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Submission No. 52

THE UNIVERSITY OF MELBOURNE

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Committee Secretary
Standing Committee on Science and Innovation
House of Representatives
Parliament House
CANBERRA ACT 2600
Email: scin.reps@aph.gov.au

Dear Secretary,

RE: Inquiry into pathways to technological innovation

Thank you the opportunity to make a submission in support of the Committee's inquiry into commercialisation.

The major points that the University seeks to make are as follows:

1. ***Knowledge generation*** **is the foundation stone of innovation and commercialisation.**

   Australia needs, above all, to value and foster intellectual creativity, curiosity, idea generation, investigation, exploration and invention.

   So much depends in the first instance on the climate in our schools, on appointing, retaining and rewarding good teachers, good facilities and learning environments and introducing students to the excitement of discovery and of research.

   Schools, and other organisations such as museums, libraries, zoos, the Publicly Funded Research Agencies (PFRAs) and universities (including through their cultural institutions and extension programs), can also help to promote an interest in innovation. This should include a focus on 'capturing ideas' and on intellectual property (IP) management and recognising the value of IP in business.

2. **Australia can also do more for its young people to** ***encourage entrepreneurship***, a feeling of wanting to develop new businesses and new products and services, a preparedness to take (calculated) risks and to back good ideas.

   These same values and points of emphasis need to be felt in post-secondary education, and especially at undergraduate level in universities where many of the next generation of scientists, researchers and business leaders will shape their careers.

3. ***Australia must continue to invest heavily in tertiary education.***

   We must give our young people an outstanding experience in institutions where knowledge creation and the application of knowledge are valued. ***Australia's efforts and investment in education need to be at the leading edge <u>not</u> the mid-stream on key OECD indicators.***

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If we get the foundations right, then valuable new knowledge will be generated and we will also have the capacity to access the very best knowledge from overseas and apply it in Australia for scientific, environmental and business benefit.

4. **We need to acknowledge and foster *a wide variety of pathways* to commercialisation.**

   We also need to help people make the best decision possible as to the most appropriate pathway in each situation.

5. **Governments can play an important in overcoming potential barriers to commercialisation,** including through

   1. Funding Australian universities to ensure they are internationally competitive in the generation of new knowledge and knowledge transfer;

   2. Continuing to co-fund with universities the development of business planning/entrepreneur challenges to bring together business students and experts with creators, inventors and scientists to develop new business ideas;

   3. Supporting the development of educational resources and teaching materials in IP management and commercialisation available to *all* schools and universities (eg. the Victorian State Government sponsored some years ago a multimedia kit on commercialisation for university staff and students; IP Australia offers on-line resources for primary, secondary and tertiary institutions);

   4. Ensuring that IP registration systems are as effective and efficient as possible, and widely understood;

   5. Establishing the right financial incentives for business expenditure on R&D and for business to collaborate in R&D and C (commercialisation) with universities and the PFRAs;

   6. Making it mush easier for universities to 'do business' with government agencies that fund research and commercialisation

      a. Legal agreements are becoming more and more complex. Negotiations can take many months and cost all parties a great deal of money. Important work is delayed. Universities are often presented with simply untenable indemnity and warranty provisions.

      b. A whole of government task force could join with university representatives to establish, and where appropriate mandate, simple form contracts;

   7. Government agencies such as DEST or ISR could co-sponsor with the AVCC a review of research contracts between industry and universities with a view to developing nationally agreed templates (this work has just been completed in the UK as an extension of the UK Treasury sponsored Lambert Review of Business-University Collaboration).

   8. Continuing targeted government programs to invest in ideas with commercial prospects but which are too 'early stage' to attract commercial funds – e.g. the NHMRC Development Grants. The Government should, at minimum, encourage the ARC to establish a similar scheme.

   9. Continuing government initiatives to support pre-seed funds.

   10. Ensuring that government has appropriate expectations about university returns from commercialisation.

If in negotiations with industry a university takes what is perceived to be an 'aggressive' position and seeks, for example, high % royalty or a large % of shares in a venture to try to maximise 'commercial income', many parties will just walk away.

Government needs to ensure that universities (and the PFRAs) are negotiating fair deals but equally to appreciate that the major return will be to the wider economy in the long-term.

11. The Commonwealth Government should offer some financial assistance to universities, perhaps on a matching basis, to invest in IP commercialisation services.

    In the UK, the Government has promoted the so-called 'third stream' of activity in universities, that is technology transfer, offering funding on a competitive basis over and above the block funds for 'streams' one and two, teaching/learning and research.

    In Australia, in recent years governments have tended to ask universities to take on 'third stream' or 'third leg' responsibilities but offered no additional resources.

    During his recent visit to Australia, Richard Lambert, chair of the Lambert Review, noted that the UK Government's modest investment in technology transfer services in universities has helped produce 'cultural change in the university system' and 'good economic returns.' (*The Age*, 13 April 2005, p. 17).

Further Discussion

Commercialisation has been defined as 'The process of transforming ideas, knowledge and inventions into greater wealth for individuals, business or society at large' (PMSEIC, 2001).

Commercialisation at the University of Melbourne has a long and distinguished history.

For example, many of the original patents behind Cochlear, one of Australia's most successful biotech companies, were filed by the University. In addition, a number of listed technology companies can trace their history back to the University, including Iatia, Prana Biotechnology, and Bionomics. The University was also responsible for one of the most successful floats of a University business in 2001 when it raised $80m in the float of Melbourne IT. More recently, the University has seen its technology put to use in Recaldent, a novel technology to remineralise teeth. University technology has also been the basis for the formation of 13 companies in the past three years.

Three publications enclosed, *Strategic Partnerships with Industry,* the *Research Review 2005* and *adVentures in Innovation,* highlight further the University's extensive involvement in the national innovation system.

The University also plays a major role in commercialisation, much more broadly defined, in terms of its graduates using their knowledge and skills to create greater wealth. Well educated people are, on average, more successful in creating wealth than those that are not. [1]

A key challenge for researchers in universities and government research agencies, the Chief Scientist Dr Robin Batterham observed, is to 'stimulate and facilitate the increased transfer of knowledge to business and society, across all sectors of the economy.'(Batterham, 2000).

[1] In a paper published in *The Australian Economic Review* (Volume 34 Issue 4 Page 403, December 2001). I reported on an economic analysis of Australian university degrees and compared science and technology degrees with humanities and social science degrees. This study showed that investing in higher education is one of the best investments a government can make in terms of rates of return and balance sheet analysis. The return to government ranges from 1.7 times the taxpayer investment for a three year science and technology degree to 2.1 times for a humanities and social science (arts) degree.

That transfer of knowledge can and does occur in many ways, including through

i. publications and the free interchange of ideas through seminars and informal communication channels
ii. education and training for company personnel
iii. extension activities
iv. consulting
v. contract research
vi. collaborative research
vii. testing for industry
viii. people transfer, including graduate recruitment and staff secondments and exchanges
ix. licensing or assignment of IP
x. joint ventures
xi. spin-outs

It is important that the contribution by universities to commercialisation through *all* these means is recognised and encouraged.

Unfortunately some government reports and indices (eg the DEST Commercialisation Survey) focus on a rather narrow set of indicators.

We also tend to count what can be more easily measured rather than what is really valuable. This potentially leads to 'playing a numbers game' rather than rewarding work based on long-term value. For example, if 'new businesses spun off from universities' became a predominant measure for reporting to government agencies such as DEST, a university could maximise its score by simply registering (perhaps for as little as $100 each) as many 'companies' as it can. But how many would be based on the IP of real value? How many would ever trade? How many people would they end up employing? How many would still be in operation say five years on? How many might one day be listed on the stock exchange? So, we need to acknowledge and foster a wide *variety* of pathways to commercialisation.

Case Studies

In terms of case studies of technology innovation, Australia's success stories illustrate the imperatives outlined above.

There are many such examples set out in the reports of the Chief Scientists, the Howard Report on CRCs and in *Mapping Australian Science and Innovation* and discussed in conferences organised by groups such as Knowledge Commercialisation Australasia (KCA), the Australasian Research Management Society (ARMS), the Intellectual Property Research Institute of Australia (IPRIA), Australian Institute of Commercialisation Ltd (AIC) and the CRC Association.

The University of Melbourne and the Bionic Ear

One of the most outstanding success stories in Australia has been the Australian Bionic Ear, the result of pioneering research commenced by Professor Graeme Clark in the late 1960s at the University of Melbourne Department of Otolaryngology. As described by the Bionic Ear Institute

> At the time scientists said that a successful Bionic Ear or cochlear implant was not possible in the foreseeable future. This made it difficult to get funding and Professor Clark and his staff had to seek donations from the general public to establish the work. The help of clubs such as Rotary, Lions and Apex was invaluable at this time.[2]

The prototype multiple-electrode Bionic Ear was implanted in the first adult at The Royal Victorian Eye and Ear Hospital by Graeme Clark and colleagues in 1978. The team discovered how to analyse the complex speech signal and present it as electrical stimulation to the hearing nerve so that speech could be understood.

[2] http://www.medoto.unimelb.edu.au/bei/AboutHistory.html

The team were then successful in engineering a speech processor small enough for the patient to wear.

As a result of this ground-breaking research, the Australian Government awarded a public interest grant that helped develop the Bionic Ear industrially by the Australian firm Cochlear Limited.

In 1985, the team implanted the first child with a multiple-electrode Bionic Ear. This Bionic Ear was developed industrially by Cochlear Limited in co-operation with The University of Melbourne and The Bionic Ear Institute.

The critical factors have included:

- outstanding researchers;
- an interest in *fundamental questions*;
- a vision of the potential public benefit of the work plus a recognition that commercial investment was needed for prototype development and later manufacturing and marketing;
- strong university support over more than four decades;
- government funding;
- the ability to attract private investment;
- government grants for fundamental research
- government investment and government-private sector support and investment at crucial points.

As described in his book, *Sounds from Silence*, as a child with a deaf father, Graeme Clark dreamed that one day he would find a way for people to hear. After leaving a career as an ear, nose and throat specialist, he returned to relative poverty as a research student to follow his vision for a Bionic Ear.

The University of Melbourne and Oral Health

In June 1999 the then Vice-Chancellor of the University of Melbourne, Professor Alan Gilbert was pictured in *UniNews* receiving the first royalty cheque payment for a product, patented worldwide under the Recaldent trademark. Recadent is a bioactive ingredient which can re-mineralise teeth and bones.

That event followed work over ***15 years*** by a University of Melbourne research team headed by Professor Eric Reynolds, Head of the School of Dental Science.

At various points to that date the research had received funding from the Commonwealth Government, in particular the National Health and Medical Research Council, and also from Bonlac and the Victorian Dairy Industry Authority (which had been supporting the research for 10 years).

This story again emphasises the value of fundamental research and the long time scales involved in developing products with potential widespread application.

This and subsequent work carried out by Professor Reynolds, his team in the School of Dental Science and their collaborators formed the basis for a Victorian Government Science and Technology Innovation (STI) Infrastructure Grant to help establish the Centre for Oral Health Sciences. This in turn helped lead to a successful application under the CRC Program, attracting $21.2 million from the Federal Government. The Oral Health Science CRC partners include the School of Dental Science at the University of Melbourne, Monash University, Victorian-based companies Recaldent and CSL, and a Japan-based multinational, GC Corporation. The Centre's nodes are located at the University of Melbourne's new Bio21 Institute, the Royal Dental Hospital and Monash University.

Speaking at the launch of the new Centre, the CEO Professor Reynolds observed

> Even beyond the immediate $3 billion Australians spend each year on treating oral disease, oral disease has now been linked to a range of illnesses from pre-term labour – and therefore poor baby birth weights – to heart attack and stroke.

> The partners making up this CRC already have a successful track record in developing and putting to market highly successful products for the prevention and treatment of major oral diseases such as tooth decay ... The [Recaldent™] additive is now in products being sold to dentists around the world and one of our major aims is to significantly expand the application of this new technology to develop toothpastes and mouth rinses for use by the general public.[3]
>
> We will also be researching how to replace lost or damaged teeth or tooth tissue with real tooth enamel. This will involve the development of biocompatible dental materials and ultimately the replacement of lost teeth by planting 'teeth seeds' in the gums.
>
> We believe the funding available to the CRC will mean we can make a major go of being the first to achieve that.

The University of Melbourne and 'new ways of seeing things'

In his overview of the technology which now forms the core of IATIA Pty Ltd.'s business[4], University of Melbourne Professor and ARC Federation Fellow Keith Nugent recalls

> I have spent much of my professional life trying to invent new ways of seeing things ... With my colleagues and students, I set out to use my insights to develop new ways that would allow the phase in an image to be measured. The obvious approaches to the problem turned out to be mathematically difficult and totally impractical. However, in 1998, with my student Dr David Paganin (now at Monash University) we developed an approach that seemed to have the promise of being simple, fast and very practical. With another student, Dr Anton Barty (now at the University of California), we showed that the methods could indeed be very effectively applied to optical, and then electron, microscopes. Their results were able to reveal - and measure - the phase in an image using clever calculations, but completely standard hardware. It was an extraordinarily flexible method.
>
> The Paganin-Barty-Nugent technique has subsequently been used to also solve problems in x-ray, neutron and atom imaging. The international scientific interest in these new methods exploded and it rapidly became clear that the methods being developed by my team could be applied to a whole range of both practical and scientific problems.
>
> We saw that this work had many commercial possibilities and so, with Drs Paganin and Barty, we took out a patent covering our new methods. This is the core patent licensed to Iatia Limited. Iatia has developed commercial packages for optical and electron microscopy. Iatia is now beginning to explore and develop the myriad other areas that can benefit from quantitative phase imaging methods.[5]

This case study illustrates, amongst other themes, the debt owed to early researchers (including Dutch physicist and 1953 Nobel Prize Winner, Frits Zernike), collaboration between academic staff and research students, the value of effective IP protection, and how new businesses can grow from new knowledge. ***There are many other 'stories' of this type at the University of Melbourne.***

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[3] see also http://www.recaldent.com/index.htm
[4] http://www.iatia.com.au/
[5] http://www.iatia.com.au/technology/qpiOverview.asp

If you would like further information, and especially if you have in mind a particular style or type of case study to be included in your report, we would be very pleased to assist.

I wish the Committee well in its efforts to provide advice for Government on policies and programs and support structures to enhance innovation.

Yours sincerely,

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