a very short line. It says ‘career structure’ and I am trying to see if I can work out what these impediments are.

Prof. Sheil—It is very complicated because it depends on personal circumstances. For each individual there is a different scenario.

ACTING CHAIR—Can I just follow that up. We have already had a lot of evidence about areas where there is some shortage of research effort and there has already been an emphasis on the scientific areas. I probably should declare that I am a former history and English teacher. What in your view is being done, and does there need to be more done, to encourage that standard of research excellence in the humanities areas? It often seems to just slip off the radar screen.

Prof. Sheil—I do not think there is any problem. I think the quality of humanities research in Australia is very high. When you look at the academic workforce, I think the divide is actually more in relation to the professional disciplines versus what I would call the scholarly disciplines. Engineering is clearly an area where it is very difficult to recruit people back into academia in the current climate. In education, nursing and practitioner focussed areas, you do not start your career thinking about being an academic. You start that career thinking about being a professional in that area and you might, through a whole range of different circumstances, end up being an academic. Whereas in the traditional humanities route—history, philosophy and

English and so on—there is a very strong research tradition that we see in incredibly high-standard applications. So I am not so worried about that as I am about how we can get high-quality academics into those professional disciplines so that we are getting not only absolutely the best research done in those areas but also the best people teaching in the universities.

ACTING CHAIR—We have also heard a lot of evidence about the value of increased mobility and collaboration between other tertiary or scientific bodies and international bodies. Is there the same drive to have that international collaboration within the humanities area of research at that level as there is in science or engineering?

Prof. Sheil—We have two international programs that are heavily subscribed from the humanities and social sciences. One is a targeted program called the Social Sciences Collaboration with the UK social sciences council. That has been a great success. The second area is the Linkage International applications. Again, we get quite a lot of demand from the humanities and the social sciences there, particularly in the Asian studies area, but more broadly than that as well. There is just as much recognition that international collaboration is important in those areas; it is just that in some cases, through various funding models in universities, the opportunity to do that has been more limited than in the sciences, where they typically might have had larger grants and access to other funds. Mathematicians, for example, see it as their No. 1 priority to have international collaboration. All the Asian studies researchers, archaeologists—a whole range of areas from our humanities and creative arts panel—would see that as really important.

ACTING CHAIR—With your Future Fellowships program, given that this is all still very new, over what period of time do you think that assessment could lead you to start making even further changes? Are you looking at that model to be ongoing for, say, the next five years or is this a model that you see going beyond a five- or 10-year period?

Prof. Sheil—It is initially a five-year program, which we will evaluate somewhere in the middle. We will look at its effectiveness and the impact it has had on other areas of the academic workforce and our application base, and then we will review it at that point.

ACTING CHAIR—When you were designing that program, obviously there would have been a number of constraints on the design of that model. What were some of those constraints? If you had a blank sheet of paper in front of you, what would you see as being the optimum model?

Prof. Sheil—We essentially had a blank sheet in front of us. We had a commitment for 200 fellowships a year for each of the next five years. There were three constraints. They had to be mid-career; the period of time was fixed; and there was the commitment to have it more broadly than university, so going into the publicly funded research institutions. After that, essentially by undertaking consultation with the other people involved, it has been designed as we proposed in the consultation paper. I am very comfortable with the way we are proposing to do it and I think it will have a big impact on the sector.

ACTING CHAIR—Are there any final points that you wanted to make?

Prof. Sheil—I think it is excellent that you are doing this inquiry; I think it is really important. The future of our academic and research workforce is absolutely critical to not only the nation's universities but also business and a whole range of areas, so I think it is wonderful that you are doing this.

Mr RAMSEY—I just have more question. On page 13 there is reference to the success rates of fellowships. Pardon my ignorance, but what denotes a success in a fellowship and what denotes a failure?

Prof. Sheil—It is a simple ratio. It is application numbers.

Mr RAMSEY—I see—successful applications.

Prof. Sheil—Yes.

Mr RAMSEY—I am sorry; I misread it. Okay, that is fine.

Committee adjourned at 11.18 am