Australian Government

AUSTRALIA'S CHIEF SCIENTIST

KEYNOTE ADDRESS TO UNIVERSITY OF ADELAIDE'S

HEALTH SCIENCES POST GRADUATE RESEARCH CONFERENCE

25 – 30 MINUTE SPEECH PLUS 10 - 15 MINUTE Q & A

NATIONAL WINE CENTRE - ADELAIDE

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Good afternoon and thank you to the Faculty of Health Sciences at the University of Adelaide for inviting me to speak here this afternoon.

The University of Adelaide has produced a magnitude of successful graduates and some of our country's brightest; not to mention an astronaut and a MasterChef winner[i]. But I am not here to focus on the famous; I am here to focus on you: the future of Australia, who wants to make a difference to this world, for the better.

The Faculty of Health Sciences has received above world standard ratings across six areas of health and medical research[ii], which is no small feat. You should all be extremely proud of your contributions to this ranking, and the success of your University on the global-scale.

Earlier this year, I released the report, *Health of Australian Science* to uncover Australia's science, technology, engineering and mathematics landscape, and in particular, where we are strong, where there are vulnerabilities, where are our research links, and what is their quality. After an eight month intensive research project, my Office found that

Australian science is in good shape in many areas, however, there are some potential issues brewing in the pipeline. We need to be wary of them, and prepare for them now.

In particular though, the health and medical science field is growing strongly. From 2002 to 2010, commencing enrolments grew by more than 70% and students who completed their degrees are higher than the system-wide average, indicating the persistence and strength of its students. In the medical and health fields of science, females currently comprise more than 50% of total enrolments. Even more promising is the number of commencing higher degree researchers which grew substantially by 20.7%[iii].

Australia has a broad range of health and medical research foci. Particular research priority areas are in disease prevention and indigenous health. We are also focusing on diseases affecting a large proportion of the population; in particular, cancer, cardiovascular disease, diabetes, mental illness, obesity, arthritis, dementia, and asthma[iv]. It is vital that we have the skills in the medical and health sciences areas to be able to meet the future research needs of these diseases

and subsequently produce medications and aids to assist in treatment, prevention, and cure.

Australia's health and medical landscape is changing, and we will continue to see more changes over the next five to ten years. The burden of disease is becoming increasingly apparent to society, and we are beginning to see the dramatic effects of our ageing population. Chronic diseases such as arthritis and diabetes in conjunction with mental illness are now the leading causes of morbidity and mortality. So what can be done?

We know that mapping of the human genome is progressing steadily and when teamed with the ICT revolution, the potential for yielding new insights into genetically-based diseases (like cystic fibrosis and Huntington's disease) is promising. Australia has already contributed to the development of treatments for infectious diseases such as penicillin, relenza and flu vaccines; and we have the potential to develop new treatments for sporting injuries and new treatments in preparedness for potential pandemic outbreaks.

It is easy to say we can change the world through our research; however, translating this research into new, practical treatments isn't always as easy or straight-forward. We need some sort of link to facilitate a pathway from discovery to health. We need to take the research from the labs to surgeries and transform basic-science breakthroughs into clinical applications.

The translation of research into health care has an important spin-off for medical research because it is a factor in the high public regard for medical research and medical researchers. There are of course, some instances where it is under attack. Inoculations, stem cell research and therapeutic cloning for example, invoke strong emotions and opinions in the community and parliament in Australia, and in other countries.

But overall, medical research is widely supported. As evidence, you can look to public opinion polls or perhaps even to the lack of concerted threats and intimidation presently reported by medical researchers.

This hasn't always been the case. One only needs to look back to WWII and some of the so-called medical experiments

done then, the nuclear tests in or on bikini atoll, or the Tuskegee syphilis study to see that trust in, and respect for medical research depends on what is done, how - and the ethical standards applied to the work.

But right now, in this culture of scepticism even cynicism, medical research flies high.

Perhaps this is because medical research offers better health; it has the most obvious potential to improve lives in a very personal way – and we all have an interest in that.

But a study conducted by the Australian Society for Medical Research found that more than a third of Australian families have been affected by medical conditions that could not be adequately treated[v]. This number may not be substantially different from, say, a decade ago, but the difference is in the attitude - people no longer accept serious illness as ‘a part of life’. Eighty per cent of people agreed with the statement that “*it is unacceptable that Australians are suffering from conditions that would be curable with more investment in medical and health research*.”[vi]

To Australians then, medical research is important. And if we are to deliver on the expectations that follow, we must recognise that it can't all be done here; we are part of a global system, a global effort.

We contribute to, and draw from, the global stock of knowledge. And we certainly play our part as a global contributor. We are a world leader in health and medical research. On a *per capita* basis, our research output is twice the OECD average, even though we spend much less *per capita* than say the US or the UK[vii].

Australian expenditure on medical research is estimated to be 1.1% of the global expenditure but the proportion of world health returns attributable to Australian research is 3.0%[viii].

However, we can't be complacent. We have a responsibility to continue to strive to be a world leader in research.

To secure a successful future for Australia, we need an education system that values the pursuit of knowledge and critical thinking. This year, more than a million students will be studying in Australia[ix] . In institutions such as this, the future

policy makers of the country are being trained today. In institutions such as this, we are providing the skills and knowledge which will shape Australia for the future. And we need to do a good job. Not only because if we don't, Australia will slip behind, but because I need to be looked after in my retirement!

On a serious note though, the value of education, to the individual and society, extends beyond just your immediate field of study. Education in all STEM fields is particularly important and valuable; that is science, technology, engineering and mathematics. Many people think of scientists and laboratories when they think of STEM. But actually, a STEM education provides graduates with many skills relevant to the information-rich modern economy. Skills such as problem-solving and evidence-based thinking form the backbone of STEM; however, these skills can be applied to many contexts. STEM graduates can be found across most, if not all sectors of the economy. According to a report I launched recently for the Australian Council of Dean's of Science, 95% of STEM graduates found their STEM skills useful in their employment, regardless of sector.[x]

Graduates in STEM have creative and analytical talents that can be harnessed in business and other sectors, as well as academic research. Demand for STEM graduates is high, a trend that is likely to continue well into the future.

Universities play a crucial role in attracting young people to STEM fields, training them in STEM skills, and influencing their career directions. In the report Mathematics, Engineering and Science in the National Interest commissioned by the Prime Minister and released by my Office in May, we found that the key to maintaining interest in science is quality teaching. This includes at a university level. Since we are teaching the leaders of the future, and given the broad range of occupations that graduates may enter, it is timely for us to consider how we are preparing students for these roles.

As employers, there are things that can be done to better prepare PhD students for your career progression. A key area is for employers to engage with universities to ensure degree accreditation schemes and curricula accurately reflect skill demands. The former Australian Learning and Teaching Council has recommended universities map their science curricula against a set of skills valued by employers[xi]. As part

of this process, curricula could explicitly embed training in STEM skills, rather than relying on implicit skill development during experimental work or other training.

Employers should also further engage with universities to ensure degree accreditation schemes and curricula accurately reflect skill demands. In the UK, the House of Lords Select Committee on Science and Technology has emphasised the value of employers engaging with university advisory boards and with professional accreditation bodies to identify required skills[xii]

As I am sure you are all aware, you are continually learning, and you can't just rely on theoretical skills learnt at university. To ensure success in any career you choose, you need to develop generic skills that will be valued by any employer. These include skills such as teamwork, communications, writing ability, and presentation skills.

There are other ways to increase your research experience, and build your name and skills. As globalisation is changing the employment landscape, there are many benefits related to research experience overseas. Importantly, a sense of global

awareness and the opportunity to network with colleagues provide the stepping-stones for a healthy career. Australian researchers generally maintain strong and enduring international connections. These collaborations keep Australian science current and globally relevant and benefit our researchers in terms of access to complementary capabilities and large scale infrastructure not easily available to any single country, particularly Australia with its relatively small population[xiii].

PhDs are supposed to push boundaries of knowledge, not encourage acquiescence; however free-thinking an institution may be, it is surely harder to think anew when fixed in one place, among one group of people. International exposure offers PhD student's access to new ideas and methodologies, exposes them to new pedagogical strategies and educational infrastructures, and allows them to serve as ambassadors from the earliest moment of their professional lives, forging links they can take forward as their careers progress[xiv].

Studying in different cultures enables young leaders to understand cultural nuances and become actively engaged with global organisations. Harvard Business School now

sends all 900 MBAs to work overseas in its Global Immersion Program. The coming decades will belong to those global citizens who are comfortable operating anywhere in the world and who can collaborate with people of different cultures to develop solutions to the world's most pressing problems. Organisations filled with these global citizens will not only survive but thrive and grow. For you, life will be richer and more fulfilling.[xv]

There are also publication benefits that can be attributed to spending time overseas. Internationally collaborative publications are now at the forefront of overall growth in publication outputs. Between 2002 and 2010 the proportion of international co-authored health sector papers increased; 28% in immunology, 19% in medicine (non-clinical), 16% in neuroscience, 24% in pharmacology and 12% in psychology [xvi].

Researchers who have returned to the UK after an extended time abroad are significantly more productive in terms of articles published than those who have never left the UK[xvii]. Articles that have co-authors residing in more than one country are more highly cited: 46% of UK researchers publish

articles with non-UK researchers. UK-based researchers' ability to move internationally and to collaborate with non UK researchers are seen as key drivers of the UK's leading global position in terms of research efficiency. Furthermore, this research showed that UK researchers who had spent time at an overseas institution had higher relative productivity than researchers who had only remained in the UK. While not necessarily causal, it further highlights the value of international travel and collaboration.

To assist in overseas opportunities, there are a variety of Government and University scholarships and grants that you can apply for to assist with undertaking study, research or professional development abroad.

And if your thinking, overseas??? I'd be lucky to get anything here let alone abroad, then have some faith as your discipline has taught you, have faith in the stats as they are on your side!

It would appear that all of your hard work and expertise does pay off as most research graduates do find employment quickly. The Postgraduate Destinations Report 2010 showed

that amongst graduates of a higher degree by research (HDR) available for full time work, 88% of life sciences graduates and 87% of medicine graduates were in full time work within four months after graduation. This is higher than for chemistry, mathematics, computer science and most fields of engineering, though lower than physical sciences. The average for all HDR graduates is 85% and the average for all bachelor graduates is 76%.[xviii]

Unfortunately we cannot speculate about future increases in fellowships. 32% of NHMRC fellowship applications in 2011 were approved, including 33% of early career fellowships. These are both up on 2010, when 29% of all fellowship applications and 28% of early career fellowship applications were funded.[xix]

Based on the HAS report, there was an increase in ARC funding 2002 – 2009, and an increase in number of projects in ARC and HHMRC from 2002 – 2010. Unfortunately, there were declining success rates in ARC and NHMRC from 2002 – 2011.

But from where I am standing, the world is your oyster. You have worked hard, in a discipline crucial to the future of Australians and humanity. It will be you and your cohort who will discover how to cope with a pandemic, progress even further on cures for cancer and HIV and advance our understanding of the wonderment of the human body.

If we wish to build a productive future for all Australia, we have to draw on the knowledge and capacity of all Australians as a matter of national priority. Only by drawing on the expertise, creativity and knowledge of all our disciplines will we be able to meet the challenges we face now and into the future, to secure a prosperous future for all Australians.

Once again, thank you all for inviting me here today, and I wish you all the greatest adventures and successes in your future careers, whether you end up a practising scientist, or in another career, your skills and knowledge will be an asset everywhere.

Thank you.

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[i] The University of Adelaide webpage, Facts and Figures: http://www.adelaide.edu.au/about/facts/

[ii] Faculty of Health Sciences webpage: http://health.adelaide.edu.au/research/

[iii] HAS Report, p 164-5
[iv] NHMRC Research Funding Facts Book 2011: http://www.nhmrc.gov.au/guidelines/publications/nh154
[v] Research Australia. 2010. Health and Medical Research Opinion Poll 2010. Available: http://researchaustralia.org/Publications%20Public%20Opinion%20Polls/Research%20Australia%20Public%20Opinion%20Poll%202010%20low%20res.pdf
[vi] ibid
[vii] Australian Society for Medical Research. 2008.The value of Investing in Health R&D in Australia. Available: http://www.asmr.org.au/ExceptII08.pdf
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[x] Harris K-L (2012), A Background in Science: What science means for Australian society. Centre for the Study of Higher Education, Melbourne.
[xi] Australian Learning and Teaching Council (2011), Learning and Teaching Academic Standards Statement – Science, p16
[xii] UK Government House of Lords Select Committee on Science and Technology (2012), Higher education in STEM subjects, p54
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[xiv] 'Why PhD students need overseas opportunities to broaden their minds', Tanya Filer, Guardian Professional (15th May 2012), http://www.guardian.co.uk/higher-education-network/blog/2012/may/15/phds-international-travel-broaden-mind.
[xv] 'Enhance Your Overseas Experience', John Coleman and Bill George, HBR Blog Network (March 6, 2012) http://blogs.hbr.org/cs/2012/03/enhance_your_overseas_experience.html.
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[xvii] International Comparative Performance of the UK Research Base – 2011. A report prepared for the Department of Business, Innovation and Skills (BIS): http://www.bis.gov.uk/assets/biscore/science/docs/i/11-p123-international-comparative-performance-uk-research-base-2011
[xviii] Graduate Careers Australia, Postgraduate Destinations 2010, http://www.graduatecareers.com.au/wp-content/uploads/2012/01/Postgraduate-Destinations-2010.pdf - 2010 is most recent available
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