

# Getting to the Future First

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**Susan Greenfield**

Thinker in Residence 2004-2005



Government  
of South Australia

## **Getting to the Future First**

Prepared by  
Baroness Professor Susan Greenfield

Department of the Premier and Cabinet  
c/- GPO Box 2343  
Adelaide SA 5001

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# Baroness Professor Susan Greenfield



## The following partners and sponsors were involved in Baroness Professor Susan Greenfield's residency:

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Baroness Professor Susan Greenfield is a pioneering scientist, an entrepreneur, a communicator of science and a policy adviser.

Susan has long been regarded as a world-leading expert on the human brain, and is widely known for her research into Parkinson's and Alzheimer's disease. She has received a life peerage and a CBE in the United Kingdom.

Susan is the first woman to lead the prestigious Royal Institution of Great Britain and also holds the positions of Senior Research Fellow, Lincoln College, Oxford and Honorary Fellow at St Hilda's College, Oxford.

Baroness Professor Susan Greenfield is an outstanding communicator and a significant contributor to the public understanding of science – she is the author of best-sellers *The Human Brain: A Guided Tour*, *Brain Story* and *Tomorrow's People: How 21st Century Technology Is Changing the Way We Think and Feel* among others. Susan has presented numerous television and radio programs, including a major six part series on the brain and mind, *Brain Story* broadcast on the BBC and the ABC.

# Foreword

Baroness Professor Susan Greenfield is making an outstanding contribution to South Australia – and the public's understanding of science.

She came to us with a reputation as being one of the most influential and inspirational women in the world – as both a pioneering scientist and a gifted communicator.

While in Adelaide, as our Thinker in Residence, she shared her insights into the human brain – how it works, how it copes with ageing and how it responds to drugs, for example.

Susan successfully took her message to the widest possible audience, including children, teachers, health professionals and community groups.

Her brilliant lecture at the Adelaide Convention Centre early in her residency showed that science can be presented in a compelling and entertaining fashion, and that South Australians have a thirst for such public forums.

Most importantly, Baroness Greenfield used her time in South Australia to instigate a number of science-related programs that will be of long-term benefit to the State. These included: the Australian Science Media Centre, which was launched in August 2005; a project designed to "twin" scientists with teachers; the Science Outside The Square series of public events; and the creation of a Graduate Certificate in Neuroscience specifically for teachers.

She has put forward a number of other valuable ideas as part of the recommendations in this report, which I commend to all those interested in improving science literacy and awareness.

I thank Baroness Greenfield for her hard work and generosity of spirit, and for continuing to make a difference to South Australia.

Mike Rann  
Premier of South Australia

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# Introduction

My residency was essentially an exploration of ways in which science can escape from the ivory tower agenda of university research and thus be seen to add value to sectors with which science and scientists are not normally associated.

Over the two instalments of my residency (June–August 2004 and July–August 2005) it has been possible to identify ten recommendations/initiatives to enhance the quality of life in South Australia. These ten initiatives range from being centred on individuals and institutions requiring relatively small means, through to resource heavy initiatives that could have a long-lasting iconic legacy for South Australia, both nationally and internationally.

Some of these initiatives are already in train. Those which are more ambitious to implement will come into fruition over the next few years.

The funds required for these initiatives are drawn from a variety of sources and certainly do not depend solely on the government. The main thrust of the residency is to attract scientists to South Australia and to retain the brightest and best who are already here. In this way South Australia will not only perpetuate its image of being an intellectual hub for the rest of the country, but indeed be seen as part of a far-sighted global vanguard embracing the advantages of the science and technology industries for the increased prosperity of all its citizens.

**I shall argue that only if science is at the heart of the community, driving initiatives in other sectors with which it traditionally has had only a tangential relationship, then, and only then, will we have a sustainable way forward for the 21st Century and beyond.**

## Initiatives

- I Bragg Initiative
- II Oxford Centre for Science of the Mind
- III James Martin 21st Century School
- IV Science Outside the Square
- V Twinning Scientists & Teacher Program
- VI Women in Science, Engineering and Technology
- VII Health and Community Services
- VIII Continuing Training for Teachers
- IX Australian Science Media Centre
- X Science Infrastructure and Research

# Chapter 1

## Thinking About Science

Susan Greenfield | Getting to the Future First

The basic brief of the *Thinkers in Residence* Scheme is 'To Assist with the Strategic Development and Promotion of South Australia'.

Surely there can be no better place to start with this broad goal than with science, technology and engineering, encapsulated from here on in the one term, 'science'. The following headings describe the terms of reference of my residence.

### **Promotion and Influence**

To promote South Australia and Adelaide locally, nationally and internationally and increase awareness of science and its importance to the community and the economy.

### **Science and Society**

To stimulate inward investment and wealth creation by developing strategies to increase the capacity of education, health and community service professionals to incorporate the latest understandings of how the mind and the brain work into their practices.

### **Neuroscience and Bioscience Strategy**

To develop strategies to identify South Australia's competitive strengths in neuroscience, to promote these strengths within the State, and to nationally and internationally build on its capability in neuroscience, through the establishment of an Institute for Neuroscience. To develop strategies to increase the commercialisation of public sector bioscience research for the economic benefit of South Australia.

### **The Underlying Rationale of this Report**

Science, increasingly, is touching everything that we cherish, be it the environment, nutrition, reproduction or the climate. And yet many still think of science as the indulgence of a small minority of dysfunctional nerds locked away in the ivory tower of their universities, metaphorically and often literally on the outskirts of society. Sometimes scientists are demonised by the public, often based on ignorance or misinformation.

The aim of this report, a distillation of the deliberations of the two instalments of my residency (June–August 2004 and July–August 2005), is to rethink science as a central activity not just for scientists but for the general public.

**I shall argue that only if science is at the heart of the community, driving initiatives in other sectors with which it traditionally has had only a tangential relationship, then, and only then, will we have a sustainable way forward for the 21st Century and beyond.**

As the astronomer Carl Sagan warned, 'It is suicide to live in a society dependent on science and technology, where nobody understands anything about science and technology'.

### **Science and Politics**

What are the barriers preventing politicians and scientists working effectively together? First, politicians plan on a relatively short-term basis, according to the dictates of their office, around three to four years at a time. Scientists, on the other hand, have to think in the long term, and about the implications of their research. Scientific experiments are capricious, time-consuming and rarely definitive. It will typically take years for an in-depth study, describing a complete story, to be completed.

The next problem is that politicians are, of course, accountable to the public. Until now, scientists haven't really needed to report directly to the taxpayer: instead, scientists on the whole are accountable to each other in a 'peer review' system of grant evaluation and publication of papers. Hence, the scientific community traditionally suffers from isolation: they need only to talk to each other because what matters most to scientists is convincing colleagues about the veracity and validity of their data. Thus accountability to the public is still a relative novelty for scientists and universities.

In this regard, South Australia is no different from other communities. I was frequently told when I first arrived, how lucky I was 'to have the ear of the Premier'. Given the small size of the population, and the fact that the majority of scientists, and indeed politicians, are working within the CBD of Adelaide, such a perception of disconnection is particularly unfortunate.

A good place to start is with the March 2004 *South Australia's Strategic Plan: Creating Opportunity: Moving Forward Together*. This document has provided the blueprint for six objectives. Looking at each in turn, it is easy to see how science could and should inform every single goal.

#### **Objective 1: Growing Prosperity**

#### **Objective 2: Well-being**

#### **Objective 3: Attaining Sustainability**

#### **Objective 4: Fostering Creativity**

#### **Objective 5: Building Communities**

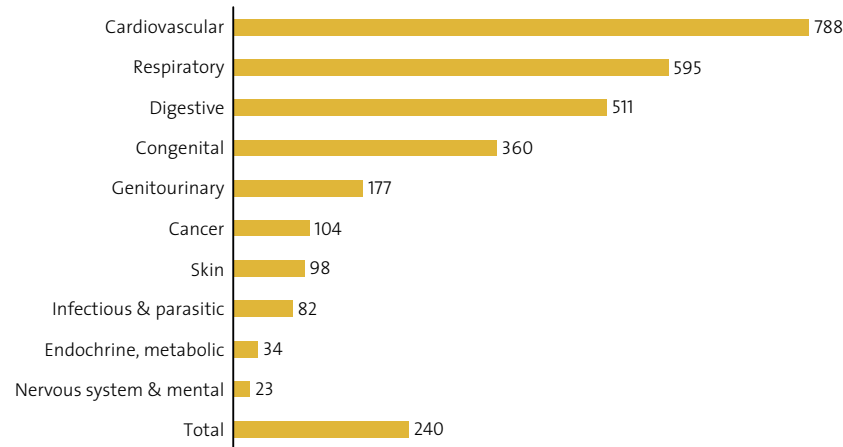
#### **Objective 6: Expanding Opportunity**

#### **Objective 1: Growing Prosperity**

Science and technology are at the heart of prosperity in the 21st Century in both a broad and specific sense. Broadly, we are shifting from the industrial age towards an economy based on diverse knowledges and technologies. The growing role of technology is reflected in economic performance. Trade in high-technology goods, such as aircraft, computers, pharmaceuticals and scientific instruments, accounted for over 25% of total trade in 2000 and 2001, up already from less than 20% in the early 1990s.

More specifically an issue explored in this report is the considerable potential gain to be made from investing in scientific research. For example, recent figures published by the Australian Government's *Investment Review of Health & Medical Research* show considerable returns (Fig 1).

Figure 1 Returns on Health and Medical Research by Major Health Area, 1999



Source: Access Economics, 'Exceptional Returns: The Value of Investing in Health R&D in Australia', September 2003, Table 43

Moreover, the last decade or so has seen a huge growth in the spinning out of high-tech and biotech companies often, but not exclusively, from universities.

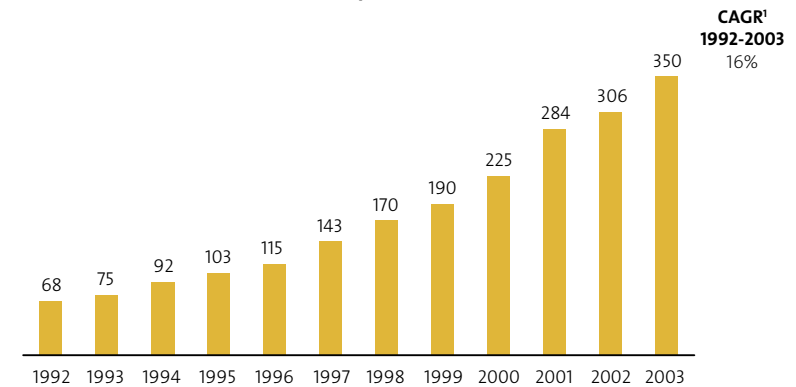
A typical example of prosperity arising from the intellectual capital of universities is Columbia University. Having earned \$1 billion in royalties, license fees and research payments since 1984 when it set up its tech transfer office, it has taken a lead in the shaping of the consortium's broad social objectives. It has reinvested its earnings into research that furthers broad technological, scientific and social advances that improve the quality of life. Columbia research has been crucial to the development of an array of technologies: the digital video compression standard MPEG-2; a laser-based process to revolutionize semiconductor manufacture and flat-panel

display screens called sequential lateral solidification (SLS); a co-transformation process that creates new proteins to develop new drugs used to treat heart and stroke problems, breast cancer, cystic fibrosis, anaemia, multiple sclerosis, rheumatoid arthritis, infertility and haemophilia; the number one treatment for glaucoma in the United States; an antibody approved for Crohn's disease and others.

By comparison, the combined value of Oxford's spin-out companies has reached only £2 billion, using quoted market capitalisations and investor valuations for unquoted companies. Meanwhile, according to the Australian government's 'Investment Review of Health & Medical Research', the growth in Australian biotech companies, is escalating (Fig 2). The number of Australian biotech companies has increased at 16% per annum to 350 from 1992 to 2003.

Figure 2 Success in Commercialisation

Number of Australian Biotech Companies, 1992-2003



1. CAGR = Compound Annual Growth Rate  
Sources: Kelvin Hopper and Lyndal Thorburn, '2002 Bio-Industry Review, Australia & New Zealand'

Yet so far, South Australia has under-performed and needs to increase both private and public investments in science research. South Australia's piece of the national Health and Medical Research Council Funding pie has decreased over the last two years (see Fig 3). Similarly the percentage of ARC Grants awarded to SA Universities is small.

Without doubt science will drive the most profitable industries in the next few decades. If South Australia is to benefit from this shift to high-tech and science based industries internationally, nationally and within the State, it must strengthen its base not only in the private sector, but also provide the maximal opportunity for developing innovative technology through investments in its universities which must be made to facilitate and catalyse activity. In turn, the quality of science research within the three universities will depend on retaining and attracting the best scientific talent.

Figure 3 National Health and Medical Research Council (NHMRC) and Australian Research Council (ARC) Funding 2000–2005

NHMRC Funding by State 2000-05						
	2000	2001	2002	2003	2004	2005
Total SA	\$19,075,461	\$23,640,277	\$27,492,950	\$38,544,216	\$29,344,481	\$31,174,473
Total Aust.	\$171,304,726	\$214,910,953	\$269,533,973	\$315,388,407	\$351,330,327	\$382,405,708
% SA of National	11.14%	11.00%	10.20%	12.22%	8.35%	8.15%

Source: NHMRC PMF Dataset 2000-2005/RMIS unpublished data provided by DEST in August 2005  
Note: Data includes funding obtained by all SA universities and medical research hospitals.

Australian Research Council (ARC) Funding by State 2002-05				
	2002	2003	2004	2005
Total SA	\$17,865,534	\$22,216,594	\$26,437,208	\$32,106,945
Total Aust.	\$288,621,498	\$362,054,506	\$386,051,924	\$443,858,154
% SA of National	6.2%	6.1%	6.8%	7.2%

Source: ARC Website

### SA Case Study Bio Innovation SA

[www.bioinnovationsa.com.au](http://www.bioinnovationsa.com.au)

Bio Innovation SA ably demonstrates how to facilitate commercialisation from biotechnology research out of academic institutions.

Established in June 2001 by the South Australian Government, Bio Innovation SA coordinates and manages bioscience activities across the State. Its mission is to accelerate the development of the local industry by creating the commercial, financial and scientific environment for 50 new bioscience companies and 2500 new jobs in 10 years.

Bio Innovation SA has focused on company formation and employment generation and has established itself as the focal point for commercialisation activities with strong R&D community and industry support. It fosters the development of the industry by creating an environment conducive to commercial success and by providing mentoring, business development, product development, financial and marketing assistance.

Through its high profile in Adelaide and as a funding body, Bio Innovation SA is providing assistance to a significant number of projects and companies in SA. Since establishment in June 2001, Bio Innovation SA has assisted the creation of 33 bioscience companies.

There are now 70 bioscience companies in South Australia and the State is ranked by the ABS as having the highest proportion,

per capita, of biotechnology companies in Australia as well as per \$1 billion GSP. Overall, the bioscience sector currently generates more than \$165 million in revenue, employs more than 1000 people and contributes 14% of the total SA business R&D expenditure.

In 2004-5, Bio Innovation SA revised its grant programs in response to industry requirements, with grants available to local research institutes and local bioscience companies across three key areas - intellectual property commercialisation; human resources; and infrastructure. To date \$1.7 million has been provided through these revised programs leveraging a further \$2.3 million from private and public sources.

Currently, nearly 20 bioscience companies and over 350 people are located in the 'Thebarton Advanced Technology and Bioscience Hub' which is 4km from the CBD and 5km from the airport. Additional land is available for construction of new facilities and a dedicated bioscience business incubator providing small modules of office and wet-laboratory space to early stage companies and business development support will be available for lease by mid 2007.

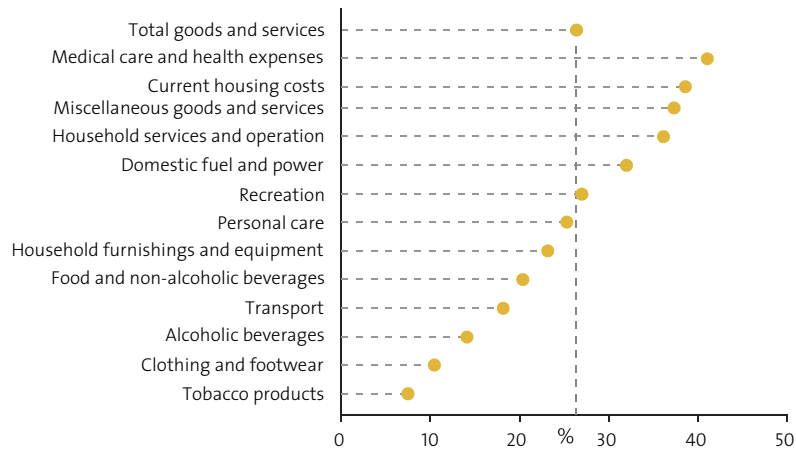
A key achievement for Bio Innovation SA in 2005 was the finalisation of negotiations for a multi-million dollar venture capital fund to be established in South Australia. This fund will invest in local bioscience companies from 2006 onwards, and will provide a much needed capital injection into the local industry.

**Objective 2: Well-Being**

Most of us in the West now have lives that are freed up from the demands of finding and maintaining shelter, food, and health. Accordingly the issues of happiness and fulfilment are becoming increasingly important to our understanding of well-being in the 21st Century.

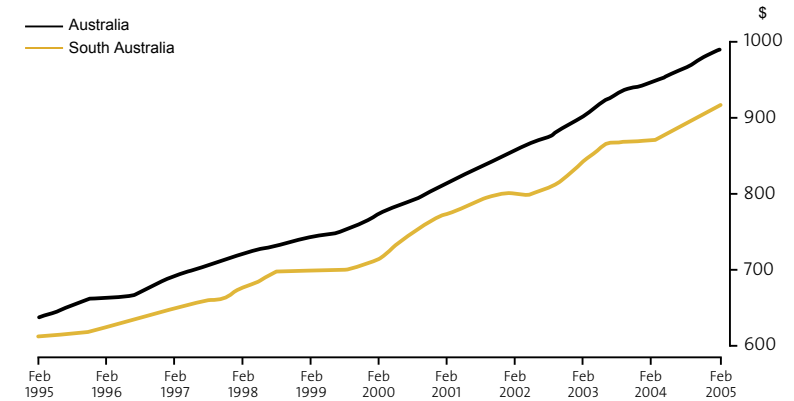
The increase in prosperity inevitably leads to an improvement in physical well-being with more goods and service (Fig 4).

Figure 4 **Increase in Average Weekly Expenditure on Goods and Services 1998-9 to 2003-4**



Source: [www.ausstats.abs.gov.au/ausstats/subscriber.nsf/lookup/6D5F1DDFF4729C60CA25705900755727/\\$file/65300\\_2003-04.pdf](http://www.ausstats.abs.gov.au/ausstats/subscriber.nsf/lookup/6D5F1DDFF4729C60CA25705900755727/$file/65300_2003-04.pdf)

Figure 5 **Full-time Adult Earnings 1995-2005**

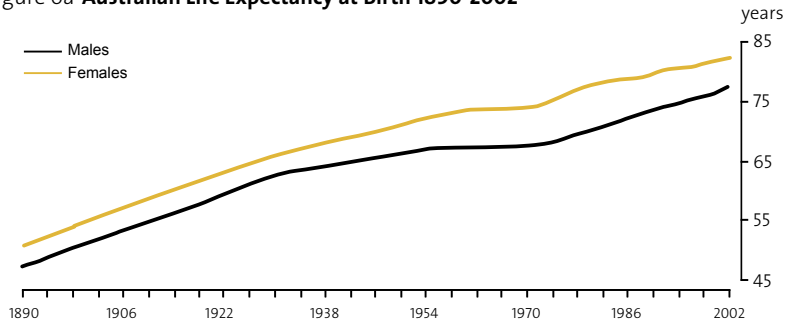


Source: Consumer Price Index, Australia (Cat. No. 6401.0)

Science also has an impact on the less tangible aspects of well-being, namely the length of our lives and lifestyles. Due to the astonishing medical advances in health care in prevention, diagnosis and the novel forms of medication and surgery that have characterised the last few decades, we are living longer and healthier lives.



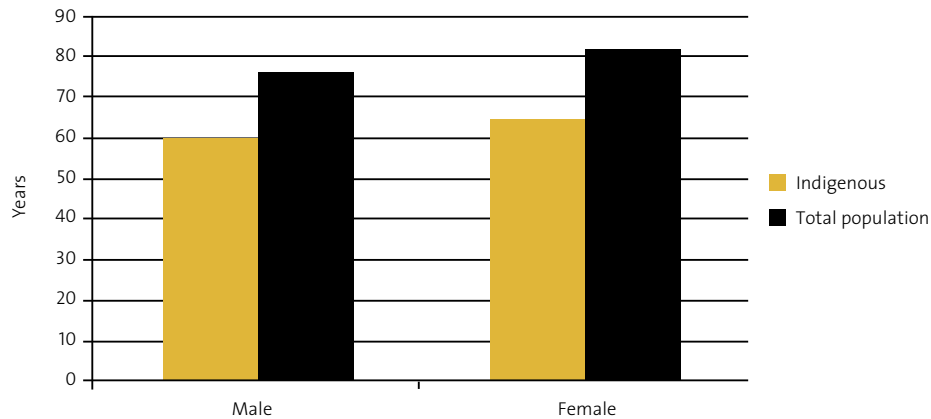
Figure 6a Australian Life Expectancy at Birth 1890-2002



Source: Deaths, Australian Bureau of Statistics

These advances are, however, not shared by all members of the Australian community, in particular Indigenous Australians. (Fig 6b)

Figure 6b Current Average Mortality Figures for Indigenous Australians



Source: Australian Bureau of Statistics

In addition, the new high-tech age brings with it a whole raft of pressures unknown to previous generations, hence an increase in psychiatric disorders.

Combined spending by state and territory governments to carry out their responsibility for running the public mental health system has increased by 40% from 1992–2002, equivalent to \$516 million.

It is vital that we advance biomedical knowledge to have more insight into mental health conditions and devise ways for combating them other than by the use of broad spectrum drugs which inevitably have side effects. Neuroscience in particular is reaching beyond the goal of improved neuropharmacological treatments, to a deeper understanding of thought processes, emotions, and indeed the human mind (see Greenfield, *Tomorrow's People*, 2004). We are facing a situation where the line between improved treatment and improved lifestyle is becoming increasingly blurred and where debate as to the best way forward is much more urgent.

We need to share advances in well-being across the community.

**Objective 3: Attaining Sustainability**

'Sustainable development is development that meets the needs of the present without compromising the ability of future generations to meet their own needs.'

*The World Commission on Environment and Development*, frequently referred to as The Brundtland Report after Gro Harlem Brundtland, Chairman of the Commission. *Our Common Future*, Oxford University Press, 1987.

Despite a growing awareness of the impact the global population is having on finite resources, global warming and health pandemics, the World Business Council for Sustainable Development reports, 'that a profound shift is needed to move towards implementing sustainable business practices. Often companies develop sustainable projects in isolation; too often sustainable development is seen as the enemy of profits; too often there is ignorance of the seriousness of the environmental and social crises facing our world.'

*South Australia's Strategic Plan* makes a good start on the delivery of a sustainable future for South Australia. The Premier's Roundtable on Sustainability makes a range of recommendations aimed at ensuring that the Plan and its implementation deliver clear, sustainable outcomes for the State.

**SA Case Study  
Premier's Roundtable on Sustainability**

[www.environment.sa.gov.au/sustainability/roundtable](http://www.environment.sa.gov.au/sustainability/roundtable)

**Three Challenges for the Future**

The Round Table recommends that government, business and the community take into account the following three challenges in implementing the Plan, and in developing the next iteration of the Plan:

- climate change
- the vulnerability of our natural systems
- the need to manage within ecological constraints

**Four Principles**

The Round Table recommends that government, business and the community adopt the following principles when implementing the Plan:

- Recognise absolute ecological limits to development and keep all economic activity within those limits.
- Reflect the costs that economic activity and consumption impose on future South Australians
- Financially reward those acts that improve environmental outcomes and are part of the solution.
- Remove all impediments and barriers to improvement of environmental outcomes.

**SA Case Study  
Sustainable Landscapes**

[www.environment.sa.gov.au](http://www.environment.sa.gov.au)

The *Sustainable Landscapes* partnership project, coordinated by the Botanic Gardens of Adelaide, is changing the way that urban landscapes are designed and created to make them more sustainable. The project is involved in a range of activities such as research into the most appropriate plant selections for our local urban environments. Water use and weed potential are the two primary criteria for plant selection. The project is working with all sectors of the community including local government, builders, landscape designers, educators and students to research and promote the changes we need to make to ensure landscape sustainability. Several biodiversity conservation research partnership projects

are currently operating in conjunction with Universities and other research organisations. The projects aim to develop scientific knowledge relating to fauna, flora and fire management issues. This knowledge will assist in the management and long term conservation of South Australian species, habitats and environments and will serve to ensure a sustainable future for biodiversity within the State. Key projects include fauna monitoring within high priority ecosystems such as the Coorong; the impacts of feral animals and their control on bird populations; animal and plant responses to fire in remnant and fragile ecosystems; and population monitoring of threatened species and population impacts.

Clearly this issue has a strong scientific basis as can be seen in many United Nation reports on climate change. We can work towards fixing these problems with technologies available today but only if we get started now. We need to take proactive steps to promote and increase achievements in sustainability across the State.



'Science of Art' event at the Governor Hindmarsh Hotel.  
Photo by Sarah Long.

#### Objective 4: Fostering Creativity

This objective might seem the least obvious as tractable to scientific expertise and discovery: on the contrary, it could be argued that the new technological age is strangling creativity and reducing young people to screen-based recipients of multimedia, where they are on response mode rather than contributing any individual insights. Journalist Kevin Kelly summed this up quite accurately: 'Screen culture is a world of constant flux of endless sound bites, of quick cuts and half-baked ideas. It is the flow of gossip tidbits, of news headlines and floating first impressions. Notions don't stand alone but are massively interlinked to everything else. This is an important thing. Truth is not delivered by authors and authorities but is assembled by the audience.' (Greenfield, *Tomorrow's People*, 2004)

On the other hand the neurosciences might well be making helpful contributions to understanding creativity and therefore fostering it, for example by analysing situations where there are claims of creativity. Moreover, science itself is one of the most creative processes as Albert Szent-Gyorgyi (Nobel Prize for Medicine 1937) remarked, science is all about, 'seeing what everyone else can see but thinking what no-one else has thought.'

Traditionally, science is regarded as different from the arts in that the latter is 'created' where the former is not. However, science

has a lot in common with the arts in that scientists ask different questions as do artists and, although their experimental methodology might be similar, individuals produce different perspectives. How you interpret what you see can, rather as with artists, vary enormously from one scientist to another. Each scientist asks new questions from their personal view and priorities. Therefore the approach of scientist and artists can be seen as very similar. Both are characterised by a highly personalised take on the world. Science can often, and increasingly does, generate images that inspire artists. One only has to look at electron microscope images or brain scan images to see how they generate a beauty and insight that we previously haven't experienced. Moreover art can prompt metaphors that can help the development of scientific ideas.

So there are several very deep and fundamental ways in which the sciences and the arts are similar and indeed in which they can interact with each other. I think that it is quite telling that up to about 150 years ago science and art were one and the same thing. The Royal Society when it was first founded included what we would now call the humanities as well as the sciences. Up until the Victorian Age these two fields of human intellectual endeavour were inseparable.

If people realise that arts and science are similar it may make them less wary of science and indeed might inspire more people to

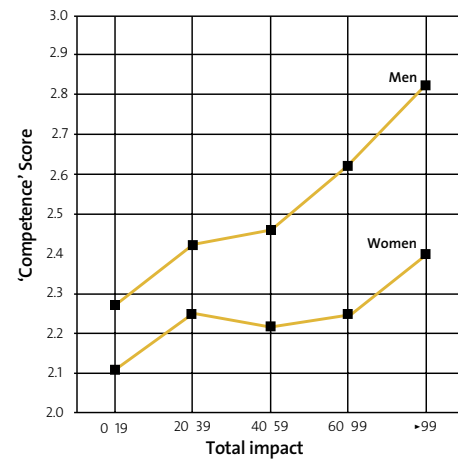
engage in science once they realise that, having mastered the fundamentals, they can then cut through them and exercise a creativity and self-expression that might have been denied them if they are not technically able at writing, or painting, or music. So an embrace of science actually broadens the chances for individuals to express themselves and be creative in different ways.

Awareness of science can make people have more insight into and interest in the world around them as they then can see the individuality and creativity of explanations and ideas of people from other disciplines. We need to develop initiatives that build stronger collaborations between scientists, educators, artists, industry, students and the community.

**Objective 5: Building Communities**

Part of this objective in the Strategic Plan concerns women in leadership. In the sector of science and technology the deficit in women is very clear. A few years ago data was published from the Swedish Medical Research Council showing that a woman who was in the top band of scientists would be perceived at about the same level as a below-average man. (Fig 9)

Figure 7 Perceptions of Women in Science



Source: Swedish Medical Research Council

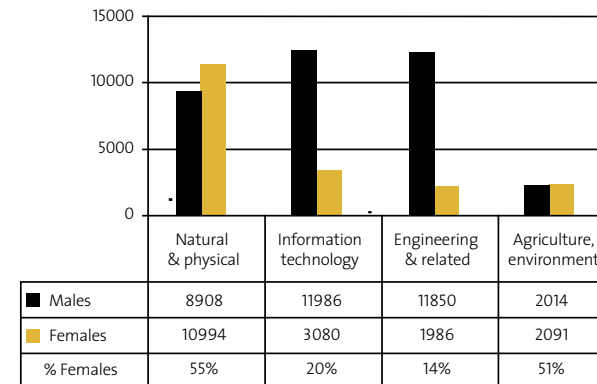
Similar analysis of these concerns appear in the report 'SET Fair' that I prepared for the UK Secretary of State for Trade and Industry a few years ago. [www.extra.scu.ac.uk/nrc/section\\_2/publications/reports/R1182/SET\\_Fair\\_Report.pdf](http://www.extra.scu.ac.uk/nrc/section_2/publications/reports/R1182/SET_Fair_Report.pdf)

In 2005 a report prepared by the SA Office for Women entitled *Participation and Advancement of Women in Science, Engineering and Technology (SET) in South Australia* provides national data on women's participation in university studies at the Bachelor level (Fig 8). Women participate in greater numbers than men in general science degrees (once again clustering in the biological sciences) and in the agricultural and environmental sciences. However, despite women's participation in natural and physical science degrees nearly equalling women's participation rate at universities (57%), women often choose to stay away from physics, chemistry and mathematics majors. Women's participation in engineering and information technology remains very low despite various campaigns to recruit women to these courses and targets being set nationally to improve participation. Given that both information technology and engineering programs rely heavily on physics and mathematics, it is not surprising to find girls' choices not to study these subjects at school impact on their choices at university.

Whilst it has been suggested that the pressures of being in a minority group could lead to stresses for women in some SET courses, a national analysis of equity groups in higher education has not found student retention in non-traditional courses for women to differ significantly between genders.

However, as women progress in scientific careers they become fewer in number.

Figure 8 Commencements for Ordinary Bachelor Degrees 2004



Source: Commonwealth Department of Education, Science and Training, 2005

Just as we can explore how women can have more impact on science, more obvious still is how science can impact on more women, all women. The increase in technology-based societies will make it easier for women with small children to work from home: future new advances might enable post-menopausal women to be reproductive. Science and technology could well change the face of communities as we know them, not just within families, but also in the degree to which individuals interact with each other.

The social context of lone occupant households has changed considerably during the period 1971 to 1991, and the overall number of people living in lone occupant households has increased throughout this period. In a sample of those aged 15-44, the proportional increase in those living alone is the largest, rising from 1.6% in 1971 to 3.8% in 1981 and 8.4% in 1991. In contrast there was a notable decrease in those living in couple-based households. The proportion of people living in such households fell by 6.5% between 1971 and 1991.

[www.abs.gov.au/ausstats](http://www.abs.gov.au/ausstats)

# Chapter 1

## Thinking About Science

In my book *Tomorrow's People*, I review how science and technology, in particular Information Communication Technology (ICT), is transforming the way we live and work in favour of far more isolated, home-based lifestyles. We need to think of ways in which the new technologies can be used to build the kind of society that we want, presumably one characterised by a strong sense of community.

### Objective 6: Expanding Opportunities

At the root of opportunity lies education, for both child and adult alike. Inevitably, science is changing the face of education, both in terms of what needs to be taught, and how it is taught. The immediate issue is how to make science more popular and accessible to school children, especially girls.

In the longer term, we will need to explore how IT is changing the way young people think and learn, and indeed whether an increased facility with search engines, and more mobile, embedded IT might lead us to question just what students will need to memorise. In addition to IT are the increasing influences of drugs, both prescribed such as Ritalin, and proscribed such as cannabis, as well as new socio-economic influences that could influence how a child processes information. We must identify these factors, and how they are affecting learning and memory processes in the brain. We need to reach consensus on what the desiderata might be for the citizen of the mid-21st Century, and most important of all, how those desiderata will be delivered, and by whom.



### SA Case Study The Australian Science and Mathematics School (ASMS)

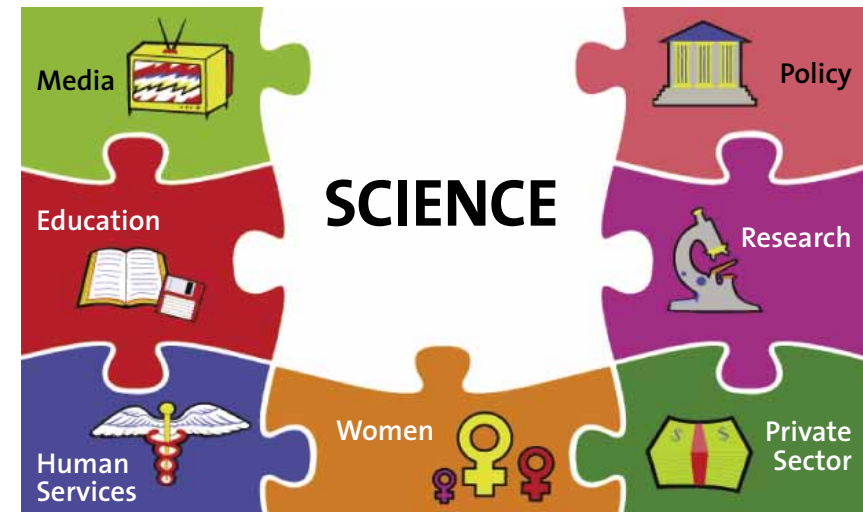
The ASMS is building science curricula for senior secondary students that specifically connect with the emerging learning of the new sciences. In particular, the partnership of the ASMS with Flinders University is developing programs in the emerging areas of science such as nanotechnology, neuroscience, aquaculture, biotechnology, laser science and communication technologies. ASMS students and teachers work alongside university professionals and industry researchers to develop curricula linked to the latest developments in the field.

## Science and Your Life

This report explores how science can interact with a range of different sectors. The reason why the particular sectors in this diagram were chosen is not only because they are fundamental cornerstones of daily life, but also because I have personal experience in working with them. Moreover, by relating science to these particular sectors, it is easy to map them on to the six objectives described above. This exercise is an appropriate way to look at mechanisms for science to relate to the bigger picture thus demonstrating science to be the central connector in the jigsaw of daily life!

## Conclusion

Soon after arriving in Adelaide, my agenda seemed very clear: to ensure that science was recognised as having the impact it does on the six objectives of South Australia's Strategic Plan. But more important was to identify ways in which science can be harnessed for maximum benefit. Accordingly, this report makes recommendations for applying science to sectors to which it previously may have had very little linkage. In order to enable the realisation and implementation of my vision the Premier's Science and Research Council approved funding to employ a Project Catalyst, Linda Cooper. This has worked brilliantly and meant that information and activities have been able to keep flowing constantly throughout my time as an Adelaide Thinker in Residence.

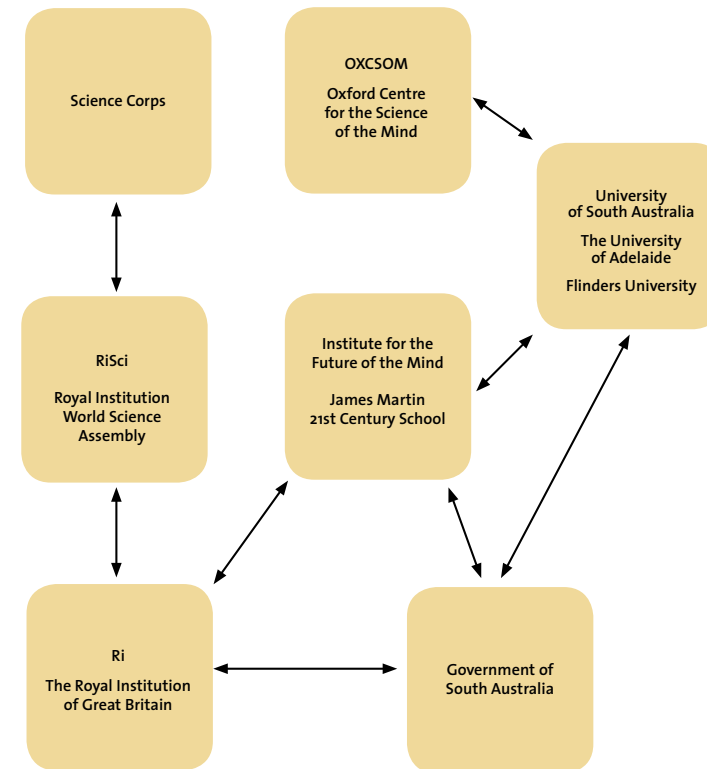


The purpose of this report is to outline specific strategies for progressing the positioning of science in the lives of the citizens of South Australia, and hence increasing their prosperity and quality of life. However to achieve this goal, it is necessary to retain and attract the very best scientists to work in the state, in both the private and public sector. Scientists put a premium on an intellectually stimulating environment. Perhaps the portfolio of initiatives recommended here will be an incentive not only for the 'consumers', the general public, but also for those who are essential to its success, the scientists. This report attempts to embed novel science-based initiatives in the *10-Year Vision of Science, Technology and Innovation in South Australia* (STI<sup>10</sup>), by addressing its three main goals: Building Capability and Infrastructure, Momentum through Collaboration and Developing People and Communities.

## Chapter 2 Momentum Through Collaboration

In the *10-Year Vision for Science, Technology, and Innovation* (STI<sup>10</sup>), the South Australian Government offers attractive opportunities for collaboration. Indeed, the concept of the entire *Thinkers in Residence* program can be viewed as an innovative experiment in collaboration with external sectors and/or individuals with no prior links to South Australia!

Figure 9 **Interconnections of Thinker in Residence Baroness Professor Susan Greenfield: Her Research, Public and International Activities**



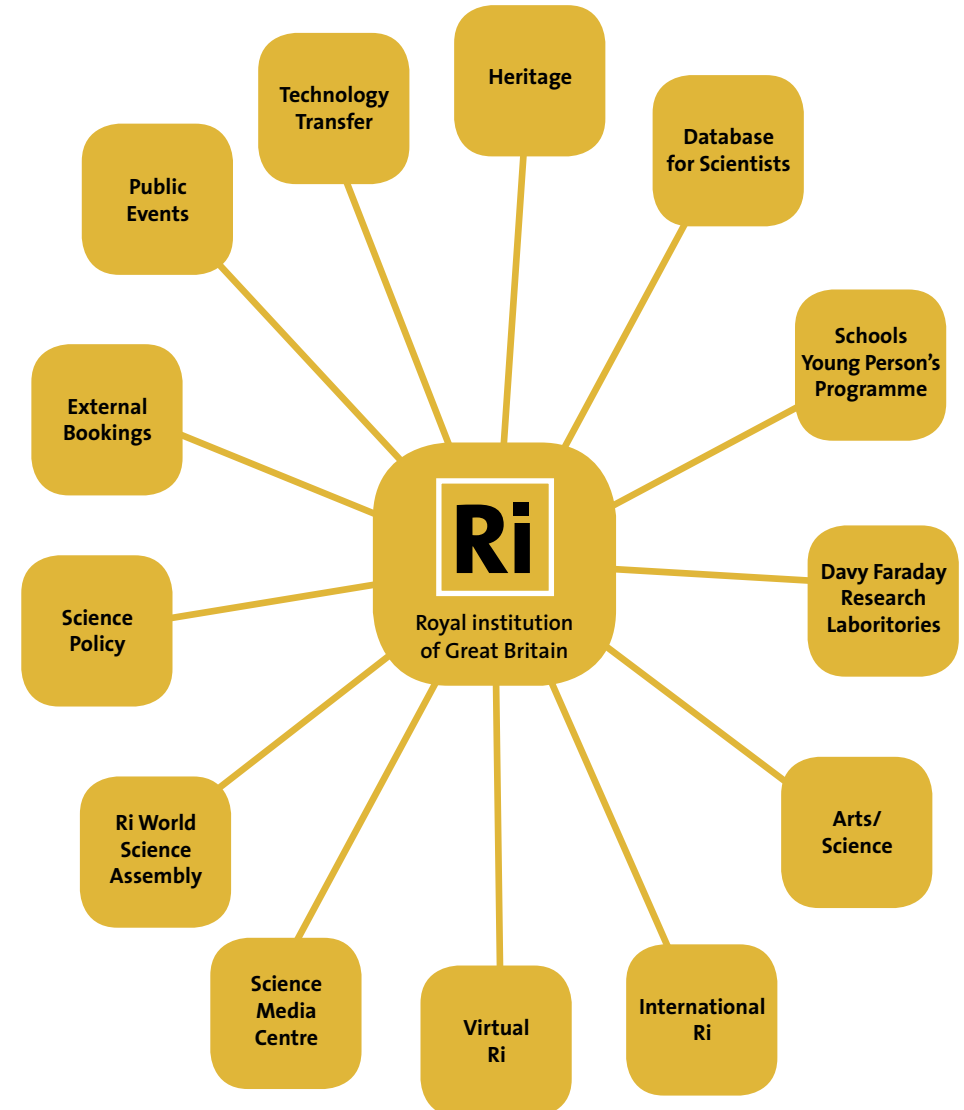
If the democratisation of science is to be achieved in South Australia then the most efficient route will surely be by collaboration with existing initiatives with comparable aims.

## The Royal Institution of Great Britain

[www.ri.ac.uk/](http://www.ri.ac.uk/)

The Royal Institution of Great Britain is the oldest independent research body in the world. For over 200 years, it has stood testament to the fact that the general public has an interest in science as a branch of human knowledge. More recently however, with the shift into the Information Age, and with the encroachment of technology on all areas of life, from reproduction to nutrition, this intellectual curiosity has quickened into a more immediate and practical interest. Fora, such as those at the Ri, give the public an experience and an opportunity for interaction that they can't gain from science reporting in either the print or broadcast media, nor indeed from popular science books. By attending public debates, lectures and discussions, any member of society can feel empowered to air the concerns and ideas that science and the new technologies are generating. Public fora give people a voice, a channel for acting on all the information they have acquired. In this way science can be democratized and become the responsibility of everyone, not just a handful of specialists. It is a common boast at the Ri that visitors should find events there as appealing as an evening at the cinema, and that they should leave excited and worried in equal measure: above all we hope that as people return home they will be arguing with each other, thrashing out the merits and otherwise of what has been said. Only then will we have an intellectually healthy society.

During my first period of residency, it soon became apparent that the lessons we were learning at the Ri could be applied to advantage in Adelaide. First, the city has a tradition of festivals: the community is experienced at organizing public events, and clearly has a taste for attending them. The capacity audiences at the most recent *Festival of Ideas* 2005 speak for themselves. Second, the relatively compact size of the city means that locations can be identified within easy reach, and, as with the small British cities of Oxford and Cambridge, the city can possess an atmosphere of concentrated intellectual excitement. Third, the current Premier and government, as with their counterparts in the UK, are anxious to democratise learning and hence improve the lives and prospects of all South Australians.



Activities of the Royal Institution of Great Britain

# Bragging rights

My current projects both in London and Oxford are obvious partners in collaborative projects linking South Australian STI with public and media, education and political sectors, as well as with scientists and scholars at an international level.

This chapter discusses collaborations between my activities in the UK and in Adelaide, some already underway, others with great potential.

## I. Bragg Initiative

- a. Bragg about Adelaide - Exhibition
- b. Spirit of Science - Bursaries
- c. Bragg Documentary
- d. Davy-Faraday Laboratory
- e. 'Dawn to Dusk'
- f. World Science Assembly
- g. Science Corps

## II. Oxford Centre for the Science of the Mind

## III. James Martin 21st Century School

## I. Bragg Initiative

A wonderful yet little known link between the Royal Institution (Ri) of London and South Australia has existed for over a century in the form of William and Lawrence Bragg. This father and son research team discovered and developed X-ray crystallography which led to the development of molecular biology and the mapping of the genome.

It was in Adelaide that William first seriously contemplated the research that launched his international career and where Lawrence was born and educated, enrolling at the The University of Adelaide at the early age of 15 and graduating in 1908 with first class honours in Mathematics.

The Braggs left Adelaide for the UK in 1909. There they developed ideas they had fostered in Adelaide, and rapidly cemented their position as leading figures in science. Together they established two of the most important X-ray crystallography laboratories in the world and their work was rewarded with the Nobel Prize for Physics in 1915.

William became Director of the Ri while Lawrence went on to direct the Nobel Prize-winning work of Francis Crick and James Watson on the structure of DNA using X-ray crystallography techniques. Lawrence moved to the Ri in 1954 and continued the tradition of research established by his father.

The Bragg name therefore offers a highly appropriate means for branding the collaboration between the Ri and South Australia on projects of mutual interest and benefit. The following initiatives, listed in order of ease of implementation, show the diversity and potential of working together. This list is far from exhaustive!

The very special historical link between Adelaide and the Ri provides a fortuitous conceptual umbrella for a range of collaborative projects of mutual benefit to both. Inevitably, some initiatives are more

feasible than others, but a pipeline could be established whereby the number of on-going projects is gradually increased. However such an ambitious and far-reaching plan can only be realised with committed staff and appropriate leadership. To this end, Mr Robert Champion de Crespigny has graciously consented to act as Chairman of the Bragg Initiative. He will therefore be in a pivotal position to coordinate the showcasing and realisation of all the Bragg initiatives.

It is of great historical significance that in December 2004, Minister Jane Lomax-Smith was able to announce the heritage listing of Bragg House, East Terrace, Adelaide. This building was designed by William Bragg for his family in 1899. This resource has enormous potential in developing connections represented by the Bragg Initiative. This building has the capacity to attract people from all across the world who are interested in the history of science.

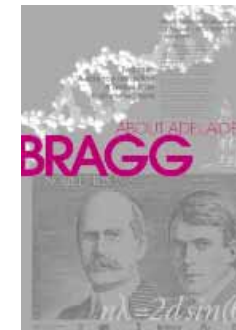


Bragg family at home, corner East Tce and Carrington St, Adelaide, ca 1902 (courtesy Dr S. Bragg)

## I.a. Bragg About Adelaide - Exhibition

*Working with South Australian Tourism Commission, South Australian Museum, Royal Institution of Great Britain, The University of Adelaide, South Australian Partnership for Advanced Computing (SAPAC).*

The exhibition *Bragg About Adelaide* provided an overdue opportunity to acknowledge South Australia's scientific heritage and innovative thinking.



*Bragg About Adelaide* drew upon the Ri's collection of Bragg-related papers, artefacts and memorabilia, to tell the remarkable story of father and son. This material was matched by content sourced from the The

University of Adelaide, personal collections and the SA Museum. For example, in the summer of 1906/07 Lawrence Bragg found a cuttlefish bone at Glenelg he did not recognise and took it to Dr Verco at the Museum who subsequently identified it as new to science. It was eventually named *Sepia braggi*.

The exhibition and its accompanying publications and programs explored the Braggs' life in Adelaide, their work in the UK, and the contemporary applications of their science today.

*Bragg About Adelaide* was launched by the Premier on August 11, 2005. In addition to the exhibition, a historical seminar about the life



## Chapter 2 Momentum Through Collaboration

Susan Greenfield | *Getting to the Future First*

### Professor Frank AJL James



Frank AJL James is Professor of the History of Science at the Ri, London. In August 2005 Professor Frank James spent two weeks in South Australia promoting the Bragg Exhibition. He has written widely on science and technology in the nineteenth century and how they relate to other areas of society and culture. He is particularly interested in the processes by which knowledge created in a laboratory is applied in practical situations, an area where the Ri plays an enormous role. He is editor of the correspondence of Michael Faraday and recently published *The Common Purposes of Life* – a collection of essays on the Ri. He is currently President of the Newcomen Society for the History of Engineering and Technology and has been nominated to be President of the British Society for the History of Science from July 2006.

and times of the Braggs was coordinated by the Royal Society of South Australia. Held in the original dwelling of the Braggs in East Terrace this seminar brought together for the first time the Australian and UK history of science experts, Prof Frank James and Prof John Jenkin, to share with an enthusiastic audience their knowledge of the personal lives of these science heroes.

### Professor John Jenkin



Professor John Jenkin studied physics at The University of Adelaide and is one of Australia's leading historians of science. He specialises in the Braggs. He completed his PhD in nuclear physics at the Australian National University, followed by postdoctoral appointments at the Atomic Energy Research Establishment in England and the University of Minnesota in the USA. In 1968 he was appointed to La Trobe University in Melbourne, where he has spent the remainder of his career: twenty-five years in the physics department and seven years in the history & philosophy of science program in the arts faculty. He is currently preparing a joint biographical study of William and Lawrence Bragg, with an emphasis on the Australian period. John assisted enormously in the development of the Bragg Exhibition and has agreed to advise on the production of the Bragg Documentary.

The exhibition was accompanied by the publication of a substantial booklet of essays compiled by the Project Catalyst team on the history of the relevance of the Braggs' work and the importance of the Adelaide/Ri connection.

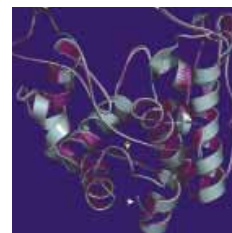


Image courtesy of M. Himrova, Plant Molecular Biology, 2004.

*Bragg About Adelaide* enjoyed a high profile location in the main foyer of the Museum from August 11 to October 3, 2005. It is estimated that approximately 112,000 visitors passed through the Museum during this time.

Complementing *Bragg About Adelaide* the South Australian Partnership for Advanced Computing (SAPAC) staged a short presentation in its newly completed VisLab. *The Braggs in Perspective* outlined the influence of the Braggs and their science, especially on the discovery of the structure of DNA. This display incorporated contemporary Bragg-related stereographs as well as specially-developed explanations of X-ray crystallography, demonstrations of modern molecular analysis using interactive models and stereographic imaging as well as segments of a documentary film produced in 1965 to celebrate the 50th anniversary of the Braggs' Nobel Prize. The presentation attracted about 300 visitors over 40 performances. Importantly, the collaboration between the SA Museum and SAPAC has led directly to discussions about how SAPAC might support future exhibitions at the Museum to promote public awareness and understanding of science.

The Bragg Exhibition clearly offered a highly tangible example of collaboration between the Ri and Adelaide in a form that benefited the community of South Australia, both scholars and the general public alike. At the same

time, the Ri welcomes and benefits from the opportunity for such international outreach. Such an endeavour is far from being a one-off. In successive years, with more lead-in time, it might be possible to mount more ambitious exhibitions with even more valuable and fascinating Ri/Bragg artefacts, lent to Adelaide perhaps for the months of July and August, when there is the lowest footfall in the premises in London.

Similarly, there is the potential for a temporary exhibition of Bragg artefacts and memorabilia currently in Adelaide to be displayed at the Ri. It is of particular significance in this regard that the Ri will undergo a major refurbishment in 2006, funded significantly by the UK Heritage Lottery Fund. The new facilities will be designed to emphasise the unique past of the Ri and to showcase how the work done by its Directors, including the Braggs, impacts on 21st Century life. There is enormous potential for South Australia to be showcased in these state-of-the-art exhibition spaces.



Perspective of Atrium Exhibition Area showing interpretation of iconic apparatus and heritage.

## Chapter 2

### Momentum Through Collaboration

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The Ri has appointed acclaimed architect Sir Terry Farrell who has devised a masterplan to showcase the Ri's magnificent architectural and collections heritage whilst widening access to accommodate our increasingly diverse audience. Key elements of the Campaign include: the construction of a new Energy Atrium; restoration of the famous Faraday Lecture Theatre; restoration of a stunning 18th century staircase (the 'Sad' Stair); re-interpretation of Faraday's Laboratory; comprehensive conservation, treatment, storage and display of the Ri's vast collection of original scientific apparatus, archives, portraits and furniture associated with those who have made scientific history in the building.

#### I.b. SpiRit of Science: Bursaries

*Working with Department Premier and Cabinet, Department of Education and Children's Services, Qantas, Myer.*

[www.scimas.sa.edu.au/scimas/pages/updates/projectdetails/](http://www.scimas.sa.edu.au/scimas/pages/updates/projectdetails/)

The SpiRit of Science is an initiative that allows a group of 10 students from Department of Education and Children's Services (DECS) schools, to attend the Christmas Lecture Series at the Ri in London during December 2005.

It is particularly important to provide first-hand opportunities for young people from low socio-economic communities to experience the wonders of science, to connect them with eminent thinkers and with their heroes, and to inspire them to see science as a possible pathway for their own learning and careers.



If this initiative is successful, the South Australian Government will work with the Ri to investigate future connections of this nature.

The Ri Christmas Lectures are an educational program dating back 125 years to the 1820s when Michael Faraday, Director of the Ri, initiated the first lecture series, establishing an exciting new venture of teaching science to young people. He presented a total of 19 series. The Lectures are held annually and are the flagship of the Ri. They serve as a forum for presenting complex scientific issues to young people in an informative and entertaining manner.

In 2005, the Christmas Lecture series investigated the Science of Food, and commenced with a Boxing Day event incorporating the preparation and scientific interpretation of Christmas Lunch.

[www.rigb.org/rimain/events/christmaslectures.jsp](http://www.rigb.org/rimain/events/christmaslectures.jsp)

#### I.c. Bragg Documentary

*Working with Department Premier and Cabinet, Department of Education and Children's Services, South Australian Film Corporation, Royal Institution of Great Britain.*

Why is so little known about the unique partnership of the Braggs that had its roots in South Australia? In 2005, ninety years later, the time is right to celebrate these individuals and the extraordinary impact their work has had on the world. It is proposed that a one hour made-for-television documentary be produced to celebrate the Braggs' contribution to scientific discovery. In addition to broadcast material, an interactive DVD will be developed for schools and available in both Australia and the UK.

The aim is to create national and international recognition for the legacy of their work and a place in South Australian popular history and culture for the Bragg name and scientific achievements.

The documentary will explore the Braggs' unique story in its historical and geographical perspectives, including the examination of cultural and political influences in both the colony of South Australia and the rest of the scientific world in the early 20th Century.

This will provide a reference point from which to navigate the impact of X-ray crystallography in the ensuing ninety years and its modern day relevance.

The project will be developed and produced in collaboration between a South Australian team and the Royal Institution in London. The

Royal Institution holds a major collection of works and memorabilia concerning William and Lawrence Bragg. These resources will be invaluable in realising the documentary and the Ri is very keen to participate and contribute in whatever ways may be considered appropriate.

#### I.d. Davy-Faraday Laboratory

[www.ri.ac.uk/DFRL/](http://www.ri.ac.uk/DFRL/)

As an integral part of the Royal Institution of Great Britain, the Davy Faraday Research Laboratory (DFRL) is at the forefront of research into the chemistry and physics of materials. The scientific insights gained through this research reveal the chemical, magnetic, electrical and optical properties of new materials that are the building blocks for the development of the next generation of technological devices and applications. These technologies may be applied across a number of industrial sectors including computing, telecommunications, aerospace, military, and the environment.

Collaborative research links could be established between the scientists in the DFRL and the chemistry departments in the three universities in South Australia. Such collaboration could take the form of short-term visits by senior scientists during the respective summer months of each hemisphere through to fellowship exchange schemes or post-doctoral students and even bursary/scholarship schemes for graduates.

## Chapter 2

### Momentum Through Collaboration

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#### I.e. 'Dawn To Dusk'

The Ri has an outstanding public program. Some of these events could be associated with Adelaide. Thus the public could have access to cutting-edge science via lectures, panel discussions and debates in formats and terminology comprehensible to the non-specialist.

It would clearly maximise the impact of these events to extend their outreach internationally, between Adelaide and Albemarle St. The following possibilities should be explored:

- (1) Pooling of expertise and ideas between the two centres to give the most comprehensive and appealing coverage of subject matter and format.
- (2) On-line web streaming of events in Adelaide and the Ri, allowing audience participation across the world, eg mid-day in UK, evening in Australia, or evening in UK, breakfast in Australia, 'Dawn to Dusk'.
- (3) Off-line access for all via a committed web-site of events in both locations, for a limited period of time, eg a month.
- (4) Exchange scheme whereby a speaker from the 'Friday Evening Discourse' series speaks at a comparable event in Adelaide, and conversely, a South Australian scientist delivers one of the Discourses at the Ri.
- (5) Pooling of expertise and ideas between the two centres to give the most comprehensive and appealing coverage of subject matter and format.

These potential linkages could be developed utilising the increased bandwidth of online environments made available to research

institutions through Australia's Research and Educational Network (AARNet). AARNet focuses on collaborations, teaching, leading and research by connecting people to Internet resources anywhere, anytime. This could be facilitated through South Australia Partnerships in Advanced Computing (SAPAC), representing each of the state's universities and has the potential to create 'global cyberfora' with other like-minded international institutions.

#### I.f. World Science Assembly

The Royal Institution World Science Assembly (RiSci) is an independent London and New York-based non-profit organization formed by a joint venture of the Royal Institution of Great Britain and The Ulanov Partnership, the longest established international strategy and management consultancy for non-profit organizations. RiSci uniquely works at the highest levels of global leadership to bridge the gap between the science and policy communities through effective convening and translation. RiSci is guided by the 40 members of its Organizing Committee, comprised of distinguished scientists and policy makers from around the world, chaired by Baroness Professor Susan Greenfield.

Globalizing the work of the Ri, RiSci works to determine effective ways for the world's most senior scientific and political leaders to address critical global issues at the intersection of science and public policy. Their first initiative, the Pandemic Preparedness Project, emerged from consultations with Organizing Committee members and other key advisors around the world, who collectively pointed to the then-muted threat of an influenza pandemic as

indicated by the spread of H5N1.

RiSci launched its Pandemic Preparedness Project in March 2005, citing a lack of adequately coordinated global preparation for what leading scientists fear is an inevitable outbreak of a deadly flu pandemic that could rapidly kill up to tens of millions of people. RiSci convened a project Steering Committee of highest-level researchers, decision makers, and industry leaders to guide the project, which is currently in its third phase. In Phase One, RiSci brought together *Nature* and *Foreign Affairs* magazines in an unprecedented collaboration to publish special issues on the avian flu threat (in May and July 2005, respectively) and to create web content to provide journalists, scientists, policy makers, and the educated public with critical information and policy recommendations. The publications led to a series of high-level briefings for policy leaders conducted with the Council on Foreign Relations and the Asia Society.

In Phase Two, RiSci convened a global virtual workshop conducted across Europe, Asia, Africa, and North America on 5-7 July 2005 that brought together over 60 top scientists, policy makers, and industry leaders to develop action plans and partnerships for four specific initiatives: policy communication, medical interventions, disease modelling, and national preparedness planning. Since then RiSci has worked to develop these initiatives. In Phase Three, we will advance a blend of these projects in partnership with other organizations, including the Nuclear Threat Initiative, the Sloan Foundation, and others.

#### I.g. Science Corps

The Science Corps (SC) will be a network of scientists who will harness advances in science to improve the quality of life for those in countries which have yet to benefit from these advances, leading to improvements in sanitation and clean water through to improved literacy, reduced eco-damage and increased GDP.

Through this network, the SC aims to introduce a new component to the lives of scientists in the West. The initiative will aim to attract scientists in mid-career, who might well find themselves, for different reasons, personal and professional, in a rather stale and jaded mindset. By experiencing a completely new scenario, of 'thinking outside the box', not only will they bring a valuable component to the developing world, but they will receive huge benefits. Despite the myriad of aid packages the one component conspicuous by its absence is science innovation actually on the ground.

Meanwhile, for scientists to experience a situation where resources aren't readily forthcoming and they have to improvise and think laterally, would bring about an enormous change in attitude when they returned to their universities. The scientists could be of any age, but emphasis will be placed on original thinking, and having a skill set already in place. Part of the funding for the SC would be for provision for a further two year grant once a scientist returned home. It will also aim to encourage expatriated scientists to return to their home countries to support their research base.

## Chapter 2 Momentum Through Collaboration

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### II. Oxford Centre for the Science of The Mind (OXCSOM)

[www.oxcsom.ox.ac.uk](http://www.oxcsom.ox.ac.uk)

OXCSOM is constituted from research in six departments of Oxford University: Anatomy, Pharmacology, Philosophy, Physiology, Theology and the Uehiro Centre for Practical Ethics. Using imaging technology we study the activity of the brain under different conditions to assess how belief systems – whether religious, spiritual or other – are formed and how they influence an individual's momentary subjective state of consciousness.

The Oxford Centre for Science of the Mind, of which I am the Director, will provide a multidisciplinary program of research into the physical basis of beliefs and subjective experience. By drawing on an unprecedented range of disciplines and harnessing cutting-edge expertise, the collective insights gained, initially as a two year pilot study funded by Templeton, could consequently inspire the development of highly innovative yet practical approaches for promoting well-being, and ultimately, maximizing individual human potential.

The benefits of collaborating on the OXCSOM project are at two levels. The first is at the current pilot stage, whereby South Australian researchers could contribute to the intellectual capital of current studies, gaining in return appropriate recognition and forging innovative academic links that would not otherwise have been possible or even imaginable.

At the second level, if the collaboration proves fruitful, centres in South Australia could be co-applicants on the full grant application for a more ambitious project currently envisaged in the range of US \$10m.

Whilst this particular project may seem to have no immediate benefits to sectors beyond academe, the value to the wider community could be considerable:

- More research income into the state, hence higher ranking in federal statistics, in turn increasing potential for further funds
- Raised profile of South Australia as an intellectual hub
- Media and public attention to subjects being studied
- South Australia offering an exciting intellectual enticement to attract top thinkers and scientists to relocate to Adelaide

An initial meeting, coordinated by the South Australian Neuroscience Institute (SANI), was held on 12th August 2005 at The University of Adelaide, to discuss possible collaboration between neuroscientists, philosophers, and psychologists in South Australia with their counterparts at Oxford University.

### III. James Martin 21st Century School

[www.21school.ox.ac.uk](http://www.21school.ox.ac.uk)

The innovation that is the 21st Century School has been made possible through the unique foresight of James Martin. His commitment

to this project makes him one of the most significant drivers of academic enterprise today. James Martin is founder and chairman emeritus of Headstrong, a global consultancy that helps leading companies worldwide create real business values from digital technologies. Known as 'the Guru of the Information Age' he is widely recognised as an authority on the social and commercial ramifications of computers and technology. The very generous support that has made the 21st Century School a reality is his second major benefaction to the University of Oxford. It builds on the work of the James Martin Institute for Science and Civilization, which has already established itself as an influential force.

The scale of the 21st Century School is possible because of the extent of the ambition that the School sets for itself: to foster new thinking that will tackle the pressing issues facing the world today. But, typically of the man whose great generosity has made it possible, the School sets out to achieve its aims in an imaginative and innovative way, stimulating research within and across many disciplines. The School will comprise a Hub and changeable Spokes. The Spokes are Research Institutes, each undertaking leading-edge research in its own subject area. The Hub will consist of the Director of the School, a small administrative staff and a number of James Martin Fellows. The School will support some ten Fellows a year from both within and without the University through the James Martin Fellowship Scheme. This will enable them to take time to work on an issue associated with the future, with the commitment that one of their outputs will be a paper in the School's publication series. In this way, it is hoped to build up a network of 'future

thinkers' in the University, and a set of relevant publications.

The 14 Institutes of The James Martin 21st Century School include:

**The James Martin Institute for Science and Civilization**  
Director: Professor Steve Rayner

**The Institute for the Future of the Mind**  
Director: Baroness Professor Susan Greenfield

**The Oxford Institute of Ageing**  
Director: Dr Sarah Harper

**The e-Horizons Institute**  
Directors: Professor William Dutton and Professor Paul Jeffreys

**The Institute for Emergent Infections of Humans**  
Director: Professor Angela McLean

**International Migration Institute**  
Directors: Professor Steve Vertovec and Professor Stephen Castles

**The Oxford Future of Humanity Institute**  
Director: Dr Nick Bostrom

**The Programme on Ethics of the New Biosciences**  
Director: Professor Julian Savulescu

**The Environmental Change Institute**  
Director: Professor Diana Liverman

**The World Education Institute**  
Directors: Dr Thomas Benson and Dr Angus Hawkins

## Chapter 2 Momentum Through Collaboration

Even aside from my personal involvement with the Institute for the Future of the Mind, the possible participation of South Australian stakeholders in other initiatives are wide-ranging. On a broader canvas still, it is possible that the big questions of climate change, demographics, infectious diseases, ageing, and e-commerce could all inspire collaborative projects at the international level. This potential is even more valuable in the light of the conviction of James Martin that the School should be much more than a mere 'talking shop'. It is possible, indeed planned, that the work arising from the School will lead to practical innovations that enhance the lives of generations to come. If South Australia was part of this vanguard, the prosperity and lives of its citizens would correspondingly be enhanced. Indeed, the relatively small population size of the State would make the participation of South Australia attractive as a community for pilot study.

On the more specific issue of collaborations with the Institute for the Future of the Mind, an immediate possibility is to join in the 21st Century education project led by senior researcher Dr Martin Westwell, who has been appointed to lead and manage its educational components. If a joint consultative report could be prepared by say June 2006, it could form the basis of debate in both the British Parliament (House of Lords) as well as the State and Federal Parliaments in Australia.

A meeting was held on August 3, 2005 to explore how the education, social services, and academic sectors in South Australia might benefit from, and enhance the work of the

Institute for the Future of the Mind.

### Conclusion

**Science is a vehicle for collaboration.**

There are obvious and natural connections between my activities in the United Kingdom and in South Australia. The twin sites of the Ri and Oxford offer wide potential for mutual benefit when linked up with their respective counterparts in South Australia.

## Chapter 3 Developing people and communities

This chapter focuses on specific, science-related schemes that could enrich the lives of the wider community of South Australia in a variety of very different ways. The schemes listed below were set in train during my residency.

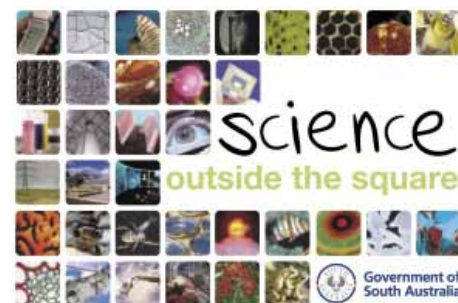
### IV. Science Outside The Square

#### V. Twinning Scientists With Teachers

#### VI. Women in Science, Engineering and Technology

### VII. Health and Community Services

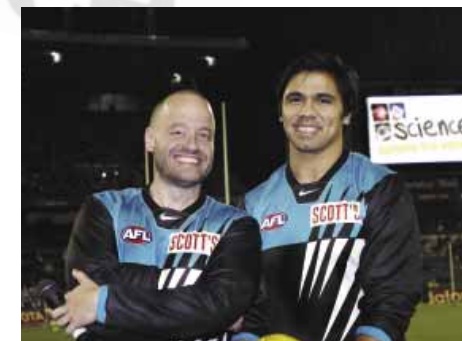
- Seminars on the Young Brain
- Volunteering for Science
- Open Day on Ageing



### IV. Science Outside The Square

[www.science.sa.gov.au](http://www.science.sa.gov.au)

*Working with Port Adelaide Football Club, the Premier's Food Council, Australian Institute of Physics, South Australian Museum, South Australian Neuroscience Institute, Australian Society of Medical Researchers, the Premier's Roundtable for Sustainability, Children, Youth and Women's Health Services, Alzheimer's Association (SA), The University of Adelaide, Flinders University, the University of South Australia, The Advertiser and Network Ten.*



Adam Spencer and Che Cockatoo-Collins at AAMI Stadium for the 'Science of Sport' event. Photo by Sarah Long.

We have seen in previous chapters how a potential crosstime and hemisphere zone 'Dawn to Dusk' collaboration between the Royal Institution (Ri) in London and Adelaide would provide a very exciting way for the public to access all forms of science. However, this would just be a start and there are many ways in which Adelaide can generate its own program of events similar to the Ri.

One idea that arose during my 2004 residency was that South Australia could serve as an exemplar community where '100% of people go to university', albeit, as with the Ri, at week-ends and evenings.

This proposal led to the planning of a pilot series of public science events initially named 'The Community University'. However because the very mention of the word 'university' can still act as a deterrent, sadly, within certain communities, the more abstract, punning title *Science Outside The Square* was adopted. During the implementation phase following the 2004 residency, the Project Catalyst Linda Cooper was in touch with the Head of Events at the Ri, Gail Cardew, who visited Adelaide briefly in February 2004. In April 2005 Ms Cooper visited the Ri to witness first-hand the strengths and weaknesses of our program, for the final planning of the pilot that was then launched in Adelaide during the second period of my residency, in July 2005.

*Science Outside The Square* was a successful pilot series of science-themed events, designed to be topical, controversial, and interactive, to bring science and scientists to public life and to capture the imagination of a broad audience. All the events created opportunities for community opinions and attitudes to be expressed and discussed.

The topics were selected through broad consultation and represented high interest subjects that tended to hit media headlines, generate interest and link to science research priorities for South Australia. The venues were chosen with a view to bring scientists out of the universities and laboratories to engage



'The Wonder Years' event, St Peter's Cathedral.  
Photo by Sarah Long.

with the community. Venues not usually associated with science activity were selected and included a football stadium, a pub, a church, the National Wine Centre, a technical college, a theatre, football clubs and an art gallery. A regional venue and areas in outer metropolitan Adelaide were also selected. Partners were brought in to assist with the coordination of each event. Supporters assisted with the promotion of the respective event through their own networks and were represented at each event. A working group and marketing group were formed to provide advice on programming and implementation of this initiative and included representatives from the Premier's Science and Research Council, Festival of Ideas, Department of Further Education, Employment, Science and Technology, South Australian Neuroscience Institute, National Science Week, Australian Society for Medical Research and local universities. An events contractor, Michels Warren, was employed to implement the

### Impact Of Science Outside The Square

The *Science Outside The Square* program was unique, not only for being the first of its kind in South Australia, but also for some of its more innovative elements including:

- i) a 3D full body scan of the captain of the AFL football team Port Power, Matthew Primus
- ii) media personality, mathematician and comedian Adam Spencer explaining *The Science of Sport* in a 4 minute video which was played at AAMI Stadium during half time at an AFL game
- iii) Extracting DNA from fruit at the *Food and Drink - the Sustenance of Life* event
- iv) An interview with NASA astronaut Col Pamela Melroy and a link with Adelaide's own Dr Andy Thomas in space at the *Shortcut to Space* event
- v) The Hon. Dr Jane Lomax-Smith MP facilitating the *Genes of Bragg* event
- vi) A sell-out crowd with not even standing room left at the *Science of Art* event
- vii) Radio SAFM's breakfast host, Lehmo, hosting the *Demystifying Depression* events.
- viii) *The Wonder Years* - a science event taking place in a cathedral
- ix) *Memory Changes* - an event in conjunction with International Alzheimer's Day

Attendance at the events demonstrated their terrific impact:

- There were 27,455 people at the first event - *The Science of Sport* - AAMI Stadium surely a record for any science event anywhere!

- *Food and Drink - the Sustenance of Life* at the National Wine Centre sold out at 200 people
- *A Shortcut to Space*, Investigator Science and Technology Centre, Regency TAFE - 370 people
- *Genes of Bragg*, Scott Theatre, The University of Adelaide - approximately 200 people
- *The Science of Art*, Governor Hindmarsh Hotel - sold out at 240 people; with 20 extra 'standing room only' tickets sold. 60 tickets sold at the door within 20 minutes
- *Demystifying Depression* - Elizabeth 70 people, Mt Gambier 60 people, Noarlunga 80 people
- *Energy Options* - 170 people, The University of Adelaide (it was Father's Day)
- *The Wonder Years* - 110 people, St. Peters Cathedral
- *Memory Changes* - 140 people, Art Gallery of South Australia fully booked 2 weeks in advance

#### Feedback

Evaluation Forms were distributed at the conclusion of each event. Over 100 forms were returned. Here are some of the comments:

'Put these lectures on TV or DVD'

'As a person who left school aged 15 with very poor grades and considered a dummy, I now find this kind of opportunity enlightening'

'More, more, more! Give it funding!'

'Food for the brain'

'Unexpectedly enjoyable - science is usually boring'

## Chapter 3 Developing People and Communities

Susan Greenfield | Getting to the Future First

events under the direction of the Project Catalyst team. This project was highly collaborative in nature, bringing together groups within government, science, media and the community who do not normally connect. The potential to build networks through this project is considerable.

### Summary

The attendance figures of *Science Outside The Square* testify to the interest that people have in science-related issues. Moreover, they provide a clear complement to the humanities and arts-based public events that characterise Adelaide life. If we can develop a continuing program for *Science Outside the Square* then each session, from the Ri and Adelaide, could add leverage to each other by developing a highly interactive agenda where we can have webcasting or webstreaming, and collaborations as to what programs to implement.

### V. Twinning Scientists With Teachers

[www.sciencetwinning.org.au](http://www.sciencetwinning.org.au)

*Working with the Australian Science and Mathematics School, (ASMS), CSIRO, SA Science Teachers' Association, the three universities, Tall Poppies, and SA Government.*

If we are to ensure we are benefiting as much as possible from all science has to offer, whilst minimizing the risks it poses, then we need to develop a scientifically literate society. In such a society, a large number would embark on careers related in some way to science and technology, whilst those who did not would still have a healthy interest in and informed view of, the current technologies

and their potential for both good and ill. It is imperative therefore that the teaching of science in schools can engage young people to the maximum, according to their individual inclinations. Yet science teaching in South Australian schools is not yet reaching this target.

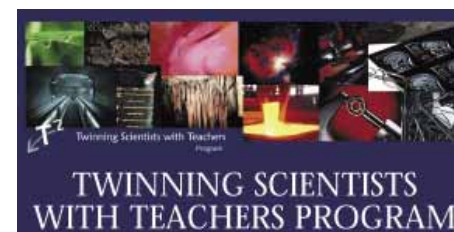
The recent national report *Who's Teaching Science? Meeting the demand for qualified science teachers in Australian secondary schools* by Kerri-Lee Harris, Felicity Jenz and Gabrielle Baldwin, of the Centre for the Study of Higher Education at the University of Melbourne for the Australian Council of Deans of Science released in January 2005, concludes:

*The results...highlight the growing need to attract more people to the study of chemistry and physics at tertiary level, and to provide these students with both the training and incentives to pursue teaching careers in secondary schools. Secondary schools report current and increasing difficulty in attracting and retaining suitable qualified teachers in both these disciplines. Indeed a large proportion of current teachers of senior school chemistry and physics lack a major in the discipline – the minimum level qualification deemed satisfactory by most heads of secondary school science departments. The shortage of suitable qualified science teachers is likely to be exacerbated in the coming years as the bulge of 'baby boomers' approach retirement age.*

*More broadly, the study's findings reveal a high level of disillusionment among science teachers, evident in the ambivalence of many towards remaining in the profession...The evidence from this study is that teaching science in schools is currently considered to be a less glamorous*

*alternative than working in industry and certainly a less financially rewarding one...Part of the sector's challenge therefore, is to raise the appeal of teaching and of teaching science in particular.*

The study makes a series of suggestions to attract and retain suitably qualified science teachers. These include opportunities for continuing involvement in research and/or applied science specific to their discipline. Possibilities raised by teachers included time-release to undertake work in research institutes or industry, and more science-specific professional development workshops with the aim to keep teachers abreast of progress in their science discipline.



The need to engage more schoolchildren in science is truly a problem. One important factor that is often omitted from the discussions of syllabi, exams, qualifications, and funds, is the morale of the teachers. Surely if teachers were excited by their subject, such enthusiasm would transmit automatically to their pupils. Currently many science school teachers feel undervalued, over-audited and most crucially, the poor relations to the scientific community at large. One novel way forward to help combat

the problems of lacklustre science teaching and hence poor science take-up in schools, is to explore a way of re-empowering science school teachers, making them feel like 'real' scientists.

The *Twinning Scientists with Teachers* program recognises that relationships are at the heart of learning. It enables scientists from universities and research organisations to be linked or 'twinned' with teachers of science from Reception to Year 12. This one to one 'pen-pal' arrangement will create informal professional development opportunities for both scientists and teachers. The scheme will be designed to allow the correspondence to take place without over-regulation or auditing to encourage open-ended and enthusiastic exchanges. The 'twinning' will take place on a website – similar to a 'dating service'. Scientists can register online with a description of their area of science research and interest. Teachers can then view these descriptions and register to be 'twinned' with their selected scientists.

The *Twinning Scientists with Teachers* program has become a key component of work with teachers in DECS Science and Mathematics Strategy. Over 120 scientists from research organizations, universities, and hospitals in Adelaide have already registered their interest in participating. Considerable interest has been shown by Australia's education and science sectors in broadening the program to achieve a national reach through the involvement of CSIRO. There are tremendous opportunities for extension activities to occur between individual groups of teachers and science research organisations. Indeed an example of this occurred recently.

#### Case Study Science Teachers Visit CSIRO Labs

Nine South Australian science teachers participated in a one week intensive visit to the CSIRO's Preventative Health (P-Health) laboratories across Australia in November 2005. This prestigious activity allowed the teachers to see the most recent application of technologies in biology, mathematics and biomedical research and how the national flagship program operates.

The project, an initiative of CSIRO and DECS with the collaboration of the Australian Science and Mathematics School, is part of a year long action learning program within the DECS' *Science and Mathematics Strategy*.

Accompanied by CSIRO P-Health Flagship Director, Professor Richard Head, who helped develop the project, the group visited various multidisciplinary research teams in Food

Science Australia at Werribee and Parkville in Victoria, Molecular Health Technologies at North Ryde in New South Wales, the CSIRO Discovery Centre in Canberra, e-Health Research Centre in Brisbane and Human Nutrition in Adelaide. Dr Head said: 'We don't want to make everyone a scientist, but we critically need a pool of talented science researchers from which to build our next generation of scientists if Australia is to hold its place globally'.

#### Feedback

*'A fantastic experience to see, talk to, and learn what is currently being done in CSIRO and take some of this back to the classroom. Having attended all sorts of conferences, professional development exercises over the years, this one, without a doubt, would have to be the best...'*

**From a teacher of 30+ years experience, Secondary Chemistry teacher and SSABSA Chief Examiner in Chemistry**

In addition, Gail Cardew, Head of Programs at the Ri, is committed to support the *Twinning Scientists with Teachers* program and hopes to engage directly with the website to extend the idea of twinning, so that the teachers and scientists are not only twinned with each other in Australia, but also with people in the UK. There are many opportunities for future flexibility to the program, including the recruitment of UK scientists through the Ri's extensive list of speakers and programs.

The website has been developed by a Year 12 student, Victoria Haar, from the Australian Science and Mathematics School, who are also hosting and managing the site. Its development has been overseen by the Project Catalyst Twinning Subcommittee of the Project Catalyst Advisory Group. Funding to support the part-time 12 month position of 'webmaster' to maintain the *Twinning Scientists with Teachers* program was provided by the Department of Premier and Cabinet.

#### Summary

The advantages of the *Twinning Scientists with Teachers* program are indisputable. First it provides leverage to study science for school children as well as invigorating and exciting teachers. All this can be achieved at minimal cost and there are reciprocal benefits to both the student and the teacher. Scientists will benefit in that they will develop a broader outlook and the teachers will benefit because they will be plugged into the latest state of the art science. Children will benefit because they will have more excited teachers. Moreover, there is distinct potential to go global. Why should we restrict it to Australian scientists

and teachers talking to each other? It would be very exciting to establish a network of scientists and teachers around the world.

## VI. Women In Science, Engineering and Technology (SET)

*Working with the Office for Women.*

In 2002, I was invited by the UK Secretary of State for Trade and Industry to prepare and submit *SET Fair*, a high level report with recommendations on how to combat the problems of lack of women in SET studies and jobs.

Since the problem of women in SET is universal in most Western societies, an obvious initiative within my residency in Adelaide was to explore how the issues raised in *SET Fair*, both the problems and the solutions, applied to South Australia. In the first instalment of my residency we held a meeting at the National Wine Centre on August 12, 2004 called *Women in Science and Engineering: getting there and staying* at which I led a roundtable discussion. The forum was attended by 150 women of all ages, backgrounds and levels of education. This forum was a two-way dialogue that inspired and invigorated those that attended. It also included a workshop where the thinking of the participants was collected and collated with the aid of new technology (Zing).

A review of women in SET in South Australia demonstrates low participation and that women who choose these industries face difficulties progressing their careers. Many of the concerns raised by women working





in South Australia are similar to those in the *SET Fair* report such as a lack of support and information for girls choosing SET subjects at school through to difficulties combining career and family life in a demanding industry. Despite various educational activities to encourage girls to consider SET careers and programs to assist women working in the industry, for example mentoring, few organisations have the resources to make a significant impact on this area. To change this, more co-ordination is required to ensure that marketing and information activities send a consistent message to young girls and that support for women working in SET meets the needs of a varied workforce. The recommendations made in this report can make a positive start to address these issues.

Project Catalyst gave a presentation to the Premier's Women's Council meeting held on August 5, 2005, and invited leading women

scientists to attend to meet members of the Premier's Women's Council. This provided excellent networking opportunities for further development/planning.

#### Summary

If we are to maximize our scientific capital as a society, then we need to recruit and retain as many women as possible in science, engineering, and technology. While little has been set in train to date, implementation of the *SET Fair* recommendations should be feasible within a reasonable timeframe.

### VII. Health and Community Services

An understanding of the Brain Sciences can prove helpful in at least three areas within Health and Community Services yet the following are really just instances where progress has been started within my residency, and perhaps would be best regarded as prototypes for further initiatives.

#### VII.a. Seminars on the Young Brain

*Working with the Department of Health, Department for Families and Communities (Children, Youth and Family Services), Department for Education and Children's Services (DECS), South Australian Neuroscience Institute (SANI).*

The *Young Brain* project aims to develop a long term and sustainable mechanism for ensuring that professionals working with children and their families have access to up-to-date information on relevant developments in neuroscience. In the context of this project

'young' refers to the developmental period from pre-birth to 25 years of age.

The project has multiple objectives including:

- Bringing research neuroscientists and practitioners together for mutual benefit
- Promoting a collaborative (cross-disciplinary) approach between professionals from different disciplinary backgrounds e.g. social work, psychology, educational professionals, medicine, physiotherapists etc. with the aim of improving service delivery
- Promoting a common understanding of the impact of neurological activity on human behaviour
- Promoting a closer relationship between neuroscience and the social and behavioural sciences
- Stimulating the development of innovative approaches to interventions with children and their families based on the insights of neuroscience
- Exploring the implications of developments in neuroscience for public policy

In 2004 I participated in a one day seminar which focused on the relationship between early brain development and optimal health and social outcomes for children and young people: a workshop was subsequently held with a diverse group of professionals to inform planning for the project. The information collected at the workshop revealed that professionals would find the following types of activities useful:

- Regular seminars exploring neuroscience, the social sciences and public policy
- Web-based information
- Mechanisms for exploring the extent to which many currently accepted professional practices are based on evidence from the neurosciences
- Ongoing mechanisms to promote discussion between neuroscientists and practitioners working with children and their families
- *A Research in review* newsletter to explain the implications of neuroscience research for the social and behavioural sciences and practitioners
- Neuroscience helpline to provide an opportunity for specific issues arising from practice to be discussed with neuroscientists

In 2005 a second seminar was held on the topic of *The Adolescent Brain: How can we undo the harm* with a focus on the insights neuroscience can provide into young people with self-harming behaviours. Demand for this seminar exceeded that anticipated by a factor of 4, indicating profound interest in the topic by the social and behavioural professionals working in the health, education and community services areas. My own presentation identified some of the factors influencing the adolescent brain was complemented by a panel of three experts from the areas of psychology, psychiatry and juvenile justice who focused on different perspectives on adolescent self-harming behaviour.

In addition to contributing to the social sciences, neuroscience raises a range of questions for public policy. If full adult brain development is not achieved until the age of 25 approximately, why are young people expected to assume adult responsibilities at age 18 and criminal responsibility at age 10. The continued development of neuroscience will raise further fundamental issues about how we as a society reconcile different disciplinary approaches to the individual.

This project provides an opportunity for a unique relationship between the neurosciences and social and behavioural sciences to be established in South Australia, to the benefit of the community, particularly families and children receiving educational, health and community services.

Because of the potential for learning from neuroscience to positively influence social and behavioural sciences, and reciprocally for the social and behavioural sciences to provide insights for neuroscience, strategies which seek to apply the knowledge generated by neuroscience should be pursued.

#### **VII.b. Volunteering for Science** *Working with Volunteers SA and Department for Families and Communities*

The traditional image of volunteering within social services is as far removed as possible from the image of cutting edge science. On the other hand it is possible that the scientific community could make a great contribution to helping communities that are underprivileged by showing that science can be of interest and helpful to them. One example is to help those who are affected by drug related crime or who are exposed to drugs in their community learn more about how drugs work. One example of this was demonstrated through my residency when I visited Cavan Training Centre.

Cavan Training Centre is a secure juvenile detention centre for young men who have been charged and convicted of serious crime. Thirty-six students aged 16-18 were present to hear my talk *How do drugs work?*

My visit to Cavan was part of Volunteering SA's initiative *Volunteering for Science*. This project aims to encourage scientists to go volunteering to bring science to the public domain and to support all the volunteers already active in science volunteering – whether it be in the environment, in the classroom, in the lab or in the community. Volunteering SA has attracted a volunteer to assist in the development of this project and is seeking resources to grow these plans from the business community and the not-for-profit volunteer involving organisations. Volunteer matching, referral and promotion will be added to this work over the next year.

I was privileged to be selected as Volunteering SA's inaugural Volunteer for Science. My visit to Cavan can be used to publicise the project and develop a volunteer pool of scientists who will visit Cavan and other settings. Other topics to be covered in the future will be: *Why do you get a buzz from driving fast? Why does your heart beat fast when you are nervous?* In the first instance VSA are looking for 12 scientists to each volunteer once a year to join the students at Cavan for a talk and forum on a science subject.



#### **VII.c. Open Day on Ageing** *Working with Alzheimers Australia (SA) and Flinders University.*

Like all Western communities South Australia is faced with the problem of caring for an increasing number of elderly people. (Fig 10) Sadly an increasing aged population will lead to an increase in the diseases that characterize old age such as Parkinson's and Alzheimer's Disease.

Over the past 20 years Alzheimer's Australia (SA) has developed as a centre of excellence providing a range of services and information for people with Alzheimer's disease, other related dementias and memory loss while placing significant emphasis on the role and support of carers, whether they be family members, friends or professional staff. The organisation has a strategic mission to lead in the provision of services and advocacy to enhance the quality of life for people, particularly the aged, living with the many forms of memory loss. It has initiated many innovative and forward thinking projects that embrace both state and national programs.

The *Open Day on Ageing*, at which I gave the keynote speech, aimed to connect researchers and their most relevant research and practices with patients and their carers. The idea was to have scientists discuss and demonstrate their most recent work directly with patients and the interested public.

- Joint venture between Parkinson's and Alzheimer's SA Open Day held on July 30 2005 at Flinders Medical Centre, Flinders University

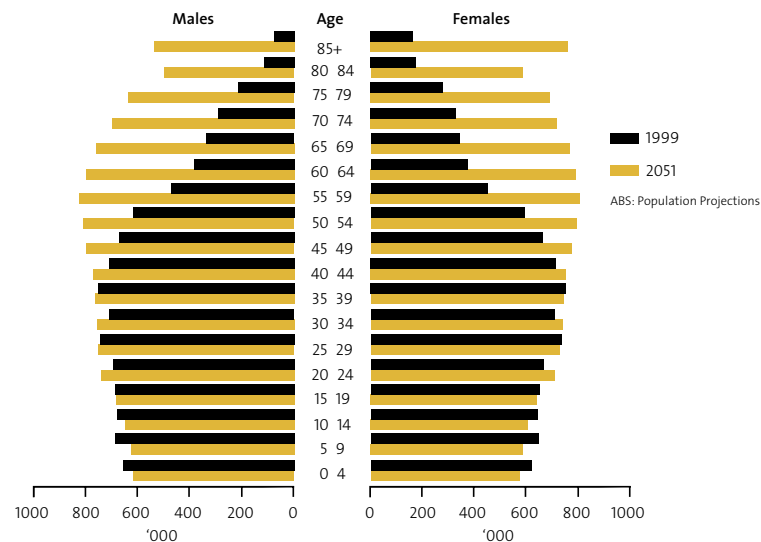
## Chapter 3 Developing People and Communities

- Approximately 200 people attended
- Speakers included 6 scientists working in the research areas of Parkinson's and Alzheimer's from nutrition to DNA mutation
- Laboratory visits were organised for members of the public and were enthusiastically taken up
- Feedback indicated it to be a very beneficial day with a high number of questions raised at the conclusion of every talk
- In summary the exercise was very valuable and worth repeating next year

### Conclusion

The development of people and communities is hard to quantify in terms of cost and its achievement is hard to show with performance indicators. On the other hand people are the most valuable component of a society and their quality of life and its improvement is incalculable and of the uttermost importance. Many of the schemes described in this chapter have already been set in train with great effect but clearly need to be sustained and developed. Some of the others which are still in the theoretical stage could readily be developed since they are relatively light on resources and depend more upon people and their interactions and attitudes.

Figure 10: Population projections 1999-2051



Source: A Framework for Living Longer, Living Better - A Strategy for an Ageing South Australia

## Chapter 4 Building Capability and Infrastructure

However strong the collaborations, and however willing and well-trained the individuals and collective South Australian community, the potential gains from the projects already described will depend first and foremost on strong internal capability and infrastructure. We need to see how existing South Australian state institutions can be expanded, or if necessary, new ones created, to provide a solid base for realising the recommendations of this report. In this chapter we shall review the very different recommendations that all work towards this goal.

### VIII. Continuing Training for Teachers – Graduate Certificate in Neuroscience

#### IX. Australian Science Media Centre

- X. Science Infrastructure and Research
  - a. Improved Liaison with the Premier
  - b. Improved Liaison between the Three Universities
  - c. Improved Liaison with Private sector
  - d. Beyond Start-Ups – Focus on Industry Building
  - e. Florey Precinct
  - f. Attracting Scientists to South Australia

### VIII. Continuing Training for Teachers – Graduate Certificate in Neuroscience

[www.flinders.edu.au/courses/postgrad/neuro.htm](http://www.flinders.edu.au/courses/postgrad/neuro.htm)

*Working with Department for Education and Children's Services, and South Australian Neuroscience Institute (SANI).*

The Graduate Certificate in Neuroscience (Learning) is the first of a series of Graduate Programs designed to equip professionals working in a range of fields with a basic knowledge of modern neuroscience delivered in a context relevant to their professional practice. The programs draw on the professional and educational expertise of members of the South Australian Neuroscience Institute (SANI) at Flinders University, The University of Adelaide and the University of South Australia. Although initially administered by Flinders University, the Graduate Certificate in Neuroscience will be developed as a genuine cross-institutional degree. As such, the course begins to fulfil one of the major aims of SANI in developing cross-disciplinary professional education in neuroscience. This is the first program of its type to be offered anywhere in Australia.

The Graduate Certificate in Neuroscience (Learning) will focus on the application of principles of modern neuroscience to understanding how people learn in the classroom environment. The overall aim of the program is to provide a framework for understanding the principles of modern neuroscience; critically appraising neuroscientific literature as it applies to learning; and application of the principles of neuroscience to understanding classroom

practice and behaviour. Four new topics have been developed especially for the program. They are: Sensing and moving, perceiving and acting; The learning brain; Knowing what we know: the neuroscience of cognition and The behaving brain. Underpinning the delivery of these cross-institutional topics will be the production of a common set of digital teaching materials that will facilitate the quick and flexible development of new educational modules.

This course will produce a group of educators with a much better understanding of brain function and appropriate critical appraisal skills to evaluate much of the neuro-scientific literature which is in the public domain. Engagement of professional educators with working neuroscientists will help develop real linkages between research into brain function and educational practice, ultimately aiming to improve the learning environment for teachers and students alike. The generation of a 'Library of Ideas' derived from assessment exercises will create an on-going resource for research projects and evaluation.

The development of the program has been strongly supported by the SA Department of Education and Children's Services (DECS) who have undertaken to provide 15 scholarships a year for three years to allow teachers to participate in this program. Most of the face-to-face teaching sessions will take place at the Education Development Centre at Hindmarsh.

The Graduate Certificate will run for the first time in 2006 commencing in Semester One. As it becomes established, articulated Graduate Diploma and Masters programs incorporating significant research components will be offered in subsequent years.

#### Summary

The Graduate Certificate in Neuroscience offers unique opportunities for South Australian teachers to act as exemplars to the profession in showing how it can integrate with the wider scientific research community. It is the first ever such initiative, not just in Australia but in the world.

Once sufficient data has been gathered to justify these initiatives, there will presumably be a case for them to be conducted at a federal level. More specifically the Graduate Certificate in Neuroscience for teachers could become an Australia-wide endeavour, enabling interchange of students, instructors and course material between the states.

#### IX. Australian Science Media Centre

[www.aussmc.org](http://www.aussmc.org)

*Working with media, industry, corporate sponsorships and scientists.*

The Australian Science Media Centre (AusSMC) is a very timely initiative that continues the work that was started by the Science Media Centre at the Royal Institution (Ri) in London. As such, I am delighted to endorse a similar facility in Australia, which will enable the media to gain fast access to informed and articulate

scientists. Over the last three years in the UK we have proven that such a forum is vital for democratising science in the 21st Century. The overall goal is to increase informed public debate on scientific issues.

The Science Media Centre has added to the quality of science reporting in both printed and broadcast media in the United Kingdom. Given the availability of our copy and materials, as well as a strong endorsement from the Premier of South Australia combined with experience of inaugural Chair Peter Yates, I have every confidence that the Australian Science Media Centre will succeed in the fastest possible time and have the maximum possible impact.

#### The UK Experience

[www.ScienceMediaCentre.org](http://www.ScienceMediaCentre.org)

The UK Science Media Centre is an independent venture working to promote the voices, stories and views of the scientific community to the news media when science is in the headlines. With its roots in the House of Lords' Select Committee on Science and Technology Third Report: *Science and Society*, it takes up the gauntlet thrown down by the Lords to meet the 'great challenge' of adapting science to frontline news.

The overall goal of the Centre is to help renew public trust in science by working to promote more balanced, accurate and rational coverage of the controversial science stories that now regularly hit the headlines. The Science Media Centre sees science in the headlines as an opportunity rather than a threat. While many

have noted that science and headline news are a 'poor fit', the Centre works to ensure that the scientific community exploits these opportunities to make the case for science at the very time when the public are most interested in and concerned about science.

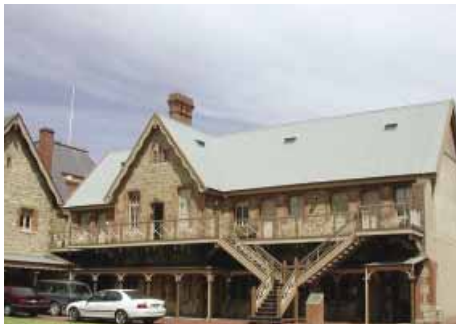
The Centre operates like a newsroom, reacting to the news agenda while proactively promoting a spectrum of scientific opinion. It aims to gain a reputation with the media for a fast, accurate and media friendly response. It focuses primarily on non-specialist correspondents and newsrooms that do not have access to their own science correspondents. For the scientific community, the Centre offers a specialist resource to scientists and science press officers when their science stories hit the headlines. It also runs a range of activities including media training, horizon scanning and lesson-learning sessions aimed at improving the science community's effectiveness at engaging with the news media. The Science Media Centre is unashamedly pro-science and was established in the spirit of the House of Lords' Select Committee's goal of improving science communication as a means to 'secure science's license to practice not to restrict it'. However, the Centre is free of any particular agenda within science and will always strive to promote a broad spectrum of scientific opinion – especially where there are clear divisions within science. It will not shy away from promoting voices that are critical of particular aspects of science.

## Chapter 4 Building Capability and Infrastructure

The Science Media Centre is housed within the Royal Institution but independent from it. Over 20 sponsors, including scientific institutions, companies and individuals, fund the Centre with donations capped at 5% of the running costs to preserve its independence. The team at the Centre is guided by a Science Advisory Panel and a Board.

### The Australian Experience

The Australian Science Media Centre (AusSMC) is a national independent media centre based on the successful Science Media Centre in the UK. The Centre is located in the Armory Building behind the South Australian Museum and was incorporated on March 1, 2005.



AusSMC Armory Building South Australian Museum Adelaide

Although the concept for AusSMC is based on that of the UK Science Media Centre, the two organisations share no formal or contractual relationship. I have, however, enabled all of the UK's Science Media Centre intellectual property to be provided to the AusSMC.

To assist in the establishment of the AusSMC, the UK staff have been on hand to help and advise AusSMC in its early stages, and the Director of the UK Science Media Centre, Fiona Fox, joined the Board of the Aus SMC. The Project Catalyst, Linda Cooper was appointed Interim CEO and worked closely with Peter Yates, who kindly accepted the challenge of being the inaugural Chair of the AusSMC. The development of the Aus SMC has been furious and frenetic and it opened for business in late 2005. (See Appendix 2, p89)

Becky Morelle, co-founder of the SMC in the UK, was seconded from the UK centre to carry out a national consultation report to inform the Centre's Board of Management on the establishment of the Centre. As with the UK's consultation exercise, this was designed to look at how AusSMC could be value-added to what already exists within the Australian science media, and to examine which niches it could fill. The consultation process was strategically planned and focused on interviews with a cross-section of key stakeholders for AusSMC, such as news editors, science and medical journalists, scientists, communication officers, and science communicators. It took place over a period of 6 weeks and meetings were carried out in Adelaide, Canberra, Brisbane, Sydney and Melbourne, together with phone interviews to cover other areas of Australia.

The role of the Centre is to respond proactively and reactively when a major science news story hits the headlines. It keeps a database of Australian scientific experts who are media savvy and prepared to give interviews directly to the media in the timeframe required.

In addition, AusSMC acts as the facilitator between journalists and scientists in providing strong proactive connections between the cultures of science and the media.

### Sponsorship

Guided by the contacts and energies of Peter Yates, AusSMC has been tremendously successful in attracting sponsorship. At the time of completion of this report, total sponsorship raised is over \$400,000.

The sponsors have largely been recruited from the Australian media industry. Key science organizations in Australia were also targeted. To ensure the independence of the AusSMC, a ceiling of 10% of total operating costs was placed on all sponsorship opportunities. Each Foundation sponsor has contributed \$30,000 per annum for two years. This includes the opportunity to participate in the formation of the AusSMC through Board representation for the two year period sponsorship period.

The full complement for Foundation Sponsors has been achieved and includes Fairfax, ABC, PBL, News Limited, Macquarie Bank, CSIRO, Shell Australia, ResMed, Royal Australian Chemical Institute and Ernst and Young.

A second tier of sponsors called Gold sponsorship was created to increase revenue and ensures recognition in all AusSMC printed material and on the web, and invitations to all AusSMC functions. Gold sponsors are also able to place specific issues on the agenda of the AusSMC board and participate in the discussion on that item. Gold Sponsors to date include: Johnston, Winter and Slattery, The

University of Adelaide, Prime TV and Dupont. The Government of South Australia through the Department of Premier and Cabinet has significantly supported the development of the AusSMC. This has been in the form of financial support for infrastructure set-up costs in the 2004/2005 year and considerable in kind assistance including:

- Provision of a fulltime Project Officer/ Board Secretary position, Geoff Robertson
- Assistance from Crown Solicitors Office and the Director, Commercial Advice, Department of Premier and Cabinet Pam Martin
- One-off cash grant of \$150,000

Johnson, Winter and Slattery have agreed to provide legal advice to the AusSMC on a Pro Bono arrangement.



Photo by Tony Lewis.

### Governance



AusSMC Board. Photo by Rosey Boehm.

Board members include: Premier of South Australia, The Hon Mike Rann, Fiona Fox, Director, Science Media Centre, UK, Mr Robyn Williams, ABC, Dr Tim Flannery, Scientist, Director, SA Museum, Mr Mark Scott, Editor-in-Chief, Metropolitan Newspapers, Fairfax Holdings Limited, Associate Professor Rob Morrison, Science Broadcaster, Gary Linnell, Editor in Chief, *The Bulletin*, Mr Melvin Mansell, Editor in Chief, *The Advertiser*, Mr Warwick Smith, Head of Corporate Communications, Macquarie Bank, Dr Donna Staunton, CSIRO, Tim Warren, Chairman, Shell Companies of Australia, Mr James Miller, CEO, Ernst and Young, Mr Kieran Gallahue, President and COO, ResMed, Dr Greg Simpson, Royal Australian Chemical Institute and Dr Susannah Eliott, CEO, AusSMC.

AusSMC also requires the support of scientific experts and has formed a Science Advisory Panel to provide scientific advice by responding to requests referred by the AusSMC from media organisations. Science Advisory Panel members are also instrumental in enhancing the profile and coverage of science in the media in Australia. (See Appendix 3, p90)

The AusSMC was officially launched by the Premier, Hon Mike Rann and myself on August 2, 2005. Over 100 representatives from media, industry, government and science attended the launch to celebrate the completion of minor works of the office space, its telecommunications facilities, financial independence and the announcement of our new CEO, Dr Susannah Eliott. On that day I was honoured to be appointed to the position of Patron of AusSMC.

### Dr Susannah Eliott, CEO of AusSMC



Photo by Rosey Boehm.

Dr Susannah Eliott is a science communicator with a PhD in cell biology from Macquarie University (Susannah studied cellular communication in the strange and wonderful soil creatures called slime moulds), a Graduate Diploma in Journalism from the University of Technology, Sydney and close to 13 years of practical experience in science communication with media as her primary focus. Since 2000, Susannah has been Communications Manager for the International Geosphere-Biosphere Program, Sweden. IGBP is an international research network of scientists working on global environmental change. I welcome Susannah to the position and wish her success in this exciting venture.

### Summary

AusSMC is set to be a huge success. A great deal has been achieved in a short time and the future looks bright.

### X. Science Infrastructure and Research

*Working with South Australian Neuroscience Institute (SANI), Healthy Development Adelaide (HDA), University of South Australia, The University of Adelaide, Flinders University, Bio Innovation SA, Playford Capital, Premier's Science and Research Council, Department of Further Education, Employment, Science and Technology.*

As we saw in Chapter One, South Australia is dropping behind the other states in most measures of federal research income. In the most recent funding round, SA performed particularly badly.

This trend is particularly serious for the following reasons:

- Future wealth creation will depend increasingly on science-based industries; and
- All of the proposals in this report are predicated on a critical mass of talented and enthusiastic scientists.

It is essential that the current negative trend in loss of scientific talent not only be reversed, but transformed into a unique and positive scenario. Such a scenario would offer incoming scientists an intellectual environment that went beyond that currently offered them in the institutions in other states and indeed countries. But the first essential is that they have adequate funds and facilities for their core activity of original research.

### X.a. Improved Liaison with The Premier

The need for a closer understanding between scientists and politicians was identified early in my 2004 residency as a key issue. The Premier's Science and Research Council is the primary link between the scientific community and the state politicians: this body has recently been reconstituted under a new Chair, Professor Max Brennan. Discussions with Professor Brennan have identified a central difficulty in that currently the Council attempt to resolve detailed issues too technical and time-consuming for the involvement of the Premier, yet at the same time need to cater for broad policy directives. Meanwhile the current composition of the Council means that urgent problems (e.g. the recent poor performance in the funding round) remain undiscussed, whilst the Premier is in any event unable to commit hours of time at a stretch to attend all or indeed sometimes any meetings.

One possibility explored with Professor Brennan is to separate these two goals. The first suggestion is to excuse the Premier from Council meetings, which could then have a far more technical remit. Accordingly, the composition of the Council should be reviewed to ensure that a critical mass of scientists is present, along with those responsible for implementation of funding. Meanwhile a monthly 'Premier's Science Briefing' could be implemented where the Council meet with the Premier and any other interested politicians, to address a specific topic of the Premier's choosing, eg 'Nanotechnology' or a policy issue such as 'Spinning out companies from universities'. If these meeting were held over a light lunch or evening drinks, they would serve a second function of overcoming the cultural divide between politicians and scientists.

It may be true to say that not all members of the Premier's Science and Research Council feel truly represented. The membership of the Premier's Science and Research Council could be reviewed to ensure that each university in the State is represented at the table when major science policy and infrastructure investments are discussed to ensure maximum collaboration and investment potentials for the State are realised.

#### X.b. Improved Liaison Between the Three Universities

Whilst research in South Australia is beginning to form under the 'Cluster' arrangement and scientists with shared interest are beginning to work together irrespective of their particular campus, clearly the universities will need to work together closely to present a critical mass. In particular, the geography of Flinders University, relatively far from the city centre compared to the other two Universities, presents a clear problem. There are three ways in which this geographical distance could be circumvented:

- 1) Provision of a free non-stop shuttle bus system between the central city universities and a central site of the campus at Flinders University
- 2) Development of state of the art webstreaming and webcasting between the three sites at Flinders, South Adelaide and Central Adelaide so that interactions can become increasingly virtual

- 3) Third, and perhaps the most controversial, would be to exchange spaces within each university building so that, for certain activities/subjects, members of University of South Australia and The University of Adelaide would have an enclave within Flinders University and visa versa.

Considerable collaborative projects are already in development between the state's universities. Appendix 1, p82 compiled recently by the Pro VC of Research from each of the universities gives many examples of the trilateral collaborations that already exist between the three South Australian Universities.

#### The Research Clusters

Among the particular initiatives mentioned are a large number of research clusters in South Australia. The two with which I have been most involved are the South Australian Neuroscience Institute (SANI), and Healthy Development Adelaide (HDA).

#### SA Cluster Example South Australian Neuroscience Institute (SANI)

[www.sani.edu.au](http://www.sani.edu.au)

SANI was conceived in 2003, established by agreement of the three SA Universities in 2004 and launched in August of the same year during the first component of my residency.

SANI comprises most neuroscientists in SA from the three Universities and from other institutions and agencies including CSIRO, DSTO, Hospitals, Bio Innovation SA, etc. Its members attract more than 10 million dollars in research funds. SANI is Chaired by Professor Marcello Costa, Professor of Neurophysiology, School of Medicine, Flinders University.

SANI promotes the understanding of how the nervous system and the brain work and how this knowledge can help society. Its major activities aim to increase the cooperation between research institutions, relevant SA Government Departments, patient groups, and the general public within SA.

Its activities include research, public education, professional and research education, commercialisation and services.

SANI increases representation of SA interests at a national and international level in matters relating to brain functions and diseases. It represents a unified resource for SA people engaged in other human activities including arts, technological, biotechnological and social sciences.

SANI is unique in Australia in its scope and composition. It is an example of researchers and educational practitioners coming together, with the full support of the higher education and research institutions, to create a critical mass in South Australia.

What really goes on  
inside your head

### SA Cluster Example Healthy Development Adelaide (HDA)

[www.adelaide.edu.au/hda](http://www.adelaide.edu.au/hda)

In 2001, the Federal Government's National Agenda for early childhood looked at maximising the future of Australian children and families. This goes hand in hand with the Government's National Research Priority 2 – Promoting and Maintaining Good Health with 'A Healthy Start to Life' being the first goal.

Following on from this, The University of Adelaide is encouraging internal collaborations between the various faculties, departments and research disciplines to increase the level of quality research output, attract more external funding and investment, provide a wide-reaching profile and to spread awareness of the University to local, national and international students and researchers. One research focus area was 'Healthy Development' with HDA being established in June 2004.

HDA is led by Professors Robert Norman and Caroline McMillen and currently includes over 90 researchers from all 5 Faculties representing 21 disciplines, with interests spanning basic, clinical and social sciences and economic and cultural disciplines with direct relevance to healthy development.

HDA is advised by a Steering Group (consisting of research leaders drawn from various disciplines) and supported by separate Working Groups along with a Network & Communications Officer appointed to maintain communications and membership.

### Summary

Research clusters provide a way of liaising with scientists of the 'union' without biasing one university over another. Above all, if they are intended to stay organic, they will change or disperse according to talents and needs from one year to the next. This makes them a very valuable resource because they are much more flexible than liaising with individual universities because they are smaller, involve fewer people, and are highly strategic. They are also appropriate as a good basis for building on and drawing from your scientific talents.

Providing supporting State funding in the form of postgraduate scholarships would provide a catalyst to drive the momentum and flexibility of building these collaborations across disciplines and institutions. These scholarships would also provide a platform for the research clusters to leverage Federal funds, thus increasing the potential for SA to attract Federal investments. The areas of research selected could in turn contribute to areas of direct interest to Cabinet and the progression of *South Australia's Strategic Plan*. One could think of these grants as the 'Premier's Graduate Studentships'.

This is not to necessarily force academics to work on areas that the Government wants, but it is a way of the Government showing an interest in basic science and freeing up funds that would then be competitive.

### X.c. Improved Liaison with Private Sector

Due to the explosion of biotechnology, information technology and nanotechnology, all of which require cutting edge science, the rise of university spin-outs has truly been an international phenomenon over the last 20 years. However, South Australian universities, as with most of their counterparts outside the USA, have not taken full advantage of exploiting the intellectual property arising from the research conducted on their premises.

The general bottlenecks for universities are as follows:

- Expectation

Scientists often confuse the goals of blue-sky research (eg in the long term to cure Alzheimer's disease) with the much more realistic and immediate expectations of specific milestones that need to be met every few months.

They would frequently regard money from the private sector as a glorified grant. Any investor who has had any experience already of academics taking the money and running might well be deterred. Even with the best will in the world, an academic will typically try and spin out a company or gain investment for their work at too early a stage, when proof of concept still needs to be clarified.

Similarly the expectation of the investors is as with 'normal' companies, that there are clear milestones, well-defined and well-thought out, complete with well-trained staff with the expertise and habit of working towards them.

Yet academic research can meander: it would not be within the scientists' mindset to focus on a specific project if something potentially more scientifically exciting distracted them.

- Management Structure

Academics do not understand why investors respect, to the extent they do, a sound and experienced management structure. Their perception is that the CEO is paid stratospheric sums that would buy them instead several lower paid junior scientists. Investment in management structure would therefore be seen as a waste of time and money. On the contrary, investors look to a good management structure as more important than interesting or innovative technology.

- Early Stage – Catch 22

The average academic would be unable to write a business plan. Even I, who have spun out three and a half companies, would not know quite where to start!

Moreover, a good business plan is needed for investment: however, investment comes only once funds are viable and one can hire a CEO: but a CEO is needed to write the business plan. The only way out of this gridlock is to lure a potential CEO in for sweat equity with the hope that they are willing to take a risk. This is a tough call and might not necessarily entice the most effective potential CEO.



- Intellectual Property (IP) Ownership

Many universities, eg Cambridge, allow the inventor to retain the IP whereas others, eg Oxford, will not. This inconsistency in university conditions is a great bottleneck to investors, as is the general technology transfer attitude. Most university technology transfer staff are on public sector salaries and are very much outnumbered by the scientists, eg in Oxford for example, there are 500 scientists to each technology transfer officer. There is no way that, even with the projects in hand, the staff can appropriately nurture and manage fully each individual project. It is still harder for them to be proactive, knocking on the door of the departments, over-viewing what is happening with the science. One of the biggest problems is that much technology might be just slipping through the cracks.

One 'solution', that I don't think that I have mentioned, might be to recruit McKinsey interns to act as talent scouts, whilst themselves learning more about science and the scientists' agenda. McKinsey is a management consulting firm advising leading companies on issues of strategy, organization, technology, and operations. I put my idea to a Mr McLean who has worked for McKinsey for 25 years and he thought that it was a great idea.

- Biotech VERSUS IT

Biotech suffers hugely compared to IT since the burn rate is high, the risk high, the exit long and not obvious and the understanding of the technology poor. By contrast, IT has a low burn rate, low risk, and obvious more

immediate exits and usually a principle that most people can understand. We need to think of ways of levelling the pitch, on the other hand, the constraints of Biotech make it easier to be spun-out from universities, whereas with IT, universities are not necessarily the lowest hanging fruit and therefore have tended to remain, as within Adelaide, under-exploited.

- The Investor/Scientist/University Triangle

In general, relations are poor between these three constituencies because they have conflicting agendas and do not really understand the language and goals of the other. The pure innovative scientist really just wants money to do their research and not to be 'soiled' by having to go on profit motives, moreover, they are very sensitive to any constraints on freedom to publish.

In my own view of funding, even from big pharmaceutical companies, this is not a problem as lawyers are happy with an abstract in the first instance, which can then be cleared even before the full paper is written for publication.

Meanwhile, the university does not necessarily have the scientists' best interests to heart and are concerned, in the UK at least, more with making a quick buck. Sometime, they require so much that they deter investors, as has been the case at Oxford sometimes, where investors are quite understandably deterred by the insistence of 50% equity pre-money with no investment on behalf of the university.

Similarly, investors do require behaviours that are not part of the academic scene for example Good Laboratory Practice, management structure, ability to understand milestones and indeed to write business plans.

### Summary

These bottlenecks are generic and not specific to South Australia nor are they particularly insuperable. On the other hand, there are alternative approaches to commercialising science without necessarily spinning out companies. During my 2005 Residency, I met with representatives from Playford Capital, a South Australian government funded technology investment company, who were able to suggest wide-ranging ways in which university science could be commercialised in South Australia.

### X.d. Beyond Start-Ups – Focus On Industry Building

A key goal of commercialisation policy must be to promote development of local industry, not only to produce Intellectual Property (IP) which is licensed or sold to concerns elsewhere. Only with a growing local innovation industry base does the innovation process become self-sustaining on a worthwhile scale.

Spinning off University IP into new start-up companies is one way of helping to achieve this. Where successful, start-ups attract capital, provide outlets for research workers' entrepreneurial aspirations, attract other entrepreneurs to the region and enhance the State's reputation for innovation.

But start-ups are often only appropriate for IP which can have a large, transformational impact on a global market. For lesser IP, start-ups may find it too difficult to compete with established concerns. Usually, only start-ups with the best prospects are able to attract the specialized management required for success. When successful, start-ups are often sold to overseas concerns, taking most of the on-going benefits away from the region. Finally, they can serve to drain away excellent staff from Universities. Even if these staff maintain a connection with their parent institutions, getting a start-up going leaves little room for concentrating on anything else.

Start-ups are therefore not a panacea. I believe there is potential for larger, innovation-focused enterprises with the following characteristics:

- Excellent local and international sales capability, as required for market-driven research
- Excellent commercial management
- Internal product development capability
- Links to Universities and other research institutions, providing a flow of new innovations in one direction, and market intelligence to guide new research in the other
- Not intended to replace or compete with the existing University commercialisation arms, but rather to provide them with new and more robust channels into the market, in addition to their current activities

## Chapter 4 Building Capability and Infrastructure

Such enterprises will be able to spread overheads over a range of products and services, allowing them to hire better management and better sales teams, and as a result commercialise more IP.

They would serve as magnets for attracting capital and research and business skills to the region, as well as other businesses. If sufficiently large and deep-rooted, even an eventual sale to an international concern would leave much of the operation in SA. They could offer entrepreneurial researchers rewards and recognition, while not consuming all of their attention in start-up management issues.

I highly recommend a detailed study of these concepts and how they might be implemented in SA.

### University IP issues

The university commercialisation arms work hard at identifying IP within their institutions and putting it in shape for delivery to the market. Nevertheless, problems persist with University IP:

From an investor's perspective:

- Only a small amount of University IP is ready for commercialisation. Even if it has good commercial potential, it usually needs a lot more fundamental work to achieve this. Doing that work may or may not be of interest to University researchers; quite often they may feel that they have solved the major science problems, and that the rest is 'detail'. But that 'detail' may represent an unfilled gap on the way to commercial fulfilment.

- Commercially, an individual piece of IP usually represents only a small proportion of the final value of a product or service, compared to the investment in sales, marketing, further product development and other commercial activities. Often the IP has value only in conjunction with IP from other sources. Universities too often fail to understand this view and demand unrealistically high valuations for their IP.
- Universities need to have more standardised, commercial processes and terms for licensing and selling IP. The perception remains that it is hard to do deals with Universities, and that too often Universities insist on retaining control over IP in ways which discourage deals.

All of these problems occur to some extent everywhere in the world. Addressing them effectively requires the market-driven focus we advocate here. This in turn requires a commitment to cultural change on the part of senior University administrators.

To progress the opportunities that are available to SA through commercialisation, it is important to engage the key decision makers of the State from these respective areas.

To this end, I suggest that the Premier's Science and Research Council meet with the Economic Development Board to jointly develop a strategy that explores the potential for an independent centralised body that can provide a critical mass for the State and support for academics.

The most critical issue of all is to establish the buy-in of the scientists as a critical mass. Only then will it be possible to facilitate the establishment of a wonderful new science facility in Frome Road, Adelaide.

### X.e. Florey Precinct

The Florey Precinct, centred on North Terrace and Frome Road in the City, represents a hub of health and medical activity which has the opportunity to become a major driver of economic development in South Australia through a package of initiatives to develop it as a nationally and internationally renowned location for excellence in health and medical R&D, health education and knowledge transfer to clinical practice.

Although the Precinct accounts for a large proportion of the State's scientific, health and medical workforce, and attracts about \$70m p.a. in research and related funds from outside the State, the Precinct lacks a significant research profile and is already experiencing declining success in attracting national research funds (eg. SA's share of National Health and Medical Research Council grants fell from 11.8% in 1996 to 8.1% in 2004).

A significant opportunity exists to reverse current trends through strategic investment in an area of research strength for the State. Such investment would also be consistent with recommendations to re-balance the health system towards health promotion, illness prevention and early intervention.

Susan Greenfield | *Getting to the Future First*



A separate but no less important issue is the lack of research space within the Precinct, compounded by ageing and out-of-date infrastructure.

### Proposed Solutions

Some initiative could be funded from the public sector, however other revenue streams could come from incubator facilities set up within the precinct.

A major capital works initiative for the Florey Precinct is the flagship and landmark building to serve as the new headquarters of the Precinct and to house significant R&D activity. A major capital investment (upwards of \$30m) is envisaged.

Support for these initiatives does not commit the State Government to future major capital investments in the Precinct but provides an overall strategy by which Precinct stakeholders can plan their own capital works. Importantly, the measures aim to demonstrate State Government support and commitment to the Precinct thus allowing Precinct partners to conduct long-term planning and approach

other potential investors/contributors eg. philanthropic causes or private sector investment.

The Florey Precinct development could provide a nodal point for international collaborations and multidisciplinary activity. It could be a test bed for trialing innovative approaches to developing research teams and funding, encouraging participation from all sectors and building on a greater understanding of the spectrum of research grant opportunities. This report endorses the South Australian Government's proposal to invest in the Precinct development, however, we also recommend that other areas are expanded, or placed in a wider context. It is essential that the Florey Precinct service the interest of the community directly and it can do this in two further ways. First is by promoting wealth and creation through spin outs not necessarily in the biomedical area, and second by open access to as many public events as possible including school events, but also for the general public.

In addition, the Florey Precinct could include:

- an incorporated base for *Science Outside The Square*
- a base for other science communication activities in SA, creating a national presence
- space for an expanded Australian Science Media Centre
- interactive IT and extensive communication systems to link to regional, national and international areas through SABRENET and AARNET linkages
- a centralised incubator for commercialisation activities with talent

- scouts based in each academic campus
- a child care centre for all staff
- a focus for activity linking the sciences and the arts including a performance or exhibition space
- facilities for school groups to visit the site and act as a facilitator for all education activity across all Precinct developments

The Florey Precinct provides SA with not only the opportunity to develop on its research strengths in a leading edge field, but to also become an exemplary Centre nationally for the democratisation of science, providing a high profile, high energy focus for science, creating the environs and networks where collaborative activities are encouraged and supported. In this way, the Ri could be used as a model. Note that the Ri receives no money whatsoever from Government, it is a self-funding organisation. I see South Australia's Florey Precinct as having the potential to be an Ri Down Under and to be for Australia what the Ri is for the UK.

**I strongly recommend South Australia seizes the opportunity of capitalising on such a major investment and certainly recommend that the Precinct become an icon for SA.**

#### **X.f. Attracting Scientists to South Australia**

Even if all the research clusters flourish and garner funds, even if the Florey Precinct provides state-of-the-art facilities, and even if an attractive investment environment is developed, the essential ingredient remains the talented scientists themselves that South Australia will need to retain and indeed attract from out of state and internationally.

All these schemes are dependent on the buy-in of the scientists. Until now, the 'scientific mindset' has not been directed to issues other than one's immediate bench research. A current issue not to be underestimated is the broadening of the scientific mind to include more societal issues, and for scientists to see themselves in a wider context.

Whilst many incentives as possible might be provided, it will probably be the case that the whole will be more than the sum of the parts and gradually the recommendations detailed here will contribute to a more general environment or scenario. I am not suggesting just legislating or changing the rules, rather a gradual change in mindset to enhance the state's talent and creativity.

Of course, the improvements and innovations outlined so far in this chapter would provide a clear incentive, as would the opportunity to participate in unique initiatives such as *Twinning Teachers with Scientists*, *Science Outside The Square*, and the Australian Science Media Centre. However this portfolio of experiences and the special intellectual environment that Adelaide could offer, needs to be brought to the attention of any potential newcomer.

One way, aside from word-of-mouth, chance publicity, or happenstance, would be to introduce short-term fellowship schemes that enabled top quality scientists to sample life in Adelaide firsthand. Two levels of Fellowship would be optimal:

- 'Bragg' Fellowships of 1 year for post-doctoral level (typically 25-35 years old)
- 'Summer' Fellowships the vacation period in the Northern hemisphere ie June, July, August for tenured, senior academics and for reciprocal visits in December-February for Australian students

It could be a requirement, indeed an incentive, that in both cases the recipient participate not only in a guest university lecture, but also the other, more integrated activities commended in this report.

#### **Summary**

Whilst the Graduate Certificate in Neuroscience and the Australian Science Media Centre are already underway and showing signs of traction it is the Florey Precinct that is the most ambitious, most expensive, the longest term and indeed would have the most impact in achieving the general recommendations set out here in establishing a science and technology base in South Australia.

On the one hand for certain activities the Ri can provide a very good model on which to craft a multi-use multi-funded institution. On the other hand the funds for new building works are quite considerable as would be the changes in lifestyle and culture for those working within the universities as well as the general public. Nonetheless, if such an endeavour could be achieved and be successful the benefits to Adelaide and South Australia would be incalculable.

# Chapter 5

## From Creativity to Innovation

The ten initiatives proposed as the recommendations of this report are framed within the three key objectives of the South Australian Government's Science Technology Innovation 10 year vision (STI 10) for science development in the State.

### Momentum Through Collaboration

- I Bragg Initiative
- II Oxford Centre for Science of the Mind
- III James Martin 21st Century School

### Developing People and Communities

- IV Science Outside the Square
- V Twinning Scientists & Teacher Program
- VI Women in Science, Engineering and Technology
- VII Health and Community Services

### Building Capacity and Infrastructure

- VIII Continuing Training for Teachers
- IX Australian Science Media Centre
- X Science Infrastructure and Research

Exciting though these initiatives are, they could be dismissed merely as 'creative' ideas. Yet many of them have already been realized while others are still to make the all-important transition to the realisation of their innovation within the existing machinery of South Australian Government.

This chapter explores how each initiative may be implemented. In each case I suggest various factors which must be considered and be in place. First a Champion, second a Lead Agency and third strategies including funding opportunities.

### The Champions

The role of the Champion recognises the leadership and influence of individuals who are committed to see these initiatives strengthen into realities for South Australia. As iconic leaders within the community, government and commercial sectors, they will lend their endorsement to the projects to allow for maximum success. This could be in the areas of fundraising or promotion of the initiative. Another role of the Champion is to maximise opportunities within both public and private sectors nationally and internationally.

### Lead Agencies

The Lead Agency recommended for each initiative has been identified as the most appropriate agency within the SA Government to drive the initiative from idea to innovation. The role of the Lead Agency is to maximise partnership opportunities nationally and internationally, to ensure the initiative continually strengthens links to *South Australia's Strategic Plan*, to actively promote the initiatives within appropriate networks, to encourage participation from their own sectors, and, recognising the importance of horizontal integration, to work collaboratively to build relationships across and outside government. The implementation of these initiatives also looks to identifying resource opportunities connected to each of the ten suggested

initiatives. Acknowledging the changing face of science funding, the initiatives suggest developing commercial collaborations, sponsorships, leveraging opportunities, and maximising international links.

### Whole of Government/ State Commitment

Recognising the success, commitment and enthusiasm of the Project Catalyst Advisory Group in driving my ideas during 2004/2005, I recommend that a Working Group be set up to oversee the implementation of these new initiatives. The membership of this group should include representatives from within and outside government to ensure maximum impact and involvement across the State.

Within the Department of Premier and Cabinet a new position to manage the initiatives has been created as the lead agency to drive the implementation of these ideas across the whole of government and to maximize their potential and impact. Linda Cooper will fill this role as Project Director, Bragg Initiative, Department Premier and Cabinet. Resources have also been made available for a Research Assistant to support this position. This position has been awarded to Alicia Gigante.

### Linda Cooper Project Director, Bragg Initiative



Linda is a consultant for public programs and policy development. She has worked for the National Science and Technology Centre, The

Investigator, Art Gallery of SA, and the Federal Government. She has served on the New Media Board of the Australia Council for the Arts and the Australian Network for Art and Technology. She has qualifications in the sciences, arts and communications and has developed collaborative projects that bring these cultures together both in Australia and internationally. In 2004 she was appointed as Project Catalyst to implement Baroness Greenfield's ideas.

### Alicia Gigante Research Assistant, Bragg Initiative



Alicia has worked in local government for over eight years in the areas of governance and community services. She has completed

management studies and continues to pursue her interest in public sector management within the arts and sciences. In July 2005 she was appointed as assistant to Adelaide Thinker in Residence, Baroness Professor Susan Greenfield.

### The Ten Initiatives

#### I Bragg Initiative

*The relationship developed between the Royal Institution and Adelaide during my 2004-2005 residency to be extended to explore further collaborative activities, programs, research and resource opportunities both internationally and in South Australia based on the science research arm and democratisation of science/communication of science for the common purposes of life objectives of the Ri. This will provide opportunities for South Australian scientists to contribute their skills, knowledge and energies to develop a southern hemisphere chapter for these developing international activities.*

#### Champion



*Mr Robert Champion de Crespigny, AC*  
Robert Champion de Crespigny is Chairman of the Economic Development Board of South Australia, an

Advisory Board created by Premier Mike Rann in April 2002. He was the Chairman and Chief Executive of Normandy Mining Limited from 1985 until 2002. From June 2000 until July 2004, Mr de Crespigny was the Chancellor of The University of Adelaide. He is presently Chairman of a number of companies including Primelife Corporation Limited, Babcock & Brown Capital Limited and Buka Minerals Limited. In 2002, Mr de Crespigny was awarded the Companion of the Order of Australia Medal for his service to the mining industry, to business and to the community in the areas of cultural preservation and education.

#### Lead Agency

Department Premier and Cabinet

#### Strategies/Achievements

- develop a number of pilot activities during 2004/2005
- use this momentum to attract participation, funding and further partnerships and collaborations between the Ri and Adelaide
- identify the most appropriate counterpart at the Ri with whom the person in Adelaide could work in development of programs and funding strategies
- explore the model of the Ri in linking communication, policy and science research activity

- build on the partnerships already established under the Bragg Initiative
- work with The University of Adelaide towards establishing a Bragg Chair in Structural Biology or X-ray crystallography.
- making of Bragg documentary, for TV and DVD
- establish 'Bragg' Fellowships of 1 year for post-doctoral level
- potential distribution of Ri Christmas Lectures on Australian TV
- potential collaboration with Davy-Faraday Laboratory
- potential collaboration with World Science Assembly
- potential collaboration with Science Corps

#### II Oxford Centre for the Science of the Mind (OXCSOM)

[www.oxcsom.ox.ac.uk](http://www.oxcsom.ox.ac.uk)

*Opportunities for parallel and complimentary research programs through the work of the South Australian Neuroscience Institute will be explored with this pilot research program at Oxford University.*

#### Champion



*Professor Marcello Costa*  
Marcello Costa is Merck, Sharpe & Dohme Professor of Neurophysiology at Flinders University and Chair of The South Australian

Neuroscience Institute. He is an editorial board member for several scientific journals. He established most topics in the field of Neurosciences at Flinders University and

was one of the founders of the Cognitive Sciences course. He is a Fellow of the Australian Academy of Science and a member of the Australian Academy of Brain Sciences.

#### Lead agency

South Australian Neuroscience Institute (SANI)

#### Strategies

- explore existing parallel and complimentary research projects through SANI membership
- track results of a number of visiting researchers to Oxford
- assist with establishing future research capability
- assist SANI with funding application to the Templeton Foundation. The mission of the Templeton Foundation is to pursue new insights at the boundary between theology and science through a rigorous, open-minded and empirically focused methodology, drawing together talented representatives from a wide spectrum of fields of expertise. [www.templeton.org](http://www.templeton.org)

#### III James Martin 21st Century School [www.21school.ox.ac.uk](http://www.21school.ox.ac.uk)

*The feasibility and future opportunities for South Australia to become an international partner in the James Martin 21st Century School across relevant proposed Research Institutes will be explored. Of particular interest is the possibility for SA to become a community for pilot study. Particular connections are planned*

## Chapter 5 From Creativity to Innovation

*with the Institute for the Future of the Mind. It is planned that the Department of Education and Children's Services take leadership in identifying the new desiderata for 21st century education through the exploration, identification and building of mutually beneficial links between education and science to generate new learning and action across the disciplines.*

### Champion



*The Hon Mike Rann*  
Mike Rann became South Australia's 44th Premier after the State election in March 2002. He also holds the portfolios of Economic Development, Social Inclusion, the Arts and Volunteers. He was first elected to the South Australian Parliament in 1985 as the Member for Briggs, later Ramsay. In December 1989 he was elected to the Labor Cabinet under Premier John Bannon, as Minister for Employment and Further Education, Minister of Youth Affairs, Minister of Aboriginal Affairs and Minister Assisting in Ethnic Affairs. In September 1992 he became Minister for Business and Regional Development, Minister of Tourism and Minister of State Services. After a brief period as Deputy Leader of the Opposition, Mike became Leader of the Opposition in late 1994.

### Lead agency

Department of Premier and Cabinet

### Strategies

- establish a Working Steering group to include representation from each contributing university, government agency and education sector
- connect with existing research from DECS' futures initiatives, specifically *Learning to*

*Learn and Creating the Future* (OECD) and the proposals of the Centre for Creativity and Learning, Education Development Centre, Hindmarsh

- to establish a leadership post to create reciprocal relationships between South Australia and the Institute for the Future of the Mind and work closely with other Bragg Initiatives through the Project Director
- map parallel research projects and future potential collaborations existing in SA across universities, research organizations, and other relevant government agencies, for example, the Department of Health
- host a two month visit from Deputy Director, Institute for the Future of the Mind, Dr Martin Westwell in 2006
- produce a joint consultative report to form the basis of future debate in both the British Parliament and State and Federal Parliaments in Australia

## IV Science Outside the Square

[www.science.sa.gov.au](http://www.science.sa.gov.au)

*A highly successful pilot program of Science Outside The Square events was held in 2005. Continued support for the Science Outside The Square program of events in 2006 and beyond will be provided by strengthening relationships with the community, media and scientists and by brokering national and international connections.*

### Champion



*Melvin Mansell*  
Melvin Mansell began his journalistic career in New Zealand before joining News Limited as a reporter in 1980. From 1984 he worked on newspapers in Hong Kong and London before returning to *The Daily Telegraph* in 1989. In March 1999 he became the editor of *The Advertiser*.

### Lead agency

Department Premier and Cabinet

### Strategies

- establish prominent media ambassadors for the program
- monitor the impact of 2005 *Science Outside The Square*
- incorporate more innovative approaches to reaching out to community and increasing participation through working with all the Initiative's Champions
- broaden the funding strategy to include more cross-agency participation
- build on links between the arts and sciences
- strengthen scientists' participation in the program regionally, nationally and internationally
- explore broadcast, online and networking opportunities for events via SABRENET and AARNET connections through working with South Australian Partnership in Advanced Computing (SAPAC)
- build on connections for regional broadcast in SA through DECS and TAFE technologies

Susan Greenfield | *Getting to the Future First*

- work with the Ri in facilitating global participation in joint events including webcasting or webstreaming

## V Twinning Teachers and Scientist Program

[www.sciencetwinning.org.au](http://www.sciencetwinning.org.au)

*The continuing development of an online environment that connects teachers with research scientists, and the exploration of opportunities for national and international relationships, and continuing education opportunities for teachers arising from these collaborations.*

### Champion



*Professor Richard Head*  
Professor Richard Head is the Director of CSIRO's Preventative Health (P-Health) National Flagship and Affiliate Professor in the

Department of Clinical and Experimental Pharmacology at The University of Adelaide. Formerly he was Chief of CSIRO's Division of Health Sciences and Nutrition and prior to that Chief of CSIRO's Division of Human Nutrition. He served as Professor of Pharmacology and Toxicology at West Virginia University Medical Centre, a Research Fellow with the Department of Medicine at the University of Melbourne and Postdoctoral Fellow at the Roche Institute of Molecular Biology. Professor Head's current research includes approaches to understanding the protective action of dietary constituents in human health.

### Lead agency

Department Education and Children's Services (DECS)

### Strategies/Achievements

- establish partners to assist the development of the program
- recruit scientist and teachers to register with it
- develop the pilot scheme through further development of the website based at the Australian Science and Mathematics School
- link with DECS' Science and Mathematics Strategy and establish DECS as the lead implementation agency
- establish a relationship through a Memorandum of Understanding with CSIRO to expand into a national project
- explore evaluation and research opportunities
- explore future continuing education opportunities for teachers using Twinning as a basis for relationship building
- identify the appropriate contact person at the Ri to extend the Twinning to an international context

### VI Women in Science, Engineering and Technology

*This initiative involves working with the South Australian government to address the recommendations made in the report Participation and Advancement of Women in Science, Engineering and Technology in South Australia, July 2005 and incorporate them into STI<sup>o</sup> policy and infrastructure development.*

### Champion



*Professor Caroline McMillen*  
Caroline was appointed as Chair of Physiology at The University of Adelaide in 1992. She is currently Pro VC, Research, University of South Australia, and engaged in

high level policy and strategic planning activities on behalf of the Australian Research Council (ARC), Rural Development Corporations, Australian and New Zealand Council for the Care of Animals in Research and Teaching (ANZCCART) and for a range of Faculties, Schools, Research Centres and multidisciplinary Research Clusters. She is the only Australian Commission Chair of the International Union of Physiological Societies and is currently a member of the National Health and Medical Research Council (NHMRC) Enabling Grants Committee and the National Collaborative Research Infrastructure Scheme Expert Sub Committee on Promoting and Maintaining Good Health.

### Lead agency

Department of Further Education, Employment, Science and Technology

### Strategies

- establish a two month study adapting the recommendations of the 2002 SET Fair Report(UK) to an SA context through the Office for Women
- present the *Participation and Advancement of Women in Science, Engineering and Technology in South Australia* to the Minister for Women, Minister Stephanie Key
- establish a relationship with the Premier's Council for Women
- establish the Department of Further

Education, Employment, Science and Technology (DFEEST) as the lead agency to enable effective links with *South Australia's Strategic Plan* science policy development and infrastructure planning

### VII Health and Community Services

*The development of a number of initiatives with State Government that link neurosciences with health and community service providers in particular in addressing issues of mental health and the developing brain.*

### Champion



*Monsignor David Cappo*  
Monsignor David Cappo is a Catholic Priest and currently the Vicar General of the Archdiocese of Adelaide and thus deputy to the

Archbishop of Adelaide. He was appointed Chair of the Social Inclusion Board of the South Australian Government in March 2002. Monsignor Cappo is also a member of the Economic Development Board and the Board of the National Beyond Blue Initiative. Monsignor Cappo has made a major contribution to national debates in social policy development and has been directly involved in national strategic planning and implementation of social programs. Monsignor Cappo has been the National Director of the Australian Catholic Social Welfare Commission in Canberra and the Chairman of Centacare Australia, the national peak body of the Catholic social welfare agencies.

### Lead agency

Department of Health

### Strategies

- continue to build on success of the pilot program: The Young Brain 2004/ 2005 which linked South Australian Neuroscience Institute (SANI) with service providers
- develop further programs linking the neurosciences with Social Inclusion Strategies
- link SANI with Ageing Strategies
- link with James Martin 21st century school opportunities
- link with STHo Florey Precinct through the activities of the Health and Medical Research Council

### VIII Continuing Training for Teachers

*The establishment and support of ongoing collaborations between university sector research and continued training opportunities for South Australian teachers, in particular through linking neuroscientists and educators.*

### Champion



*Hon Jane Lomax-Smith*  
Hon Dr Jane Lomax-Smith BSc, MBBS, PhD, FRCPA is the Minister for Education and Children's Services and Minister for Tourism in South

Australia. She has been Minister for Science and Information Economy, Minister for Employment, Training and Further Education, Minister for Small Business, and Lead Minister for the Bioscience Precinct Project. She was appointed a Member of the Executive Committee of the South Australian Cabinet in 2005.

## Chapter 5 From Creativity to Innovation

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### Lead agency

Department of Education and Children's Services.

### Strategies and achievements

- the development of a Graduate Certificate in Neuroscience directed by SANI for teachers in collaboration with the three universities
- maximisation of opportunities linked to the *Twinning Teachers and Scientists Program* through external partnerships
- integration of developments from partnership with the 21st Century Institute for the Mind with opportunities for South Australian teachers
- exploration of the challenges of a changing profession

## IX Australian Science and Media Centre (AusSMC)

[www.aussmc.org.au](http://www.aussmc.org.au)

*A fully functional and financially viable national Centre, based on the Science Media Centre (SMC) in the UK, was established in Adelaide, South Australia at the end of 2005.*

### Champion



*Mr Peter Yates*  
Managing Director of Allco Equity Partners Limited, Peter Yates was Chief Executive Officer of Publishing and Broadcasting Limited, and has worked for Macquarie Bank and Morgan Stanley in Australia, and Booz Allen Hamilton in Tokyo. He is Managing Director of Allco Equity Partners Limited,

Deputy Chairman of Asialink, a member of the Board of the Australian Chamber Orchestra, the Royal Children's Hospital Foundation (Victoria) and co-Chairman of the Financial Management Association of Australia Ltd. He is a member of the Australian Graduate School of Management Advisory Council and the Stanford Sloan Alumni Advisory Board.

### Lead agency

Private sector - Independent

### Strategies/Achievements

- establishment of a National Board of Management and 'Incorporated Association'
- location of operational funds for first two year of \$400,000 through corporate sponsorship
- establishment of national Science Advisory Panel
- refurbishing and fit-out of office facilities located at the SA Museum
- recruitment of Chief Executive Officer
- maintain and extend connection to the Bragg Initiative
- explore future collaborations with the SMC in the UK

## X Science Infrastructure and Research

*The building of a stronger support base for science research in South Australia, through improved liaison with the Premier, better relationships with the tertiary sector in South Australia, the support of leading edge research clusters and the improvement of investment uptake and opportunities, to be fostered. These activities could be incorporated as "models of collaborative practice" and components of the*

*Florey Precinct for Intergenerational Health. This Precinct could then become a model for international collaborations along similar lines to the Royal Institution (Ri), representing both research and democratisation of science activities.*

### Champion

*Professor Max Brennan,*  
*Chief Scientist, South Australia*

### Lead agency

Department of Further Education, Employment, Science and Technology.

### Strategies

- endorsement of the proposal to Cabinet to invest in State Precinct development ensuring equal stakeholder contribution and participation
- proposal of a feasibility study to look at the potential for the Florey Precinct to incorporate activities that provide a high energy focus for science in SA, including: developing a business incubator for the commercialisation of ideas, incorporating initiatives that attract and retain women scientists (eg a child care centre) and building a broader role to incorporate education, media, the arts and communication activities
- that the Florey Precinct become an icon for SA
- development of a critical mass of science activity and engagement to catalyse momentum, collaboration across disciplines and institutions, by strengthening whole of government relationship with the Premiers Science and Research Council and establishing the

"Premier's Graduate Studentships"

- exploration of ways of using the Ri as a business model for future development of a potential Ri Down Under
- encourage more practical and intellectual connections between the three universities from shuttle buses to webcasting and more research clusters
- detailed study of IP spin-out possibilities
- establish 'Summer' Fellowships for the vacation period in the Northern hemisphere ie June, July, August for tenured, senior academics

## Last Words (For Now)

When I first came to Adelaide in 2004, I had little idea of what to expect both of myself, of the residency and indeed of the people with whom I would be working. I could never have guessed the important factor of the can-do mentality that I came to learn was so characteristic of Australia.

*By identifying problems as mere bottlenecks and by not succumbing to the easy inertia of sustaining the status quo, I have learned how rewarding it can be to have ideas that can be implemented, indeed to go from creativity to innovation. At a personal level I also learnt how powerful it can be when an idea is enthusiastically received and implemented in giving one the confidence to have further ideas.*

Another career lesson was the importance and the joy of working as a team where skills can be pooled, ideas ventilated and modified so that one can have a clear practical outcome in the shortest possible time.



Also at a personal level, I was struck by the similarities between Adelaide and the Royal Institution. In both cases they are small communities acting as David to Goliath, in the case of South Australia to the Eastern Seaboard States and in my case against the establishment institutions heavily subsidised by the government within the UK.

When I first took up directorship of the Ri, it was clear to me that I had to occupy a novel niche, that we had to punch above our weight and take risks with highly novel schemes and projects that would not just give us our own position in the British landscape but, in being the vanguard, set an example to other larger institutions. South Australia is and can be comparable in its strategy by showcasing and developing unique initiatives derived from exciting ideas. The benefits could be incalculable for attracting scientists to come to the state to help and hence promote wealth creation for the 21st Century.

A further and completely parallel situation is that the Ri is about to embark on the most major refurbishment in its 206 year history. This work will commence in January 2006 and be completed by Spring 2007. The parallel would be complete if just as the Ri refurbishment was coming to a successful conclusion the first groundbreaking ceremony was occurring at the Florey Precinct site in Adelaide. It could be the case that the two iconic buildings could represent the integration of science finally into the mainstream of society.

The two buildings could then eventually stand for a long-lasting testament to the *Thinkers in Residence Program* and indeed to the bond between Adelaide and the Ri initiated so long ago by the Braggs and extended now to include the UK and in particular Oxford with the whole state of South Australia. As such I will continue to feel increasingly that South Australia isn't just the 'Ri Down Under' but indeed my second home. Clearly the range of these initiatives is broad and the degree of their feasibility extremely varied. Yet with the skill and overall support of so many leading figures in the South Australian community the chances are maximised of achieving the most ambitious of these goals.

At this stage of the 21st century South Australia has a unique opportunity to be an exemplar community, integrating the resources, knowledge and expertise of its science research community with media, education and commercial sectors through ongoing collaborations to meet the challenges of the future.

It is this community, living as it does in a relatively compact space, and therefore able to interact fully, that makes Adelaide the most likely place to achieve such exciting goals as the population rises to these challenges in the 21st Century.

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## Appendix 1

### Collaborations Between the Three South Australian Universities

Name of Activity	Type of Agreement / Collaboration	Brief Description of Activity
<b>Research</b>		
Cooperative Research Centre for Sensor Signal and Information Processing (CSSIP)	CRC	Collaboration to benefit Australia, its people and industry in the field of sensor signal and information processing through world class research, development, education and application.
South Australian Partnership for Advanced Computing	Formal MOU	Provision of high performance computing to SA.
Adelaide Integrated Bioscience Laboratories (AIB Labs)	Managed by representative Steering Committee	“Virtual facility” across multiple sites to ensure that major bioscience research equipment can be shared by the bioscience research community and core competencies established in strategic locations. Initiative of BioInnovation SA, the three universities and other research organisations.
SA Regional Microanalysis Facility	Managed by representative Steering Committee	“Virtual facility” across multiple sites. Cooperative infrastructure development through successful collaborative applications to major funding bodies.
South Australian Virtual Reality Facility (SAVRC)	Formal	\$5.3 million fully immersive three dimensional visualisation facility in Adelaide, funded by ARC, three SA universities, Curtin University and industry.
m.Net Corporation Ltd	Formal	Three universities are shareholders in this corporation which has developed an advanced wireless network that enables research into wireless network technologies and applications.
Workforce Development Research Consortium	In development	Research collaboration building on existing substantial labour market knowledge base and analytical capacity of the three universities.
Child Health Research Institute	Independent Institute	Collaborative research to understand basic mechanisms involved in health and disease, and to develop intellectual property beneficial to the health and development of children. Adelaide and Flinders major collaborating partners; some collaboration with UniSA.

Name of Activity	Type of Agreement / Collaboration	Brief Description of Activity
Australasian Research Management Society Inc (ARMS)		Professional development of research managers and administrators, and enhancement of research enterprise. South Australian Chapter Executive involves representatives from all universities.
University of Adelaide Research Clusters	In development	A number of the University of Adelaide's new research clusters involve (or are in the process of involving) researchers from the other two universities in collaborative, cross-disciplinary research.
Flinders University Areas of Strategic Research Investment (ASRIs)	In development	A number of the ASRIs involve, or intend to involve, researchers from the other universities.
Research and Education		
ICEWaRM - International Centre of Excellence in Water Resource Management	Commonwealth International Centre of Excellence	Collaborative research and teaching.
South Australian Neurosciences Institute	Formal MOU	Collaborative research and teaching.
Ethics Centre of South Australia	Formal MOU	Collaborative research and teaching.
South Australian Consortium for Information Technology and Telecommunications (SACITT)	Incorporated entity	Collaborative IT&T research and development, and encourages joint planning of IT&T education by SA universities. Currently funded to conduct a planning process for proposed South Australian Population Health Informatics Research Program. Initiating and co-ordinating body for SABRENet, SA's new research broadband network. Manages (via AITEC Pty Ltd) the DSTO Continuing Education Initiative (see below).
Joanna Briggs Institute	Formal	World-wide collaboration for evidence based nursing. Headquarters at Royal Adelaide Hospital; affiliate institution of University of Adelaide. UniSA and Flinders Medical Centre (which is linked to Flinders University) also members.

Name of Activity	Type of Agreement / Collaboration	Brief Description of Activity
Adelaide Microscopy		University of Adelaide facility provides broad range of the most technologically advanced instrumentation for microscopy and microanalysis. Also provides scientific support services available to universities, other research organisations and corporate sector. UniSA and Flinders University have representatives on AM Users' Group committee. Works with SA Regional Microanalysis Facility (see above).
TechNetSA		Support and development network for general staff of the three SA universities working in the practical application of science, engineering, health, and associated technological and support services.
South Australian Network of Institutional Biosafety Committees		Chairs and Secretaries of the institutional biosafety committees address issues and best practice in relation to biosafety. Endorsed by the Office of the Gene Technology Regulator.
Australian Federation of University Women - SA Branch		Part of global network of women graduates who believe that the education of women and girls is a key factor in bringing about social change; involves members from staff and alumni of three universities. Raises money through hiring academic dress for graduations and other functions. Proceeds used to fund bursaries and scholarships.
University of Texas at Austin, Texas and St. Edward's University, Austin, Texas, USA	MOU	Joint MOU for exchange of staff and students, collaborative research projects, exchange of publications and academic information, and other mutually agreed activities.

Name of Activity	Type of Agreement / Collaboration	Brief Description of Activity
The Ministry of Science, Research and the Arts, State of Baden-Württemberg, FR Germany; involves exchange agreements with Albert-Ludwigs University, Freiburg Ruprecht-Karls University, Heidelberg University of Hohenheim, University of Karlsruhe, University of Konstanz, University of Mannheim, University of Stuttgart, University of Tübingen, University of Ulm	MOU. State to State agreement	Exchange of students and staff, and collaborative research.
Thinkers in Residence Program	Managed by State Government	A State Government initiative with significant support and contributions from the three universities for each Thinker in Residence.
ASMR Medical Research Week		Universities contribute to the Australian Society for Medical Research's annual flagship public outreach program.
<b>Research Training</b>		
Biennial Quality in Postgraduate Research Conferences	Sponsorship and co-ordination	Established in Adelaide in 1994. Leading national conferences held in Adelaide for supervisors, postgraduate students, policy makers, administrators, members of government agencies and researchers in the area of postgraduate education.
The Postgraduate Research Administrators Taskforce (PRATS)		Established 1997; administrative support network closely aligned with the national Council of Deans and Directors of Graduate Studies (DDOGS). Currently the three universities are organising the 2006 national PRATS meeting.
Education Centre for Innovation and Commercialisation (ECIC)		Centre programs designed to develop capability in the management (including project management) of innovation and its commercialisation. Based at University of Adelaide but staff from other two institutions contribute to programs.

Name of Activity	Type of Agreement / Collaboration	Brief Description of Activity
Fulbright Scholarships	Formal	Secretaryship of South Australian Selection Committee (currently with University of Adelaide). Representatives from all universities on Committee.
The John Crampton Travelling Scholarship	Formal	Selection Committee has representatives from all three universities.
Joyner Scholarships in Science, Law and Arts	Formal	Administered on behalf of Tower Trust. Selection Committee has representatives from all three universities. Responsibility for coordinating the Joyner, Ferry and Loader Scholarships is spread across the three universities.
The Ferry Scholarship	Formal	Available for an applicant intending to undertake a higher degree by research in Physics at any of the three universities. Administered on behalf of the Public Trustee. Responsibility for coordinating the Joyner, Ferry and Loader Scholarships is spread across the three universities.
Jack Loader Research Scholarship	Formal	For research into dementia, in particular Alzheimer's Disease. Available to students at any of the three universities. Responsibility for coordinating the Joyner, Ferry and Loader Scholarships is spread across the three universities.
Mawson Fellowship Program	Formal	Support for postgraduate research, sponsored by the South Australian Government, the State's three universities and MACAJ, a consortium of leading Japanese companies. Secretarial support provided by the Office of the PPCI at University of Adelaide. UniSA and Flinders have previously provided secretarial support for the program.
General Sir John Monash Postgraduate Awards	Formal	Representatives from all three universities on State Selection Committee. Secretary located in Adelaide Graduate Centre (University of Adelaide).

Name of Activity	Type of Agreement / Collaboration	Brief Description of Activity
Education		
Helpmann Academy	Formal partnership	Partnership of the major tertiary arts training establishments in South Australia offering award courses for people seeking professional careers in the arts. Board of Governors includes Vice Chancellors of the three universities.
DSTO Continuing Education Initiative (CEI)		Universities are providers to and collaborate with Defence Science and Technology Organisation (DSTO) on the CEI, the DSTO staff development initiative that enables staff to undertake coursework postgraduate study in a range of approved areas, leading to a Graduate Certificate, Graduate Diploma or Masters award.
Graduate Certificate in Neurosciences	Formal	Course taught to school teachers by all three universities.
Cross Institutional Study	Formal	Students in various programs are permitted to undertake studies at another institution (up to certain limits) that are not available at their home institution, and have the studies counted towards their undergraduate degree.
Robotics Peer Mentoring Program		UniSA's robotics program involves collaboration with industry and the two other universities. Gives accessibility to high school students to acquire niche ICT / electronics skills in programming microchips that are normally only taught in universities.
South Australian Parliamentary Internship Scheme		Student placement scheme involving three universities where interns are placed in either the State Parliament of South Australia or with one of a range of public sector agencies.
Teaching Education Practicals		Ongoing collaboration and co-ordination of teaching practice requirements of education degrees of the three universities.
South Australian Tertiary Admissions Centre (SATAC)	Joint venture	Agent for tertiary institutions in Adelaide for receiving and processing applications for admission to tertiary level courses.

Name of Activity	Type of Agreement / Collaboration	Brief Description of Activity
Libraries		
Voyager Library System	Cooperative purchase	In 2001 the three universities collaborated to purchase system as central libraries' operating system.
The Universities' Research Repository South Australia, URRSA (the Joint Library Store)	Joint enterprise	Established in 1984 between University of Adelaide and Flinders University. Comprises large storage facility on Flinders University campus to which each library relocates lesser-used library materials. UniSA Library became a participant in 2004.
Systems Advisory Group of the University Libraries of South Australia (SAGULSA)		Meets regularly on systems matters, related to the Voyager Library System, the Endeavour portal systems, the RLG ILL Manager system, etc. Sharing of expertise, training, and work for joint purchases where possible.
The Library Courier Service		Each of the SA university libraries has several branch libraries, each delivers items to and from URRSA, and communicates with other research libraries in the metropolitan area. Since 1992, SA university libraries have jointly funded a Library Courier Service that now delivers some 3,000 items per week.
Reciprocal Borrowing		Reciprocal borrowing scheme introduced in 1998 allowing registered users of any of the three university libraries to borrow from the other institutions. Operations of the scheme are overseen by SAGULSA. In 2004 a total of more than 32,000 items were borrowed personally through the scheme.
Barr Smith Library Paging Service		Until 1991, several libraries in the metropolitan area paid staff members to attend the Barr Smith Library to borrow items and photocopy articles on behalf of their users. In 1992, the University of Adelaide Library introduced a Paging Service which undertook lending and photocopying on behalf of those libraries. Over 90% of service business derived from Flinders University and UniSA. Paging Service now integrated with Document Delivery Services.

Name of Activity	Type of Agreement / Collaboration	Brief Description of Activity
Regional Collections Development		Collaboration on development of regional collections, to avoid duplication (triplication) when it is not necessary. Also considers 'last copy' storage of old journals, etc.
Other		
Unisure Pty Ltd	Incorporated entity	Collaboration on occupational health and safety, and workers' compensation. Three universities are shareholders in Unisure Pty Ltd, which manages workers' compensation claims on behalf of the institutions.
Human Resources Officers Group		Representatives from the universities meet monthly to discuss major and/or strategic developments in human resources.

## Developmental Timeline of Australian Science Media Centre

### September 2004

- Appointment of Chair, Peter Yates, Managing Director Allco Equity Partners Limited and Interim CEO, Linda Cooper
- Scoping Consultation and Concept Validation Process with media industry and science representatives across Australia

### October 2004

- Funding strategy devised and initial sponsorship approaches made

### November 2004

- Accommodation and Infrastructure needs identified

### December 2004

- Funding support from State Government of South Australia confirmed
- Initial sponsors and Board Members confirmed

### February 2005

- CEO search strategy confirmed
- Reviewed incorporation of Association without members

### March 2005

- Inaugural Board Meeting
- Public announcement
- Implementation of sponsor strategy
- Commencement of Science Advisory Panel List

### April 2005

- Visit from UK Science Media Centre Staff, Becky Morelle for a six week consultancy to assist with the set-up (courtesy of the Royal Institution, UK)
- Commencement of CEO recruitment

# Appendix 3

## Science Advisory Panel of Australian Science Media Centre

Name	Position/Affiliation
Emeritus Professor Ian <b>Lowe</b>	Emeritus Professor School of Science Griffith University
Professor Peter <b>Andrews</b> , AO	Queensland Chief Scientist Department of State Development and Innovation
Professor Patricia <b>Rich</b>	Faculty of Science School of Geosciences Monash University
Professor Richard <b>Head</b> , BSC, PhD	Director CSIRO Preventive Health Flagship Program
Baroness Professor Susan A <b>Greenfield</b> , CBE	Director of the Royal Institution of Great Britain
Professor David <b>Henry</b>	Director Clinical Pharmacology Mater Hospital
Professor Helen <b>Quinn</b>	Director Stanford Linear Acceleration Centre Stanford University
Professor Snow <b>Barlow</b>	Professor of Horticulture and Viticulture School of Agricultural and Food Systems, University of Melbourne
Professor John <b>Zillman</b> , AO, FTSE	President, Australian Academy of Technological Sciences and Engineering (ATSE)
Dr Andy <b>Thomas</b>	NASA Astronaut
Professor Adrienne <b>Clarke</b> , AC	Laureate Professor School of Botany University of Melbourne
Sir Gustav <b>Nossal</b> , AC	Emeritus Professor Department of Pathology University of Melbourne
Dr Bryan <b>Gaensler</b>	Assistant Professor Department of Astronomy Harvard University

Name	Position/Affiliation
Dr. Kenneth <b>Fischer</b>	Adjunct Professor, The School of Food and Land Sciences University of Queensland
Emeritus Professor Nancy <b>Millis</b> , AC, MBE	Chancellor La Trobe University
Professor Peter <b>Doherty</b> , AC,	Laureate Professor Department of Microbiology and Immunology, University of Melbourne
Professor Fiona <b>Stanley</b> , AC	Director TVW Telethon Institute for Child Health Research
Emeritus Professor Derek A <b>Denton</b>	Emeritus Professor Department of Physiology University of Melbourne
Professor Bob <b>Williamson</b> AO	Consultant
Professor Lyn <b>Beazley</b> MA PhD	Professor of Zoology School of Animal Biology University of Western Australia
Professor Frank <b>Fenner</b>	Visiting Fellow at John Curtin School of Medical Research Australian National University
Professor Michelle <b>Simmons</b>	Federation Fellow School of Physics University of New South Wales
Professor Fellow Malcolm <b>Walter</b>	Director of Astrobiology Department of Earth and Planetary Sciences Division of Environmental and Life Services Macquarie University
Professor Marcia <b>Langton</b>	Chair of Australian Indigenous Studies School of Anthropology, Geography & Environmental Studies University of Melbourne
Professor Alan <b>Cooper</b>	School of Earth and Environmental Sciences University of Adelaide
Professor Robert <b>Hill</b>	Head of Science Science Centre SA Museum The University of Adelaide

# Appendix 4

## Adelaide Thinkers In Residence Susan Greenfield Media Coverage March 2003 – December 2004

MARCH 2003		
891 ABC Adelaide	Wed 5/3/03	News item, Premier announcing first 4 Thinkers. 9am
The Advertiser	Wed 5/3/03	Article "It's the thinking cap brigade" page 9
MAY 2003		
Sydney Morning Herald	Sat 15/5/03	Article, "Science's Cinderella"
The Age	Sat 15/5/03	Article, "Paying the price for making science sexy", pg 5 – Insight
JUNE 2003		
Business Life	June 03	Feature on Thinkers program "Smart Thinking", pg 11-13
JULY 2003		
The Age	Mon 7/7/03	Article "The Baroness of scientific thought"
JANUARY 2004		
The Guardian	Sat 24/1/04	Article "My work space"
MAY 2004		
Sydney Morning Herald	Sat 15/5	Article "Science's Cinderella"
The Age	Sat 15/5	Article "Paying the price for making science sexy", Insight
The Advertiser	Sat 29/5	Article "Think again" Weekend page 9
JUNE 2004		
Sunday Mail	June 2004	Article "\$2m bill to think about Adelaide" page 34
The Advertiser	Tue 22/6	Article "It's fashionable to think about intelligence" page 3
Radio National Breakfast	Tue 22/6	In Conversation interview, 8:09am
The Advertiser	Wed 23/6	Editorial, "Visitors who get us thinking" page 16
The Advertiser	Wed 23/6	Letters to the Editor, "Backward Adelaide needs thinkers" pg 17
The Advertiser	Thur 24/6	Article "Fashion is part of professor's formula" page 18
Bio News	June-July	Article "Thinkers back in Adelaide"
JULY 2004		
International Biology Olympiad	July	Advertising lecture "Minds of the Future"
Sunday Mail	Sun 4/7	Ref in article "Hunger for approval turns ugly" p114

Adelaidean	Tue 6/7	Article "Thinker shares insights into human brain" page
The Advertiser	Wed 7/7	News item "Scientists and the media" page 26
The Advertiser	Wed 14/7	Opinion column "What really goes on inside your head" pg 18
The Advertiser	Thur 15/7	Article "Media Unit to give scientists a voice" page 14
The Advertiser	Fri 16/7	Letter to the editor "Breath of fresh air" page 16
Weekend Australian	Sat 17-18/7	Flinders University Today lecture advertisement page 14
Xpress	Thu 22/7	Article "Northern educators think for the future" page 3
Weekend Australian	Fri 23-25/7	Flinders University Today lecture advertisement page 11
The Advertiser	Sat 31/7	Flinders University Today lecture advertisement page 8
The Advertiser	Sat 31/7	Advertisement Public Lecture, weekend section
The Advertiser	Sat 31/7	News item "Port Augusta Workshop" page 55
AUGUST 2004		
891 ABC	Wed 4/8	Morning show, interview 9.10-9.40
Radio National	Thur 5/8	Science Show, "In Conversation" interview
Adelaidean	Sat 7/8	Article "Adelaide's Thinker in Residence" page 9
The Advertiser	Sat 7/8	Advertisement public lecture
The Australian	Mon 9/8	Features article "March of the automatons" page 10
The Advertiser	Thur 12/8	Article "Kirstey's mission to aid our finest medical minds" pg 11
The Advertiser	Sat 14/8	Saturday Magazine Article "A mind of your own" page 4-5
The Australian	Mon 16/8	Article "Art of discovering science" page 10
The Advertiser	Thur 19/8	News item "Grant for science post" page 30
Xpress	Thur 19/8	Article "Regional visit for thinker" page 7
Flinders Journal	Mon 23/8-5/9	Article "1400 flock to hear Baroness Greenfield's summing up"
ABC TV – Catalyst	Thur 26/8	Feature story "Baroness and the Brain" 8pm
ABC TV – Stateline SA	Fri 27/8	Feature story "Inspiring Students to turn to Science"
The Advertiser	Sat 28/8	Article "Scientific university to involve everyone" page 20



SEPTEMBER 2004		
The Adelaide Review	9/2004	Article "The Curiosity Show" page 6
ABC TV – Enough Rope Andrew Denton	Mon 13/9/04	Interview with Andrew Denton
OCTOBER 2004		
ABC TV Asia Pacific	Fri 22/10	Nexus Interview
The Advertiser	Sat 30/10	Article "New Uni as US giant to open city campus" Page 8
DECEMBER 2004		
Xpress	Thu 9/12	Thinkers in Residence feature, pages 14/15
The Advertiser	Sat 11/12	Article "Mysteries within" page 11
Encounter 2004	Dec	Flinders Uni News, page 13

**Adelaide Thinkers In Residence Susan Greenfield Media Coverage  
March 2005 – September 2005**

MARCH 2005		
The Adelaide Review	Fri 4/3/05	Article: Science to place SA in the news Focus: AusSMC
ABC Radio National The World Today	Wed 9/3/05	Interview: Rob Morrison, Peter Yates Focus: AusSMC
New Scientist	Sat 12/3/05	'Antipodes' section – AusSMC mention
R&D Info eNewsletter	Tues 22/3/05	Headlines: 'Science Media Centre to open in Adelaide'
MAY 2005		
Channel 10 TV News	Tues 10/5/05	Launch of "Bragg Initiative", 5.19pm, featuring Susan Greenfield and Premier Mike Rann at RI, London
Channel 9 TV News	Tues 10/5/05	Launch of "Bragg Initiative", 6.11pm, featuring Susan Greenfield and Premier Mike Rann at RI, London

Channel 2 TV News	Tues 10/5/05	Launch of "Bragg Initiative", 7.17pm, featuring Susan Greenfield and Premier Mike Rann at RI, London
R&D Info eNewsletter	Wed 18/5/05	Headlines: 'Bragg Initiative to promote science in SA'
JUNE 2005		
Independent Weekly	June 12-18/05	Article: Where science meets the headlines Focus: AusSMC, p6
JULY 2005		
ABC Melbourne Morning Show	Thu 7/7/05	Interview with Jon Faine, 9:40am Focus: International Conference on Thinking
891 ABC Adelaide	Tues 12/7/05	Morning Show – Matt Abraham & David Bevan Focus: The brain Q&A, 9:07-9:30am
The Advertiser	Mon 18/7/05	Article: Forums to boost our knowledge of science Focus: Science Outside the Square – launch, p13
Adelaide Uni website	July 2005	Science Outside the Square & Genes of Bragg
Radio 5AA	Thu 21/7/05	Interview with Adam Spencer Focus: Science Outside the Square, The Science of Sport, 8:40-8:43am
891 ABC Adelaide	Wed 27/7/05	Morning Show interview Focus: Marijuana and your brain, 9:09-9:27am
City Messenger	Thu 28/7/05	Mention: Great Escape, p3
The Advertiser	Fri 29/7/05	Advertisement: Science Outside the Square – Food and Drink – the Sustenance of Life, p26
The Advertiser	Fri 29/7/05	Article: Hunger for knowledge Focus: SOTS Food and Drink event, p9
The Advertiser	Sat 30/7/05	Advertisement: Science Outside the Square – Food and Drink – the Sustenance of Life, p50
SA Museum newsletter	July/Sept 2005	Bragg About Adelaide Exhibition
AUGUST 2005		
The Advertiser	Tues 2/8/05	Education section – Science Week focus. Science Outside the Square mention, pg29
The Advertiser	Wed 3/8/05	Article: New centre makes it as easy as A-B-C Focus: AusSMC launch, p4

## Appendix 4

The Advertiser	Wed 3/8/05	Article: Plenty of food for thought Focus: SOTS, Food and Drink – The Sustenance of Life, p4
City Messenger	Thu 4/8/05	Article: Greenfield returns as Adelaide's 'Thinker in Residence' Focus: AusSMC, p27
City Messenger	Thu 4/8/05	What's On section – 'A Shortcut to Space' p22
The Advertiser	Sat 6/8/05	Front page 'Inside a Brilliant Mind', full interview in Review section – cover story, pages 3, 4, 5
The Advertiser	Sat 6/8/05	Social Scene – photo from Food & Drink event
Independent Weekly	Aug 7-13/05	'In Adelaide' section, pg 2 Focus: Science Media Centre launch
The Advertiser	Mon 8/8/05	Letter to the Editor – "Look after scientists", p19
Campus Review	Wed 10/8/05	Article: Invented in Hades: why the RQF stinks Pgs 1 and 8
Campus Review	Wed 10/8/05	Article: Susan Greenfield – Unplugged, p5
The Advertiser	Fri 12/8/05	Issues piece – 'Bragging Rights' Focus: Braggs in Adelaide, p21
The Australian Financial Review	Fri 12/8/05	Opinion column by Susan Greenfield 'Tomorrow's selfless people', p4 of Review section
The Advertiser	Fri 12/8/05	Article: Salute to pioneers of genetics Focus: Bragg exhibition, p16
The Advertiser	Sat 13/8/05	Article: 'Youth making science sexy' Focus: Student science media awards, p18
Sydney Morning Herald	Aug 13-14 2005	Article – 'There's never a dull moment in quest for a sharper brain', pg 5
Sydney Morning Herald	Aug 13-14 2005	Spectrum liftout. 'The Hot Seat' interview. "A Mind of Her Own". Pgs 1,4 & 5
The Weekend Australian	Aug 13-14 2005	Article: Out to change your mind Focus: Susan Greenfield, p20
City Messenger	Thu 18/8/05	'What's On' section: Science Outside the Square Demystifying Depression, pg 22
Independent Weekly	Aug 21-27 2005	'In Adelaide' section. Focus: Science Teacher Twinning, pg 2

The Australian	Tues 23/8/05	'Strewth' column: 'Scientific approach', focus: Media & Politics event, Sydney, pg 11
The Australian	Thu 25/8/05	Media section: 'Centre fosters better science reporting' Focus: AusSMC, pg 17
SEPTEMBER 2005		
The Advertiser	Thu 1/9/05	Advertisement – Science Outside the Square Energy options for a warming world, p31
The Advertiser	Sat 3/9/05	Article: Experts look for energy options Focus: SOTS event – Energy Options for a Warming World, p31
The Advertiser	Sat 3/9/05	Advertisements – Science Outside the Square Energy options for a warming world, p71
Xpress	Thu 8/9/05	Article – Pairing to make science 'twinkle' Focus: Science Teacher Twinning, p5
The Advertiser	Sat 10/9/05	Advertisement – Science Outside the Square The Wonder Years, p82
The Advertiser	Sat 10/9/05	Article: Ten students get royal science treat Focus: Student visit to Ri Christmas Lectures, p41
NOVEMBER 2005		
Cosmos Magazine	Nov 2005	Article: Power & Passion Focus: Susan Greenfield profile, p60-64
The Bulletin	Wed 2/11/05	Article: Lunch with Diana Bagnall Focus: Susan Greenfield profile

# Appendix 5

## Websites

[www.stv.columbia.edu/](http://www.stv.columbia.edu/)

[www.ausstats.abs.gov.au/](http://www.ausstats.abs.gov.au/)

[www.dh.sa.gov.au/pehs/PROS/Mental-Health-Status-Oct-97-Report-6.pdf](http://www.dh.sa.gov.au/pehs/PROS/Mental-Health-Status-Oct-97-Report-6.pdf)

[www.environment.sa.gov.au/sustainability/](http://www.environment.sa.gov.au/sustainability/)

[www.abs.gov.au/austats](http://www.abs.gov.au/austats)

[www.scimas.sa.edu.au/scimas/pages/updates/projectdetails/](http://www.scimas.sa.edu.au/scimas/pages/updates/projectdetails/)

[www.rigb.org/rimain/events/christmaslectures.jsp](http://www.rigb.org/rimain/events/christmaslectures.jsp)

[www.ri.ac.uk/DFRL/](http://www.ri.ac.uk/DFRL/)

[www.rigb.org/rimain/calendar/](http://www.rigb.org/rimain/calendar/)

[www.21school.ox.ac.uk/](http://www.21school.ox.ac.uk/)

[www.science.sa.gov.au](http://www.science.sa.gov.au)

[www.sciencetwinning.org.au](http://www.sciencetwinning.org.au)

[www.flinders.edu.au/courses/postgrad/neuro.htm](http://www.flinders.edu.au/courses/postgrad/neuro.htm)

[www.aussmc.org](http://www.aussmc.org)

[www.sciencemediacentre.org](http://www.sciencemediacentre.org)

[www.sani.edu.au](http://www.sani.edu.au)

[www.adelaide.edu.au/hda](http://www.adelaide.edu.au/hda)

[www.templeton.org/](http://www.templeton.org/)

[www.oxscom.ox.ac.uk](http://www.oxscom.ox.ac.uk)



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