



## **Australian Technological Innovation and Pathways to Commercialisation**

***Submission by the Australian Institute of Marine Science  
to the House of Representatives Standing Committee  
on Science and Innovation***

**4 May 2005**

## **Australian Institute of Marine Science**

The Australian Institute of Marine Science ("AIMS") is a Commonwealth statutory authority established by the *Australian Institute of Marine Science Act (1972)*. Its mission is to generate and transfer the knowledge to support the sustainable use and protection of the marine environment through innovative, world class research.

The role of AIMS under its Act is to:

- carry out research and development;
- encourage and facilitate the application and use of the results of that research;
- co-operate with other institutions and persons in carrying out research and development;
- collect and disseminate information relating to marine science and marine technology and, in particular, to publish reports and papers;
- provide and sell goods and services; and
- make available to others, on a commercial basis, the knowledge, expertise, equipment and facilities of the Institute.

AIMS delivers this research through an integrated research programme drawn from capabilities in Conservation & Biodiversity, Coastal Processes and Marine Biotechnology. This research provides new knowledge and understanding about Australia's marine resources (particularly in the tropics) and makes a significant contribution to the ecologically sustainable development of these resources. AIMS' research is focused on *Australia's National Research Priorities* and supports Government Policy (e.g. *Australia's Oceans Policy*) and other priority initiatives such as the *Great Barrier Reef Water Quality Protection Plan*.

Research is developed in consultation with stakeholders and clients, including industries such as agriculture, aquaculture, fisheries, mining, petroleum and tourism; the educational sector; government and other national and international research agencies. The rationale and the work to be undertaken by AIMS is described in its *Research Plan 2003-2006*. The alignment of AIMS' research with the *National Research Priorities* is described in the AIMS NRP Implementation Plan.

The Institute applies its skills and capabilities base to target environmental research that contributes to the sustainable use of Australia's marine environment and resources. Australian economic growth will be founded through the protection and sustainable use of its marine environment and resources. In undertaking this research, AIMS develops techniques and technologies to enable improvement in the understanding of the processes that determine marine biodiversity, and the identification of novel applications for Australia's marine resources. AIMS seeks to identify, protect and capture opportunities arising from its research, in particular, outputs that have potential commercial applications.

## Pathways to Commercialisation

AIMS' capabilities and activities focus on environmental Science & Technology. Effective transfer of knowledge and technologies is a primary goal and this delivered through a variety of mechanisms. One of these mechanisms is the commercialisation of appropriate technologies. Our research focus means this effort is targeted at the early phase of knowledge and technology development in the commercialisation process.

In order to realise the value from the commercial application of these technologies, considerable investment is required to take the technologies from:

1. Research concept and/or application to proof-of-concept (pre-seed phase).
2. Proof-of-concept to commercial concept (seed phase).
3. Commercial concept to commercial application (start-up or industry transfer phase).

AIMS manages an Intellectual Asset Portfolio to create value for the Institute<sup>1</sup> and its partners and collaborators through commercially sound transfer of this knowledge and these technologies. AIMS establishes partnerships to develop technologies further and pursues commercialisation outcomes through Intellectual Property ("IP") assignments and licenses through commercial vehicles such as spin-off companies where appropriate or collaborative arrangements with industry partners.

The Institute's research is at the early phase of knowledge and technology development in the commercialisation process - the first step towards commercial application. Further significant resources are required to ensure potential commercial opportunities are realised from the technologies and novel applications of bioresources that are developed. The AIMS experience highlights the funding challenges in the development of technologies and applications through the pre-seed phase.

AIMS has commercialised a number of technologies and applications to date. Three companies have been spun-off from the Institute:

- WetPC Pty Ltd (novel technology to control computer devices in mobile situations, originally developed at AIMS to enable research divers to control underwater computers while undertaking basic coral reef research).
- Sunscreen Technologies Pty Ltd (novel UV blocking compounds with industrial and human applications, originally identified at AIMS during the course of basic research into coral reef physiology).

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<sup>1</sup> Income generated is invested back into research.

- Cleveland Biosensors Pty Ltd (seafood toxin bioassay IP developed jointly by AIMS and James Cook University (“JCU”) based on an application of published basic research into the ecology and physiology of marine toxins).

The technologies and applications that formed the basis of the spin-off companies were developed during the course of basic research and their development to proof-of-concept required significant investment by the Institute, particularly in relation to the mobile computer device technology and the UV blocking compounds.

One mechanism to overcome the pre-seed funding gap is co-investment and AIMS has co-invested with industry partners, other research agencies and universities in collaborative arrangements to develop both current and new technologies and applications. For example, AIMS has co-invested with industry partners in the pharmaceutical and agrichemical fields to generate lead compounds with potential commercial applications from the AIMS Biodiversity Collection (“The Collection”):

- National Cancer Institute (USA) (collaborative research that consisted of collections of Australian biogenetic resources and screening of extracts to identify lead compounds with anti-cancer activity, AIMS has an ongoing MOU with the NCI).
- AMRAD Corporation Ltd (collaborative research that consisted of collections of Australian biogenetic resources and screening of extracts to identify lead compounds with anti-cancer activity).
- Nufarm Ltd (collaborative research, including JCU, to screen extracts to identify lead compounds with herbicidal activity; 30 lead compounds with herbicidal activity were identified).
- Faustus Forschung Companie, Austria (current collaborative research to screen extracts to identify lead compounds with anti-cancer activity).
- Numerous FRDC collaborations in advancing Australian marine aquaculture opportunity

These types of collaborative arrangements based on the application of Australia’s marine biogenetic resources require ongoing IP and sample management to ensure the terms of marine jurisdiction access permits are complied with. Additionally, both direct and indirect economic benefits are created for marine jurisdictions and Indigenous Australians through benefit sharing arrangements.

There are potential advantages in this approach, particularly in the early phase development of novel technologies suitable for transfer into the Australian and global economies to ensure the utilisation of Australia’s marine bioresources for commercial benefit is undertaken in an ethical and sustainable manner.

A range of Commonwealth grant funding schemes have been implemented in order to facilitate the commercialisation of public sector research, particularly through the proof-of-concept and early commercialisation stages as identified in *Backing Australia's Ability*. These schemes include the Pre-Seed Fund Program ("PSF") and Commercial Ready. However, the schemes require that an incorporated entity be the recipient of grant funding; the PSF specifies an incorporated company with no sales revenue and Commercial Ready specifies an SME with less than \$50m in turnover. The funding schemes tend to suit proved or established technologies and products.

Early phase research concepts or applications usually harbour significant technical challenges that must be overcome before proof-of-concept can be achieved. The outcome of such an endeavour in early phase research is usually likely to be uncertain. In AIMS experience, significant technical risk reduces the attractiveness of a project to Commonwealth funding schemes, SME's, angel investors and venture capitalists. In order to progress technologies and applications through the pre-seed phase, AIMS must co-invest its own resources to make projects more attractive to potential investors, funding schemes and industry collaborators. Impacts on the Institute include:

- The reallocation of funding from already heavily committed internal sources<sup>2</sup>;
- The early phase of development and the uncertainty of the research outcome limits the ability to negotiate commercial returns for investment in future potential technologies and applications for commercial development.

Funding to enable the development of research concepts and applications through the pre-seed phase will enhance AIMS' ability to transfer potential commercial developments with greater likelihood of success for investors, and research and industry partners without compromising the impact of appropriation funded research from which concepts and applications are developed.

## **Intellectual Property and Patents**

Sound and effective Intellectual Asset ("IA") Portfolio Management is a cornerstone of the successful generation and transfer of knowledge and technology in a research organisation. This involves effectively managing the organisation's IP Portfolio including registered IP such as patents. The Australian National Audit Office detailed the benefits of effectively

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<sup>2</sup> AIMS co-invests to deliver research outputs and outcomes supporting the National research Priorities that would be directly affected by significant internal reallocation to enable the development of technologies and applications through the pre-seed phase.

managing IP in its report “Intellectual Property Policies and Practices in Commonwealth Agencies” (2004)<sup>3</sup> (Appendix 1).

The effective management of the AIMS IA Portfolio is critical to maintain our capabilities to grow and transfer AIMS’ research outputs and outcomes to the commercial benefit of the Institute and its investors and research and industry partners and collaborators.

### **Skills and Business Knowledge**

AIMS produces research outputs with potential commercial development as typified by its record of spin-off companies and past and ongoing co-investment arrangements particularly in the marine biotechnology sector. Both academically and in terms of potential commercial research, Australia’s marine environment and resources are recognised as strong sources of opportunity.

The Commonwealth and State Governments have contributed substantially to the improvement in the development of the commercialisation skills and business knowledge of the research community. Initiatives such as Biotechnology Australia and the Australian Institute of Commercialisation provide education and training information and services. The activities of industry representative organisations such as AusBiotech, Knowledge Commercialisation Australasia, the Intellectual Property Research Institute of Australia and a range of programs delivered by commercial training providers has also increased the scope for accessing education and training in the areas of IP management and the commercialisation of research.

However, in AIMS experience, the awareness level of research graduates regarding Intellectual Asset and Property Management and the process of research commercialisation can be limited. This situation may lead to the inability to pursue commercial opportunities through such instances as early disclosure of research outcomes impacting on the protection of the IP generated. The future identification and development of commercial opportunities will be greatly assisted and enhanced by the early education and training at the graduate level, in marine science in particular, in the basic concepts and frameworks of Intellectual Asset and Property management and the process of research commercialisation.

### **Business and Scientific Regulatory Issues**

Arguably, Australia is leading the world in both business and scientific regulatory domains. Australia has sound Corporate Governance legislation as regulated by the Australian Securities and Investment Commission. Australia also is a world leader in the ethics associated with science particularly in the emergent biotechnology sectors.

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[http://www.anao.gov.au/WebSite.nsf/Publications/D73A444246EFD214CA256E2F006F12D1/\\$file/Audit%20Report%2025.pdf](http://www.anao.gov.au/WebSite.nsf/Publications/D73A444246EFD214CA256E2F006F12D1/$file/Audit%20Report%2025.pdf)

At both State and Federal levels, Australia is creating the policy and legislation that other countries are utilising as a benchmark. Recent Access and Benefit Sharing Agreement and Ethics policy and law established through the State of Queensland's Biodiscovery Act (2004) exemplifies this highly proactive and ethical approach. Similarly, the Commonwealth and Australia's other marine jurisdictions are pursuing and developing policies and discussion papers regarding the utilisation of Australia's marine biogenetic resources. Much of this leadership is being recognised in the United Nations Environment Programme's Convention on Biological Diversity's ("Convention")<sup>4</sup> deliberations on the ethics of bioprospecting and related topics. AIMS follows the policies of the Convention in its arrangements regarding the commercial development of Australia's marine biogenetic resources.

### **Research and Market Linkages**

Developing linkages with investors and research and industry partners and collaborators is a crucial component of the research commercialisation process. This expensive and time-consuming process has been greatly assisted by various Commonwealth and State initiatives such as networking opportunities through organisations such as Biotechnology Australia and the pooling of effort through trade missions to international events such as the Bio conventions, BioJapan, Biotechnica, etc. The Australian Institute of Commercialisation also provides services to assist with market research and connection to potential investors and partners. The networking activities organised by industry representative organisations such as AusBiotech, Knowledge Commercialisation Australasia and the Intellectual Property Research Institute of Australia provide opportunities to connect with research and industry partners and investors.

AIMS also undertakes a range of other international linkages such as in the environmental sector in marine domains through the Census of Marine Life. From AIMS experience, international agencies are constantly scanning Australia for ideas and products to invest in and capture significant IP (e.g. AIMS has a development arrangement with ITOCHU Corporation of Japan). However, these organisations will not support pre-seed development projects. For AIMS and Australia to retain maximum IP prior to international investor dilution, there is an urgent need for a fund that supports development though pre-seed to proof of concept phases of research commercialisation.

### **Conclusion**

AIMS' capabilities and research activities focus on environmental Science & Technology. Effective transfer of knowledge and technologies is a primary goal and this delivered through mechanisms such as commercialisation. Our

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<sup>4</sup> <http://www.biodiv.org/welcome.aspx>

research focus means this effort is targeted at the early phase of knowledge and technology development, or the pre-seed phase in the commercialisation process. The AIMS experience highlights the funding challenges in the development of technologies and applications through the pre-seed phase.

AIMS manages an Intellectual Asset Portfolio to create value for the Institute and its partners and collaborators. The Institute establishes partnerships to develop technologies and applications further and pursues commercialisation outcomes through Intellectual Property (“IP”) assignments and licenses through commercial vehicles such as spin-off companies where appropriate or collaborative arrangements with industry partners.

AIMS has a commercialisation track record with creation of spin-off companies and past and ongoing collaborative co-investment arrangements. It is important to note that the technologies and applications that formed the basis of the three AIMS’ spin-off companies were developed during the course of basic research and their development to proof-of-concept required significant investment by the Institute.

Early phase research concepts or applications usually harbour significant technical challenges that must be overcome before proof-of-concept can be achieved. Significant technical risk reduces the attractiveness of a project to Commonwealth funding schemes, SME’s, angel investors and venture capitalists. AIMS must co-invest its own resources to make projects more attractive. In an attempt to overcome the pre-seed funding gap, AIMS also co-invests with industry partners, other research agencies and universities in collaborative arrangements to develop both current and new technologies and applications. This can be to the detriment of research funded from appropriation which develops the research concepts and applications with commercial potential.

Funding to enable the development of research concepts and applications through the pre-seed phase will enhance AIMS’ ability to transfer potential commercial developments with greater likelihood of success for investors, and research and industry partners without compromising the impact of appropriation funded research from which concepts and applications are developed.



## Appendix 1.

Benefits of Managing Intellectual Property, ANAO Audit report, 'Intellectual Property Policies and Practices in Commonwealth Agencies' (February 2004).

BENEFITS OF MANAGING IP	
<b>Improved accountability of resources</b>	
<input type="checkbox"/>	Know what IP is owned
<input type="checkbox"/>	Know what IP results from investment in research and development
<input type="checkbox"/>	Know what IP is core, secondary or surplus to activities
<input type="checkbox"/>	Cost-effectively protect IP on a timely basis to minimise risk of third-party abuse and inadvertent loss
<input type="checkbox"/>	Assists with compliance in chief executive's duties
<input type="checkbox"/>	Assists in more accurate reporting and cost-effectiveness of development costs and investment
<b>Improved operational performance</b>	
<input type="checkbox"/>	Enables more informed decision-making by management because of better understanding of what IP assets are owned, what is needed to operate and their IP value
<input type="checkbox"/>	Enables more accurate internal and external financial reporting
<input type="checkbox"/>	Enables sharing of significant and incremental innovations within an organisation (or the broader public service) and thereby minimises wastage of resources or duplication
<b>Improved financial performance</b>	
<input type="checkbox"/>	Unlocks hidden or under-performing value of IP
<input type="checkbox"/>	Opportunity to generate cash from licensing or sale of non-earning IP
<input type="checkbox"/>	Enables cost savings and increased revenue
<input type="checkbox"/>	Enables valuation of IP and inclusion of IP assets on balance sheets
<b>Improved risk management</b>	
<input type="checkbox"/>	Preserves the opportunity to use and commercialise IP by minimising risk of failing to identify and protect IP on a timely basis
<input type="checkbox"/>	Minimises risk of failing to renew IP assets protected by registration
<input type="checkbox"/>	Minimises risk of legal action for infringing third-party IP. The risks include potential damages, legal costs and damaged reputation
<input type="checkbox"/>	Minimises risk of disposing of IP that is necessary for the organisation's work

Source: Adapted from Ch'ang, S & Yastreboff, M, 'Discover your intellectual property assets' *Software Engineering Australia Journal*, August 2002, p.80.