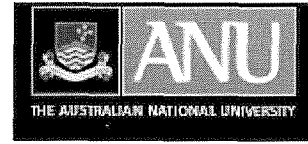


**Centre for Antimatter-
Matter Studies**
Australian Research Council Centre
of Excellence



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Submission No: 5

The Secretary
House Standing Committee on Industry, Science and Innovation
Parliament House
Canberra

22 January 2010

Dear Sir/Madam,

Please find attached a submission to the House Committee's Enquiry into International Research in Australia.

Yours sincerely,

Stephen Buckman

Professor Stephen J. Buckman
Research Director

**Submission to the House Standing Committee on Industry, Science and Innovation
Inquiry into Australia's International Research Collaborations**

Professor Stephen J. Buckman
Research Director
Australian Research Council Centre of Excellence for Antimatter – Matter Studies

22 January 2010

I make the following submission in my capacity as Research Director of the Australian Research Council Centre of Excellence for Antimatter – Matter studies (CAMS), however the views expressed herein are my own and do not necessarily represent those of my employer, the Australian National University, nor the other Australian universities that employ members of the CAMS joint venture. In this capacity, I submit the following introduction to the research work of CAMS and following comments in response to the committee's terms of reference.

Introduction

CAMS is a broad, interdisciplinary Research Centre encompassing studies from the fundamental to the applied, across atomic and molecular physics, chemistry and materials and biomedical sciences. The Centre's Research Mission is to develop tools and techniques to lead Australia into a new and exciting area of research based upon positron and electron interactions in the physical, chemical and biological sciences.

CAMS relies on established and emerging international collaborations to leverage its research and maximise its impact.

In 2007 the Australian researchers within CAMS were awarded an International Science Linkages Grant from the Department of Innovation, Industry, Science and Research entitled *Positron and Electron Induced Processes*. This 3-year ISL program (July 2007 – June 2010) has been remarkably successful and has:

- involved more than 70 exchange visits of Australian and European Scientists (including early career researchers and students) for collaborative research,
- assisted in the employment of 3 Australian Research Associates (joint appointments between Australian partners, with European participation)
- resulted in 3 joint Australian-European Research Workshops.
- resulted in more than 30 joint publications in international refereed journals and multiple invitations for plenary lectures at international meetings
- Involved joint developments of significant items of experimental research infrastructure.

The ISL programme has been extremely successful in enabling us to develop these important relationships with our European partners. Many of the Australian participants are now well positioned within several European Research Networks and are engaged in planning their participation in various European Training Network and COST action proposals in the immediate future.

The ISL programme has revealed several important areas of ongoing focus, where Australia is positioned to play a leadership role. One in particular which looks extremely fruitful involves fundamental developments in our understanding of some of the underlying physics and chemistry of PET (Positron Emission Tomography) technologies.

With respect to the Terms Of Reference:

The nature and extent of existing international research collaborations

Due to Australia's size and relative remoteness, engaging in international collaboration is a natural part of conducting research. While very prevalent, it is also largely *ad hoc*, and driven opportunistically by researchers. The extent of this collaboration varies across disciplines, while in the Sciences, it is my view that it is clearly critical to the success of many programmes to maintain a strong international presence and profile.

Outside of specific international facilities and research endeavours (for example, CERN or ITER), the largest broad international research collaboration takes place in the EU, under the 'Seventh Framework Program' (FP7) and its predecessors. FP7 is the EU's main instrument for funding research, and allocates a budget of approximately 50 billion Euros over the period 2007 to 2013. Significantly, approximately 32 billion Euros is allocated to supporting international collaborations. While the program itself is made complex and difficult to access through the vagaries of international and European bureaucracy, it nonetheless is very effective at driving international collaboration and is indicative of the importance placed on collaboration within the EU.

Other strong links exist between Australia and several of our north Asian neighbours – Japan and Korea in particular – and these have been supported by targeted programs under the ISL (and other) schemes, with strong reciprocal support from the JSPS and KOSEF, respectively.

In comparison, and perhaps surprisingly, the situation regarding collaboration with North America is not so clear, despite the fact that US science and scientists present perhaps the most 'natural' collaborative link for Australian science. At a personal and institutional level, collaboration with US scientists is relatively easy to establish and maintain. However it is far more problematic to find funding avenues (other than ARC perhaps) where there are substantial programs to support such collaborative research. It is also much more difficult to access funding from the US system, as opposed, for example, to the EU (which is already difficult enough). It is apparent to me, for example, that the scale of ISL-type programs with Europe and North Asia are not matched when considering opportunities with the USA. This seems quite anomalous and is one area that could be addressed in a bilateral approach.

The benefits to Australia from engaging in international research collaborations

There are manifold benefits to individual researchers and to Australia in engaging in international research collaborations, including:

- International exposure for early career researchers and graduate students. International experience is essential for Australian career scientists, offering exposure not only to new ideas, techniques and technologies, but also the opportunity to build networks with the international scientific communities that will support the scientist throughout their working life. Both long- and short-term exchange opportunities are a common and valuable feature of international research collaboration.
- Strategic positioning and opportunities for leadership – both national and international. Australian science is generally well-regarded internationally. International collaboration gives an opportunity not only to establish and maintain the enviable reputation of Australian science, and also to leverage this reputation. Many opportunities exist for positioning Australian science and scientists in positions of leadership within collaborations, and hence for setting and driving research agendas to the advantage of the individual researcher and the country.
- Maximising impact. Participating in international research collaborations provides a broader market for the outputs of research and for the intellectual capacity of the country.
- Access to large-scale research infrastructure. Some research requires infrastructure and facilities that are beyond the scope of Australian science funding. Participating in international research collaborations allows access to these facilities for the pursuit of local research goals.
- Maximising markets for Australian facilities and expertise. The reverse argument is also true: some specialist research infrastructure and expertise exists in Australia that is unique. To efficiently use these resources, any spare capacity should be utilised. Where demand for full utilisation does not exist in Australia, international collaboration provides a useful avenue for ensuring facilities are fully utilised.

The key drivers of international research collaboration at the government, institutional and researcher level

Many of the benefits to the nation as a whole translate directly to the reasons that local researchers seek to participate in international research collaborations, in particular:

- Constructing international networks to support local research work and careers.
- The opportunity for career advancement through international experience.

- Exposure and the opportunity to share new ideas, perspectives, techniques and technology.
- Access to facilities, in particular large scale research infrastructure
- Science is a human/cultural activity that benefits enormously from cross-cultural, personal contact

The impediments faced by Australian researchers when initiating and participating in international research collaborations and practical measures for addressing these

There are many impediments to participation in international research collaborations. In my experience, the following are paramount:

- Funding the direct cost of involvement in international research collaborations. Effective participation in collaborations requires the in-person attendance of researchers from the collaborating organisations. Due to Australia's relative geographical isolation, direct costs can be very high for travellers in both directions.
- Funding the indirect costs of involvement. Many collaborative projects have a structure which requires a financial contribution from each of the collaborating parties. There are few strategic funds available to the researcher for this kind of expenditure. Australian science is already over-leveraged. Whilst this indicates an effective and resourceful sector it is not the most efficient way for cutting-edge science to have to operate.
- The ability to be responsive to opportunities. Many collaborative opportunities are opportunistic in nature. The ability to seize such an opportunity requires resources to be available at the time. The nature of obtaining research funding under Australia's various schemes often has long lead times. In those cases where the researcher cannot be responsive, such opportunities are often lost to the individual, or the research does not get done and the opportunity is lost entirely.
- Too narrow a range of bilateral funding opportunities. Many opportunities arise that fall outside the 'mainstream' funding agreements – although the mainstream does not appear to really reflect the some of the key scientific engagements that Australian science has.

Principles and strategies for supporting international research engagement

Drawing together the threads of my discussion above, support for international research engagement should be:

- Strategic in nature. Support should favour opportunities which support the country in achieving its research or innovation priorities. Of particular interest are opportunities in which Australia gains a particular advantage, or can position for leadership.
- Recognise the costs of supporting bilateral collaboration, and the fact that the benefits should considerably outweigh these costs.
- Support the need for responsiveness in pursuing collaborative opportunities as they arise.
- Broadly reflective of the key axes of research collaboration available to our scientists.

Summary and conclusion

Participating in international collaborations is essential to maximising both the productivity of our Centre and the impact of its research, and I expect the majority of Australian researchers in the physical sciences would reflect this view.

The returns from participation in international collaborations are many times greater than the cost of such participation through:

- Opportunities for postgraduate students and early career staff to broaden their experience and networks;
- Exposure to new ideas, techniques and perspectives (many of which are culturally driven);
- Access to facilities and large research infrastructure which is often beyond the scope of the Australian research environment;
- Opening of new markets for Australian facilities; and
- Opportunities for international leadership.

I urge the committee to recommend that the Australian Government continue and expand the International Science Linkages program and to consider further programs which encourage Australian researchers to participate in, and strategically lead, international research collaborations.

Stephen Buckman

Professor Stephen J Buckman