SPECIAL RESEARCH INITIATIVES

Guidelines

for initiatives commencing in

2002 and 2003

Australian Research Council

Special Research Initiatives

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Acronyms

The following acronyms are used throughout these guidelines.

ARC	Australian Research Council
NCGP	National Competitive Grants Programme
SRI	Special Research Initiatives

Australian Research Council

Special Research Initiatives

Guidelines for Initiatives Commencing in 2002 and 2003

1 Introduction

These guidelines set out the funding rules under the *Australian Research Council Act 2001* for the Special Research Initiatives Scheme.

The ARC takes a proactive role in identifying specific initiatives to be undertaken in this Scheme. Initiatives may be identified by the ARC in consultation with institutions, professional organisations and peak bodies representing higher education communities. Initiatives may result from ARC Discipline Cluster Reviews or other discipline research strategies, reviews of National Competitive Grants Programme (NCGP) outcomes in a particular field or from other reviews or reports of a similar nature. The ARC expects that some initiatives will be identified by ARC Expert Advisory Committees in the course of their work on NCGP programmes. In providing advice to government on Australian research, the ARC may identify initiatives to be funded under SRI.

Because of its proactive role in identifying initiatives and the diverse nature of the initiatives to be funded under SRI, the ARC may invite applications from one or more parties (who may include researchers, consultants and facilitators).

2 Objectives

Special Research Initiatives (SRI) aims to support specific activities which:

- encourage greater collaboration among Australian researchers, including the development of international research linkages; and
- encourage the co-operative development of a high quality research capacity in innovative areas; and
- enhance the scale and focus of research in Priority Areas (refer to section 3).

3 Description

Type of research supported

Funding under the scheme is available to support activities related to high quality research endeavour in all fields, including the social sciences and humanities as well as the natural sciences and engineering, supported under the NCGP.

Specifically, SRI funding supports:

- co-operative activities among researchers;
- co-operative development of national and international linkages;
- co-operative development of innovative research areas; and
- other activities which the ARC judges to be consistent with the Scheme's objectives.

Activities may include one-off conferences, workshops, seminars and development of networks, where the purpose is to initiate collaboration that would not otherwise occur and, where appropriate, the dissemination of the outcomes of the collaborative activities funded under the Scheme.

The scheme does not fund research *per se*. Funding is not available under the Scheme for research infrastructure support or for the actual costs of undertaking research. Funding is not available for regular conferences.

The Minister for Education, Science and Training has designated the following areas of research as priority areas of research for the 2003 funding round (see Appendix 2):

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

The Minister for Education, Science and Training has designated the following areas as national research priorities for the 2004 funding round and applications related to Research Networks (see Appendix 3):

- An Environmentally Sustainable Australia
- Promoting and Maintaining Good Health
- Frontier Technologies for Building and Transforming Australian Industries
- Safeguarding Australia

Each Research Priority includes a number of Priority Goals (PG), which are listed below:

- Research Priority 1: An Environmentally Sustainable Australia:
  - PG 1 Water – a critical resource
  - PG 2 Transforming existing industries
  - PG 3 Overcoming soil loss, salinity and acidity
  - PG 4 Reducing and capturing emissions in transport and energy generation
  - PG 5 Sustainable use of Australia's biodiversity
  - PG 6 Developing deep earth resources

- Research Priority 2: Promoting and Maintaining good Health:
  - PG 1 A healthy start to life
  - PG 2 Ageing well, ageing productively
  - PG 3 Preventive healthcare

- Research Priority 3: Frontier Technologies for Building and Transforming Australian Industries:
  - PG 1 Breakthrough science
  - PG 2 Frontier technologies
  - PG 3 Advanced materials
  - PG 4 Smart information use

- Research Priority 4: Safeguarding Australia:
  - PG 1 Critical infrastructure
  - PG 2 Protecting Australia from invasive diseases and pests
  - PG 3 Protecting Australia from terrorism and crime
  - PG 4 Transformational defence technologies

4 Eligibility

Funding under the Special Research Initiatives scheme may be awarded to a higher education institution or other administering organisation. All institutions listed at Appendix 1 are eligible for support under the Special Research Initiatives Scheme.

5 Funding

Applications will be invited by the ARC.

5.1 Level and length of funding

The ARC reserves the right to determine the level and length of funding allocated to the initiative. Normally, funding will only be provided for one-off or seed activities. Funding is normally awarded for one year.

5.2 Areas of investigation/work not supported

Special Research Initiatives does not support the following:

- clinical medical and dental research and training, and public health research and training that are covered by the NHMRC;
- activities leading solely to the creation or performance of a work of art, including visual art, musical compositions, drama, dance, designs and literary works, for which Commonwealth Government support is provided through the Australia Council for the Arts.

6 Application process

6.1 Applications

The ARC may identify and promote activities suitable for funding, and call for applications from relevant groups or individuals. Applications would include:

- an outline of the activity or activities being proposed;
- a statement on how these activities will meet the Scheme objectives;
- an indication of the funding sought, relative to the total cost of the proposed activity;
- financial and in-kind contributions from participating institutions and from other sources.

At the time of calling for applications the ARC will set, and advise prospective applicants of the relevant timeframes for the:

- closure of applications;
- assessment process; and
- notification to applicants of the outcome of the assessment process.

6.2 Application Forms

When applications are invited they must be submitted on the application form. At the time of calling for SRI applications the ARC will advise whether a paper application form or the on-line application form in the ARC's Grants Application Management System (GAMS) must be used.

All proposals and applications must be signed by the Chief Investigator and Deputy Vice-Chancellor (Research) or delegate, or equivalent in other administering organisations.

An original and **one identical** paper copy only are required.

Applications should be sent to the ARC–

by **mail**, to

Programme Coordinator (Special Research Initiatives)
Australian Research Council
GPO Box 2702
CANBERRA ACT 2601

by **courier**, to

Programme Coordinator (Special Research Initiatives)
Australian Research Council
AGSO Building
Cnr Jerrabomberra Avenue and Hindmarsh Drive
SYMONSTON ACT 2609

7 Selection and approval process

Applications will be assessed by the ARC using the following criteria:

- the likelihood that the activity will meet the Scheme's objectives and the objectives of the specific initiative;
- the range of collaboration involved;
- financial and in-kind contributions to be made by the participating organisations; where appropriate, funding from other sources; and
- the expected results of the activity.

Applications under the Special Research Initiatives Scheme involving support from other sources would be viewed favourably. For the purposes of this Scheme, "funding from other sources" comprises funding from sources other than the Commonwealth Education, Science and Training portfolio, and includes funding from other Commonwealth competitive grants schemes (excluding the ARC), funding from State government sources, industry, other Government research organisations such as CSIRO, non-profit organisations or endowments. Where organisations other than higher education institutions participate in proposed activities, they would be expected to contribute at an appropriate level, either in cash or in kind, to the joint activities.

Applications will be assessed by the ARC. The ARC reserves to the right to approve applications and determine the funding to be offered to successful applicants. The ARC reserves the right not to fund an Initiative should no suitable application be forthcoming.

8 Ministerial approval

A recommendation from the ARC Board is sent to the Minister for his/her consideration. The Minister determines if the application will be offered funding. The Minister's decision is final.

9 Offer of funding

The successful administering organisation will be notified in a letter of offer, that will indicate the funding to be provided and will include the Funding Contract.

9.1 Funding Contract

The successful applicants must accept the terms of the Funding Contract and the administering institution must sign the Funding Contract before payments can be made. The Funding Contract must be signed by the administering institution within one month of the offer of the Funding Contract. Failure to do so will result in withdrawal of the offer of funding.

9.2 Ownership of assets

Funding Contracts specify that the ownership of any asset purchased wholly or partly with the funding will be vested in the administering institution and listed in its assets register.

10 Funding administration

Administering organisations should note that the Funding Contract covers the post-award management including reporting requirements and financial management.

10.1 Privacy of individuals

The ARC is bound by the provisions of the *Privacy Act 1988*. Section 14 of the *Privacy Act 1988* contains the Information Privacy Principles (IPPs), which prescribe the rules for handling personal information.

Persons, bodies and organisations involved in the Special Research Initiatives Scheme are requested by the ARC to abide by the *Privacy Act 1988* when handling personal information collected for the purposes of that scheme. In brief, persons, bodies and organisations should ensure that:

- personal information is collected in accordance with IPPs 1-3;
- suitable storage arrangements, including appropriate filing procedures are in place;
- suitable security arrangements exist for all records containing personal information;
- access to a person's own personal information held by the organisation is made available to the person at no charge;
- records are accurate, up-to-date, complete and not misleading;
- where a record is found to be inaccurate, the correction is made;
- where the person contends that a record is inaccurate, and it is found to be accurate, the details of the request for amendment are noted on the record;
- the personal information is only to be used for the purposes for which it was collected, or for other purposes where expressly allowed by IPP 10; and
- personal information is only disclosed in accordance with IPP 11.

10.2 Freedom of Information

All documents created or held by the ARC with regard to the Special Research Initiatives Scheme are subject to the Freedom of Information Act 1982. Unless a document falls under an exemption provision, it will be made available to the general public if requested under the *Freedom of Information Act 1982*.

Decisions regarding requests for access will be made by the CEO of the ARC or by her authorised officer in accordance with the requirements of the *Freedom of Information Act 1982*.

10.3 Confidentiality

Information contained in applications is regarded as confidential unless otherwise stated and will be received and treated as confidential by the ARC, institutions and assessors.

10.4 Intellectual property

Applicants must agree to comply with the National Principles of Intellectual Property Management for Publicly Funded Research (available at www.arc.gov.au) and act in accordance with any intellectual property policies of the applicant's institution.

10.5 Incomplete or misleading information

If an application is incomplete or contains information that is considered misleading, it will be excluded from any further consideration for funding.

If the ARC believes that omissions or inclusion of misleading information are intentional, or if there is evidence of malpractice, the ARC will refer the matter for investigation with a view to prosecution under Commonwealth criminal law. The Commonwealth Government is committed to protecting its revenue, expenditure and property from any attempt, by members of the public, contractors, sub-contractors, agents, intermediaries or its own employees, to gain financial or other benefits by deceit.

Examples of malpractice include, but are not restricted to:

- providing fictitious track records; or
- falsifying claims in publications records (such as describing a paper as accepted for publication when it has only been submitted).

10.6 Contact points

Enquiries about SRI may be addressed to

Programme Coordinator (Special Research Initiatives)
Australian Research Council
GPO Box 2702
CANBERRA ACT 2601
Email arc@arc.gov.au
Phone 02 6284 6600
Fax 02 6284 6638
Web address www.arc.gov.au

APPENDIX 1

Eligible higher education institutions

Higher education institutions receiving Commonwealth funding on a triennial basis

New South Wales

- Charles Sturt University
- Macquarie University
- Southern Cross University
- The University of New England
- The University of New South Wales
- The University of Newcastle
- The University of Sydney
- University of Technology, Sydney
- University of Western Sydney
- University of Wollongong

Victoria

- Deakin University
- La Trobe University
- Melbourne College of Divinity
- Monash University
- RMIT University
- Swinburne University of Technology
- The University of Melbourne
- Victoria University
- University of Ballarat

Queensland

- Bond University
- Central Queensland University
- Griffith University
- James Cook University
- Queensland University of Technology
- The University of Queensland
- University of Southern Queensland
- The University of the Sunshine Coast

Western Australia

- Curtin University of Technology
- Edith Cowan University
- Murdoch University
- The University of Notre Dame Australia
- The University of Western Australia

South Australia

- The Flinders University of South Australia
- The University of Adelaide
- University of South Australia

Tasmania

- Australian Maritime College
- University of Tasmania

Northern Territory

- Northern Territory University
- Batchelor College

Australian Capital Territory

- The Australian National University
- University of Canberra

Multi-State

- Australian Catholic University

APPENDIX 2

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.

The Genome-Phenome Link

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 co ntrol 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 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 3

Descriptions of Designated National Research Priorities and associated Priority Goals

Research Priority 1: An Environmentally Sustainable Australia

Transforming the way we use our land, water, mineral and energy resources through a better understanding of environmental systems and using new technologies

Natural resources have traditionally fuelled our national and regional economies. They have the potential to generate further wealth and employment opportunities in the future.

But our natural resources and biodiversity must be used on a sustainable basis so that the benefits continue to be enjoyed by future generations.

Australia faces significant environmental challenges:

- Efficient and sustainable water use is a critically important issue for our economic and social development;
- Significant land degradation issues, such as salinity, need to be arrested to underpin our agricultural production systems;
- Climate change can be expected to have complex, long term consequences for the environment, and for our agricultural and marine production systems; and
- The cleanliness and efficiency of our energy production systems should be enhanced.

There is substantial effort underway to develop more efficient water utilisation practices, to protect our rivers and groundwater resources, and to protect and remediate our fragile soils.

Our agricultural and mining industries are being transformed through the adoption of new technologies, and the development of new types of foods.

This will help to revitalise our regional communities and generate substantial export earnings for the nation over the coming decades.

The Government is committed to meeting the greenhouse gas emissions target set for Australia at Kyoto.

Australia is well placed to take an international lead in developing new and improved energy technologies and in capturing and 'sequestering' carbon dioxide.

Other opportunities lie in managing and using our unique, rich land- and marine-based biodiversity, and in developing our deep earth resources.

Australia has a strong record of achievement in research in fields such as agriculture, natural resource management, climate change, horticulture, forestry, mining, energy, and marine sciences.

We must build on these strengths to improve our competitive advantages while enhancing our understanding of natural systems and the interplay of human activities.

To understand and manage these complex interactions better will require significant collaboration within the research community and with other stakeholders.

Priority goals for research fall in the six areas of water utilisation, transforming resource-based industries, overcoming land degradation, developing cleaner, more efficient fuels and energy sources, managing biodiversity and deep earth resources.

Priority Goals

1 Water – a critical resource

Ways of using less water in agriculture and other industries, providing increased protection of rivers and groundwater and the re-use of urban and industrial waste waters.

Australia is one of the driest continents and is dependent upon access to freshwater supplies for economic and social development. It has a complex geological structure and unique ecosystems, flora and fauna. Enhancing our understanding of the links between water availability and these factors will result in a better understanding of sustainable water management practices.

2 Transforming existing industries

New technologies for resource-based industries to deliver substantial increases in national wealth by reducing environmental impacts on land and sea.

Resource-based industries underpin much of Australia's prosperity and have the potential to do so in the future. For example, Australia remains highly prospective for minerals discoveries and highly attractive for the development of new era foods from agricultural and marine sources. Our competitive advantage will depend on research and new technologies.

3 Overcoming soil loss, salinity and acidity

Identifying causes and solutions to land degradation using a multidisciplinary approach (examples include incorporating hydrology, geology, biology and climatology) to restore land surfaces.

The Australian landscape is fragile: soil salinity, acidity, and nutrient levels pose significant, long term challenges for agriculture and the environment. Research is helping to find solutions to these problems. For example, the *National Land and Water Resources Audit* shows the extent of salinity in the Australian environment and illustrates Australia's leading edge in national mapping of critical resource data.

4 Reducing and capturing emissions in transport and energy generation

Alternative transport technologies and clean combustion and efficient new power generation systems and capture and sequestration of carbon dioxide.

Australia is well positioned to produce world class solutions to reduce and capture greenhouse gas emissions and the Government is committed to meeting the emissions target set for Australia at Kyoto. We are also well placed to develop alternative energy technologies and ecologically sustainable transport and power generation systems.

5 Sustainable use of Australia's biodiversity

Managing and protecting Australia's terrestrial and marine biodiversity to develop long term use of ecosystem goods and services ranging from fisheries to ecotourism.

Australia has a unique and rich flora and fauna. Our complex ecosystems are resilient and have adapted to events such as drought and fire, and underpin the health of our agricultural, fisheries and tourism industries. There is a need for a more comprehensive understanding of these natural systems and the interplay with human activities.

6 Developing deep earth resources

Smart high-technology exploration methodologies, including imaging and mapping the deep earth and ocean floors, and novel efficient ways of commodity extraction and processing (examples include minerals, oil and gas).

Many of Australia's known mineral assets may be nearly exhausted within the next decade. New land-based deposits are believed to be buried deeper in the crust and the deep marine areas surrounding Australia are also largely unexplored. New technologies, such as remote sensing, indicate scientists are on the brink of being able to 'see' inside the earth and identify deeply buried deposits.

Research Priority 2: Promoting and Maintaining Good Health

Promoting good health and preventing disease, particularly among young and older Australians

Average life expectancies have increased markedly in recent decades. Australians also expect to lead longer and healthier lives in the future, and to remain productive and independent over an extended period.

Enhancing the health outcomes of Australians will yield economic and social benefits and add materially to national well-being.

Australians expect that their children and grandchildren should have a healthy start to life. Developing strategies to promote the healthy development of young Australians, and reducing the impact of the genetic, social and environmental factors which diminish their life potential will be critical.

A revolution is also underway at the other end of the life cycle. Australia, like many other developed nations, is undergoing a major demographic shift involving significant growth in the aged population.

To meet this challenge, it will be important to promote healthy ageing by developing better social and medical strategies to ensure that older Australians enjoy healthy and productive lives.

Informed insights into the causes of disease and of mental and physical degeneration will contribute to the achievement of this goal.

All Australians stand to benefit from preventive healthcare through the adoption of healthier attitudes, habits and lifestyles.

Evidence-based preventive interventions may help reduce the incidence and severity of many diseases, including major health problems such as cardiovascular and neurodegenerative diseases, mental ill-health, obesity, diabetes, asthma and chronic inflammatory conditions.

Improvements in the health and well being of the young, of older Australians and in preventive healthcare will be underpinned by research.

However, while Australia has an enviable record in health and medical research, the research effort is spread across the many universities, hospitals and health and medical research institutes, resulting in critical mass only in limited areas of research.

There is also a need to draw on multi-disciplinary approaches that include research contributions from the social sciences and humanities.

This priority is designed to promote health and prevent disease through a more focused and collaborative effort.

Priority goals for research fall in the three areas of a healthy start to life, ageing well, ageing productively, and health promotion and disease prevention healthcare.

Priority Goals

1 A healthy start to life

Reducing the impact of genetic, social and environmental factors predisposing infants and children to ill health and reducing their life potential.

Human health in the developing foetus and in early childhood is absolutely critical to the future well being of the adult. Research shows that health and well being in early childhood is predictive of later positive outcomes, and that health in middle and late childhood is also crucial. This goal fits well with the Government's *National Agenda for Early Childhood* initiative.

2 Ageing well, ageing productively

Developing new and better social and medical strategies to reduce mental and physical degeneration based on greater knowledge and understanding of the causes of disease and degeneration of mind and body.

Australia's population is ageing, with a significant projected increase in the number of people aged over 65 and over 85. While Australia is relatively well placed compared with many other OECD nations, major shifts in cultural expectations and attitude are necessary to respond constructively to ageing, at both an individual and population level. This goal fits well with the Government's *National Strategy for an Ageing Australia*. A healthy aged population will actively contribute to the life of the nation through participation in the labour market or through voluntary work.

3 Preventive healthcare

New evidence-based strategies to promote healthy attitudes, habits and lifestyles and to develop new health-promoting foods and nutraceuticals.

Preventive healthcare research will improve the prediction and prevention of disease and injury through the adoption of healthier behaviours, lifestyles and environments. Research will generate an improvement in the design, delivery and uptake of programmes such as exercise-based rehabilitation. There are several major disease targets amenable to immediate study, such as cardiovascular health, neurodegenerative diseases, mental ill-health, obesity, diabetes, asthma and chronic inflammatory conditions. Research in prevention will emphasise interdisciplinary research, drawing on contributions from the social sciences and humanities, as well as from the health and medical sciences.

Research Priority 3: Frontier Technologies for Building and Transforming Australian Industries

Stimulating the growth of world–class Australian industries using innovative technologies developed from cutting–edge research

Wealth often derives from the unforeseen application of new discoveries.

Australia must be at the leading edge if it is to stay abreast of international developments and take advantage of opportunities.

Our national capabilities in emerging sciences and their underpinning disciplines determine our capacity to develop and implement new technologies.

Australia has a strong base of expertise, skills and technological capacities in the fundamental sciences and key technologies.

Our strengths are in a wide range of areas such as biotechnology, material sciences, information and communications technology (ICT), photonics, nanotechnology and sensor technology.

ICT is currently the critical enabling technology and is a major contributor to national productivity and growth.

But breakthrough science underpins technological advancements in many areas and Australia needs to foster an environment that stimulates creativity and innovation.

Applications for frontier technologies are potentially very large. Australia has the capacity to exploit niche markets for new products and services.

Australia also has an enviable track record as an innovator and developer of advanced materials and must grasp the opportunity to stay ahead.

Smart information use involving improved data management, intelligent transport systems and creative applications for digital technologies provides huge opportunities to improve the performance of key Australian industries.

Australia needs to invest in this research area as it is fundamental to our future competitiveness and well being.

This priority will help to strengthen the capacity of Australian researchers to participate in new areas of research, enhance Australia's international scientific reputation, stimulate local expertise, and help create vibrant new industries.

Enhanced research effort will also be achieved through initiatives that develop a critical mass of researchers in key areas.

Priority goals for research fall in the four areas of breakthrough science, frontier technologies, advanced materials and smart information use.

Priority Goals

1 Breakthrough science

Better understanding of the fundamental processes that will advance knowledge and develop technological innovations (examples include bio-informatics, nano-assembly, quantum computing and geo-informatics).

Breakthrough science underpins technological innovation across a range of industries critical to maintaining Australia's position as a developed country. Some examples include bio- and geo-informatics, nano-assembly and quantum computing. Technological advances are often unexpected and a strong foundation in mathematics and the fundamental sciences will provide an environment that fosters creativity and innovation. Early participation in leading edge areas of research will enable Australian researchers to benefit more fully from international developments.

2 Frontier technologies

Enhanced capacity in frontier technologies to power world-class industries of the future and build on Australia's strengths in research and innovation (examples include nanotechnology, biotechnology, ICT, photonics, genomics/phenomics, and complex systems).

The potential applications of frontier technologies across a range of industries in Australia are vast. Australia has significant capacity to exploit niche markets for new products and services emerging from frontier technologies. Australia has world-class research expertise in many such areas. Some examples include nanotechnology, biotechnology, ICT, photonics, genomics and phenomics. Also important are advanced frameworks such as complex systems in which these technologies are applied. Future directions in this priority area need to target the cutting-edge science critical for each emerging technology.

3 Advanced materials

Advanced materials for applications in construction, communications, transport, agriculture and medicine (examples include ceramics, organics, biomaterials, smart material and fabrics, composites, polymers and light metals).

The development of advanced materials will underpin growth in many areas of industrial and economic activity in Australia. Australia has substantial infrastructure in this area and an enviable track record as an innovator and developer of advanced materials. The era of advanced materials is just beginning in spite of the tremendous progress in recent years. Substantial scientific and technological challenges remain ahead, including the development of more sophisticated and specialised materials. Some examples include ceramics, organics, biomaterials, smart materials and fabrics, composites, polymers, and light metals.

4 Smart information use

Improved data management for existing and new business applications and creative applications for digital technologies (examples include e-finance, multimedia, content generation and imaging).

ICT applications are providing huge opportunities to deliver new systems, products, business solutions, and to make more efficient use of infrastructure. Examples include e-finance, multimedia, content generation and imaging. Improved data management is central to the future competitiveness of key industries such as agriculture, biotechnology, finance, banking, education, transport, government, health and 'infotainment'. The ability of organisations to operate virtually and collaborate across huge distances in Australia and internationally hinges on our capabilities in this area. Research is also needed to exploit the huge potential in the digital media industry.

Research Priority 4: Safeguarding Australia

Safeguarding Australia from terrorism, crime, invasive diseases and pests, and securing our infrastructure, particularly with respect to our digital systems

The importance of security and safety to Australia has been underscored by recent events.

Australia has to be capable of anticipating and tackling critical threats to society, strategic areas of the national economy and the environment.

The threats can potentially come from within and outside Australia.

The world is now characterised by the widespread and rapid movements of people, digitally coded data, goods and services, and exotic biological agents.

Critical infrastructure in Australia is increasingly dependent on digital technology for its management and integration.

Information protection and the integrity of security systems are now more important than ever before.

It is also necessary to protect the status of Australia as a nation free of many of the diseases affecting primary production around the world.

Terrorism has emerged as a very real global threat and crime is taking a significant toll on Australian society and economy.

Maintaining the operational advantage of Australia's defence forces through superior capabilities is also fundamental to our national security.

Leading edge research in Australia is already yielding high dividends and as a national research priority will improve the effectiveness of that contribution.

Stronger research capabilities will ensure that solutions are tailored to Australia's unique circumstances, reflecting its geographic features and small population.

Greater collaboration within the research community and with other stakeholders will allow us to better understand and manage potential threats to Australia.

Harnessing the knowledge and capabilities across Australia offers us the best chance of developing innovative and rapid solutions to serious threats.

Australia's international relations and its regional influence will be strengthened through new science and technologies that enhance security and safety.

The heightened interest in personal and electronic security across the world also provides opportunities for Australian solutions.

Priority goals for research fall in the four areas of critical infrastructure, protecting Australia from invasive diseases and pests, protecting Australia from terrorism and crime, and transformational defence technologies.

Priority goals

1 Critical infrastructure

Protecting Australia's critical infrastructure including our financial, energy, computing and transport systems.

Protecting our critical infrastructure is important to national security and to the social and economic well being of Australia. An important aspect of this priority goal is e-security which is an enabler of e-commerce. Maintaining a critical mass of research in e-security will be essential in providing Australia with the tools to protect our way of life.

2 Protecting Australia from invasive diseases and pests

Counteract the impact of invasive species through the application of new technologies and by integrating approaches across agencies and jurisdictions.

Australia is free of many of the pests and diseases affecting primary production around the world. This status needs to be protected as the introduction of exotic species has the potential to adversely affect our exports and the environment. Australia already has strong skills and expertise in this area of research and further work will offer immediate benefits to the community. A greater level of coordination of our research effort will mean that Australia can more effectively develop innovative and rapid solutions to serious threats.

3 Protecting Australia from terrorism and crime

By promoting a healthy and diverse Research and Development system that supports core competencies in modern and rapid identification techniques.

Protecting Australia from terrorism is now more important than ever before in light of recent events and our involvement in the 'war on terror'. Crime takes a significant toll on Australian society and economy. The June 2000 report from the Prime Minister's Science, Engineering and Innovation Council estimated that crime costs Australia at least $18 billion per annum. Personal identification, information protection and the integrity of security systems are fundamental towards ensuring the national security of Australia. An effective solution will include building on Australia's existing strengths in rapid detection using new analytical technologies and managing significant data collections.

4 Transformational defence technologies

Transform military operations for the defence of Australia by providing superior technologies, better information and improved ways of operation.

Australia has a small defence force to protect a large continent and a substantial maritime region of responsibility. Its operational advantage has been maintained through a superior capability which is dependent on leveraging innovative technologies. Although some benefits can be gained from overseas research, Australia has to conduct its own research to address uniquely Australian demands. A systems approach which harnesses the research capabilities of all stakeholders is essential to the successful development and introduction of innovative technologies.