



LINKAGE PRIORITY CENTRES OF EXCELLENCE

Discussion Paper
National consultation
March 2002

Foreword

Australians have benefited greatly from Commonwealth Government investment in research directed towards social, cultural and economic outcomes. This directed research always builds on pure basic research across many disciplines. The importance of balancing national investment between basic research, and research that is selectively directed towards national priorities has been recognised around the world. On the 25 January 2002, the Minister for Education, Science and Training, Dr Brendan Nelson, wrote to the Chairman of the ARC, Mr Peter Wills AC, to advise of the Government's decision on directing some of the ARC's funding to priority research areas.

The Minister's media release of 29 January 2002, "*Backing Australia's Ability – Funding for Research Priorities Announced*", noted that the priority areas will be funded through the establishment of new Centres of Excellence concentrating teams of researchers in these areas, and through the ARC's Discovery and Linkage grants to outstanding individual researchers. Funding for grants and centres will be guided by factors including research excellence, potential national benefit and capacity to build scale, focus and critical mass in these areas.

The areas of priority for the ARC have been identified as fields of existing or emerging research strength in which Australia can achieve international leadership and which have the potential to deliver significant economic and social benefits to the community. The priority areas are: Nano-Materials and Bio-Materials; Genome/Phenome Research; Complex/Intelligent Systems; and Photon Science and Technology.

The ARC has now commenced the task of establishing a new Linkage Priority Centres of Excellence program to implement the Government's directive. The first phase of this will involve wide-ranging consultation with organisations and individuals interested in research & development, innovation, and business investment. This paper has been prepared by the ARC to promote discussion and comment on arrangements for establishing and overseeing the new Centres. I encourage you to participate in this important initiative.

Vicki Sara
Chief Executive Officer,
Australian Research Council

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AUSTRALIAN RESEARCH COUNCIL

Linkage Priority Centres of Excellence

Discussion Paper

1. Background

In January 2001, the Commonwealth Government announced the Innovation Action Plan, *Backing Australia's Ability*. The Plan presented a range of initiatives designed to strengthen our ability to generate ideas and undertake research, to accelerate the commercial application of these ideas, and to develop and retain Australian skills.

In the Innovation Action Plan, the Government announced an additional \$736.4 million over 5 years for the ARC, doubling the funding for the National Competitive Grants Program (NCGP) by 2005-6. The additional funding will improve the competitiveness of researchers' salaries and increase the support available under the Discovery and Linkage elements of the NCGP. The Plan announced that there would be an emphasis on areas in which Australia enjoys, or wants to build, a competitive advantage.

On 25 January 2002, the Minister for Education, Science and Training, Dr Brendan Nelson, announced the Government's decision regarding this emphasis, through the targeting of ARC funding to priority areas of research. The Minister's direction to the ARC requires that no less than 33% of the total funds allocated to research projects under the National Competitive Grants Programme in the 2003 funding round will be allocated to four priority research areas:

- Nano-materials and Bio-materials
- Genome/Phenome Research
- Complex/Intelligent Systems
- Photon Science and Technology

Descriptions of these areas are attached in Appendix A.

To maximise the outcomes from the Government's investment in the priority areas, the ARC proposes to establish Linkage Priority Centres of Excellence. The Centres will build national capability in these areas and develop the scale and focus necessary for Australia to be internationally competitive. The designated areas are very broad, and Centres will build this scale and focus in specific research themes within the broader priority areas. Some Centres may undertake research extending over two or more priority areas.

The Linkage Priority Centres of Excellence program will have a budget of \$80M over five years. It is expected that approximately eight to ten Centres will be established, with one to three in each priority area. Centres will have ARC funding of the order of \$2M per year. Selection of the Centres will take place in 2002, and funding will commence in 2003. The timetable for the selection of Centres is attached in Appendix B.

It is possible that, within the \$80M funding envelope, one or more Centres may be co-funded by the ARC and other partners, in a manner similar to the Australian Centre for Plant Functional Genomics being established by the ARC and the Grains Research and Development Corporation. Should this occur, separate funding rules may be established for the joint Centre before competitive applications are invited within its specific theme area.

Linkage Priority Centres of Excellence will build on the ARC's experiences with its successful programs for Special Research Centres and Key Centres of Teaching and Research. They will differ from the Government's Cooperative Research Centres by permitting greater flexibility in commercialisation models and in their interaction with industry participants, by being less prescriptive regarding the legal nature of the Centre operator, and by undertaking a large fraction of research at the basic and pre-competitive stages.

This discussion paper seeks comment from the community regarding the establishment and operation of the Linkage Priority Centres of Excellence Program. Comments will help ensure that the new Centres program supports Australian research in the designated Priority Areas which is highly esteemed in the world arena, and which returns public investment through clear national socio-economic and cultural benefits. Comments received from the community by the deadline of Friday 5 April 2002 will be taken into account in the preparation of the Funding Rules for the new Centre program.

2. Objectives of the Centres Program

The objectives of the Linkage Priority Centres of Excellence program are to:

- a) undertake highly innovative research at the forefront of developments within the Priority Areas, with a scale and a focus leading to outstanding international and national recognition;
- b) promote research that will enhance Australia's future economic, social and cultural wellbeing;
- c) link existing Australian research strengths and build new capacity for interdisciplinary, collaborative approaches to addressing the most challenging and significant research problems;
- d) build Australia's human capacity in the Priority Areas by attracting, from within Australia and abroad, researchers of high international standing as well as the most promising research students;
- e) provide high quality postgraduate and postdoctoral training environments for the next generation of researchers in the Priority Areas;
- f) offer Australian researchers access to world class infrastructure and equipment, and to key research technologies;
- g) develop relationships and build new networks with major international centres and research programmes that help achieve global competitiveness and recognition for Australian research;
- h) establish Centres of such repute in the wider community that they will serve as points of interaction among higher education institutions, Governments, industry and the private sector generally; and
- i) raise awareness of the Priority Areas in Australia, particularly their importance in innovation and international competitiveness.

3. Qualities of Successful Centres

In a survey of international research organisations considered to be *centres of excellence*, a number of common features indicative of success were highlighted, including:

- a) a critical mass of high calibre research scientists;
- b) a clear, formal structure within which a research agenda is set and pursued;
- c) a capability to integrate across different fields and to attract complementary skills;
- d) an ability to attract and to renew high quality staff, and to act as a source of such talented people for other organisations;
- e) a capacity to generate new knowledge and to add value to existing knowledge, thus playing a dynamic role in the relevant innovation system;
- f) a high level of international scientific or technological visibility and reputation;
- g) substantial and assured funding over an extended period, providing the basis for investing in people and reaping a return, and building long-term partnerships; and
- h) an ability to leverage on committed public funding through the attraction of private and other public finance.

Linkage Priority Centres of Excellence will build these features into their business plans. They will attract visionary leadership and be characterised by decisive and responsive management. Guided by this leadership, Centres will aim to obtain a high degree of leverage from the Commonwealth funding allocated to each Centre, in order to maximise the value of the outputs achieved. This objective implies that Centres will require flexible and adaptive management structures that can exploit emerging opportunities for attracting investment and for undertaking collaborative research.

4. Issues

4.1. Building National Capability in Designated Priority Areas

4.1.1. Research Excellence

Linkage Priority Centres of Excellence will undertake highly innovative, world-class research on specific themes within the designated Priority Areas, aiming to produce outcomes of economic, social and cultural benefit to Australia.

Centres will manage a portfolio of research projects that build on Australia's existing strengths and develop new capabilities to generate new knowledge and understanding in the Priority Areas. Centres will address challenging and significant problems whose resolution will lead to international acclaim. The rapid build-up of investment in the research portfolios of Centres will strengthen Australia's research capacity, forming a critical mass in selected fields within the Priority Areas.

Centres' research portfolios may include experimental and theoretical projects undertaken to acquire new knowledge, as well as original research seeking to address problems that arise in specific applications. In view of the rapid advance of global knowledge in the Priority Areas, adaptability, flexibility and a capacity to concentrate effort on focussed research problems will be key elements of a Centre's success. Centres will develop and maintain cooperative links with end user communities, and exploit these links to help select the most promising research projects.

Issues for comment

1. How will Centres balance research programs building on existing Australian strengths, with research in new and emerging areas?
2. What measures are available to determine the level of scale and focus that will ensure optimal returns on investments in particular fields?
3. What is the critical mass for research teams in various fields within the designated Priority Areas?
4. Are there significant differences between the research modalities in the different Priority Areas that should be reflected in the ARC's funding rules?
5. What mechanisms are available to encourage Centres to develop research portfolios in collaboration with end users, to help ensure outcomes with economic, social and cultural benefit?
6. To what extent should applications be assessed against a proposed research portfolio, compared with on-going evaluation of annually revised plans?

4.1.2. Developing Excellent People

Linkage Priority Centres of Excellence will provide a world-class research environment encouraging leading Australian researchers to work in Australia, and attracting international researchers to Australia. The Centre environment will support the development of the careers of Australia's best young researchers and research leaders. Centres will deliver or collaborate in the delivery of education and training programs designed to build understanding of, and expertise in, the Priority Areas at the regional and national level.

A Director will be appointed to lead each Centre. The Director, in consultation with the Board, will be responsible for setting the research focus of the Centre, implementing the policies of the Board, and establishing the Centre. The Director will be in a unique position to attract outstanding researchers from within Australia and from overseas. Where a Centre's research portfolio involves more than one organisation, the Director will be responsible for coordinating the research effort and the Centre's accountabilities across the organisations involved. The ARC recognises that potential Centre operators may wish to delay the recruitment and appointment of the Director until the outcome of the application is known, and will accept proposals nominating Interim Directors.

ARC Federation Fellowships are prestigious awards designed to provide internationally competitive salaries that will support and encourage outstanding Australian and international researchers to work in Australia. Federation Fellows with expertise in the designated Priority Areas of Research will play key roles in establishing the Australian research agenda in these areas. In addition they could support and promote the work of Centres, mentor staff and students, and help build international links. It is also expected that the research environment of Linkage Priority Centres of Excellence will prove to be attractive to many Federation Fellows. Federation Fellows would, in some circumstances, be well suited to the role of an Executive Research Director in a Centre.

Accordingly, the ARC foreshadows the inclusion of Priority Areas among the selection criteria for the next round of Federation Fellowships (for Fellowships commencing in 2003). It proposes to select approximately 16 Fellows out of the total of 25 to be appointed from applicants whose research achievements lie in the Priority Areas. It is anticipated that most of these Fellows will be associated with Linkage Priority Centres of Excellence. Even where they are associated with Centres, Fellows' salaries will be met from the Federation Fellowship program, not from ARC Centre funding. The requirements for matching funding in the Guidelines for the Federation Fellowship Program will remain. Matching funding may *not* be met from anticipated ARC Linkage Priority Centre funding or from resources put forward as a matching component in other applications for Commonwealth funding, including Linkage Priority Centres of Excellence.

High quality postdoctoral researchers working full time in the Centres will be critical to achieving the intended research outcomes. The ARC wishes to identify and acknowledge these researchers through prestigious *ARC Centre Fellowships (ACFs)*. Nominations for ARC Centre Fellowships will be made from the full-time, research-only, ARC-funded staff of the Centres, and endorsed by the ARC. In view of the international competition for outstanding researchers in the Priority Areas, Centres will have flexibility in the salaries offered to ARC Centre Fellows, based on the minimum levels set out in the ARC Postdoctoral Fellowship, Research Fellowship, and Professorial Fellowship notional salary scales. ARC funding for ACF salaries will be paid from the ARC Centre budget.

Postgraduate research training will be an important Centre activity, giving students an opportunity to undertake their research within a team of world-class researchers equipped with state-of-the-art facilities. In recognition of the importance of building Australia's human capacity in the priority areas, Centres will be able to offer *ARC Centre Postgraduate Awards (APA-Cs)*. In view of the importance of attracting top students into the priority areas, Centres will be able to offer stipends at a level above the standard stipend for Australian Postgraduate Awards. ARC funding for APA-C stipends will be paid from the ARC Centre budget.

Centres will be responsible for a comprehensive program of training at the professional and pre-doctoral level. A centrepiece of the training program will be a vibrant research environment sustaining excellent research training at the honours and postgraduate levels. Centres will be regional and national leaders in continuing professional education, including, where appropriate, distance education programs.

Issues for comment

1. It is expected that Centres will concentrate and focus research activity primarily through full-time research staff. Some of these staff may be presently engaged in a mix of duties, including undergraduate teaching and administration. What issues arise when staff are seconded from pre-existing activities to undertake full-time research, and when they are re-integrated after the period of secondment?
2. How can the ARC assist potential centre operators to link the opportunity to apply for a Centre with the opportunity to host a Federation Fellow in the corresponding priority area, recognising that ARC funding must be committed to both in 2002?
3. Are there issues or potential problems to be explored regarding the proposed ARC Centre Fellowships and ARC Centre Postgraduate Fellowships?

4.1.3. Infrastructure and Equipment

World-class research in some designated Priority Areas may require expensive, specialized infrastructure and facilities. The prior existence of such facilities may be a favourable aspect of certain Linkage Priority Centre of Excellence proposals, especially when associated with an existing locus of excellent research.

The ARC recognises that some Centres may require a significant, up-front investment in new facilities to support the proposed research program. Since new Centres may not be in a position to commence with a full staffing complement, the ARC will encourage Centres to purchase major items of equipment from their first year funding. Expenditure of this kind will be subject to a minimum of \$100,000 of ARC Centre funding, and require at least 25% matching cash funding from the Centre operators, consistently with the ARC's Linkage Infrastructure Equipment & Facilities (LIEF) program guidelines. Budget proposals will be required to reveal the Centre's major equipment needs over a 5-year time frame, at the time of submission to assist the ARC's planning of major equipment programs.

Issues for comment

1. How can Centres best capture benefits from prior and proposed Government investment in expensive research infrastructure and facilities?
2. What models are available to encourage networked Centres to share facilities and infrastructure across geographic and institutional boundaries?
3. How might the application process best identify and evaluate a Centre's requirements for expensive infrastructure?
4. Will selected Centres be in a position to purchase large items of equipment from their first year funding?

4.1.4. Access to other ARC Programs

The ARC intends that Linkage Priority Centres of Excellence will be a focal point for Australian research in specific research themes within the respective priority areas. Many, but by no means all, Australian researchers in these research themes will be associated with the Centres. The magnitude of the ARC's funding to Centres will allow a Centre itself to support areas of research that are the highest priority within the Centre's research portfolio. Accordingly, researchers [with the possible exception of Federation Fellows] who are associated with a Centre will not be eligible to apply for project funding under the ARC's Discovery-Projects (DP) and Linkage-Projects (LP) programs in the core research areas of the Centre. Centre Directors will be asked to certify that any DP or LP application by an associate of a Centre is not within the Centre's core business. The ARC's Expert Advisory Committees will determine eligibility.

Researchers associated with a Centre who may be otherwise eligible to apply for an ARC Fellowship, or to ARC programs other than Discovery-Projects and Linkage-Projects, will continue to be eligible to do so. Note however that there is an expectation that the ARC's Centre funding will be used to purchase any major items of equipment that are required in the first years of the Centre's existence. It is unlikely that the key investigators in a Centre will apply to the ARC's Linkage Infrastructure Equipment and Facilities (LIEF) program for equipment needed by the Centre within the first three years of its existence. Applications submitted in 2002 for LIEF funding will be unaffected.

It is possible that Chief Investigators and other researchers associated with a Centre will hold, or have been offered, ARC grants in the core business of the Centre. These could include ARC Special Research Centre or Key Centre grants, "old" Large Grants or Fellowships, or "new" Discovery-Project or Linkage-Project grants. To avoid funding the same research proposal twice, the ARC will require that such grants be relinquished. The date of relinquishment has yet to be determined.

Issues for comment

1. Should researchers working full-time in a Centre be eligible to apply in the ARC DP and LP programs, in areas outside the core research of the Centre?
2. Should ARC Fellowships other than the new Centre Fellowships be tenable at Centres, and should researchers associated with the Centres be eligible for such Fellowships?
3. How can the ARC best ensure that researchers associated with a Centre do not engage in "double dipping"?

4.2. Linkage at Regional, National and International levels

4.2.1. National and Regional Cooperation and Coordination

Linkage Priority Centres of Excellence will build on existing research strengths at particular sites, and also develop strong networking between sites. The ARC does not intend to indicate a preference between "building on" and "strong networking" approaches to the development of Centres. It is recognized that successful Centres can operate in a concentrated mode at a single location, or distributed through networks or "virtual" structures.

Applications for Centres that are either primarily “concentrated” or primarily “distributed” should address the potential weaknesses of either structure. For concentrated Centres, these include the possible exclusion of excellent researchers and infrastructure in other institutions, the potential to be insular and to fragment, limitations to rural and regional participation and on access to State Government funding, inflexibility in recruitment owing to mobility requirements, and possible restrictive filtering of international linkages and commercial opportunities. For distributed Centres, potential weaknesses include increased management and communication overhead, additional operating and infrastructure costs, a potential loss of focus and identity, and the challenges of developing critical mass at separate nodes.

There will be exciting opportunities to build or extend relationships between the new Linkage Priority Centres of Excellence and existing research concentrations such as the ARC’s Special Research Centres and Key Centres for Teaching and Research, the Cooperative Research Centres, and the Major National Research Facilities. The ARC encourages linkage between Centres and private sector research laboratories, Commonwealth-funded research organisations such as CSIRO, AIMS and ANSTO, and State Government research institutions. Links with industry associations, technology parks and incubators, and emerging innovation networks and clusters will also be highly regarded.

Issues for comment

1. Are there preferred regional and national networking structures for Centres, and are these different in different Priority Areas?
2. What lessons have been learned in Australia and overseas about the relative merits of “concentrated” and “networked” Centres?
3. How is appropriate scale and focus best built in a networked centre?
4. How will the new Centres articulate with research initiatives already underway in Australia in the Priority Areas?

4.2.2. International Linkage

Priority Areas of Research are already the subject of intense global R&D and commercialisation activity, and this will increase over time. Linkage Priority Centres of Excellence will establish close links with leading overseas researchers and centres in the Priority Areas, to capitalise on these global developments. Links will be characterized by the exchange of researchers and students, and in some cases collaborative research projects. A key performance indicator for Centres will be measures of international recognition and significance, as well as the frequency and quality of international researcher exchanges.

The international links established by Centres will generate a flow of information regarding important advances in the Priority Areas. This information will include research results, but will extend to information about industry trends and commercial initiatives. Centre staff will be in an advantageous position to acquire such commercial intelligence and to ensure that it is used to improve the outcomes from their Centre's operations and in the national interest. There has been ongoing discussion in Australia about optimal ways to capture national benefit from publicly funded research. Important perspectives on these issues are discussed in Appendix C, which comes from the Industry Research and Development Board.

Issues for comment

1. What strategies are available to extract the maximum national benefit from international networking?
2. What is an appropriate balance between investment in international links, and forging regional and national links?
3. Can the ARC play a role to play in fostering international linkages in the Priority Areas through its relationships with Government funding agencies in other countries?

4.3. Strategic Development of Centres

4.3.1. Corporate Structure and Management

Linkage Priority Centres of Excellence will have management and corporate governance structures designed to ensure optimal returns on Commonwealth investment in the Centre. The ARC does not intend to prescribe the Centre governance structure, but anticipates that most Centres will be established as entities within the academic and corporate governance structures of Australian universities. Such entities will provide considerable flexibility for centre management in deploying resources and in pursuing commercialised opportunities. Host institutions will demonstrate a capacity to manage large research Centres and to spawn successful commercial ventures.

A Board or similar body will set the strategic directions for each Centre. The Board will bring together leading researchers and potential end users of the Centre's research. Active membership of the Board by overseas researcher leaders in the Priority Areas will be highly regarded.

Centre management arrangements will reflect the programmatic structure of a Centre's research portfolio, as well as geographic and other factors. Centre selection criteria will place considerable weight on management and governance arrangements, including evidence of previous successful cross-institutional collaborations where these are relevant.

Issues for comment

1. What are the strengths and weaknesses of alternative Centre governance structures? Are there optimal structures, or structures that have been shown to be problematic?
2. What features characterize the membership and the operating rules of the Boards of successful Centres?
3. Are there management arrangements and communication strategies that are particularly suited to networked or virtual Centres?

4.3.2. Centre Partners

Linkage Priority Centres of Excellence will build on Commonwealth ARC funding by attracting significant commitments of cash and in-kind resources from the Centre operators and other participants. Successful applications are likely to propose to at least match the requested ARC funding with cash and in-kind payments from other organisations participating in the Centre. Organisations may participate in the funding and support of Centres in several different roles.

For example, some organisations may have an interest in supporting research in the Priority Areas while not having a capacity to undertake the research themselves. National research funding agencies such as the ARC and its international counterparts, Commonwealth and State Government research boards and councils, industry research coordination bodies, venture capitalists and investment houses are examples in this category. For such organisations, participation in a Centre will normally be arranged by negotiations with prospective Centre operators and not involve the ARC directly. However, the ARC is ready to participate directly in co-funding arrangements with certain organisations where such participation does not preclude competitive selection of Centres. Examples of potential co-funding organisations are the national research funding agencies of other countries and Australian industry research boards and associations. An example of a co-funded Centre is the Australian Centre for Plant Functional Genomics, jointly funded by the ARC and the Grains Research and Development Corporation.

As mentioned above, the ARC anticipates that many Centres will be formed with Australian universities as leading participants in the research programs. Universities that are prospective Centre operators will have explored opportunities for assembling strong, complementary research expertise by drawing together the research capacity of participating universities and other research bodies such as CSIRO, AIMS, ANSTO, other research agencies funded by the Commonwealth and State Governments (including Co-operative Research Centres (CRCs) and the Centres of Excellence in Biotechnology and Information & Communications Technology), and private sector research laboratories. The ARC wishes to encourage the formation of Centres involving such collaborations, which will help assemble the critical mass required to be globally competitive.

While the ARC encourages their participation as partners in Linkage Priority Centres of Excellence, organisations already funded by the Commonwealth or State Governments to undertake research (e.g. CSIRO, AIMS, ANSTO, CRCs and the Centres of Excellence in Biotechnology and in Information and Communications Technology) will not be eligible to receive additional funding under the ARC's Linkage Priority Centres of Excellence program.

Linkage Priority Centres of Excellence will encourage participation by Australian industry. The ARC is particularly eager to ensure that Centres encourage small and medium enterprises (SMEs) to participate in Centre research projects and commercialisation and place no deliberate or inadvertent impediments on their participation. Accordingly, arrangements for industry participation will be flexible in terms of duration and the commercial and legal relationship. Some arrangements will involve foundation industry participation that endures with the Centre, while others will see Centres undertaking research projects with organisations that are not partners in the Centre, provided that an appropriate contract is entered into between the Centre and the organisation concerned sufficient to protect the rights of all parties concerned. Participation of international industry partners will be encouraged, with the proviso that proposals with such partners will be required to pay particular attention to mechanisms for capturing national benefit from the arrangements. Important considerations regarding national benefit are outlined in Appendix C, which has been developed by the Industry Research and Development Board.

Issues for comment

1. How can the ARC assist prospective applicants optimise the number and complementarity of potential participants and optimise the scope of potential funding arrangements?
2. What might the ARC do to encourage industry and business participation in Centres?

4.3.3. Fiscal Leverage (cash and in-kind) and long-term funding of Centres

There has been considerable recent discussion about the beneficial and detrimental effects of fiscal leverage in Australian research funding. It is important to note that institutions participating in Centres will have made a strategic decision to make a significant investment in building research and research training capacity in the relevant Priority Areas. This choice will be reflected in the cash and in-kind contributions committed in the Centre application. The magnitude and nature of these commitments will be part of the selection criteria. The relatively high level of Commonwealth investment in the designated Priority Areas of Research aims to ensure a scale and focus in research that is commensurate with a Centre that has a significant presence on the global research arena.

The ARC has noted that in existing Centres, it is not uncommon for more than 20% of the ARC's Centre funding to be used to pay the salaries of staff involved in research support, either in an administrative or a technical capacity. The ARC's National Competitive Grants Program funds only the *direct component* of research. While it may be appropriate for some Centre funding to be applied to the salaries of administrative and technical staff, the ARC will encourage applicants to provide administrative and technical staff positions as part of their cash or in kind contribution. This will help contain overhead costs, and concentrate ARC Centre funding on supporting research outcomes.

Centres will receive initial indicative Commonwealth funding for 5 years, 2003-2007. This interval is relatively short compared with the expected lifetime of most Centres. The selection process will evaluate applicants' proposals for sustaining a Centre past the 5 year funded period. Some options for continuation would include seeking funding from a possible extension to this ARC Centres program; conversion to, or reconfiguration as, a Cooperative Research Centre (CRC) or similar body; integration into the host institution; or commercial spin-off.

Issues for comment

1. What is an appropriate balance between cash and in-kind contributions in the establishment of a new Centre?
2. Are problems likely to arise if the ARC expects that the salaries of some research support and administrative staff to be paid wholly or predominantly from matching funds?
3. Are there favoured approaches to managing Centres past the end of their initial ARC funding?

4.3.4. Commercialisation and Intellectual Property

Linkage Priority Centres of Excellence will provide a mechanism for Australian researchers to undertake high quality research with the potential to put Australia at a comparative advantage internationally, especially in terms of commercial opportunities arising from the sale of intellectual property (IP) and the establishment of spin-off companies. Centres will generate valuable IP, and may have a strong emphasis on its commercialisation, both in Australia and internationally. Centres will have an IP management strategy and a commercialisation strategy that includes (1) commercialisation policies and services supporting the commercial exploitation of research outputs for the benefit of Australia, and (2) policies and practices necessary to foster an entrepreneurial culture amongst the staff of the Centre.

Issues for comment

1. Are potential centre operators aware of the National Principles of Intellectual Property Management for Publicly Funded Research?
2. To what extent should commercial potential guide the selection process and a Centre's research portfolio?

5. Contacts

The deadline for comments is 5 April 2002.

For comments or enquiries about a specific priority area or field of research contact the appropriate Executive Director from the list below.

For general comments on the Linkage Priority Centres of Excellence program contact Professor Lawrence Cram (details below).

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APPENDIX A

Descriptions of Designated Priority Areas of Research

Nano-Materials and Bio-Materials

The development of advanced techniques in materials science and in biotechnology underpins progress and growth in almost every area of industrial and economic activity. The marriage of biotechnology and materials science promises exciting research opportunities, with enormous potential for economic, social and environmental applications and impact.

Biotechnology promises to revolutionise our approaches in areas such as medicine, microbiology and agriculture. Reconstitution of molecular motors, DNA and DNA-protein recognition systems, bio-membranes, and the reconstruction of extracellular and intracellular matrixes, are likely to form the basis of new generation biosensors, bio-inspired materials, high throughput screening systems, chloroplast-like energy transduction systems, and tissue reconstruction procedures.

Materials such as metals, ceramics, polymers, composite materials and natural products are used in a wide range of sectors, such as manufacturing, construction, infrastructure, communications, transport, agriculture and medicine. The ability to 'tailor' material properties at scales near to those of individual atoms and molecules promises to allow the production of materials with novel mechanical, thermal, chemical and surface properties, and with vastly improved performance compared to conventional materials. As well, the ability to form nano-scale assemblies of atoms and molecules is vital to advances in computing, drug design, chemical processing and synthesis, and sensor development.

Australia has extensive existing research strengths both in advanced materials science and in biotechnology. Priority funded research into nano-materials and bio-materials would build on this existing base, in these areas of internationally recognised importance, and would lead to:

- higher performance levels, and hence greater materials utilisation efficiency, to improve product performance and conserve natural resources;
- improved cost-effectiveness and value-added use of materials through advanced manufacturing;
- the development of novel devices, sensors, and techniques for medical, biochemical, industrial and environmental applications; and
- revolutionary new ways to produce implants for medical applications, and the 'production' of replacement organs.

Genome/Phenome Research

The complete description of the human genome and those of other organisms has been a major achievement of modern science. There is a heightened expectation that gene therapies and the genetic improvement of plants and animals of agricultural importance by gene transfer will lead, among other things, to the eradication of inherited disease and to a solution to the world's food problems. However, the connection between an organism's genes (its genome) and its physical appearance and behaviour (its phenotype) is exceptionally complex and, at present, highly elusive. The growth and differentiation of cells and an organism's predisposition to disease can be controlled by multigene clusters and fine control of the gene expression mechanisms. Although molecular biologists have been very successful in identifying and manipulating genes,

the control of gene expression and the interactions of gene products which lead ultimately to the expression of a unique phenotype are poorly understood.

The reductionist approaches of molecular biologists have often focused on the analysis of bimolecular systems (protein-protein, protein-DNA, protein lipid). Although it has been revealing to understand these interactions, the reactions that lead to the expression of a unique phenotype are infinitely more complex. Nevertheless, molecular genetics coupled with the use of modern technologies based on microchip gene arrays and high through-put and high sensitivity screening are allowing scientists to experimentally access these complex systems and to describe the way in which environmental and genetic factors cooperate positively or negatively to determine the final phenotype.

The post-genomic era will see an increasing focus on the nature of the link between the genome and phenome. Molecular biologists will continue to describe DNA sequences, but there will be an increasing need for biologists who understand not only molecular genetics but also the behaviour of the whole cell, the whole tissue and the whole organism. The problem requires a team approach and the collaboration of molecular biologists, cell biologists, physiologists and biophysicists.

Key areas of study include:

- Genomics and bioinformatics;
- cell differentiation;
- control of gene expression;
- cell signalling pathways;
- energy transduction;
- multigene control of the phenotype traits; and
- identification of quality and disease resistance genes in plants and farm animals.

Complex/Intelligent Systems

Real-world systems are almost always made up of a large number of components that interact in varying and complex ways. This leads to complex behaviour that is difficult to understand, predict and manage. Research into the characterisation and control of such systems attempts to describe them in explicit (often mathematical) ways, in order to provide enhanced degrees of understanding, predictability, control and efficiency in management.

Very simple control systems include the thermostat that controls the temperature of a hot water system, or a street light that comes on at dusk. Much more complex systems which benefit from the application of research into control and system characterisation include the Internet, air traffic control, irrigation, robotics and a wide array of systems associated with power distribution, telecommunications, defence, manufacturing, transport and finance, as well as ecological and biological systems.

Complex systems are modelled and control strategies implemented by mathematicians, computer scientists, information scientists, engineers and other scientists from a broad range of disciplines.

Relevant areas of research include:

- system analysis and control theory;
- mathematical and statistical modelling;

- system and software engineering;
- software-hardware co-design;
- intelligent systems, and
- communications engineering.

Photon Science and Technology

Photon Science and Technology is one of the major growth areas of modern science and technology. Unexpected discoveries in basic photon science, new applications that penetrate many disciplines very swiftly, and very rapid idea-to-market cycles characterise the field. Australia has exceptional quality and some considerable breadth and depth in photon science research, with a demonstrated capacity to found and grow commercial ventures.

Photon Science and Technology includes:

- modern areas such as:
 - laser science and applications;
 - optical fibres and communication systems;
 - photonics, linking photon science and electronics;
 - materials characterisation by synchrotron and other X-ray sources; and
 - atom optics and quantum computing; and
- traditional areas such as:
 - optical materials and components including astronomical instrumentation;
 - solar energy conversion (for example silicon photovoltaics and artificial photosynthesis);
 - photometry and spectroscopy; and
 - human vision.

APPENDIX B

Timetable for Selection of Priority Centres of Excellence

| Linkage Priority Centres of Excellence Selection Timeline | |
|--|---|
| Mar | Consultations with the research sector and industry partners |
| May | Funding rules and application forms released on ARC web site |
| Mon 15 July | Closing date for Letter of Intent (LoI) to submit an application. LoI summaries made available on ARC web site. |
| Mon 16 Sept | Deadline for full applications |
| Oct | Assessment of full applications by panel |
| Oct-Nov | Interviews and site visits if required |
| Dec | Recommendations to ARC Board and Minister |
| Dec | Linkage Priority Centres of Excellence announced |

All applications will be required to refer to the corresponding letter or letters of intent forwarded by the participants. The purpose of letters of intent is to allow the ARC to publish a list of prospective applicants to facilitate wide-ranging discussions and negotiations before the final applications are submitted. The ARC will reserve the right to broker such discussions, and to encourage further discussions at any point in the selection process, or in the development of funding contracts.

It is proposed that the evaluation of proposals and the preparation of recommendations regarding Centres to the ARC Board and Minister will be undertaken by a panel formed from the ARC's Expert Advisory Committees and other experts. The ARC may seek written advice from national and international assessors, to assist the panel. Any such advice may not be subject to a rejoinder process. It is anticipated that independent international experts may visit Australia to advise in the selection process. Prospective Centre operators may be interviewed before selection, following a short-listing process based on the full applications and written assessments.

APPENDIX C

Industry Research and Development Board Policy on National Benefits

Policy No. 01: National Benefits

The IR&D Board has been considering the complex issue of national benefit for some time. The current action (November 1999) on this issue arose from concerns raised by the IIF Fund Managers that provisions in the R&D Start Grant Agreement regarding intellectual property and the assessment process were constraining the ability of grantees to raise equity capital required to commercialise the results of R&D. The following principles were agreed by the Board at its meeting of 19 October 1999.

National Benefit Principles

The principles are:

- national benefit comprises both applicant (private) and spillover (public) returns;
- the R&D project and its commercialisation should maximise the total national benefit;
- private return ie return to the applicant, is an important component of the “national benefit” and “benefit of the Australian economy”;
- increases in the private return should not be at the expense of national spillover (public) benefits;
- the R&D project and its commercialisation should include features which are likely to generate significant national spillover benefits;
- knowledge and strategic spillover benefits are generally the most powerful spillover benefits;
- knowledge spillovers include human capital development;
- national knowledge and strategic spillover benefits are likely to be generated when -
 - the physical location of the R&D or commercialisation activities are geographically close to Australian suppliers, customers and competitors;
 - there is close interaction between Australian firms and research institutions (both domestically and internationally); and
 - the home-base R&D facilities are located in Australia;
- strategic spillovers are likely to be generated when the R&D and its commercialisation activities are in a field or area which -
 - addresses a weakness in the national innovation system; or
 - contributes to Australia developing an international reputation as a “centre of excellence”; or
 - is likely to contribute to national productivity or economic growth; or
 - affects industries that are in any sense strategic to Australia;

- the globalisation of markets and the need to be close to customers, suppliers and competitors, meaning that the “national benefit” or “benefit to the Australian economy” may be best served by commercialising the results of the project overseas. Where commercialisation occurs overseas, the onus is on the applicant to demonstrate that the total national benefit is increased;
- the national embodied consumption and consumer surplus spillover benefits and community spillovers are not as reliant on the R&D being conducted in Australia; that is, the economy can obtain such spillover benefits from the adoption of technology developed overseas;
- the national embodied, consumption and consumer surplus spillover benefits are likely to increase as consumption (either as an input or consumable) of the product, service or process increases; and
- national community spillovers are likely to be increased the more prevalent the environmental issue, for example, skin cancer, is in Australia.

Desirable indicators for assessing the national benefit criterion

In the circumstances where the company concerned seeks to maximise its private benefit by commercialising other than in Australia, if the commercialisation does not retain substantial domestic spillovers (national benefit) in Australia, or if the company did not seek Board approval for changes to their commercialisation strategy, then the assistance should be recovered from the company.

As spillovers cannot be accurately quantified, the identification of spillovers will be derived from the proportion of spillover features, which are at the higher end of the Principles listed. In submitting their proposals companies should have regard to the following hierarchy of indicators. This hierarchy is developed to provide companies with an indication of the important features the Board will consider in assessing the national benefit criterion.

It should be noted that consideration of applications for assistance and/or applications to vary commercialisation plans will always be an on-balance decision having regard to the circumstances of each case. In practice, this will mean that where commercialisation is likely to be partly or wholly undertaken offshore, the applicant will have to demonstrate that the benefits to Australia justify the Government assistance being sought.

Desirable indicators for assessing the national benefit criterion for R&D Start grant applications

Indicators developed from the Principles for assessing the national benefit criterion for grant applications are:

- the company’s home base for R&D is located in Australia;
- the R&D and its commercialisation activities utilise linkages between other firms and research institutions (both domestic and international);
- the R&D and its commercialisation activities interact with existing Australian research institutions, customers, suppliers and/or competitors in Australia;

- the R&D and its commercialisation activities interact with research institutions that have an international reputation in the same field or area of research;
- the R&D and its commercialisation activities are in a field or area of research not currently well represented in Australia but which enhances, through complementarity, Australia's overall indigenous innovation capacity;
- the results of the R&D and its commercialisation activities will give rise to enabling technology that will enhance the effectiveness and/or efficiency of other generally available or emerging technology in Australia;
- the results of the R&D and its commercialisation activities are directly targeted at enhancing national and/or resource security;
- the commercialisation plan should state the probable ultimate location of the production and the competitive reasons for this location. Overseas production is reasonable where -
 - local production is demonstrated to be uneconomic in terms of cost structure; and/or
 - the production or commercialisation requires close physical interaction with overseas companies, customers, suppliers and competitors;
- the commercial outcome, (product, process or service), arising from R&D activities is used as an input for industries which constitute a large proportion of the Australian economy; and
- the commercial outcome, (product, process or service), arising from R&D activities addresses a social, health or environmental issue which is particularly prevalent in Australia.

Desirable indicators for assessing national benefit for commercialisation purposes (for R&D Start, IIF and R&D Tax Concession Programs)

Indicators developed from the Principles for assessing national benefit for commercialisation purposes are:

- commercialisation plan includes Australia being maintained as the home base for future R&D;
- commercialisation (manufacture, product development, et cetera,) of the results of the project is conducted in Australia;
- further development of the results of the R&D activities is conducted and controlled in Australia;
- the ongoing development of the commercial outcomes, (product, process or service), arising from R&D activities involves interactions with other firms and research institutions (both domestic and international);
- the commercialisation of the products, processes or services arising from R&D activities result in an increase in the number of employees in the company's operations based in Australia; and
- as a result of the commercialisation, Australian residents receive commercial compensation through royalties, licence fees, equity, dividends or outright sale.

- production overseas is reasonable where -
 - local production is demonstrated to be uneconomic in terms of cost structure; and/or
 - the production or commercialisation requires close physical interaction with overseas companies, customers, suppliers and competitors;
- where a company is proposing to conduct exploitation overseas due to economic viability in terms of cost structure, the Board will consider -
 - the level of commitment to retaining or enhancing the companies R&D facilities in Australia;
 - the degree of globalisation of the relevant industry sector;
 - the relative input costs to production as identified by the company;
 - the relative transport costs as identified by the company;
 - the relative costs of skilled labour as identified by the company; and
 - legal barriers to entry; and
 - any other factors the Board considers relevant;
- where the company is proposing to conduct exploitation overseas due to close proximity to customers, suppliers and competitors, the Board will consider -
 - the level of commitment to retaining or enhancing the companies R&D facilities in Australia;
 - the mechanisms established to disseminate knowledge and market intelligence from overseas to the companies operations based in Australia;
 - the industry norms in terms of proximity;
 - the level of competition in the industry sector and the need to innovate quickly;
 - the nature of the products' inputs which require close contact eg perishables, knowledge, etc.; and
 - any other factors the Board considers relevant.