

Petrovic, Natasha (REPS)**SUBMISSION 50**

From: Bryant, Sharon (REPS)
Sent: Wednesday, 9 May 2007 10:37 AM
To: Petrovic, Natasha (REPS)
Subject: FW: Manufacturing hearing 22 March: CSIRO response

-----Original Message-----

From: Rebecca.Carter@csiro.au [mailto:Rebecca.Carter@csiro.au]
Sent: Wednesday, 9 May 2007 9:09 AM
To: Bryant, Sharon (REPS)
Subject: Manufacturing hearing 22 March: CSIRO response

Dear Sharon

During the hearing on 22 March 2007 as part of the inquiry into *Australia's manufactured export and import competing base now and beyond the resources boom*, The Committee asked several questions which CSIRO took on notice:

1. The Committee Chair, Mr Baird, asked for a list outlining where CSIRO Industry Roadshows have been held; what they covered; and any other relevant information (e.g. feedback, attendance statistics etc). Our response to question 1 is on pages 3 - 4 of the attached document.
2. Mr Baird requested a list of "what types of people" are on the manufacturing-relevant Sector Advisor Committees. Our response to question 2 is on page 5 of the attached document.
3. Deputy Chair, Ms Bird, asked for a brief of CSIRO's involvement in the Wollongong/Illawarra area. Our response to question 3 is on page 6 of the attached document.
4. Mr Baird asked for a list of the commercialised companies that CSIRO has set up. Our response to question 4 is on pages 7 - 9 of the attached document.

You also sought clarification on the following points:

- i. How CSIRO interacts with industry (particularly manufacturing) and the motivations etc for different modes of interaction with external bodies. For example, where spin-out companies come into the equation; how do they spin-out from CSIRO (who motivates the activity); what is the on-going relationship with CSIRO (if any); do they take staff out of CSIRO; and how does the CSIRO benefit from spin-outs?;
- ii. How is Industry-CSIRO research collaboration conducted (that is, the problem solving type behaviour). Is it (a) on the premise that it is a public research entity assisting for free; (b) fee for service; (c) some intellectual property split agreement; or (d) a mix of some of these? (Is the vast majority of collaboration in regard to 'incremental innovation'?);
- iii. Dr Rod Hill stated that the majority of work results from industry approaching CSIRO. How then are these industry requests prioritised? Are projects judged on: (a) commercial scope/viability; (b) something that is intellectually challenging; (c) where a solution would be of public importance; or (d) one which brings financial return to the CSIRO?; and
- iv. Where CSIRO enters "contracts" with overseas companies, what is the nature of these agreements? Is it for global research access? What benefit is the collaboration to Australia?

Our response to the first three points, which relate to CSIRO's interactions with Australian industry, is on pages 10 - 20 of the attached document. Our response to the fourth point, which is on the nature of CSIRO's contractual agreements with overseas companies, is outlined on pages 21 of the attached document. We have also provided a copy of a media release by the Hon. Bob Baldwin, MP, which highlights collaboration between CSIRO and Australian industry in the context of Action Agendas (see page 22 of the attached document).

You may be aware that as part of the Government's Industry Package announced on 1 May, CSIRO will receive an additional \$36.2 million over four years to establish a new Niche Manufacturing National Research Flagship. This will provide a major boost to the manufacturing sector. The new Flagship aims to add value to existing high-value segments of the manufacturing sector and create a new wave of niche industries based on nanotechnology. A fact sheet on the new Flagship is included on page of the attached document.

Please do not hesitate to contact me should you or the Committee have any further questions regarding the information provided.

Kind regards
Rebecca

9/05/2007



CSIRO response to Questions on Notice

Australia's manufactured export and import competing base now and beyond the resources boom

May 2007

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1. CSIRO Industry Roadshows

Objectives of the Roadshows:

- To demonstrate the benefits of working with CSIRO.
- To build goodwill with potential customers.
- To publicly acknowledge/thank major CSIRO customers
- To launch/promote a number of CSIRO projects and breakthroughs where there is potential for industry or RDC involvement; and
- To demonstrate the depth and breadth of CSIRO research to selected industry sectors that may not have previously been exposed to the organisation.

Roadshow format

The CSIRO National Industry Roadshows present information on CSIRO's science partnerships, science breakthroughs, current projects and research opportunities. They target key decision makers of selected companies in targeted industry sectors. To date, the Roadshows have focussed on the following industry sectors:

- Manufacturing;
- Materials;
- Health;
- Minerals;
- Oil and Gas;
- ICT;
- Water;
- Energy; and
- Exploration and Mining.

The Roadshows are a relationship and marketing exercise designed to send a message to potential clients that CSIRO is very keen "to see more of them" and that they are important to the organisation. They also send a message to major current clients that CSIRO values their work and partnership.

Where appropriate, the Roadshows also incorporate more focussed meetings and/or dinners where selected customers and stakeholders meet in a more intimate environment.

The Roadshow audiovisual material and brochure provide examples of what CSIRO did for particular companies; how CSIRO managed to solve problems that particular companies could not; and what innovative ideas CSIRO brought to the table to solve the problems. They also demonstrate or discuss the various ways in which stakeholders can engage with CSIRO.

Locations, attendance and feedback

To date, Roadshows have been held in the following cities: Brisbane; Adelaide; Sydney; Perth; Melbourne; and Canberra.

As the Roadshows aim to target high level engagement, senior and influential industry stakeholders are invited to attend. Invitees include stakeholders that CSIRO already have relationships with, in addition to those that the organisation would *like* to become involved

with. Invitees include company CEOs; industry group leaders; senior executives of Research Development Corporations; relevant state and federal government officials; and senior representatives from peak bodies and professional associations. The events have been overwhelmingly successful from a number of perspectives and support for CSIRO has consolidated and increased.

Roadshows attendance statistics:

State	2005	2006
South Australia	76	90
Queensland	59	93
New South Wales	122	180
Victoria	195	200
Western Australia	111	90
Total Attendance	563	663

Consolidated feedback from attendee survey statements:

Survey Statement	Consolidated response*
I learnt something new about the work CSIRO does	95% of participants agree or strongly agree
I am more likely to consider CSIRO as a research provider because of this event	75% of participants agree or strongly agree
I am more likely to consider CSIRO as a collaborator because of this event	79% of participants agree or strongly agree
The event was useful for me to attend	88% of participants agree or strongly agree
I had adequate opportunity to get to know CSIRO staff at this event	80% of participants agree or strongly agree
Overall, this event improved my perception of CSIRO	97% of participants agree or strongly agree
The event allowed me to easily network with industry colleagues	82% of participants agree or strongly agree
Would you consider attending this event again next year?	96% of participants wish to attend next year

* Average responses from for five Roadshow events

2. CSIRO's Sector Advisory Councils

CSIRO's Sector Advisory Councils (SACs) provide advice that helps to ensure that CSIRO's planned programs of research and development are responsive to the strategic research needs of industry and society. Currently CSIRO has SACs responsible for:

- Energy and Transport
- Health
- Information, Communication & Services
- Manufacturing
- Environment and Natural Resource Management
- Minerals.

Members of these SACs represent CSIRO's stakeholders and customers. They include CEOs and senior operations and technical staff from both small and large companies; senior executives of government departments; CEOs and senior staff from industry peak bodies; and representatives from CSIRO's research and development partners, for example, university deputy vice chancellors. The following table lists the members (and their professional affiliations) of CSIRO's Manufacturing SAC.

Manufacturing Sector Advisory Council members

Member details	Affiliation
Chair: Dr Peter Burn	Associate Director, Public Policy, Australian Industry Group
CSIRO Manufacturing Sector Coordinator: Ms Vicki Tutungi	Chief, CSIRO Manufacturing and Infrastructure Technologies
Member: Mr Philip Binns	Managing Director and General Manager, Pacific RIM Operations, Varian Australia Pty Ltd.
Member: Mr Ray Doyle	Executive Director, Office of Manufacturing and Service Industries. Department of Innovation, Industry and Regional Development.
Member: Mr Stephen Payne	Head, Manufacturing, Engineering and Construction Division. Department of Industry, Tourism and Resources.
Member: Mr Roy Rose	Immediate Past President, Australian Industrial Research Group.
Member: Dr Klaus Schindhelm	Senior Vice President Applied Research, ResMed Ltd.

3. CSIRO's involvement in the Illawarra region

CSIRO does not have any sites or facilities in the Illawarra region. However, there has been substantial involvement in iron and steel making at local operations of BHP Billiton Limited in Wollongong over a number of years. While the engagement of CSIRO in this context has not been huge, it is important to recognise and understand that CSIRO's research and development outputs benefit Australia as a whole and are not limited to the regions where the research is performed.

4. CSIRO commercialised spin-out companies

The following table lists commercialised spin-out companies that CSIRO set up over the past ten years

Company Name	Date Established	Country	Structure	Technology/Notes
Ascentia Pty Limited	21/12/2001	Australia	Private	Barley Cultivar technology
Australian Synchrotron Operations Pty Ltd	7/07/2006	Australia	Private	Operating a synchrotron facility
Avipep Pty Limited	4/07/2005	Australia	Private	Therapeutic use for cancer treatments.
Betabiotics Pty Ltd	13/07/2003	Australia	Private	Antibiotic drug discovery
BioCure Inc		USA	Private	Non Ophthalmic Biomaterials
Biomolecular Research Institute Limited	1/10/1990	Australia	Limited by Guarantee	Biotechnology
Carbon Management Group Pty Ltd	16/09/2003	Australia	Private	Environmental consulting
Ceramic Fuel Cells Limited	6/07/2001	Australia	Unlisted Public	Solid oxide fuel cell technology
ComEnergy Pty Ltd	24/06/2003	Australia	Private	Generating electricity from coal waste and mine drainage gasses
CSIRO FFP Pty Ltd	27/04/2004	Australia	Private	Forestry
DataTrace DNA Pty Ltd	9/02/2005	Australia	Private	Luminescent Phospors
Dunlena Pty Limited	10/07/1985	Australia	Private	Agricultural chemicals
epiTactix Pty Ltd	2/09/2003	Australia	Private	Novel semi conductor and transistor devices.
Evogenix Ltd	12/07/2001	Australia	Private	Diagnostic Technologies
Exsynd 1	26/06/1992	Australia	Private	Westpac MM Wave Radio R&D Syndicate

Continued overleaf

Company Name	Date Established	Country	Structure	Technology/Notes
Exsynd 2	3/07/1990	Australia	Private	Westpac MM Wave Radio R&D Syndicate
Exsynd 3	14/04/1992	Australia	Private	MBL Amrad Anti-Virals R&D Syndicate
Exsynd 4	17/09/1991	Australia	Private	MBL Amrad Anti-Virals R&D Syndicate
Exsynd 5	30/07/1992	Australia	Private	MBL Rumentek Beef R&D Syndicate
Exsynd 6	18/06/1993	Australia	Private	MBL Rumentek Dairy R&D Syndicate
Exsynd 7	11/06/1994	Australia	Private	MBL Rumentek Dairy R&D Syndicate
FunnelBack Pty Ltd	6/09/2005	Australia	Private	Enterprise search engine
Gene Shears Pty Ltd	2/05/1989	Australia	Private	Agricultural and pharmaceutical technology
Gropep Limited	30/05/1998	Australia	Listed Public	Pharmaceuticals and Biotechnology
HRZ Wheats Pty Ltd	7/10/2003	Australia	Private	High Rainfall Wheat
Hydropem Pty Ltd	18/12/2006	Australia	Private	HydroPEM technology
HySSIL Pty Ltd	1/01/2003	Australia	Private	High strength lightweight concrete
Intalysis Pty Limited	2/09/2005	Australia	Private	Low Frequency Moisture meter - for the coal industry.
Intellecion Holdings Ltd	19/06/2003	Australia	Private	QEMSEM - minerals evaluation
Plantic Technologies Limited	17/07/2001	Australia	Private	Biodegradable Plastic Packaging
PolyNovo Biomaterials Pty Ltd	27/02/2004	Australia	Private	Biomaterials
Provisor Pty Ltd	27/06/2002	Australia	Private	Wine research facility

Continued overleaf

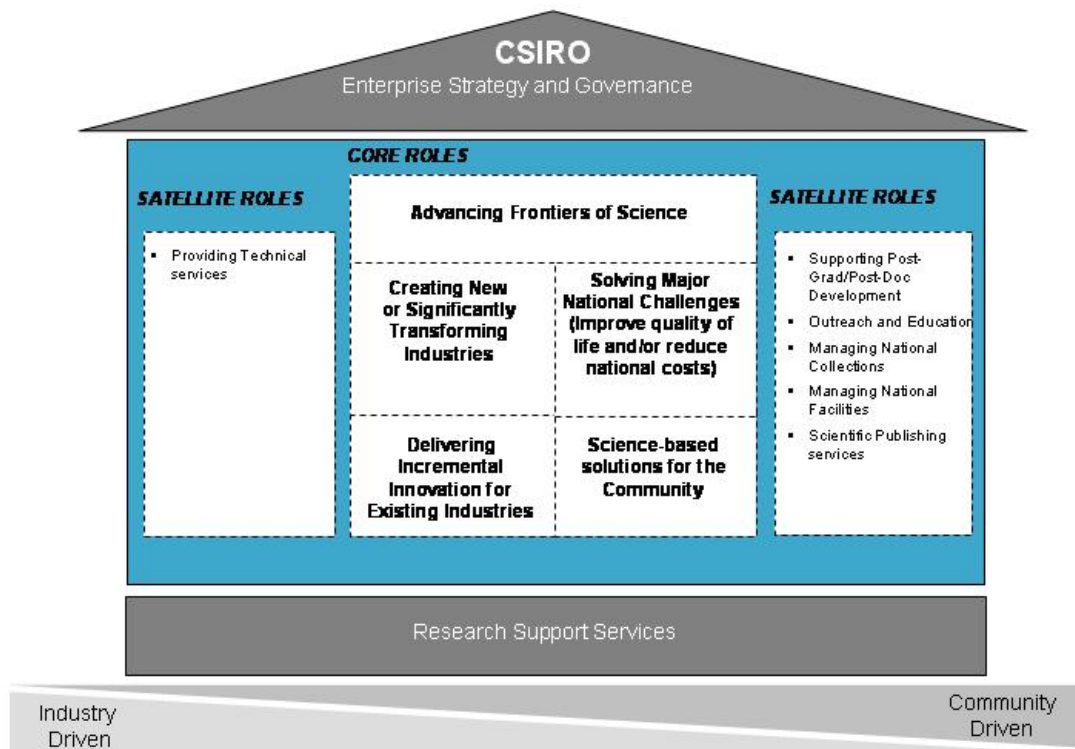
Company Name	Date Established	Country	Structure	Technology/Notes
QuickStep Holdings Ltd	20/03/2001	Australia	Unlisted Public	Manufacture of components/structures
Starpharma Holdings Ltd	13/05/1997	Australia	Listed Public	Dendrimer Nanotechnology
VacTX Pty Ltd	11/12/2003	Australia	Private	Vaccine technology
WindLab Systems Pty Ltd	17/04/2003	Australia	Private	Commercialise "WindScape" a wind mapping tool
WLAN Services Pty Ltd	1/04/2005	Australia	Private	Managing company

(i - iii) CSIRO's interactions with Australian industry

Background

CSIRO's interactions with Australian industry are many, diverse and complex. The framework for these interactions is set by CSIRO's "role house" model, which identifies in a useful and simple way the roles that CSIRO plays within the National Innovation System (NIS).

The CSIRO "role house" diagram



The "house" illustrates CSIRO's *core roles* at the centre of the diagram, surrounded by its *satellite roles*. The *enabling functions* are represented as the "roof" and "floor" of the house, highlighting the support that they provide to the other roles. The house also illustrates CSIRO's continuum between industry-driven activities (left side of the house) and community-driven activities (right side of the house) for the various roles. The industry driven/community-driven continuum is a spectrum. While all of CSIRO's activities deliver public good benefits for Australia, some activities are more driven by industry needs and others are more driven by community needs. The dashed lines within the house represent the integration and interdependence between the roles. None of the roles can exist in isolation; there are linkages between each of them. No sharp boundaries exist between roles, and no core role is separable. Within the core roles, *time horizons* correlate with *height* within the house. In other words, "Advancing Frontiers of Science" has a *long term* time horizon while "Delivering Incremental Innovation for Existing Industries" has a *much nearer* time horizon. Moreover, the extent of spillovers also varies with height within the house such that the benefits of incremental research will be less pervasive than those aimed at creating new industries. In the extreme case, a single firm can be the sole beneficiary of research aimed at delivering incremental innovation for existing industries.

CSIRO's interactions with industry and the basis on which they take part reflect this conceptual framework and in addition, the proper use of government funding. When a single company is able to capture the benefit of the research, the company should pay the full cost of that research. When there is a greater level of potential spillovers and less likelihood that individual firms will support the research themselves, there is more need for government support. This can lead to the use of appropriation funding and the development of co-investment opportunities that, should the research be successful, result in financial return for CSIRO and the enhanced performance of the firms using it.

The following excerpts are from CSIRO's submission to the Productivity Commission's *Study on Public Support for Science and Innovation* which sets out in more detail the extent to which these types of business models for industry interactions occur:

Additionality

Public funding for science and innovation is not meant to be a substitute for private sector funding but should support activity additional to that the private sector would support. When the government is the primary user of the research it funds, this does not become an issue. Work falling into this category includes that in the 'role house' categories of developing science-based solutions for the community; and solving major national challenges aimed at improving the quality of life of all Australians and reducing national costs. However, when the research has the potential to assist industry directly, the question will always arise as to whether the private sector would have funded the research in the absence of government funding.

When CSIRO is performing fully funded contract research or providing scientific services for a fee that covers the full costs of providing the service, the issue of substituting for private sector funding does not arise. Similarly, in conducting research to advance the frontiers of science, CSIRO is unlikely to be operating in an area that Australian business would support by itself.

The question of whether CSIRO is supporting work that the private sector should fund becomes most acute when CSIRO delivers incremental innovation for existing industries.

Given the arguments presented previously about the size, structure and capabilities of Australian business preventing the private sector from occupying certain niches in our national innovation system, the possibility that CSIRO research might substitute for business funded research is much less of an issue with respect to CSIRO's core role of creating new or significantly transforming existing industries. Most Australian firms are not sufficiently large to mount major research efforts aimed at developing breakthrough technologies.

Important though it is, the issue of 'additionality' is not clear cut. Even if the private sector would have performed certain research in the absence of public support, it might have done so in a different way. For example, in deploying a lower level of resources, or the same resources over a longer time period, it may have taken longer to achieve the necessary outputs – and in a highly competitive environment, speed is of the essence. A lack of public support might have produced a lower quality output – perhaps because the technical resources available to the private sector, or the breadth of expertise available internally to single firms, might have set limits on the means used to tackle the problem. Moreover, while the private sector might be capable of funding research that it needs to maintain its operations, it might have other options available that could disadvantage Australia. For example, major resource companies that operate globally might decide to

use easier minerals deposits overseas than to continue to work with their more problematic Australian resources. Publicly supported research might help retain operations in Australia.

There are other issues to consider. For example, performance of the research by an organisation such as CSIRO can develop linkages that can have much broader benefits than finding a solution to an immediate problem; and when CSIRO uses its own funds for research it can make its findings available to every Australian business, community group or other organisation able to use them – whereas, if a firm funds the same research it will appropriate to itself the findings to gain an advantage over its competitors. The overall benefit to Australia might well be greater in the former case. More generally, when the private sector manages research it does so to maximise its financial return. When CSIRO manages research it has an interest in all the impacts that the research might have, including the non-financial impacts – the spillovers and second order effects that might have wider benefits.

As a further example of the complexities that exist, it is worth considering the public's confidence in CSIRO. If CSIRO were to perform research that allowed it to reassure the Australian community, for example about the safety of a genetically engineered plant or of novel energy technologies, the impact of the reassurance might depend on whether industry had funded the research or CSIRO had funded the work as a matter of public interest from its appropriation funding. The issue is not that the research or its results would have been different; however, the perception of the public about the independence of the research might well be different.

This being said, CSIRO's position is that it does not fund research that the private sector is likely to support itself. A decreasing proportion of CSIRO's appropriation resources goes into the incremental innovation roles; and an underlying principle of CSIRO's business models is that CSIRO will not subsidise activity that business should pay for itself.

Given the risk averse nature of much of Australia business, and the significance of SMEs in our economy, it is not always easy to make a decision on whether CSIRO's support will substitute for work that the private sector would otherwise fully fund. This provides an additional reason for adopting a co-investment approach which provides CSIRO with an ongoing share of the benefits that arise from the application of its research by its co-investors.

If the private sector view is that the research has a high level of certainty and will produce significant benefits, it is less likely to agree to co-investment proposals, preferring to pay the full costs of the research upfront and retain for itself all the expected returns. The greater the level of uncertainty and risk, the more likely firms will be to agree to share the costs, risks and benefits.

Appropriation funding

Because it receives appropriation funding, CSIRO is able to use co-investment approaches to share risk with firms that are themselves too small to maintain a portfolio of projects. In doing this, CSIRO's scale has allowed it to experiment with more flexible arrangements that help SMEs. Among other things, this involves using different fee arrangements. These include mechanisms (such as the use of royalty streams, revenue/profit sharing or success bonuses) that share the risk and rewards of the research. This can help compensate for the structure of Australian industry that tends to inhibit corporate research. Moreover,

CSIRO's 'fast fail' approach to research management provides a more refined risk management strategy that both supplements and complements the scale advantage. In particular it can help limit the downside risks and prevent unnecessary investment in research that will not meet its agreed objectives.

A particular advantage of appropriation funding is that it facilitates sustained research into areas that the general community and business have not yet identified as important. The competitive grants and contracts open to CSIRO usually focus on existing problems rather than on providing a means to develop technology to respond to issues not yet on their agenda.

The immediate customers for research may not recognise the wider implications of new scientific developments, or lack interest because of the time it will take to realise their potential. Scientific developments likely to have greatest impact on a sector can be outside the existing technology paradigm of the sector and the interests of its practitioners. However, if Australia does not follow up these opportunities, its industry or other Australian research users may find their business disappears. Appropriation funding provides the means through which CSIRO can work on these issues and communicate their significance to its relevant stakeholders. Appropriation funding also ensures that CSIRO's work in these areas can take place at a scale that makes it globally relevant and so increase the probability that it will provide significant benefits for Australia.

Contract work

Reacting to opportunities for contract and grant work has benefits but too great a dependence on this kind of reactive external funding could create a research portfolio of many small, unrelated, short-term projects. The end result would be a fragmented, reactive research effort. Moreover, a system that becomes too dependent on externally contestable funding can quickly lead to the loss of national capabilities, as demonstrated by New Zealand's experience in establishing its Crown Research Institutes.

Fortunately, a purely reactive approach to external funding opportunities is not always necessary. For example, the strategic development of major research activities carried out in partnership with relevant stakeholders can help create opportunities for contract and grant funding. In other words, a significant research planning effort can identify opportunities that other stakeholders participating in the planning process value and may choose to support. As already mentioned, however, this collaborative development of a national research response to a national challenge is itself expensive and requires funding.

Contracts for research or the provision of scientific and technical services differ from grants in that they usually fund the full costs of the work they are purchasing, including the cost of using the infrastructure and other overheads. The organisation seeking such work can generally capture all its benefits and in these circumstances there is no need or reason for the government to subsidise the work.

Because contracts cover full costs, performing contract research or providing scientific services to industry on a full fee basis does not reduce the work carried out using appropriation funding, but adds to it. By increasing the use of infrastructure provided by appropriation funding, contract research for Australian industry increases the return on national investment in science and technology infrastructure.

Co-investment

In some cases CSIRO may negotiate partnerships with industry to share the costs, risks and benefits of the research. This can provide an opportunity for CSIRO to capture directly some of the financial benefits that arise from the application of its science, while making it easier for a firm (especially an SME) to accept the risks of the research failing, or of it not having its projected commercial impact. This co-investment role can be important in responding to the market failures that result from the size structure of Australian firms, as previously discussed.

In performing work directly for industry, CSIRO is bound by competitive neutrality principles and the 'yellow pages test'. It is not the role of CSIRO to crowd out business, just as it is not CSIRO's role to provide subsidies to business.

Technology transfer issues

As discussed earlier, CSIRO's basic operating principle is the need to maximise the benefits of its work. It offers some services to its customers on a full cost recovery basis, with the customer retaining all intellectual property. The firm and the nation benefit from the improved business performance that comes from using the intellectual property. In other cases CSIRO enters into co-investment agreements in which the customer and CSIRO both contribute to the cost of the research and share in the benefits that result.

In these cases Australia benefits not just from the improved performance of the customer, but also from the increased resources that CSIRO receives from its share of the return on the research investment. This enables CSIRO to build its own capacity additional to the support it receives from government and helps the organisation contribute even more to the welfare of Australia. An earlier section of this paper has already discussed the importance of this co-investment approach in helping Australian business, especially SMEs, cope with the technical and commercial risks of research. It plays an essential role in strengthening Australia's overall innovation system.

Technology transfer also includes what are sometimes more narrowly defined as 'commercialisation' activities. In particular these include the patenting and licensing of research funded by CSIRO and the use of spin-off companies to develop business opportunities originating in CSIRO research and capabilities. These often require a technology push approach. One reason for this is that CSIRO's research is often attacking problems and issues that are not yet on the horizon of those who need to know about them. CSIRO's role is not just to respond and react to existing problems; its responsibility is to look ahead beyond the immediate vision of industry and other research users.

One problem with working ahead in this way is that the domestic innovation system might lack the ability – or not have the inclination – to make use of the technologies and solutions that CSIRO might develop. This can happen for a range of reasons – from a lack of appropriate technical or management skills, an inability to obtain the necessary finance, risk aversion, and so on. The 'absorptive capacity' of the Australian innovation system for new technologies may well be less than that of other countries, in part because of the size structure of Australian firms, already discussed.

Because of the research domain in which it operates, CSIRO has a significant concentration of commercialisation and technology transfer expertise. In working to strengthen the particular role that it plays in the national innovation system, CSIRO has put more resources into strengthening and refocussing these business development and commercialisation activities. This has involved increasing the number of people working

in these areas and further developing the organisation's skills base, in part by recruiting new staff with highly specialised skills.

In particular, CSIRO has capabilities in areas such as specialised legal skills, marketing and venture finance that go beyond those available in many other parts of Australia's innovation system if only because the scale of CSIRO's operations facilitates a degree of specialisation and concentration that most other research organisations cannot justify. This concentration of effort and expertise helps to strengthen not only CSIRO but Australia's science, business and other research user links.

Technology transfer is not a simple process and the avenues to application can vary significantly from one technology to another or one sector to another. One size does not fit all and detailed analysis is necessary to determine which approach is most likely to be successful in any particular case. This is an area of activity in which it is important to be creative and to use whatever works. In some cases this might involve working with business, individual firms or government. In other cases it is possible to go directly to the general community. One very successful example here is the way that CSIRO's Total Wellbeing Diet book has served to transfer the results of scientific research, in a very digestible way, directly to the individuals able to benefit from the research.

Flagships

CSIRO's Flagship initiative provides the most advanced, obvious and concrete manifestation of the organisation's efforts to increase the relevance and impact of its research. Flagships demonstrate a deliberate intention to change the way in which CSIRO operates and they provide an explicit response to changes in the global innovation system. In particular, they recognise and respond to Australia's place in the world. The rapid economic and other changes taking place in Asia mean that Australia needs to achieve critical mass research programs and to identify niche areas within which it can build on its capabilities to maintain and create the opportunities necessary to support its continued economic development. This is what flagships are about.

CSIRO is currently managing six flagships, each of which has an explicit goal that provides the focus for its management:

- *Energy Transformed*: To halve greenhouse gas emissions and double the efficiency of the nation's new energy generation, supply and end use, and to position Australia for a future hydrogen economy.
- *Food Futures* (originally named *Agrifood Top 5*): To transform international competitiveness and add \$3 billion annually to the Australian agrifood sector by the application of frontier technologies to high-potential industries.
- *Light Metals*: To lead a global revolution in light metals, doubling export income and generating significant new industries for Australia by the 2020s while reducing environmental impact.
- *Preventative Health*: To improve the health and wellbeing of Australians and save \$2 billion in annual direct health costs by 2020 through the prevention and early detection of chronic diseases.
- *Water for a Healthy Country*: To achieve a tenfold increase in the economic, social and environmental benefits from water by 2025.
- *Wealth from Oceans*: To position Australia by 2020 as an international benchmark in the delivery of economic, social and environmental wealth based on leadership in understanding ocean systems and processes.

The identification of these six areas was the outcome of a long and intensive process involving the collection of data, its analysis and widespread consultation with other researchers, business and government. This process took into consideration not only domestic capabilities, issues and challenges but also what was happening overseas.

The significance of Flagships goes beyond that of the effort and processes that CSIRO used to develop them. This is because their focus on outcomes provided some of the impetus for the development of the performance management and evaluation techniques already described. The focus throughout their development has been on impact and a recognition that impact depends on the activities of partners outside the research system.

While CSIRO's skills and experience in managing large scale projects have developed over time, the Flagships present a major leap forward. Flagships represent more than an increase in scale and the development of more effective research management techniques. They also demonstrate an increased commitment to partner with other research performers and with the users of research outputs. The Flagships are ambitious, integrated programs of coordinated activity directed towards achieving agreed goals. Their purpose is to help shape the future of an industry or sector within Australia or to address a major national challenge. They go beyond research in that their planning and implementation integrates the capture and application of the research results within Australia.

In developing flagships the approach has been to identify opportunities that require a research solution, rather than to search for problems that existing research strategies might address. Apart from anything else, this has meant that the research capabilities necessary to address the problem might lie outside CSIRO. This in itself creates the need for the partnerships and linkages that lead to additional synergies. The \$97 million Flagship Collaboration Fund is one of the mechanisms supporting this approach and is helping to create long term collaborative partnerships that will produce outcomes that none of the partners would be able to produce alone.

Flagship programs are some of the largest directed research efforts ever mounted in Australia. They depend on the highly sophisticated research management skills that CSIRO has developed through its evolving experience with ever larger and more complex programs; and focus significant resources on areas of national importance. Their development has required partnerships and cooperation.

It is important to recognise that two quite different kinds of external partnerships are critical to Flagships meeting their goals:

- Collaborative relationships with other research agencies: these range across the public/private spectrum with collaborators including universities, government agencies at federal and state levels, publicly funded research agencies and companies; and
- Relationships with delivery partners (those who convert the research outputs produced by the Flagships into outcomes in the economy, society or the environment).

The outcomes that Flagships strive to achieve require all parts of the innovation system to work together to capture and apply the research outputs. Moreover, the scale and intensity of the effort CSIRO put into developing and coordinating these programs, and will continue to put into their management, will help reduce the risk to the businesses that become partners.

The considerable background work and market intelligence that has led to the identification of the priority areas is often beyond the capabilities of the other partners, including business partners, yet plays an important part in reducing the commercial risks of participation.

The Flagships are the centrepiece of CSIRO's revised value proposition. They are based on:

- tackling Australia's biggest national challenges
- delivering high impact, high quality science in pursuit of those challenges
- delivering effective outcomes by working with partners
- achieving long-term goals by a combination of short, mid and long-term science outputs
- introducing a new way of doing science (multidisciplinary, multi-agency, transformational science to make a difference)
- investing significant resources from CSIRO and its Flagship partners
- delivering high standards of accountability through rigorous governance controls.

To ensure that they focus on meeting this value proposition, all Flagships develop technology roadmaps that outline the technical developments necessary to achieve their long term goals. They also develop engagement roadmaps that show the relationship developments (with commercial partners, research collaborators, end users and others) necessary for the successful delivery and uptake of flagship outputs.

Each Flagship has established an advisory committee, whose members are largely external and drawn from relevant industry/stakeholder groups. These committees provide guidance to the Flagship Directors on maximising portfolio effectiveness. They also provide strategic advice about possible Flagship investment and commercialisation/ technology transfer opportunities and options. Members of the advisory committees also act as advocates for the Flagship in various forums.

At this stage of their development, Flagships are still primarily CSIRO entities. CSIRO retains overall responsibility for determining their strategic directions (in consultation with external stakeholders) and provides the majority of the funds invested in them, as well as most of the other resources involved. A CSIRO Flagship Oversight Committee plays a major role in their governance by recommending resource allocations, undertaking performance reviews and directing the overall portfolio of research. Nevertheless, the intention has always been that as they develop, and as new Flagships become necessary, the approach will increasingly be one of 'Team Australia Flagships', rather than just CSIRO Flagships.

In summary, Flagships have helped CSIRO focus its activities on major national goals closely aligned with the National Research Priorities (and the adoption of a 'fast fail' approach to project management has ensured that they remain appropriately focused). They have received the largest redirection of CSIRO funding in the organisation's history. They have emphasised the importance of partnerships, not just for research purposes but also for delivering impact to the economy, society and environment. And they have pioneered the sophisticated use of the Program Performance Framework as a structured approach to the setting, pursuit and achievement of goals.

Attachment 8 (*to the submission*) provides information on some of the impacts that the flagships have already made. More generally, in 2004-05 alone, flagships lodged 30 patent applications, signed nine major contacts (each over \$500 000), received \$16 million in partner contributions and published more than 200 scientific reports and publications. Perhaps more important than all of this is the progress they have made towards realising their longer and shorter term goals.

- (i) How CSIRO interacts with industry (particularly manufacturing) and the motivations etc for different modes of interaction with external bodies. For example, where spin-out companies come into the equation; how do they spin-out from CSIRO (who motivates the activity); what is the on-going relationship with CSIRO (if any); do they take staff out of CSIRO; and how does the CSIRO benefit from spin-outs?**

CSIRO has many types of interaction with industry, of which spin-outs are (numerically speaking) a relatively minor component. The types of interaction include:

- Information and knowledge transfer through testing services and consultancies.
- New knowledge development by fee for service contract research (higher degree of technical/scientific risk involved – scientific method applied to generate new knowledge).
- New knowledge development by jointly funded research, which may address a market gap or failure, where benefits are captured by many parties.
- New knowledge development by jointly funded research, on a return-on-investment basis, benefits often captured by a single company.
- Transfer of access to intellectual property by licensing of technologies.
- Access to intellectual property by outright sale.
- Spin-outs.

The factors which determine the mode of interaction include:

- The nature of the problem/challenge and the degree of technical and market risk involved.
- Whether the solution requires use of pre-existing intellectual property from either CSIRO, another source or the industry itself, or if the solution will rely primarily on the creation of new intellectual property.
- What is the most appropriate means of adoption or transfer of technology that will ensure benefit to Australia accrues.

Spin-outs

The process whereby each spin-out is formed is very much on a case by case basis. In most cases, CSIRO is the driver of the company formation but only after considerable research has been undertaken to ensure this is the appropriate commercialisation model. Things that we would be looking for include the:

- availability of an experienced management team;
- intellectual property being "clean" and well protected;
- technology having an identifiable path to market;
- technology being "commercial ready" (i.e. no further focussed research required); and
- availability of a commercial partner and/or funds to fund the company for a minimum of two years.

Where CSIRO is the driver, our specialist commercialisation team takes responsibility for forming the company, securing capital, securing the management team, identifying and appointing board members, ensuring appropriate contracts are in place (licence agreements, constitution, shareholders agreement etc) and assisting the management team-elect in preparing and signing off on the business operating plan. In other cases, CSIRO may be approached by an existing customer/collaborator who wish to enter in an incorporated joint venture whereby CSIRO is not the primary driver of the spin-outs and much of the process is conducted by the other party.

CSIRO's ongoing role with the spin-out is also established on a case-by-case basis. Where the spin-out is a *CAC Act* company, CSIRO takes a strong role in ensuring appropriate governance is in place ranging from providing company secretarial services to ensuring that CSIRO has full information rights and receives board papers and shareholder updates and works with the company to ensure they comply with the appropriate requirements under the *Commonwealth Authorities and Companies Act 1997 (CAC Act)*. Where the company is not a *CAC Act* company but CSIRO still has a major shareholding, we will usually take a board seat so as to ensure that our investment is managed appropriately and also to provide support and advice to the company as required. Generally CSIRO maintains a board seat only for the initial stages of the company (two-three years) and is looking to reduce our involvement as the company matures and brings on industry and commercial partners. In some cases in addition to CSIRO's role as a shareholder, we are also a research and/or facilities provider generally on an arms' length commercial basis.

In some cases CSIRO staff do go with the spin-off. The way this takes place ranges from a staff member choosing to resign from CSIRO and join the company (rare) through to staff being seconded to the spin-off (more common) or being made available to the spin-off via a services agreement with CSIRO (less common). CSIRO is as flexible as possible in encouraging key staff to go with the technology and assist the company to achieve its objectives.

CSIRO benefits through spin-off activity in a number of ways. First and foremost a well constructed spin-off can give commercialisable technology the best chance to be adopted by the market and therefore generate impact for industry and for Australia - this helps CSIRO achieve its strategic goals. Secondly, CSIRO can and does benefit from being an ongoing research partner with the spin-off thereby generating revenue for CSIRO and having an established path to market. Thirdly by demonstrating that CSIRO is willing and able to work proactively to create new industry focussed companies this generates new pathways for CSIRO to maximise impact as there becomes more of a market pull approach as partners (such as SME's and capital providers) approach us seeking new opportunities. Finally, ultimately CSIRO looks to exit its shareholding at an appropriate time (when the company is well established) for a cash consideration - such cash then being re-invested into further research activities.

(ii) How is industry-CSIRO research collaboration conducted (i.e., the problem solving type behaviour). Is it (a) on the premise that it is a public research entity assisting for free; (b) fee for service; (c) some intellectual property split agreement; or (d) a mix of some of these? (Is the vast majority of collaboration in regard to 'incremental innovation'?)

A mix of (b) and (c). Generally speaking, research conducted under (b) is in the incremental innovation role; under (c) it is a mix of incremental innovation and transforming industry.

(iii) Dr Rod Hill stated that the majority of work results from industry approaching CSIRO. How then are these industry requests prioritised? Are projects judged on: (a) commercial scope/viability; (b) something that is intellectually challenging; (c) where a solution would be of public importance; or (d) one which brings financial return to the CSIRO?

Projects are judged using all of the parameters listed, in addition to:

- Whether CSIRO has the resources or capability required and whether they can be deployed at the relevant time;
- How the project fits with CSIRO's Science Investment Process priorities (which themselves are set by taking into account factors such as the benefit to Australia, industry situation, potential for research and development to make a difference, CSIRO's competitive position and so on).

The important point is that decisions are not made on the basis of a single factor, rather by weighing up and balancing off a range of factors. The emphasis is on whether impact can be delivered to Australia most effectively and efficiently by CSIRO.

(iv) Where CSIRO enters "contracts" with overseas companies, what is the nature of these agreements? Is it for global research access? What benefit is the collaboration to Australia?

The same basic engagement principles apply as outlined in (i-iii; pages 18 - 20), and selection factors apply, especially including the decision around whether the best way to get a new technology into the marketplace is via an early adopter internationally, that creates pull through into the Australian market. Where appropriate, CSIRO will endeavour to ensure that the offshore firm does not lock out the intellectual property from Australia or obtain carve-outs of intellectual property for Australian access. Access to internationally developed intellectual property that can be transferred into Australia is another driver.

An important point is that if we believe that doing business with an offshore company will disadvantage Australian companies, we will decline the opportunity. CSIRO endeavours to engage in projects that bring impact and benefit to Australia and CSIRO. Examples of types of projects that could be of value include:

- Those that would have direct benefit to these companies Australian operations - if their Australian operations do well then that improves exports, employment, taxes, royalties, infrastructure development, secondary benefits to support industries in the value chain etc all of which benefits Australia.
- Those that would increase these companies likelihood to invest further in Australia.
- Those that improve CSIRO capabilities in a core strategic area - sometimes it is necessary to first work on projects with a non-Australian entity or operation to build these capabilities, which can then be applied in the Australian context;
- Those with a non-Australian entity or operation to develop market acceptance/ awareness/penetration of a new technology.
- Those with a non-Australian entity or operation that are priced to provide CSIRO with premium resources (funding).
- Those where the Australian operations get first rights, first to market or a "better deal" to the technology than their overseas operations.

Media Release on CSIRO Engagement with Action Agendas

Media Release

The Hon Bob Baldwin, MP

2 April 2007

COLLABORATION TAKES CENTRE STAGE AT CSIRO SEMINARS

Greater collaboration between CSIRO and Australian industry will be the focus of two seminars to be opened by the Parliamentary Secretary to the Minister for Industry, Tourism and Resources, Bob Baldwin.

"The CSIRO Action Agenda-Business Development Seminars in Sydney and Melbourne on 2 April 2007 give business an opportunity to view first hand CSIRO's business development function and its industry engagement plans," Mr Baldwin said.

"Business development is a misunderstood concept: it's not commercialisation and it isn't a slick new marketing term to sell CSIRO research. Business development is much more complex than that!

"It's about CSIRO working in partnership with industry to determine how best CSIRO can allocate its \$600 million a year of public funds to get the best results for Australia."

Mr Baldwin said Action Agendas have been a valuable tool in leveraging benefits from CSIRO research – a long-term aim of the Australian Government.

"A key goal of Action Agendas is to forge more beneficial partnerships between researchers, Government and industry.

"Action Agendas are a partnership between Government and industry to realise opportunities and overcome impediments to growth. By involving CSIRO more intensely we will provide an enormous boost to achieving this goal," Mr Baldwin said.

CSIRO is developing a small and medium enterprise engagement strategy.

This strategy aims to build stronger research-industry partnerships and increase the national benefits gained through the commercialisation of CSIRO's technology and the application of its capabilities.

Following the seminars, business representatives will be able to undertake a tour of CSIRO facilities and have discussions with senior CSIRO staff.

"Research shows that, in the long run, it is productivity that drives economic growth. At the heart of greater productivity you find innovation and there is probably no organisation in the world more innovative than CSIRO. This is a fantastic opportunity for Australian businesses to see what CSIRO has to offer," Mr Baldwin said.

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■ NICHE MANUFACTURING NATIONAL RESEARCH FLAGSHIP (NM NRF)



The Australian Government is establishing a new National Research Flagship for Niche Manufacturing within Commonwealth Scientific and Industrial Research Organisation (CSIRO) with the aim of adding further value to existing high value-add segments of the manufacturing industry and creating a new wave of niche industries based on nanotechnology.

WHAT IS IT ALL ABOUT?

The Australian Government is investing \$36.2 million to establish a new National Research Flagship for Niche Manufacturing within CSIRO. The aim is to add further value to existing high value-add segments of the manufacturing industry and help drive a new wave of niche industries based on nanotechnology. *A Rejuvenating Manufacturing Platform* will be established within the Flagship to act as an interface for small and medium enterprises and other manufacturers so as to help;

- Develop globally competitive medical products;
- Identify next generation fabricated devices;
- Capture value from nanotechnology for new materials; and
- Consider health, safety and environmental issues of research into nanotechnology.

The Flagship will also support the roll-out of the Australian Government's National Nanotechnology Strategy.

WHY DO IT?

Nanotechnology is a key enabling technology and offers exciting opportunities for Australian industry. If we quickly focus on current nanotechnology strengths, Australia can become an important player in the emergence of entirely new industries.

Australia's nanotechnology capability is already growing across a number of industry sectors, including minerals, agribusiness, health and medical devices, energy and environment. By significantly extending and providing a national focus for this existing capability, the NM NRF initiative provides Australia with the realistic prospect of becoming an important player in the emergence of entirely new industries.

WHO WILL IT HELP?

This new flagship will help drive new niche industries based on nanotechnology. By their nature they will be high tech, high value-adding industries and this will mean that Australia is likely to remain competitive in these industries. It will also assist existing niche high-value manufacturing industries which are currently flourishing, eg. scientific equipment and instrumentation and medical devices, to remain competitive within a highly competitive global market.

FURTHER INFORMATION

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