

## **Inquiry into Australia's International Research Collaborations**

### **Submission by The Australian National University.**

#### *1) The nature and extent of existing international research Collaborations*

The Australian National University is an internationally linked research institute, and as such a key stakeholder in this Inquiry. The Australian National University maintains multidisciplinary expertise in Asia-Pacific issues through its legislative mandate. In addition as Australia's top ranking University, according to international indices such as that produced since 2003 by the Shanghai Jiao Tong University which analyzes the top research universities in the world, we have strong collaborations in the sciences and social sciences with international institutes globally.

The Australian National University has a proactive approach to international engagement. ANU has an on-the-ground presence in the US and Brussels. The University is a founding member of the International Alliance of Research Universities (IARU), an alliance of ten of the world's leading research universities - ANU, ETH Zurich, National University of Singapore, Peking University, University of California, Berkeley, University of Cambridge, University of Oxford, University of Copenhagen, University of Tokyo and Yale University – which share a similar international vision and commitment to the education of future world leaders.

The University is leading Australian participation in the international Giant Magellan Telescope (GMT) project through an \$88.4m Education Investment Fund (EIF) grant. The project is an international collaboration that counts amongst its participants the Carnegie Institution for Science, Harvard University, the Smithsonian Institution, the University of Chicago, Texas A&M University, the University of Arizona and the University of Texas from Austin, the Korean Astronomy and Space Science Institute, and Australian Astronomy Limited (AAL). The University also hosts the China-Australia Centre for Phenomics Research in collaboration with the Institute of Biophysics in Beijing and includes leading research groups from the University of Melbourne, the Monash Institute of Medical Research, and the Walter and Eliza Hall Institute in Australia. The Department of Innovation, Industry, Science and Research provided \$1.5M of funding in 2007 through the China-Australia International Scientific Linkages scheme with a similar investment from China's Ministry of Science and Technology for an initial period of three years. In this area of science in particular, there will be many more opportunities to expand and strengthen our bioscience connection with China over the next few years.

ANU has recently signed an agreement for a Research Attachment Placement Program with A\*STAR to provide our PhD students opportunities to work in laboratories in Singapore. ANU has also concluded an agreement with the Graduate University of the

Chinese Academy of Sciences to encourage exchange in areas such as the physical sciences, life sciences, geoscience and environmental science. Links with the Chinese Academy of Sciences and Chinese Academy of Social Sciences are also deepening through recent contacts.

ANU also engages in training and research collaborations with international industry partners such as IBM, Microsoft Research (in China, US and UK), Intel, Sun Microsystems, BASF, Chromasun Inc., Bayer CropScience GmbH among others.

As an appendix to this submission we have included a summary of countries with which ANU researchers have co-authored papers. The countries with the greatest counts of co-authored papers, in order, are United States of America, the United Kingdom, and Germany. The Field of Research with the greatest number of internationally co-authored papers is Astronomical and Space Science (0201) with strong links with the United States. Additional information on institutions of collaboration and Fields of Research can be provided on request.

## *2) The benefits to Australia from engaging in international research collaborations*

The international research community does not operate as isolated national clusters. Researchers are more internationally mobile than they have ever been with it being commonplace for an individual to take positions in several countries during their career. Australia would do well to take advantage of this trend to leverage its own research investments.

As a nation with an advanced economy but a small and geographically dispersed population, Australia is positioned to benefit from international research collaboration as it allows for economies of scale to be exploited. The resulting global trade in knowledge and intellectual property can provide economic benefits similar to other forms of trade through access to markets, people, facilities and standards:

- Publicly funded researchers gain access to expertise, skills and knowledge;
- Publicly funded researchers import skills and knowledge;
- Expertise is imported through migration of international experts;
- Expertise, skills and knowledge are transmitted through the nation – an important premise is that industry and research institutes are effectively connected.

Other nations similar in research scale to Australia such as Ireland, New Zealand, Israel and Scandinavian countries, actively engage with 'knowledge trading' as part of their economy.

The benefits of international collaboration include but are not limited to:

- Intellectual stimulus is provided through an increased sphere of collaborators increasing innovation and the flow of ideas;
- Shared resources through collaboration increases efficiency of research investments;
- Provides access to equipment that might otherwise be prohibitively expensive;
- Provides access to large 'data' repositories that don't reside in Australia;

- Leveraging of Australian research funds with international funding for increased returns;
- Increased relevance through connections to international agenda;
- Reduced duplication of research effort through international coherence;
- Diplomatic and geopolitical goals met through international engagement, cooperation and credibility;
- Research productivity and impact enhanced, as measured by citation rates, through multilateral and bilateral research.

3) *The key drivers of international research collaboration at the government, institutional and researcher levels*

The key drivers for international research collaboration include:

- To increase return on investment of research dollars
- To maintain an internationally relevant and highly regarded research community and higher education system;
- To achieve diplomatic goals;
- To gain critical mass in areas where Australia lacks capacity (e.g. Mathematics);
- To facilitate top quality research;
- To facilitate exchange of students and postdoctoral fellows;
- To gain access to international research funds;
- To gain access to infrastructure not available in Australia;
- To have access to disciplinary colleagues;
- To have internationally relevant publications.

4) *The impediments faced by Australian researchers when initiating and participating in international research collaboration and practical measures for addressing these*

International research collaboration has relatively low dedicated funding available. Making seed funding or travel grants available would assist researchers to establish and maintain international collaborations. To facilitate international collaboration and competitiveness student and postdoctoral travel and exchange programs should be better funded and more accessible. It is worth noting that most research collaborations begin bottom-up through contact between individual researchers. The ability of researchers to move internationally and meet face-to-face with peers is critical to foster these relations.

Likewise domestic funding bodies should recognise international travel and collaboration as core to research programs and not auxiliary. International collaboration for established research programs is best treated as integral to research funding. International components of domestic funding applications are often cut, e.g. travel components are reduced. International engagement should be recognised as a core component of grants.

Administrative complexities associated with bilateral agreements could be reduced through more active management of bilateral and multilateral research agreements by an Australian Government Agency with the portfolio responsibility for international engagement. Currently participation in the European Framework Program is hampered by the EU struggling to engage with multiple Australian institutions.

To maintain and improve access to overseas research infrastructures, a national strategy should be adopted which incorporates funding for local and national facilities in combination with investment in foreign facilities. Australia already participates in the OECD Global Science Forum and has a number of national infrastructure investment processes such as the National Collaborative Research Infrastructure Strategy. These should be built into a coordinated national strategy for infrastructure investment. A well-designed national program will in addition promote effective collaboration with Australian industry. This should include Australia joining relevant international organizations, for example the European Space Agency for space-based astronomy. These organizations have proven successful in providing the cutting edge facilities required by the science community, while ensuring that member countries are able to participate at all levels.

Australian researchers should be encouraged to participate as international experts for international funding bodies, for example as an expert evaluator for the EU Framework Program. However, domestic funding processes are increasing the administrative burden on our researchers through frequent and intensive grant applications and onerous reporting requirements and so act as a deterrent to engaging in international activities.

##### *5) Principles and strategies for supporting international research engagement*

At a Government level we should gain a better understanding of Australian and International research strengths and weaknesses. This would help facilitate research partnerships in areas where Australia needs to import knowledge and expertise and improve diplomatic ties where we can export knowledge and expertise. There will also be areas of mutual benefit where we can partner with countries with similar needs increasing the total research effort. It may be prudent for the Department of Innovation, Industry, Science and Research to commission research on international research engagement, our strengths and weaknesses, and develop a national strategy.

The Centre for Policy Innovation at The Australian National University has a unique concentration of expert knowledge in international collaboration, including hosting FEAST which is Australia's contact point for European engagement. They have already conducted a wealth of analyses in this area. For example, by using relative citation index they can identify areas of research where Australia leads such as geosciences. Other analyses completed by the Centre for Policy Innovation have confirmed that publications with European co-authorship are much more highly cited than those with Australian authors alone. Publications with US and European co-authors have even greater citation rates. Correspondingly Australian publications in the Science Citation Index with international co authorship have increased from nearly 21% in 1991 to over 44% in 2005 (Matthews et al. 2009. Feast Discussion Paper 1/09. 'A Bibliometric

Analysis of Australia's International Research Collaboration in Science and Technology: Analytical Methods and Initial Findings.' <http://www.feast.org/index/document/1>).

In 2010, the Australian Government will develop mission-based compacts to commence in 2011 with Australian universities. The compacts are aimed at promoting excellence and building capacity in the university sector. They are expected to encourage institutes to work to and develop their areas of strength. University compacts provide an opportunity for Australian universities to adopt distinctive strategies to international engagement as fits with their research strengths and missions. Incorporating international engagement into compacts would aid with the distribution of funds by the Australian Government for this purpose and improve the international competitiveness of our institutes. It is also likely to aid engagement by promoting hubs of excellence to the international research community.

Tied to the concept of research leadership is the idea that Australia has a stewardship role to play in the southern hemisphere. In areas of international importance such as climate change or of international proportions such as astronomy, Australia can play a key role by through its position in the southern hemisphere, e.g. as custodian of much of the research conducted at the Antarctic. Likewise the close ties Australia has with Europe and the US allow it to play a key role as a representative of the Asia-Pacific region in research. The Australian National University is uniquely positioned in terms of Asia-Pacific research holding the regions key research expertise in related sciences and social sciences. As the National University we are well placed to form conduits for the flow of research knowledge and expertise in southern hemisphere related and Asia-Pacific research.

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Appendix 1. Countries with which ANU researchers have co-authored publications (HERDC and non HERDC)

Number of Publications Country	Year					Total
	2004	2005	2006	2007	2008	
<<Unknown Country>>	24	32	6	8	27	97
Afghanistan			1			1
Algeria		2			1	3
American Samoa				1		1
Argentina	7	7	11	8	9	42
Austria	10	17	11	17	16	71
Azerbaijan			1			1
Bangladesh	3	7	4	4	2	20
Barbados		2				2
Belarus			1	1	1	3
Belgium	19	24	28	24	26	121
Belize		1	1			2
Bolivia			3	1	2	6
Botswana	5		3	1		9
Brazil	32	39	27	26	25	149
Brunei Darussalam	1		1	1	1	4
Bulgaria	1	6	3	4	6	20
Cambodia		2		1		3
Cameroon	1	1	1	1	2	6
Canada	112	124	113	96	80	525
Chile	15	28	32	21	26	122
China	61	89	101	95	127	473
Colombia		1	2	2		5
Congo, Democratic Republic of			2			2
Cook Islands		1				1
Costa Rica				2		2
Croatia	2	3	4	2	1	12
Cuba	1					1
Czech Republic	5	8	6	5	2	26
Denmark	22	37	33	20	28	140
East Timor		1	1		1	3
Ecuador		1				1
Egypt		1		1		2
Eritrea				1		1
Estonia	2			1	1	4
Ethiopia		1	1			2
Falkland Islands	1					1
Faroe Islands		1				1
Fiji	3	3	12	5	8	31
Finland	26	35	19	18	22	120
France	81	118	119	123	132	573
French Antilles	1					1
French Polynesia		1	2	1		4
Gambia	1					1
Georgia		2		1		3

Germany	192	234	209	212	188	1,035
Ghana		2		5	1	8
Greece	9	6	3	2	1	21
Greenland	2			1		3
Honduras			1			1
Hong Kong	17	23	16	17	10	83
Hungary	5	5	14	11	3	38
Iceland			1	1	2	4
India	19	24	22	28	21	114
Indonesia	25	16	26	17	21	105
Iran	12	9	10	6	10	47
Ireland	13	16	9	12	12	62
Israel	7	10	11	15	13	56
Italy	57	67	59	63	68	314
Jamaica				1		1
Japan	96	80	106	103	79	464
Jersey	1					1
Jordan	1	1			1	3
Kenya	1	4	2	3	2	12
Kiribati			2	1	1	4
Korea, North	1		2			3
Korea, South	22	14	23	22	22	103
Kuwait				1		1
Laos		1				1
Latvia	1			1		2
Lebanon	1			2		3
Liechtenstein			1	1	1	3
Lithuania	1	1	3	2	1	8
Luxembourg		2				2
Macau			1	1	1	3
Macedonia		1				1
Madagascar					1	1
Malaysia	4	14	4	4	2	28
Maldives			1			1
Malta	1				1	2
Marshall Islands	1					1
Mauritius					1	1
Mexico	3	11	10	8	6	38
Monaco			1			1
Morocco	1	2	1	1		5
Mozambique	1	1		1	2	5
Myanmar (Burma)	1					1
Namibia			1		1	2
Nauru			1			1
Nepal		1				1
Netherlands	63	56	66	61	65	311
New Caledonia	2	1	4	6	1	14
New Zealand	56	63	61	64	55	299
Nigeria					1	1
Norway	16	18	14	15	12	75

Oman		1				1
Pakistan	2	3		1	1	7
Panama	1	1	6	1		9
Papua New Guinea	7	1	12		5	25
Philippines	1	7	2	10	7	27
Poland	6	10	10	11	5	42
Portugal	8	15	9	6	6	44
Puerto Rico			2	1		3
Qatar		1				1
Romania		5	10	14	6	35
Russia	22	20	20	18	13	93
Samoa		1				1
Saudia Arabia				2		2
Serbia	1	3	3	1	1	9
Singapore	27	26	14	17	23	107
Slovakia		1		1	2	4
Slovenia	2	2	6	5	2	17
Solomon Islands	1		2			3
South Africa	28	36	27	19	31	141
Spain	44	55	38	45	34	216
Sri Lanka	6	7	1	9	3	26
Swaziland				1		1
Sweden	64	69	60	57	46	296
Switzerland	47	48	46	48	43	232
Syria			1			1
Tahiti			2			2
Taiwan	13	28	14	13	9	77
Tanzania		2		3	1	6
Thailand	6	24	9	14	6	59
Trinidad and Tobago		6				6
Turkey	1			3	18	22
Uganda			1			1
Ukraine	1	4	6	3	6	20
United Arab Emirates	3	3		2	1	9
United Kingdom	318	304	279	286	239	1,426
United States of America	491	528	529	484	487	2,519
Uruguay		1				1
Uzbekistan		1	2		1	4
Vanuatu	1	2	1	1	2	7
Venezuela	2			2	1	5
Vietnam	2	2	5	7	9	25
Zambia			1			1
Zimbabwe		2		1		3
<b>Total Intl. Collaborative</b>	<b>1475</b>	<b>1640</b>	<b>1603</b>	<b>1533</b>	<b>1487</b>	<b>7,738</b>
<b>ANU Total</b>	<b>4,869</b>	<b>5,272</b>	<b>5,158</b>	<b>4,929</b>	<b>4,984</b>	<b>25,212</b>