Submission No 66

Review of Australia's Relationship with the Countries of Africa

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REPLIES TO QUESTIONS ON NOTICE FROM THE JOINT STANDING COMMITTEE ON FOREIGN AFFAIRS, DEFENCE AND TRADE

INQUIRY INTO AUSTRALIA'S RELATIONSHIP WITH THE COUNTRIES OF AFRICA

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TERMS OF REFERENCE

The Joint Standing Committee on Foreign Affairs, Defence and Trade shall inquire into and report on Australia's relationship with Africa, with special emphasis on:

- *Bilateral relations at the parliamentary and government levels;*
- *Economic issues, including trade and investment;*
- *Cultural, scientific and educational relations and exchanges;*
- *Development assistance cooperation and capacity building;*
- *Defence co-operation, regional security and strategic issues; and*
- *Migration and human rights issues.*

The Committee will consider both the current situation and opportunities for the future

The purpose of this document is to respond to questions taken on notice by the Department of Innovation, Industry, Science and Research at the Department's appearance before the Committee on Wednesday, 21 April 2010 in Canberra.

AUSTRALIAN RESEARCH COUNCIL

Hansard Page 4: ***CHAIR****—On page 7 of your submission, under 'Australian Research Council', you say South Africa accounts for the majority of collaboration with researchers in Africa—58 per cent—and the other countries involved include Egypt, Kenya, Ethiopia and Ghana. Can you expand on their roles and activities, and are there any other countries that we might have an interaction with? I appreciate that these people may not necessarily be located in a specific country, but they might be located in another country on the continent and move around a bit.*

DIISR (ARC) Response

The data provided in the ARC submission is drawn from an application tick box in which applicants indicate if their proposal will involve international collaboration and, if so, to identify the country or countries involved. It is not possible from this information to identify the specific nature of collaborative activities involved. However the most common forms of collaboration involve:

- 'formal' linkages – the ARC defines projects involving formal linkages as those projects where there is a partner investigator or partner organisation from the overseas country specifically identified in the proposal.
- 'informal' linkages – the ARC defines projects involving informal linkages as those where the intent to collaborate is identified but no specific participants have been identified in the proposal. The collaborative activities proposed range from the conduct of fieldwork in the overseas country (which may involve liaison with local experts, researchers or other staff and the use of local research facilities) to the training of PhD or Masters students from the overseas country.

As indicated in the ARC submission, there were 85 new and ongoing ARC-supported research projects with funding allocations in 2009 that involved collaboration with countries of Africa. Across these 85 projects there were 103 intended instances of collaboration with 25 countries – the full list of countries is provided in the table below.

Country	Number of instances of collaboration
Algeria	1
Botswana	1
Central African Republic	1
Congo	1
Egypt	6
Ethiopia	3
Ghana	2
Kenya	6
Madagascar	2
Malawi	1
Mauritius	2
Morocco	1
Mozambique	1
Namibia	1
Nigeria	2
Reunion, Island of	1
Rwanda	1
Seychelles	1
Sierra Leone	1
South Africa	60
Sudan	2
Tanzania	3
Uganda	1
Zambia	1
Zimbabwe	1
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AUSTRALIAN NUCLEAR SCIENCE AND TECHNOLOGY ORGANISATION

Hansard Page 5: ***Mr MURPHY****—You mentioned that ANSTO's administration of the applied science of oncology distance learning program includes 13 nations. Do you know which nations are participating in the program?*

DIISR (ANSTO) Response

The countries in Africa which have participated in the applied science of oncology distance learning program are: Egypt, Ethiopia, Ghana, Kenya, Morocco, Mozambique, Nigeria, South Africa, Zambia, Tanzania, Tunisia, Uganda and Zimbabwe.

Hansard Page 5: ***CHAIR****—On page 8 of your submission you say that in 2009 ANSTO coordinated the placement of fellows and scientific visitors from a number of countries in Africa, including Sudan, Zambia, South Africa and Madagascar. Can you tell us exactly how many scientific visitors were involved, and were there any other countries besides the ones you have mentioned?*

DIISR (ANSTO) Response

African IAEA fellows placed at Australian institutions in 2009 and 2010 came, or will come, from:

2009

Country	**No. of placements**
Madagascar	2
South Africa	3

2010

Country	**No. of placements**
Botswana	1
Sudan	1
South Africa	2

Planned for 2010 (but dates not confirmed)

Country	**No. of placements**
Namibia	1
Seychelles	2
South Africa	1
Zambia	1

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COLLABORATIVE SCIENTIFIC PUBLICATIONS

Hansard Page 11: ***Mr FITZGIBBON****—Are you able to get back to us with some further information about those rankings and give us a greater insight into how we perform so well, at least on the surface?*

Mr FITZGIBBON*—You just say that, generally, we rank fourth, but can we find out whether we are, for example, fourth by an inch or by a mile? How are the other countries in front of us doing?*

DIISR Response

The Tables 1, 2 and 3 in the Appendix to this document provide the following information:

1. Total scientific publications (registered in the Thompson-ISI Web of Science) produced by selected countries in 2009, and the number of those publications that were produced in collaboration with South African researchers, ranked by the countries' total 2009 publications output.
2. The same information, but ranked by the countries' joint papers with South Africa.
3. A ranked list of countries involved in Australia's 2009 publications.

In terms of world rankings:

- Australia was the world's 12th most important producer of registered scientific publications in 2009, with Australian researchers involved in over 42,000 registered scientific publications or about 3% of the world's total.
- The USA is the world's top producing country with involvement in nearly 400,000 publications, although outweighed by the EU as a whole. China, the UK and Germany were each involved in over 100,000 publications.
- Australia's numbers were very similar to Spain, India and South Korea.
- Australia achieved a higher *per capita* output than any nation ranked above us. Of the top 34 producers of scientific publications, only Switzerland, the Netherlands, and the Nordic countries had a higher per capita output than Australia.
- South Africa was the 34th ranked publications producer, with 7,500, far higher than any other African nation. Egypt, with 5,500, was the second African nation.

Reasons for Australia's relatively high performance include:

- A high average level of education (the countries with higher per capita publications than Australia also have reputations for their quality education, especially in maths);
- Access to world-class research infrastructure across the spectrum in universities, the CSIRO and other government agencies, private industry and not-for-profit research institutions, covering a broad range of disciplines;
- High levels of English language skill, which boosts chances of publication in the high reputation journals;
- Good links to international partners through alumni of Australian universities, relatives and friends of recent immigrants, and professional networks such as those of the Learned Academies; and
- Government support for international research collaboration, which has been demonstrated to improve research outcomes and hence the attractiveness of Australian researchers to international teams.

In terms of partners of South Africa:

- Although 12th in the world, Australia was South Africa's 4th most important partner with 343 joint publications, relatively close to Germany in 3rd (474 publications) very close to France in 5th (338) but a long way behind the UK in 2nd (911) and the USA in 1st (1,268). Slightly over 50% of South Africa's publications included at least one author from another country.
- South Africa was Australia's 20th ranked partner, well behind the levels with our top ten partners but much higher than most developing, and some developed, nations.
- Other countries that were much higher in South Africa's partner ranking than their world ranking were the Netherlands, Switzerland, Belgium, Sweden and Norway, mid-sized countries with well-regarded for their innovation and science (only Belgium has a lower per capita output than Australia, and it is only slightly lower).
- Not surprisingly, two of the more significant sub-Saharan African nations, Nigeria and Kenya, and near neighbour Zimbabwe, were also relatively high in South Africa's partner list compared to their world standing.
- China, South Korea, Taiwan and Japan are much lower in South Africa's partners than their world standing. These countries produce more than 75% of their publications with no international collaboration, compared to around 40% to 50% for the European nations and 55% for Australia, so this low relative level of collaboration with South Africa is not particularly surprising.
- Likewise Russia and Turkey, although prominent in scientific publications, are less liable to collaboration, and figure relatively low in South Africa's partner rankings.
- This suggests that Australia's high standing in South Africa's partner rankings is due to a range of factors including:
    - Common interests and research strengths in the two countries (more detail is provided in answer to the third question below);
    - Common language and cultural elements;
    - Geographic proximity; and
    - Both countries are relatively collaborative, while not relying solely on collaboration for access to high quality science. This balance between domestic strength and international leverage is also particularly strongly displayed by the north-western European countries.

Important points to note about these publications data are:

- The 2009 data are very similar to the 2008 data provided in the original DIISR submission to the inquiry.
- Partnerships with South Africa were highlighted as South Africa is the only African nation with a high enough output and collaboration to draw meaningful conclusions.
- A complete list of the 34 top producers has been included, along with a representative sample of lesser ranked producers, including Africa's other significant producers (Egypt, Tunisia, Nigeria, Algeria, Morocco and Kenya) and important partners for South Africa (Uganda, Tanzania and Zimbabwe).
- The number of collaborative publications with each country *cannot* be simply added together to give the total number of collaborative publications, because some publications have authors from three or more countries. For instance, there are over 32,000 instances of a particular country contributing an author to a paper with an Australian author in 2009, but only 19,000 of Australia's papers were produced through collaboration (each collaborative paper had an average of 1.7 other countries involved in addition to Australia).

Hansard Page 11: ***Mr FITZGIBBON****—And maybe you could give us a snapshot of the publications or projects that got us to that ranking?*

DIISR Response

Table 4 in the Appendix shows the number of papers by subject area for joint Australia-South Africa publications in 2009.

Publication rates differ by field of science, so the numbers of joint papers by subject area need to be read in that context. Of the areas with high numbers of joint Australia-South Africa publications:

- Space Science and Astronomy accounts for only about 1.1% of world publications. With 12% of joint papers in Astronomy and Astrophysics, this is an area of immense joint interest and research strength for Australia and South Africa.
- Ecology and Environment account for 2.5% of total world publications, so once again this is a field in which the two countries have extremely strong joint interests and world-class research teams.
- Clinical Medicine accounts for 21.4% of all publications worldwide, and a medical field is usually our top joint publication field with other countries. There seems to be a lesser level of collaboration in medicine between Australia and South Africa, although not unduly so.
- Geosciences account for 2.7% of world publications, so there is a significantly high level of Australia-South Africa collaboration in this field.

An important point about this data:

- Some papers involve multiple topics, so a simple addition of the number of papers by subject area would overstate the number of joint papers (by about 50%).

INTERNATIONAL POSTGRADUATE RESEARCH SCHOLARSHIPS

Hansard Page 11: ***Ms GRIERSON****—Under the International Postgraduate Research Scholarships program, apparently 34 recipients in 2008 were from African countries. I would imagine they would reflect excellence in those countries or the areas of excellence in research. Again, do they reflect engineering, minerals, health, education? Do we have any idea what they reflect about the recipients in any trends?*

DIISR Response

In 2008, our records now indicate that 37 International Postgraduate Research Scholarships (IPRS) were provided to students from African countries. This represented 4% of all IPRS allocated in 2008. The breakdown of students from African countries is as follows:

Botswana	1
Cameroon	1
Congo, Democratic Republic of	1
Ethiopia	3
Egypt	5
Ghana	1
Kenya	7
Mauritius	3
Nigeria	4
South Africa	5
Tanzania	1
Uganda	1
Zimbabwe	4

There are no trends in relation to fields of study. The distribution of students across fields of study is diverse, with most fields of study only having single enrolments. The fields of study of Physics, Medical studies and Tax law, are the only fields where two students are enrolled. However, in each case these enrolments are from different African countries.

*Hansard Page 11: **Ms GRIERSON**—I would like an answer on that. When we visit many developing countries or meet people who are recipients of these scholarships, a common theme is the importance of being able to have family with them. Generally they have larger families and they cannot afford to be here away from their families. Are these scholarships sufficient for them to bring families with them and are they assisted to do so?*

DIISR Response

The International Postgraduate Research Scholarship (IPRS) program does not provide a stipend. The IPRS program enables international students to undertake a postgraduate research qualification in Australia and gain experience with leading Australian researchers. The program provides funding to cover tuition fees and health cover costs for scholarship holders, and health cover costs for their dependants.

SQUARE KILOMETRE ARRAY

*Hansard Page 12: **CHAIR**—We are a little bit over time. As there are no further questions, can I go back to the SKA. Again, I am not sure whether you did indicate the eight African countries that are in the South African bid. Who are the other seven?*

DIISR Response

The countries currently included in South African bid for the SKA are:

- South Africa
- Namibia
- Botswana
- Mozambique
- Madagascar
- Mauritius
- Kenya
- Zambia

APPENDIX: PUBLICATIONS STATISTICS

The three tables in this Appendix provide the following information:

Table 1.	Total scientific publications (registered in the Thompson-ISI Web of Science) produced by selected countries in 2009, and the number of those publications that were produced in collaboration with South African researchers, ranked by the countries' total 2009 publications output.
Table 2.	The same information as Table 1, but ranked by the countries' joint papers with South Africa.
Table 3.	Australia's publications in 2009 ranked by instances of international collaboration.
Table 4.	The number of papers by subject area for joint Australia-South Africa publications in 2009.

TABLE 1: 2009 Scientific Publications ranked by total national output

Country	Total 2009 Publications	World Ranking	2009 Publications with South Africa	Ranking with South Africa
USA	396,303	1	1,268	1
China	131,919	2	125	14
UK	108,922	3	911	2
Germany	106,919	4	474	3
Japan	91,598	5	107	16
France	75,184	6	338	5
Italy	64,010	7	165	10
Canada	61,616	8	238	7
Spain	49,535	9	153	12
India	44,671	10	128	13
South Korea	42,848	11	41	37
Australia	**42,096**	**12**	**343**	**4**
Brazil	34,940	13	101	17
Netherlands	34,735	14	264	6
Russia	31,547	15	46	(equal) 31
Switzerland	26,762	16	194	8
Taiwan	25,393	17	21	(equal) 50
Turkey	24,195	18	31	42
Poland	21,708	19	77	20
Sweden	21,642	20	156	11
Belgium	19,488	21	166	9
Iran	16,484	22	13	(equal) 57
Austria	13,992	23	66	23
Greece	13,323	24	24	(equal) 46
Denmark	12,983	25	78	19
Israel	12,820	26	46	(equal) 31
Finland	10,526	27	48	(equal) 29
Czech Republic	10,191	28	51	(equal) 27
Mexico	10,089	29	51	(equal) 27
Portugal	10,038	30	54	26
Norway	9,705	31	118	15
Singapore	8,941	32	19	(equal) 53
Argentina	7,890	33	61	24
South Africa	***7,572***	***34***	***7,572***	***N/A***
Ireland	7,111		46	(equal) 31
Romania	7,031		22	(equal) 48
New Zealand	6,921		70	22
Hungary	6,701		45	34
Thailand	5,705		30	43
Egypt	5,510		26	45
Chile	4,843		37	(equal) 38
Malaysia	4,570		16	(equal) 55
Pakistan	3,954		48	(equal) 29
Slovak Republic	3,018		10	(equal) 66
Tunisia	2,936		8	(equal) 75
Saudi Arabia	2,622		13	(equal) 57
Nigeria	2,419		92	18
Algeria	1,732		10	(equal) 66
Morocco	1,460		6	(equal) 83
Kenya	1,123		74	21
Indonesia	1,046		10	(equal) 66
Uganda	652		44	35
Tanzania	618		42	36
Zimbabwe	206		56	25

TABLE 2: 2009 Scientific Publications ranked by collaboration with South Africa

Country	Total 2009 Publications	World Ranking	2009 Publications with South Africa	Ranking with South Africa
South Africa	***7,572***	***34***	***7,572***	***N/A***
USA	396,303	1	1,268	1
UK	108,922	3	911	2
Germany	106,919	4	474	3
Australia	**42,096**	**12**	**343**	**4**
France	75,184	6	338	5
Netherlands	34,735	14	264	6
Canada	61,616	8	238	7
Switzerland	26,762	16	194	8
Belgium	19,488	21	166	9
Italy	64,010	7	165	10
Sweden	21,642	20	156	11
Spain	49,535	9	153	12
India	44,671	10	128	13
China	131,919	2	125	14
Norway	9,705	31	118	15
Japan	91,598	5	107	16
Brazil	34,940	13	101	17
Nigeria	2,419		92	18
Denmark	12,983	25	78	19
Poland	21,708	19	77	20
Kenya	1,123		74	21
New Zealand	6,921		70	22
Austria	13,992	23	66	23
Argentina	7,890	33	61	24
Zimbabwe	206		56	25
Portugal	10,038	30	54	26
Czech Republic	10,191	28	51	(equal) 27
Mexico	10,089	29	51	(equal) 27
Finland	10,526	27	48	(equal) 29
Pakistan	3,954		48	(equal) 29
Russia	31,547	15	46	(equal) 31
Israel	12,820	26	46	(equal) 31
Ireland	7,111		46	(equal) 31
Hungary	6,701		45	34
Uganda	652		44	35
Tanzania	618		42	36
South Korea	42,848	11	41	37
Chile	4,843		37	(equal) 38
Turkey	24,195	18	31	42
Thailand	5,705		30	43
Egypt	5,510		26	45
Greece	13,323	24	24	(equal) 46
Romania	7,031		22	(equal) 48
Taiwan	25,393	17	21	(equal) 50
Singapore	8,941	32	19	(equal) 53
Malaysia	4,570		16	(equal) 55
Iran	16,484	22	13	(equal) 57
Saudi Arabia	2,622		13	(equal) 57
Slovak Republic	3,018		10	(equal) 66
Algeria	1,732		10	(equal) 66
Indonesia	1,046		10	(equal) 66
Tunisia	2,936		8	(equal) 75
Morocco	1,460		6	(equal) 83

TABLE 3: Australian 2009 Scientific Publications ranked by number of instances of collaboration with partner country

Country/ Territory	2009 Publications with Australia	% of 42,096	Ranking with Australia
Australia	**42,096**	**100.00%**	**N/A**
USA	6,181	14.68%	1
Ukraine	4,028	9.57%	2
China	2,295	5.45%	3
Germany	1,931	4.59%	4
Canada	1,770	4.20%	5
France	1,491	3.54%	6
New Zealand	1,100	2.61%	7
Japan	1,010	2.40%	8
Italy	937	2.23%	9
Netherlands	889	2.11%	10
Switzerland	782	1.86%	11
Spain	697	1.66%	12
Sweden	610	1.45%	13
Singapore	562	1.34%	14
Denmark	455	1.08%	15
Belgium	439	1.04%	16
India	394	0.94%	17
South Korea	385	0.91%	18
Brazil	352	0.84%	19
South Africa	***343***	***0.81%***	***20***
Austria	328	0.78%	21
Norway	302	0.72%	22
Thailand	283	0.67%	23
Poland	276	0.66%	24
Taiwan	274	0.65%	25
Finland	269	0.64%	26
Ireland	265	0.63%	27
Russia	253	0.60%	28
Iran	246	0.58%	29
Israel	216	0.51%	30
Malaysia	180	0.43%	31
Czech Republic	162	0.38%	32
Argentina	146	0.35%	33
Indonesia	140	0.33%	34
Mexico	137	0.33%	35
Greece	133	0.32%	36
Chile	118	0.28%	(equal) 37
Portugal	118	0.28%	(equal) 37
Turkey	102	0.24%	39
Hungary	99	0.24%	40
Vietnam	79	0.19%	41
Slovenia	73	0.17%	42
Philippines	69	0.16%	43
Sri Lanka	58	0.14%	44
Pakistan	56	0.13%	45
Bangladesh	55	0.13%	46
Papua New Guinea	53	0.13%	47
Colombia	44	0.10%	48
Kenya	43	0.10%	49
Ukraine	42	0.10%	50
Saudi Arabia	40	0.10%	51
Croatia	38	0.09%	52
Iceland	36	0.09%	(equal) 53

TABLE 3: Australian 2009 Scientific Publications ranked by number of instances of collaboration with partner country

Romania	36	0.09%	(equal) 53
Panama	34	0.08%	(equal) 55
Slovakia	34	0.08%	(equal) 55
Estonia	33	0.08%	57
Fiji	32	0.08%	58
Egypt	31	0.07%	59
New Caledonia	30	0.07%	60
Bulgaria	29	0.07%	(equal) 61
UAE	29	0.07%	(equal) 61
Armenia	22	0.05%	(equal) 63
Jordan	22	0.05%	(equal) 63
Serbia	22	0.05%	(equal) 63
Peru	21	0.05%	66
Nigeria	20	0.05%	67
Namibia	19	0.05%	68
Cambodia	15	0.04%	69
Costa Rica	13	0.03%	(equal) 70
French Polynesia	13	0.03%	(equal) 70
Kuwait	13	0.03%	(equal) 70
Tunisia	13	0.03%	(equal) 70
Uruguay	13	0.03%	(equal) 70
Cuba	11	0.03%	(equal) 75
Cyprus	11	0.03%	(equal) 75
Lithuania	11	0.03%	(equal) 75
Uganda	11	0.03%	(equal) 75
Venezuela	11	0.03%	(equal) 75
Cameroon	10	0.02%	(equal) 80
Mongolia	10	0.02%	(equal) 80
Qatar	9	0.02%	(equal) 82
Tanzania	9	0.02%	(equal) 82
Byelarus	8	0.02%	(equal) 84
Iraq	8	0.02%	(equal) 84
Malawi	8	0.02%	(equal) 84
Nepal	8	0.02%	(equal) 84
Syria	8	0.02%	(equal) 84
Algeria	7	0.02%	(equal) 89
Lebanon	7	0.02%	(equal) 89
Luxembourg	7	0.02%	(equal) 89
Oman	7	0.02%	(equal) 89
Reunion	7	0.02%	(equal) 89
Zambia	7	0.02%	(equal) 89
Bolivia	6	0.01%	(equal) 95
Cote d'Ivoire	6	0.01%	(equal) 95
Ghana	6	0.01%	(equal) 95
Mauritius	6	0.01%	(equal) 95
Senegal	6	0.01%	(equal) 95
Sudan	6	0.01%	(equal) 95
Ethiopia	5	0.01%	(equal) 101
Laos	5	0.01%	(equal) 101
Macedonia	5	0.01%	(equal) 101
Madagascar	5	0.01%	(equal) 101
Mali	5	0.01%	(equal) 101
North Korea	5	0.01%	(equal) 101
Botswana	4	0.01%	(equal) 107
Ecuador	4	0.01%	(equal) 107
Malta	4	0.01%	(equal) 107

TABLE 3: Australian 2009 Scientific Publications ranked by number of instances of collaboration with partner country

Monaco	4	0.01%	(equal) 107
Myanmar	4	0.01%	(equal) 107
Georgia	4	0.01%	(equal) 107
Seychelles	4	0.01%	(equal) 107
Trinidad & Tobago	4	0.01%	(equal) 107
Zimbabwe	4	0.01%	(equal) 107
Barbados	3	0.01%	(equal) 116
Bosnia & Hercegovina	3	0.01%	(equal) 116
Brunei	3	0.01%	(equal) 116
Burkina Faso	3	0.01%	(equal) 116
Jamaica	3	0.01%	(equal) 116
Latvia	3	0.01%	(equal) 116
Mozambique	3	0.01%	(equal) 116
Niger	3	0.01%	(equal) 116
Palau	3	0.01%	(equal) 116
Uzbekistan	3	0.01%	(equal) 116
Vanuatu	3	0.01%	(equal) 116
Afghanistan	2	0.00%	(equal) 127
Bahrain	2	0.00%	(equal) 127
Benin	2	0.00%	(equal) 127
French Guiana	2	0.00%	(equal) 127
Gambia	2	0.00%	(equal) 127
Morocco	2	0.00%	(equal) 127
Netherlands Antilles	2	0.00%	(equal) 127
Solomon Islands	2	0.00%	(equal) 127
Zaire	2	0.00%	(equal) 127
Azerbaijan	1	0.00%	(equal) 136
Bahamas	1	0.00%	(equal) 136
Bhutan	1	0.00%	(equal) 136
Congo	1	0.00%	(equal) 136
Gabon	1	0.00%	(equal) 136
Guatemala	1	0.00%	(equal) 136
Guinea	1	0.00%	(equal) 136
Honduras	1	0.00%	(equal) 136
Kazakhstan	1	0.00%	(equal) 136
Kyrgyzstan	1	0.00%	(equal) 136
Libya	1	0.00%	(equal) 136
Liechtenstein	1	0.00%	(equal) 136
Micronesia	1	0.00%	(equal) 136
Moldova	1	0.00%	(equal) 136
Swaziland	1	0.00%	(equal) 136
Tonga	1	0.00%	(equal) 136
Vatican	1	0.00%	(equal) 136

TABLE 4: Subject Areas of Australia-South Africa collaborative publications in 2009

Subject Area	Australia-South Africa Joint Papers in 2009	% of 343
Astronomy & Astrophysics	42	12.24%
Ecology	39	11.37%
Evolutionary Biology	23	6.71%
Medicine, General & Internal	20	5.83%
Genetics & Heredity	19	5.54%
Biochemistry & Molecular Biology	15	4.37%
Zoology	14	4.08%
Environmental Sciences	13	3.79%
Geochemistry & Geophysics	13	3.79%
Geosciences, Multidisciplinary	13	3.79%
Plant Sciences	13	3.79%
Infectious Diseases	11	3.21%
Marine & Freshwater Biology	11	3.21%
Entomology	9	2.62%
Multidisciplinary Sciences	9	2.62%
Veterinary Sciences	9	2.62%
Neurosciences	8	2.33%
Virology	8	2.33%
Cardiac & Cardiovascular Systems	7	2.04%
Clinical Neurology	7	2.04%
Psychiatry	7	2.04%
Public, Environmental & Occupational Health	7	2.04%
Biodiversity Conservation	6	1.75%
Biology	6	1.75%
Forestry	6	1.75%
Health Care Sciences & Services	6	1.75%
Immunology	6	1.75%
Microbiology	6	1.75%
Physiology	6	1.75%
Anthropology	5	1.46%
Biotechnology & Applied Microbiology	5	1.46%
Meteorology & Atmospheric Sciences	5	1.46%
Mycology	5	1.46%
Pediatrics	5	1.46%
Respiratory System	5	1.46%
Engineering, Chemical	4	1.17%
Geography, Physical	4	1.17%
Mineralogy	4	1.17%
Oncology	4	1.17%
Rehabilitation	4	1.17%
Sport Sciences	4	1.17%
Surgery	4	1.17%
Agriculture, Dairy & Animal Science	3	0.87%
Agriculture, Multidisciplinary	3	0.87%
Behavioral Sciences	3	0.87%
Chemistry, Inorganic & Nuclear	3	0.87%
Metallurgy & Metallurgical Engineering	3	0.87%
Parasitology	3	0.87%
Pathology	3	0.87%
Pharmacology & Pharmacy	3	0.87%
Physics, Particles & Fields	3	0.87%
Allergy	2	0.58%
Cell Biology	2	0.58%
Chemistry, Analytical	2	0.58%

TABLE 4: Subject Areas of Australia-South Africa collaborative publications in 2009

Chemistry, Applied	2	0.58%
Chemistry, Multidisciplinary	2	0.58%
Computer Science, Artificial Intelligence	2	0.58%
Energy & Fuels	2	0.58%
Engineering, Civil	2	0.58%
Engineering, Electrical & Electronic	2	0.58%
Food Science & Technology	2	0.58%
Integrative & Complementary Medicine	2	0.58%
Materials Science, Composites	2	0.58%
Mining & Mineral Processing	2	0.58%
Nutrition & Dietetics	2	0.58%
Obstetrics & Gynecology	2	0.58%
Oceanography	2	0.58%
Ophthalmology	2	0.58%
Paleontology	2	0.58%
Physics, Multidisciplinary	2	0.58%
Psychology	2	0.58%
Rheumatology	2	0.58%
Spectroscopy	2	0.58%
Substance Abuse	2	0.58%
Agronomy	1	0.29%
Anesthesiology	1	0.29%
Biochemical Research Methods	1	0.29%
Computer Science, Information Systems	1	0.29%
Computer Science, Theory & Methods	1	0.29%
Critical Care Medicine	1	0.29%
Education, Scientific Disciplines	1	0.29%
Engineering, Biomedical	1	0.29%
Engineering, Environmental	1	0.29%
Engineering, Geological	1	0.29%
Engineering, Mechanical	1	0.29%
Engineering, Multidisciplinary	1	0.29%
Environmental Studies	1	0.29%
Fisheries	1	0.29%
Geography	1	0.29%
Geology	1	0.29%
Health Policy & Services	1	0.29%
Hematology	1	0.29%
Horticulture	1	0.29%
Information Science & Library Science	1	0.29%
Instruments & Instrumentation	1	0.29%
Materials Science, Biomaterials	1	0.29%
Medical Informatics	1	0.29%
Medical Laboratory Technology	1	0.29%
Medicine, Legal	1	0.29%
Nuclear Science & Technology	1	0.29%
Physics, Mathematical	1	0.29%
Polymer Science	1	0.29%
Psychology, Clinical	1	0.29%
Radiology, Nuclear Medicine & Medical Imaging	1	0.29%
Transplantation	1	0.29%
Transportation	1	0.29%
Transportation Science & Technology	1	0.29%
Tropical Medicine	1	0.29%
Urology & Nephrology	1	0.29%
Water Resources	1	0.29%