



8 December 2005

NCRIS Committee
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UNSW Response to the NCRIS Capability Scoping Document

The University of New South Wales welcomes the opportunity to comment on (i) the scope of the prioritised capabilities; (ii) the strategic infrastructure and support requirements; and (iii) other issues raised in the Exposure Draft of the Strategic Roadmap.

UNSW is a comprehensive, research-intensive institution and our research programs span a diverse range of innovative research initiatives from biomedical research, information technology and materials engineering through to economics, social policy, history and interactive cinema.

As a leading Australian research university, UNSW will continue to invest strongly in existing and new research infrastructure. UNSW already has a significant investment in major infrastructure supporting research programs in photovoltaics, quantum computing, photonics, stem cell research, anti-cancer and HIV research, advanced computing, “*e-research*” and major data bases and library facilities underpinning research in Law and the Social Sciences.

In addition to this overarching institutional submission, UNSW has encouraged particular areas of the University to submit specific comments on the capabilities listed in the “*Exposure Draft*”. The University of New South Wales is aware of, and supports, the submission made by the Go8, and other key stakeholders including the New South Wales State Government, NANO & APAF MNRFs, the Australian Institute for Bioengineering & Nanotechnology, the Sydney Harbour Institute of Marine Science (SHIMS), AC3 and the SESIAHS.

1. GENERAL ISSUES

(i) The University of New South Wales strongly endorses the principle espoused in the ***Exposure Draft*** that major research infrastructure must be located in an environment where:

- major equipment can be properly and reliably maintained;
- where there is a critical mass of support staff to ensure adequate training and supervision of users; and
- where there is ready access to all users.

- (ii) There are already a number of strong Major National Research Facilities, other major facilities and Systemic Infrastructure in place in Australia. ***It is essential that NCRIS considers ways to support these existing world-class research facilities*** - to build on the strong commitment and investment that research-intensive institutions, the Federal Government and the State Governments, have already made.
- (iii) ***It is critical that there is good access to research infrastructure for all users*** and to this end, UNSW endorses the "Travel and Access" type program developed by the NANO MNRF where there is a robust program providing travel and logistical support for users travelling to use various parts of this facility.
- (iv) UNSW notes that the detail of how the NCRIS process will operate is still to be developed and this is a critical factor in determining how to proceed. It is clear, from the recent NCRIS consultations that the use of dedicated facilitators to coordinate NCRIS proposals in each of the capability areas will be crucial positions in ensuring the appropriate coordination of each major cluster of instrumentation. The detail surrounding these positions must be carefully thought out and the people appointed to these roles must not only have good knowledge of their respective capability, but also command the respect and confidence of the user community nationally.

2. UNSW ANALYTICAL CENTRE

UNSW is in the process of building a new facility to co-locate major research instrumentation in a single, purpose built, high-grade facility to service both UNSW and strong collaborative institutions, as well as providing a limited service to industry partners.

The UNSW Analytical Centre, due to be completed early in 2007, will house equipment valued in excess of \$25m including the most important major instruments used in the characterisation of biological, chemical and physical materials. The Analytical Centre will also include preparation laboratories, smaller instruments and computing facilities. It will incorporate:

- Electron Microscope Unit;
- Biomedical Mass Spectrometry Facility; and
- Other major infrastructure including:
 - University Analytical Laboratory;
 - Nuclear Magnetic Resonance;
 - X-ray Group (XRD + XRF);
 - Nano-Structure E-beam Facility
 - Surface Analysis Facility
 - Mass Spectrometry Group; and
 - Separations Group (Chromatography).

The co-location of major research equipment will permit the University to provide the appropriate infrastructure to support the instruments and provide a world-class research environment within which the instrumentation can be maintained and operate to specification. The UNSW Analytical Centre will also provide the technical/professional support for the instruments.

Key UNSW research facilities already identified which will operate through the UNSW Analytical Centre include:

2.1. Electron Microscope Unit

The UNSW Electron Microscope Unit is a central research infrastructure unit that provides microscopy and analysis facilities to the research community of the University, as well as providing microscopy for a range of external organisations.

UNSWs Electron Microscope Unit is a founding member of the Nanostructural Analysis Network Organisation (NANO) Major National Research Facility involving The University of Sydney, The University of Melbourne, UNSW, The University of Queensland, the

University of Western Australia, CSIRO and The University of Wollongong. This facility acts as the peak body for nanostructural analysis in Australia and combines the resources of over \$70M of instrumentation and 100 staff across 5 national nodes.

The UNSW Electron Microscope Facility includes:

- transmission electron microscope;
- scanning electron microscope;
- focused ion beam;
- electron probe microanalyser;
- atomic force microscope;
- Xray Microtomograph; and
- A wide array of equipment for the preparation of specimens (both organic and inorganic in nature).

2.2. Biomedical Mass Spectrometry Facility (BMSF)

UNSW has big infrastructure investment and ongoing interest in Mass Spectrometry through its Biomedical Mass Spectrometry Facility (BMSF). The BMSF is a comprehensive analytical mass spectrometry facility that, in 2000, was classified by the Commonwealth as an Australian Major Research Facility. The BMSF is part of the UNSW node of the Australian Proteome Analysis Facility (APAF) through a joint MNRF grant involving UNSW, Macquarie University, Sydney University and TGR Biosciences (Adelaide). The BMSF also has established links with The Institute of Molecular Bioscience, Ludwig Institute for Cancer Research - Joint Proteomics Laboratory, and International Mass Spectrometry Web Resource (i-mass).

The BMSF undertakes research and training through independent programs, collaborations and analytical services in the overlapping areas of biomarkers and small molecules, proteomics and large molecules, and scientific instrumentation and technology.

3. OTHER MAJOR RESEARCH FACILITIES AT UNSW

UNSW is also home to a range of other research facilities including:

3.1. University Analytical Laboratory

The University Analytical Laboratory builds on the access to state-of-the-art scientific instrumentation and well-established strengths in instrumental and analytical chemistry.

3.2. Nuclear Magnetic Resonance (NMR) Spectroscopy

Nuclear Magnetic Resonance (NMR) Spectroscopy is a major investigative technique in science with applicability across chemistry, biochemistry, engineering and materials science. The NMR facility operates and maintains 5 high-field spectrometers enabling it to provide an analytical service for materials testing, trace analysis, purity of materials, agrochemicals, biomaterials and organic and inorganic synthesis. The facility has also developed considerable expertise in method development in areas such as foodstuffs, agrochemicals, pharmaceuticals, polymers and nutra-ceuticals.

3.3. Mass Spectroscopy

The Mass Spectroscopy unit has an extensive array of instrumentation including an FT/ICR mass spectrometer, several laser sources (Nd-YAG, UV and a tuneable dye laser), TOF/FT-ICR mass spectrometer and a laser and arc fullerene generator: various ionisation sources including MALDI and laser ablation are available.

3.4. Surface Science (Sydney Surface Analysis Facility)

The Sydney Surface Analysis Facility (SSAF) is a key materials characterisation centre for industry, universities, Government and R & D laboratories. SSAF has the most comprehensive range of specialised surface analysis instrumentation and expertise dedicated to contract analysis and research in Australia including XPS, IXPS, AES, LIMA, SIMS and TOF-SIMS. In addition to traditional applications of surface analysis in stains

and contaminants, particle characterisation, forensic studies and environmental testing, the SSAF underpins research in surface treatments and coatings, film technology, metallurgy, adhesives, polymers, biomaterials, mining and microelectronics.

3.5. Clive & Vera Ramaciotti Centre for Gene Function analysis

UNSW is home to the Clive and Vera Ramaciotti Centre for Gene Function Analysis which houses a state-of-the-art microarraying facility and the Sequence Analysis Facility for genome-wide characterisation of gene expression. The Centre is colocated with the DNA Sequencing and Robotics Facility at UNSW to optimise management and effective use of high throughput instrumentation.

The Centre's expertise includes DNA microarraying, robotics, gene knockout technology and high capacity PCR.

There are five major distributed nodes connected to the Centre through effective information technology which allows efficient processing of data at sites throughout the network and also permits access to the Centre's resources by external researchers. These include The University of Sydney, The University of Newcastle, Macquarie University, The Victor Chang Cardiac Research Institute and the Westmead Millennium Institute. The University of Western Sydney (Macarthur), the Garvan Institute of Medical Research, the Kolling Institute and the New Children's Hospital are also partners in the Centre.

3.6. Photovoltaics Research Laboratories

The Centre for Photovoltaic Engineering has established some of the best laboratory facilities internationally for silicon solar cell research. The Photovoltaics Research Laboratories the largest and most sophisticated bulk silicon solar cell research facility in Australia, and incorporates the High Efficiency / LED, and the Buried Contact Cell Laboratories. Other facilities in this Centre include:

- A Device Characterisation Laboratory which houses characterisation equipment;
- An Optoelectronic Research facility is used for photoluminescence and electroluminescence measurements; and
- A Thin-Film Cell Laboratory which is equipped with a range of equipment for thin-film deposition and patterning.

4. ADVANCED ANIMAL IMAGING FACILITIES

While not explicitly included in the list of capabilities, **UNSW strongly supports the need for Advanced Animal Imaging Facilities**. There is currently no facility for MRI of **small animals** (whole animal imaging) available in New South Wales. UNSW strongly believes that there is a need to establish advanced animal imaging facilities relevant to a range of animal models of disease, which is equally appropriate to both small and large animals. In addition, there is also an urgent need to ensure that such facilities incorporate live animal imaging capabilities co-located with an animal facility that includes PC2 and surgical capabilities.

Advanced Animal Imaging facilities could be incorporated under any one of the following:

- Evolving biomolecular platforms and informatics;
- Integrated Biological Systems;
- Characterisation – high level microscopy & microanalysis;
- Fabrication;
- Biotechnology Products;
- Translating health discovery to clinical application.

5. EXPOSURE DRAFT CAPABILITIES

UNSW has a strong direct presence in many of the areas identified in the Exposure Draft. These are areas where UNSW can contribute most directly in terms of:

- delivering national benefit in the areas of National Research Priorities;
- producing world-class excellence in areas of critical mass; and
- promoting accessibility and collaboration

Support for Metabolomics

The placement of Mass Spectrometry in this section explicitly underpins Bio-structural analysis. It is also included implicitly in Proteomics where Mass Spectrometry is the main downstream technology and absolutely crucial to the field. This highlights an interesting issue for Mass Spectrometry at UNSW. The university's Biomedical Mass Spectrometry Facility (BMSF) does more than proteomic analysis and it is pleasing to see that the *Exposure Draft* views Mass Spectrometry as underpinning all of *"analysis of biological structure"*.

UNSW is increasingly networking its Mass Spectrometry facility with those at The University of Sydney and Macquarie University and plan the same with Monash University and Queensland Institute of Medical Research in Proteomics Australia. This is a valuable arrangement wholly within the "National" principles in NCRIS and offering genuine efficiencies in specialised instrument access.

UNSW's BMSF could become the central hub of the Mass Spectrometry network within this area where it would be of great benefit to proteomics, metabolomics and to a lesser extent genomics and transcriptomics. It would be in an excellent position to coordinate access into the proteomic Mass Spectrometry network and other Mass Spectrometry labs across the country that are not primarily in the proteomic community (e.g., Wollongong, Melbourne, Adelaide).

A hub and node model (similar to the NANO MNRF model) would be a good arrangement so intellectual infrastructure can be distributed, and this provides access to the largest range of users. Mass Spectrometry and proteomics is also a mixture of routine instruments that should be placed in every capital city plus specialised larger instruments in the major centres.

The BMSF is highly capable in the Mass Spectrometry part of metabolomics – this sets UNSW aside from the other nodes of the Proteomics Australia consortium and fits well with the megalithic area of both *"Evolving bio-molecular platforms & informatics"* and *"Integrated Biological Systems"*.

Support for Australia's participation in EMBO/EMBL

UNSW strongly supports the initiative for Australia to become a member of the European Molecular Biology Organisation (EMBO) and the European Molecular Biology Laboratory (EMBL). This will be especially important to Australia's future research capacity in this area, especially if Australia can attract EMB laboratories to Australia, or at least to the Asia Pacific region.

The support for EMBO/EMBL participations contributes to the NCRIS Capability of *"Evolving bio-molecular platforms & informatics"*.

Support for Australia's own Synchrotron

The University of New South Wales is a strong supporter of the Synchrotron Project and it is important that this key piece of national infrastructure come on line as soon as possible. UNSW stresses that *the existing "ASRP access to major facilities program" which provides access for Australian researchers to visit international synchrotron facilities in Japan, Chicago and Europe must not be compromised*. This program is extremely effective and ensures access for Australians to the cutting-edge facilities overseas which will not be available in Australia.

Support for microscopy & microanalysis

UNSW strongly supports the proposal outlined in the Exposure Draft for a national network of optical, scanning probe and electron microscopy and microanalysis facilities. The NANO MNRF is an excellent example of an effective nodal model of managing a distributed research facility.

Much of the existing infrastructure requirements for microscopy and microanalysis is enabling Australia to be world-leaders in nanotechnology. For Australia to remain at the cutting-edge, we must update and expand the capability and capacity to meet increasing demand.

Support for Very Large Telescopes

UNSW is an international leader in the area of astrophysics and telescopes. Research specialties include cosmology, large-scale structure in the Universe, star formation and the interstellar medium. In addition there is a strong instrumentation group, which is pioneering the development of astronomy in Antarctica. It has built a range of instrumentation for large telescopes, particularly in the infrared. UNSW operates two telescopes, the Automated Patrol Telescope and the Mopra millimetre-wave telescope.

Much of the expertise and technological capacity exists already in Australia, but the future of the discipline needs to be secured by creating and updating major research facilities. Australia must continue to develop innovative technologies in the field of modern telescope design, to take advantage of Australia's unique perspective on the southern sky.

UNSW continues to play a leading role in international consortia addressing astronomy world-wide via SKA and Gemini.

Support for Integrated marine Observing Systems

While UNSW supports the proposition that infrastructure is urgently needed for automated and *in-situ* observing systems to calibrate remotely sensed data, such infrastructure must be optimally located near harbours for maintenance and maximum return to the scientific community. The Eastern Australian Current linking the Great Barrier Reef, Lord Howe Island and Tasmania is where not only the majority of our ports and population are located, but is also where there is considerable potential for monitoring and teasing out anthropogenic signals. In this way NCRIS could link:

- the existing expertise to marine observing systems;
- marine biotechnology and pharmacology; and
- catchment science & technology in a terrestrial ecosystem network

The Sydney Harbour Institute of Marine Science (SHIMS) was recently launched as a collaborative venture between Macquarie University, UNSW and the University of Technology, Sydney. Key research areas will be the ecology of ports and harbours; coastal oceanography and geomorphology; biotechnology and bio-prospecting; and urban fisheries science. SHIMS will link marine researchers of the East Australian Current and coastal catchments, but required major research infrastructure investment.

Low-emission, large scale energy processes

The door is now open for solar energy to take centre stage in energy usage stakes on the planet, and in the process minimise the environmental impacts of our energy use. UNSW has held the world record for silicon solar cell efficiencies for almost 15 years and has been responsible for developing the most successfully commercialised new photovoltaic technology internationally throughout the same period. Photovoltaics offers a cost-effective way to provide renewable energy and produce no pollution during energy generating, but must have the infrastructure to underpin it.

Photovoltaics research at UNSW focuses on the key challenges facing the field of photovoltaics over the next 20 years as well as "spin-off" applications in microelectronics and optoelectronics. It covers areas including silicon wafer-based ('first generation') photovoltaic approaches, silicon thin-film ('second generation') approaches, 'third generation' photovoltaic approaches, thin film

gallium arsenide solar cells, research on photovoltaic systems and applications, and industry issues.

The Centre also owns equipment within, and has access to, the Semiconductor Nanofabrication Facility (SNF) at UNSW which houses a microelectronics laboratory and a nanofabrication laboratory for e beam lithography.

Support for e-Research

The University of New South Wales supports the collective submission made by Deputy and Pro-Vice-Chancellor's (Research) to capitalise and build upon the AC3 consortium and APAC.

While UNSW supports the need to continue to reduce the threat and impact of crime and terrorism, the University feels as though "Financial Forensics" has been overlooked as a solution to help anticipate, prevent, protect, respond and recover from threats including money laundering, corruption and funding terrorism which raises a range of security, audit, and assurance issues especially in the e-business domain. This also highlights the need for advanced supercomputer facilities.

6. CONCLUSION

UNSW believes that for NCRIS to succeed, it must recognise the importance of national networking of facilities, without duplication. The "multiple distributed nodes" model is a good model for many major facilities with strong coordination and networking between the nodes.

Investment in major research infrastructure and equipment is a strategic investment to enable Australian researchers to remain at the cutting edge of international research.

One of the main factors which differentiates the Go8 research-intensive Universities is their commitment to maintaining and providing access to world-class research infrastructure and facilities.

Attachment 1 – MAPPING NCRIS CAPABILITIES TO RESEARCH@UNSW

Exposure Draft Capability	research@unsw	Underpinned @ UNSW by	Supporting UNSW centres	Key UNSW Contacts
1 Evolving bio-molecular platforms and informatics	Brain science & neurosciences	neuroscience psychiatry psychology neurophysiology	Black Dog Institute Prince of Wales Medical Research Institute Garvan Institute of Medical Research Beyond Blue	Associate Professor Peter Schofield, School of Biotechnology and Biomolecular Sciences (BABS) - Garvan Institute of Medical Research - St Vincent's Hospital 9295 8285 p.schofield@garvan.unsw.edu.au Professor Philip Mitchell School of Psychiatry Prince of Wales Hospital 9382 3711/3713 phil.mitchell@unsw.edu.au
	Cancer and vascular biology	oncology vascular biology	Children's Cancer Research Institute National Stem Cell Centre Centre for Thrombosis and Vascular Research Prince of Wales Medical Research Institute Garvan Institute of Medical Research	Professor Bernard Stewart Research Director - Medicine - School of Paediatrics (Children's Cancer Research Institute) 9382 1820 / 1829 b.stewart@unsw.edu.au Professor Philip Hogg, Centre for Thrombosis and Vascular Research 9385 1004 p.hogg@unsw.edu.au Professor Robert Sutherland, Director of Cancer Research Program - Medicine - Garvan Institute of Medical Research, St Vincent's Hospital 9295 8322 r.sutherland@garvan.org.au
	Health and ageing	clinical medicine vision sciences pathology women's health physiology paediatrics pharmacology anatomy	Vision CRC Centre for Health Assets Australasia Research Centre for the Study of Ageing and Retirement Garvan Institution of Medical Research	Professor Richard Henry Faculty of Medicine 9385 3067 r.henry@unsw.edu.au Professor Terry Campbell Head of Medicine St Vincents 8382 2352 t.campbell@unsw.edu.au Professor Anthony Zwi, Head of School of Public Health and Community Medicine 9385 3811 a.zwi@unsw.edu.au

	HIV/AIDS, immunology research	HIV AIDS hepatitis immunology infectious diseases microbiology	National HIV Epidemiology and Clinical Research Centre National Centre in HIV Social Research Centre for Immunology Prince of Wales Medical Research Institute	Scientia Professor David Cooper Director of National Centre in HIV Epidemiology and Clinical Research (NCHECR) 9332 4648 or 8382 2049 dcooper@nchechr.unsw.edu.au Professor Susan Kippax, Director - National Centre in HIV Social Research 9385 6799 s.kippax@unsw.edu.au
	Proteomics, genomics, and tissue engineering	proteomics genomics stem cells microbiology biosciences microbial sciences	National stem Cell Centre Clive and Vera Ramaciotti Centre for Gene Function Analysis CRC for Environmental Biotechnology Australian Proteome Analysis Facility (APAF) MNRF	Associate Professor Michael Guilhaus Director of Bioanalytical Mass Spectrometry Facility 9385 5958 m.guilhaus@unsw.edu.au Scientia Professor Ian Dawes School of Biotechnology and Biomolecular Sciences 9385 2089 i.dawes@unsw.edu.au
2 Integrated biological systems	Brain science & neurosciences	neuroscience psychiatry psychology neurophysiology	Black Dog Institute Prince of Wales Medical Research Institute Garvan Institute of Medical Research Beyond Blue	Associate Professor Peter Schofield, School of Biotechnology and Biomolecular Sciences (BABS) - Garvan Institute of Medical Research - St Vincent's Hospital 9295 8285 p.schofield@garvan.unsw.edu.au Professor Philip Mitchell School of Psychiatry Prince of Wales Hospital 9382 3711/3713 phil.mitchell@unsw.edu.au
	Cancer and vascular biology	oncology vascular biology	Children's Cancer Research Institute National Stem Cell Centre Centre for Thrombosis and Vascular Research Prince of Wales Medical Research Institute Garvan Institute of Medical Research	Professor Bernard Stewart Research Director - Medicine - School of Paediatrics (Children's Cancer Research Institute) 9382 1820 / 1829 b.stewart@unsw.edu.au Professor Philip Hogg, Centre for Thrombosis and Vascular Research 9385 1004 p.hogg@unsw.edu.au Professor Robert Sutherland, Director of Cancer Research Program - Medicine - Garvan Institute of Medical Research, St Vincent's Hospital 9295 8322 r.sutherland@garvan.org.au

	Health and ageing	clinical medicine vision sciences pathology women's health physiology paediatrics pharmacology anatomy	Vision CRC Centre for Health Assets Australasia Research Centre for the Study of Ageing and Retirement Garvan Institution of Medical Research	Professor Richard Henry Faculty of Medicine 9385 3067 r.henry@unsw.edu.au Professor Terry Campbell Head of Medicine St Vincents 8382 2352 t.campbell@unsw.edu.au Professor Anthony Zwi, Head of School of Public Health and Community Medicine 9385 3811 a.zwi@unsw.edu.au
	HIV/AIDS, immunology research	HIV AIDS hepatitis immunology infectious diseases microbiology	National HIV Epidemiology and Clinical Research Centre National Centre in HIV Social Research Centre for Immunology Prince of Wales Medical Research Institute	Scientia Professor David Cooper Director of National Centre in HIV Epidemiology and Clinical Research (NCHECR) 9332 4648 or 8382 2049 dcooper@nchechr.unsw.edu.au Professor Susan Kippax, Director - National Centre in HIV Social Research 9385 6799 s.kippax@unsw.edu.au
	Proteomics, genomics, and tissue engineering	proteomics genomics stem cells microbiology biosciences microbial sciences	National stem Cell Centre Clive and Vera Ramaciotti Centre for Gene Function Analysis CRC for Environmental Biotechnology Australian Proteome Analysis Facility (APAF) MNRF	Associate Professor Michael Guilhaus Director of Bioanalytical Mass Spectrometry Facility 9385 5958 m.guilhaus@unsw.edu.au Scientia Professor Ian Dawes School of Biotechnology and Biomolecular Sciences 9385 2089 i.dawes@unsw.edu.au
3. Characterisation 3.1 Neutron scattering 3.2 X-ray techniques 3.3 Optical & electron microscopy/microanalysis	Advanced materials	quantum computing nanoscience nanomaterials polymer science membrane science photovoltaics solar-hydrogen energy materials science	ARC CoE for Quantum Computing Technology ARC CoE in Advanced Silicon Photovoltaics and Photonics ARC CoE for Functional Nanomaterials CRC for Advanced Composite Structures CRC for Polymers Australian Photonics CRC CRC for Intelligent Manufacturing Systems Nanostructural Analysis Network Organisation	Professor Michelle Simmons School of Physics 9385 6313 michelle.simmons@unsw.edu.au Associate Professor Paul Munroe Director - Electron Microscope Unit 9385 4435 p.munroe@unsw.edu.au Professor Bob Clark Centre for Quantum Computer Technology 9385 4574 r.clark@unsw.edu.au

			(NANO) MNRF	<p>Professor Martin Green Centre for Photovoltaic Engineering 9385 4018/4060 m.green@unsw.edu.au</p> <p>Professor Robert Lamb, Head of School of Chemical Sciences 9385 4683 r.lamb@unsw.edu.au</p>
	Fundamental and enabling sciences	chemistry physics astronomy astrophysics biology geology	Biomedical Mass Spectrometry Facility Nanostructural Analysis Network Organisation (NANO) MNRF UNSW Analytical Laboratory	<p>Professor Bob Clark Centre for Quantum Computer Technology 9385 4574 r.clark@unsw.edu.au</p> <p>Professor Martin Green Centre for Photovoltaic Engineering 9385 4018/4060 m.green@unsw.edu.au</p> <p>Professor Michelle Simmons School of Physics 9385 6313 michelle.simmons@unsw.edu.au</p> <p>Associate Professor Paul Munroe Director - Electron Microscope Unit 9385 4435 p.munroe@unsw.edu.au</p> <p>Associate Professor Michael Guilhaus Director of Bioanalytical Mass Spectrometry Facility 9385 5958 m.guilhaus@unsw.edu.au</p> <p>Professor Robert Lamb, Head of School of Chemical Sciences 9385 4683 r.lamb@unsw.edu.au</p>
<p>4. Fabrication</p> <p>4.1 fabrication of advanced materials (including nanomaterials)</p> <p>4.2 Bio- and chemo- pre-commercial synthesis, fabrication and rapid prototyping</p> <p>4.3 Micro/nanofabrication enabling microelectronics, photonics, optoelectronics, integrated optics</p>	Advanced materials	quantum computing nanoscience nanomaterials polymer science membrane science photovoltaics solar-hydrogen energy materials science	ARC CoE for Quantum Computing Technology ARC CoE in Advanced Silicon Photovoltaics and Photonics ARC CoE for Functional Nanomaterials CRC for Advanced Composite Structures CRC for Polymers Australian Photonics CRC	<p>Professor Michelle Simmons School of Physics 9385 6313 michelle.simmons@unsw.edu.au</p> <p>Associate Professor Paul Munroe Director - Electron Microscope Unit 9385 4435 p.munroe@unsw.edu.au</p> <p>Professor Bob Clark</p>

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	Civil, structural and applied engineering	civil engineering structural engineering other applied engineering		Professor Mark Bradford School of Civil and Environmental Engineering 9385 5014 m.bradford@unsw.edu.au
	Fundamental and enabling sciences	chemistry physics astronomy astrophysics biology geology	Biomedical Mass Spectrometry Facility Nanostructural Analysis Network Organisation (NANO) MNRF UNSW Analytical Laboratory	Professor Bob Clark Centre for Quantum Computer Technology 9385 4574 r.clark@unsw.edu.au Professor Martin Green Centre for Photovoltaic Engineering 9385 4018/4060 m.green@unsw.edu.au Professor Michelle Simmons School of Physics 9385 6313 michelle.simmons@unsw.edu.au Associate Professor Paul Munroe Director - Electron Microscope Unit 9385 4435 p.munroe@unsw.edu.au Associate Professor Michael Guilhaus Director of Bioanalytical Mass Spectrometry Facility 9385 5958 m.guilhaus@unsw.edu.au Professor Robert Lamb, Head of School of Chemical Sciences 9385 4683 r.lamb@unsw.edu.au

	Information technology and robotics	systems engineering electrical engineering software engineering informatics robotics	ARC CoE for Autonomous Systems Capital Markets CRC CRC for Smart Internet Technology National Information and Communication Technology Centre (NICTA)	Professor Paul Compton School of Computer Science and Engineering 9385 6939 p.compton@unsw.edu.au Dr Rob Bursill School of Physics 93855713 ph1rb@phys.unsw.edu.au
5. Biotechnology Products	Cancer and vascular biology	oncology vascular biology	Children's Cancer Research Institute National Stem Cell Centre Centre for Thrombosis and Vascular Research Prince of Wales Medical Research Institute Garvan Institute of Medical Research	Professor Bernard Stewart Research Director - Medicine - School of Paediatrics (Children's Cancer Research Institute) 9382 1820 / 1829 b.stewart@unsw.edu.au Professor Philip Hogg, Centre for Thrombosis and Vascular Research 9385 1004 p.hogg@unsw.edu.au Professor Robert Sutherland, Director of Cancer Research Program - Medicine - Garvan Institute of Medical Research, St Vincent's Hospital 9295 8322 r.sutherland@garvan.org.au
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	Proteomics, genomics, and tissue engineering	proteomics genomics stem cells microbiology biosciences microbial sciences	National stem Cell Centre Clive and Vera Ramaciotti Centre for Gene Function Analysis CRC for Environmental Biotechnology Australian Proteome Analysis Facility (APAF) MNRF	Associate Professor Michael Guilhaus Director of Bioanalytical Mass Spectrometry Facility 9385 5958 m.guilhaus@unsw.edu.au Scientia Professor Ian Dawes School of Biotechnology and Biomolecular Sciences 9385 2089 i.dawes@unsw.edu.au

<p>6. Translating health discovery to clinical applications</p>	<p>Cancer and vascular biology</p>	<p>oncology vascular biology</p>	<p>Children's Cancer Research Institute National Stem Cell Centre Centre for Thrombosis and Vascular Research Prince of Wales Medical Research Institute Garvan Institute of Medical Research</p>	<p>Professor Bernard Stewart Research Director - Medicine - School of Paediatrics (Children's Cancer Research Institute) 9382 1820 / 1829 b.stewart@unsw.edu.au</p> <p>Professor Philip Hogg, Centre for Thrombosis and Vascular Research 9385 1004 p.hogg@unsw.edu.au</p> <p>Professor Robert Sutherland, Director of Cancer Research Program - Medicine - Garvan Institute of Medical Research, St Vincent's Hospital 9295 8322 r.sutherland@garvan.org.au</p>
	<p>Fundamental and enabling sciences</p>	<p>chemistry physics astronomy astrophysics biology geology</p>	<p>Biomedical Mass Spectrometry Facility Nanostructural Analysis Network Organisation (NANO) MNRF UNSW Analytical Laboratory</p>	<p>Professor Bob Clark Centre for Quantum Computer Technology 9385 4574 r.clark@unsw.edu.au</p> <p>Professor Martin Green Centre for Photovoltaic Engineering 9385 4018/4060 m.green@unsw.edu.au</p> <p>Professor Michelle Simmons School of Physics 9385 6313 michelle.simmons@unsw.edu.au</p> <p>Associate Professor Paul Munroe Director - Electron Microscope Unit 9385 4435 p.munroe@unsw.edu.au</p> <p>Associate Professor Michael Guilhaus Director of Bioanalytical Mass Spectrometry Facility 9385 5958 m.guilhaus@unsw.edu.au</p> <p>Professor Robert Lamb, Head of School of Chemical Sciences 9385 4683 r.lamb@unsw.edu.au</p>

	Health and ageing	clinical medicine vision sciences pathology women's health physiology paediatrics pharmacology anatomy	Vision CRC Centre for Health Assets Australasia Research Centre for the Study of Ageing and Retirement Garvan Institution of Medical Research	Professor Richard Henry Faculty of Medicine 9385 3067 r.henry@unsw.edu.au Professor Terry Campbell Head of Medicine St Vincents 8382 2352 t.campbell@unsw.edu.au Professor Anthony Zwi, Head of School of Public Health and Community Medicine 9385 3811 a.zwi@unsw.edu.au
	HIV/AIDS, immunology research	HIV AIDS hepatitis immunology infectious diseases microbiology	National HIV Epidemiology and Clinical Research Centre National Centre in HIV Social Research Centre for Immunology Prince of Wales Medical Research Institute	Scientia Professor David Cooper Director of National Centre in HIV Epidemiology and Clinical Research (NCHECR) 9332 4648 or 8382 2049 dcooper@nchechr.unsw.edu.au Professor Susan Kippax, Director - National Centre in HIV Social Research 9385 6799 s.kippax@unsw.edu.au
	Proteomics, genomics, and tissue engineering	proteomics genomics stem cells microbiology biosciences microbial sciences	National stem Cell Centre Clive and Vera Ramaciotti Centre for Gene Function Analysis CRC for Environmental Biotechnology Australian Proteome Analysis Facility (APAF) MNRF	Associate Professor Michael Guilhaus Director of Bioanalytical Mass Spectrometry Facility 9385 5958 m.guilhaus@unsw.edu.au Scientia Professor Ian Dawes School of Biotechnology and Biomolecular Sciences 9385 2089 i.dawes@unsw.edu.au
	Public policy	health policy public policy politics sociology social science indigenous policy	Social Policy Research Centre National Drug and Alcohol Research Centre Aboriginal Research and Resource Centre National Centre in HIV Social Research Australian Defence Studies Centre Australian Housing and Urban Research Institute (AHURI) Gilbert + Tobin centre of Public Law	Professor Susan Kippax, Director - National Centre in HIV Social Research 9385 6799 s.kippax@unsw.edu.au Dr Peter Saunders, Social Policy Research Centre (SPRC) 9385 7810 p.saunders@unsw.edu.au Professor Ralph Hall School of Social Science and Policy 9385 2427 / 2292

			Indigenous Law Centre Centre for Gender-Related Violence Institute for Environmental Studies	r.hall@unsw.edu.au
7. Population Health and clinical data linkage	Health and ageing	clinical medicine vision sciences pathology women's health physiology paediatrics pharmacology anatomy	Vision CRC Centre for Health Assets Australasia Research Centre for the Study of Ageing and Retirement Garvan Institution of Medical Research	Professor Richard Henry Faculty of Medicine 9385 3067 r.henry@unsw.edu.au Professor Terry Campbell Head of Medicine St Vincents 8382 2352 t.campbell@unsw.edu.au Professor Anthony Zwi, Head of School of Public Health and Community Medicine 9385 3811 a.zwi@unsw.edu.au
	HIV/AIDS, immunology research	HIV AIDS hepatitis immunology infectious diseases microbiology	National HIV Epidemiology and Clinical Research Centre National Centre in HIV Social Research Centre for Immunology Prince of Wales Medical Research Institute	Scientia Professor David Cooper Director of National Centre in HIV Epidemiology and Clinical Research (NCHECR) 9332 4648 or 8382 2049 dcooper@nchechr.unsw.edu.au Professor Susan Kippax, Director - National Centre in HIV Social Research 9385 6799 s.kippax@unsw.edu.au
	Proteomics, genomics, and tissue engineering	proteomics genomics stem cells microbiology biosciences microbial sciences	National stem Cell Centre Clive and Vera Ramaciotti Centre for Gene Function Analysis CRC for Environmental Biotechnology Australian Proteome Analysis Facility (APAF) MNRF	Associate Professor Michael Guilhaus Director of Bioanalytical Mass Spectrometry Facility 9385 5958 m.guilhaus@unsw.edu.au Scientia Professor Ian Dawes School of Biotechnology and Biomolecular Sciences 9385 2089 i.dawes@unsw.edu.au

	Public policy	health policy public policy politics sociology social science indigenous policy	Social Policy Research Centre National Drug and Alcohol Research Centre Aboriginal Research and Resource Centre National Centre in HIV Social Research Australian Defence Studies Centre Australian Housing and Urban Research Institute (AHURI) Gilbert + Tobin centre of Public Law Indigenous Law Centre Centre for Gender-Related Violence Institute for Environmental Studies	Professor Susan Kippax, Director - National Centre in HIV Social Research 9385 6799 s.kippax@unsw.edu.au Dr Peter Saunders, Social Policy Research Centre (SPRC) 9385 7810 p.saunders@unsw.edu.au Professor Ralph Hall School of Social Science and Policy 9385 2427 / 2292 r.hall@unsw.edu.au
8. Networked PC3 containments and bio-molecular facilities for emerging infectious disease, bioterrorism and forensics	Health and ageing	clinical medicine vision sciences pathology women's health physiology paediatrics pharmacology anatomy	Vision CRC Centre for Health Assets Australasia Research Centre for the Study of Ageing and Retirement Garvan Institution of Medical Research	Professor Richard Henry Faculty of Medicine 9385 3067 r.henry@unsw.edu.au Professor Terry Campbell Head of Medicine St Vincents 8382 2352 t.campbell@unsw.edu.au Professor Anthony Zwi, Head of School of Public Health and Community Medicine 9385 3811 a.zwi@unsw.edu.au
	HIV/AIDS, immunology research	HIV AIDS hepatitis immunology infectious diseases microbiology	National HIV Epidemiology and Clinical Research Centre National Centre in HIV Social Research Centre for Immunology Prince of Wales Medical Research Institute	Scientia Professor David Cooper Director of National Centre in HIV Epidemiology and Clinical Research (NCHECR) 9332 4648 or 8382 2049 dcooper@nchechr.unsw.edu.au Professor Susan Kippax, Director - National Centre in HIV Social Research 9385 6799 s.kippax@unsw.edu.au

	Proteomics, genomics, and tissue engineering	proteomics genomics stem cells microbiology biosciences microbial sciences	National stem Cell Centre Clive and Vera Ramaciotti Centre for Gene Function Analysis CRC for Environmental Biotechnology Australian Proteome Analysis Facility (APAF) MNRF	Associate Professor Michael Guilhaus Director of Bioanalytical Mass Spectrometry Facility 9385 5958 m.guilhaus@unsw.edu.au Scientia Professor Ian Dawes School of Biotechnology and Biomolecular Sciences 9385 2089 i.dawes@unsw.edu.au
10. Optical and radio astronomy	Fundamental and enabling sciences	chemistry physics astronomy astrophysics biology geology	Federation Fellow - Professor Bob Clark Federation Fellow - Professor Martin Green Federation Fellow - Professor Michelle Simmons Biomedical Mass Spectrometry Facility Nanostructural Analysis Network Organisation (NANO) MNRF UNSW Analytical Laboratory	Professor Bob Clark Centre for Quantum Computer Technology 9385 4574 r.clark@unsw.edu.au Professor Martin Green Centre for Photovoltaic Engineering 9385 4018/4060 m.green@unsw.edu.au Professor Michelle Simmons School of Physics 9385 6313 michelle.simmons@unsw.edu.au Associate Professor Paul Munroe Director - Electron Microscope Unit 9385 4435 p.munroe@unsw.edu.au Associate Professor Michael Guilhaus Director of Bioanalytical Mass Spectrometry Facility 9385 5958 m.guilhaus@unsw.edu.au Professor Robert Lamb, Head of School of Chemical Sciences 9385 4683 r.lamb@unsw.edu.au
11. Terrestrial ecosystem research network	Complex systems, modeling, mathematics and numerical analysis	complex systems statistical modeling mathematics numerical analysis	CoE for Mathematical and Statistical Modelling of Complex Systems CRC for Intelligent Manufacturing Systems Centre for Energy and Environmental Markets Centre for Environmental Modelling and Prediction	Professor Matthew England Centre for Environmental Modelling and Prediction (CEMAP) 9385 7065 m.england@unsw.edu.au Professor Tony Dooley MASCOS 9385 7114

			ARC Centre for Complex systems	A.Dooley@unsw.edu.au
	Water use, re-use and environmental sustainability	environmental microbiology pathogens environmental studies environmental engineering water use water re-use waste water environmental remediation urban impact built environment architecture landscape industrial design interior architecture	Bushfire CRC Coal in Sustainable Development CRC Greenhouse Gas Technologies CRC CRC Water Quality CRC for Environmental Biotechnology Centre for Marine Biofouling and BioInnovation Institute for Environmental Studies Centre for Sustainable Built Environment Australian Housing and Urban Research Institute (AHURI) Centre for Health Assets Australasia	Professor Staffan Kjelleberg, School of Microbiology and Immunology 9385 2102 s.kjelleberg@unsw.edu.au Professor Mark Adams School of Biological, Earth and Environmental Sciences 93852067 Email mark.adams@unsw.edu.au Dr Rodney Weber ADFA University College 02 6268 8897 r.weber@adfa.edu.au Professor Peter Steinberg, School of Biological, Earth and Environmental Sciences 9385 3273 p.steinberg@unsw.edu.au Professor Colin Ward, School of Geology 9385 4285 c.ward@unsw.edu.au
12. Integrated marine observing system	Complex systems, modeling, mathematics and numerical analysis	complex systems statistical modeling mathematics numerical analysis	CoE for Mathematical and Statistical Modelling of Complex Systems CRC for Intelligent Manufacturing Systems Centre for Energy and Environmental Markets Centre for Environmental Modelling and Prediction ARC Centre for Complex systems	Professor Matthew England Centre for Environmental Modelling and Prediction (CEMAP) 9385 7065 m.england@unsw.edu.au Professor Tony Dooley MASCOS 9385 7114 A.Dooley@unsw.edu.au

	Water use, re-use and environmental sustainability	environmental microbiology pathogens environmental studies environmental engineering water use water re-use waste water environmental remediation urban impact built environment architecture landscape industrial design interior architecture	Bushfire CRC Coal in Sustainable Development CRC Greenhouse Gas Technologies CRC CRC Water Quality CRC for Environmental Biotechnology Centre for Marine Biofouling and BioInnovation Institute for Environmental Studies Centre for Sustainable Built Environment Australian Housing and Urban Research Institute (AHURI) Centre for Health Assets Australasia	<p>Professor Staffan Kjelleberg, School of Microbiology and Immunology 9385 2102 s.kjelleberg@unsw.edu.au</p> <p>Professor Mark Adams School of Biological, Earth and Environmental Sciences 93852067 Email mark.adams@unsw.edu.au</p> <p>Dr Rodney Weber ADFA University College 02 6268 8897 r.weber@adfa.edu.au</p> <p>Professor Peter Steinberg, School of Biological, Earth and Environmental Sciences 9385 3273 p.steinberg@unsw.edu.au</p> <p>Professor Colin Ward, School of Geology 9385 4285 c.ward@unsw.edu.au</p>
	Defence & Homeland Security	critical infrastructure protection defence policies defence technologies finance and economics intelligent systems risk analysis surveillance technologies	Australian Defence Studies Forum Australian Hypersonics Initiative ARC Research Network for a Secure Australia DSTO Centre of Expertise in Control and Guidance DSTO Centre of Expertise in Helicopter Structures and Diagnostics	<p>Professor Joseph Lai ADFA University College - School of Aerospace and Mechanical Engineering 02 6268 8272 j.lai@adfa.edu.au</p> <p>Dr Andrew Lynch, Gilbert & Tobin Centre of Public Law - Terrorism and Law Project. 9385 2259 a.lynch@unsw.edu.au</p> <p>Dr John Milthorpe, ADFA University College - School of Aerospace and Mechanical Engineering 02 6268 8263 j.milthorpe@adfa.edu.au</p>

<p>13. structure & evolution of the Australian continents</p>	<p>Complex systems, modeling, mathematics and numerical analysis</p>	<p>complex systems statistical modeling mathematics numerical analysis</p>	<p>CoE for Mathematical and Statistical Modelling of Complex Systems CRC for Intelligent Manufacturing Systems Centre for Energy and Environmental Markets Centre for Environmental Modelling and Prediction ARC Centre for Complex systems</p>	<p>Professor Matthew England Centre for Environmental Modelling and Prediction (CEMAP) 9385 7065 m.England@unsw.edu.au</p> <p>Professor Tony Dooley MASCOS 9385 7114 A.Dooley@unsw.edu.au</p>
	<p>Fundamental and enabling sciences</p>	<p>chemistry physics astronomy astrophysics biology geology</p>	<p>Federation Fellow - Professor Bob Clark Federation Fellow - Professor Martin Green Federation Fellow - Professor Michelle Simmons Biomedical Mass Spectrometry Facility Nanostructural Analysis Network Organisation (NANO) MNRF UNSW Analytical Laboratory</p>	<p>Professor Bob Clark Centre for Quantum Computer Technology 9385 4574 r.clark@unsw.edu.au</p> <p>Professor Martin Green Centre for Photovoltaic Engineering 9385 4018/4060 m.green@unsw.edu.au</p> <p>Professor Michelle Simmons School of Physics 9385 6313 michelle.simmons@unsw.edu.au</p> <p>Associate Professor Paul Munroe Director - Electron Microscope Unit 9385 4435 p.munroe@unsw.edu.au</p> <p>Associate Professor Michael Guilhaus Director of Bioanalytical Mass Spectrometry Facility 9385 5958 m.guilhaus@unsw.edu.au</p> <p>Professor Robert Lamb, Head of School of Chemical Sciences 9385 4683 r.lamb@unsw.edu.au</p>

	Water use, re-use and environmental sustainability	environmental microbiology pathogens environmental studies environmental engineering water use water re-use waste water environmental remediation urban impact built environment architecture landscape industrial design interior architecture	Bushfire CRC Coal in Sustainable Development CRC Greenhouse Gas Technologies CRC CRC Water Quality CRC for Environmental Biotechnology Centre for Marine Biofouling and BioInnovation Institute for Environmental Studies Centre for Sustainable Built Environment Australian Housing and Urban Research Institute (AHURI) Centre for Health Assets Australasia	<p>Professor Staffan Kjelleberg, School of Microbiology and Immunology 9385 2102 s.kjelleberg@unsw.edu.au</p> <p>Professor Mark Adams School of Biological, Earth and Environmental Sciences 93852067 Email mark.adams@unsw.edu.au</p> <p>Dr Rodney Weber ADFA University College 02 6268 8897 r.weber@adfa.edu.au</p> <p>Professor Peter Steinberg, School of Biological, Earth and Environmental Sciences 9385 3273 p.steinberg@unsw.edu.au</p> <p>Professor Colin Ward, School of Geology 9385 4285 c.ward@unsw.edu.au</p>
14. Low-emission, large-scale energy processes	Advanced materials	quantum computing nanoscience nanomaterials polymer science membrane science photovoltaics solar-hydrogen energy materials science	ARC CoE for Quantum Computing Technology ARC CoE in Advanced Silicon Photovoltaics and Photonics ARC CoE for Functional Nanomaterials CRC for Advanced Composite Structures CRC for Polymers Australian Photonics CRC CRC for Intelligent Manufacturing Systems Nanostructural Analysis Network Organisation (NANO) MNRF	<p>Professor Michelle Simmons School of Physics 9385 6313 michelle.simmons@unsw.edu.au</p> <p>Associate Professor Paul Munroe Director - Electron Microscope Unit 9385 4435 p.munroe@unsw.edu.au</p> <p>Professor Bob Clark Centre for Quantum Computer Technology 9385 4574 r.clark@unsw.edu.au</p> <p>Professor Martin Green Centre for Photovoltaic Engineering 9385 4018/4060 m.green@unsw.edu.au</p> <p>Professor Robert Lamb, Head of School of Chemical Sciences 9385 4683 r.lamb@unsw.edu.au</p>

	Complex systems, modeling, mathematics and numerical analysis	complex systems statistical modeling mathematics numerical analysis	CoE for Mathematical and Statistical Modelling of Complex Systems CRC for Intelligent Manufacturing Systems Centre for Energy and Environmental Markets Centre for Environmental Modelling and Prediction ARC Centre for Complex systems	Professor Matthew England Centre for Environmental Modelling and Prediction (CEMAP) 9385 7065 m.england@unsw.edu.au Professor Tony Dooley MASCOS 9385 7114 A.Dooley@unsw.edu.au
	Public policy	health policy public policy politics sociology social science indigenous policy	Social Policy Research Centre National Drug and Alcohol Research Centre Aboriginal Research and Resource Centre National Centre in HIV Social Research Australian Defence Studies Centre Australian Housing and Urban Research Institute (AHURI) Gilbert + Tobin centre of Public Law Indigenous Law Centre Centre for Gender-Related Violence Institute for Environmental Studies	Professor Susan Kippax, Director - National Centre in HIV Social Research 9385 6799 s.kippax@unsw.edu.au Dr Peter Saunders, Social Policy Research Centre (SPRC) 9385 7810 p.saunders@unsw.edu.au Professor Ralph Hall School of Social Science and Policy 9385 2427 / 2292 r.hall@unsw.edu.au
	Water use, re-use and environmental sustainability	environmental microbiology pathogens environmental studies environmental engineering water use water re-use waste water environmental remediation urban impact built environment architecture landscape industrial design interior architecture	Bushfire CRC Coal in Sustainable Development CRC Greenhouse Gas Technologies CRC CRC Water Quality CRC for Environmental Biotechnology Centre for Marine Biofouling and BioInnovation Institute for Environmental Studies Centre for Sustainable Built Environment Australian Housing and Urban Research Institute (AHURI) Centre for Health Assets Australasia	Professor Staffan Kjelleberg, School of Microbiology and Immunology 9385 2102 s.kjelleberg@unsw.edu.au Professor Mark Adams School of Biological, Earth and Environmental Sciences 93852067 Email mark.adams@unsw.edu.au Dr Rodney Weber ADFA University College 02 6268 8897 r.weber@adfa.edu.au Professor Peter Steinberg, School of Biological, Earth and Environmental Sciences 9385 3273

				<p>p.steinberg@unsw.edu.au</p> <p>Professor Colin Ward, School of Geology 9385 4285 c.ward@unsw.edu.au</p>
<p>15. Next generation solutions to counter crime and terrorism</p>	<p>Public policy</p>	<p>health policy public policy politics sociology social science indigenous policy industrial relations superannuation economics banking and finance accounting commerce marketing organisational behaviour</p>	<p>Social Policy Research Centre National Drug and Alcohol Research Centre Aboriginal Research and Resource Centre National Centre in HIV Social Research Australian Defence Studies Centre Australian Housing and Urban Research Institute (AHURI) Gilbert + Tobin centre of Public Law Indigenous Law Centre Centre for Gender-Related Violence Institute for Environmental Studies Securities Industry Research Centre of Asia-Pacific (SIRCA) Capital Markets CRC CRC for Sustainable Tourism</p>	<p>Professor Susan Kippax, Director - National Centre in HIV Social Research 9385 6799 s.kippax@unsw.edu.au</p> <p>Dr Peter Saunders, Social Policy Research Centre (SPRC) 9385 7810 p.saunders@unsw.edu.au</p> <p>Professor Ralph Hall School of Social Science and Policy 9385 2427 / 2292 r.hall@unsw.edu.au</p>
	<p>Information technology and robotics</p>	<p>systems engineering electrical engineering software engineering informatics robotics</p>	<p>ARC CoE for Autonomous Systems Capital Markets CRC CRC for Smart Internet Technology National Information and Communication Technology Centre (NICTA)</p>	<p>Professor Paul Compton School of Computer Science and Engineering 9385 6939 p.compton@unsw.edu.au</p> <p>Dr Rob Bursill School of Physics 93855713 ph1rb@phys.unsw.edu.au</p>

	Defence & Homeland Security	critical infrastructure protection defence policies defence technologies finance and economics intelligent systems risk analysis surveillance technologies	Australian Defence Studies Forum Australian Hypersonics Initiative ARC Research Network for a Secure Australia DSTO Centre of Expertise in Control and Guidance DSTO Centre of Expertise in Helicopter Structures and Diagnostics	Professor Joseph Lai ADFA University College - School of Aerospace and Mechanical Engineering 02 6268 8272 j.lai@adfa.edu.au Dr Andrew Lynch, Gilbert & Tobin Centre of Public Law - Terrorism and Law Project. 9385 2259 a.lynch@unsw.edu.au Dr John Milthorpe, ADFA University College - School of Aerospace and Mechanical Engineering 02 6268 8263 j.milthorpe@adfa.edu.au
	Human rights, law and criminology	human rights indigenous rights law criminology taxation law	Australian Human Rights Centre ATAX Gilbert + Tobin Centre of Public Law	Professor George Williams Faculty of Law 93852259 george.williams@unsw.edu.au Professor Chris Evans ATAX 93859346 cc.evans@unsw.edu.au
16. Systemic information infrastructure 16.1 data access and discovery, storage and management 16.2 grid enabled technologies and infrastructure 16.3 technical expertise 16.4 high performance computing 16.5 High capacity communications networks	Complex systems, modeling, mathematics and numerical analysis	complex systems statistical modeling mathematics numerical analysis	CoE for Mathematical and Statistical Modelling of Complex Systems CRC for Intelligent Manufacturing Systems Centre for Energy and Environmental Markets Centre for Environmental Modelling and Prediction ARC Centre for Complex systems	Professor Matthew England Centre for Environmental Modelling and Prediction (CEMAP) 9385 7065 m.england@unsw.edu.au Professor Tony Dooley MASCOS 9385 7114 A.Dooley@unsw.edu.au
	Public policy	health policy public policy politics sociology social science indigenous policy	Social Policy Research Centre National Drug and Alcohol Research Centre Aboriginal Research and Resource Centre National Centre in HIV Social Research Australian Defence Studies Centre	Professor Susan Kippax, Director - National Centre in HIV Social Research 9385 6799 s.kippax@unsw.edu.au Dr Peter Saunders, Social Policy Research Centre (SPRC) 9385 7810 p.saunders@unsw.edu.au

			Australian Housing and Urban Research Institute (AHURI) Gilbert + Tobin centre of Public Law Indigenous Law Centre Centre for Gender-Related Violence Institute for Environmental Studies	Professor Ralph Hall School of Social Science and Policy 9385 2427 / 2292 r.hall@unsw.edu.au
	Information technology and robotics	systems engineering electrical engineering software engineering informatics robotics	ARC CoE for Autonomous Systems Capital Markets CRC CRC for Smart Internet Technology National Information and Communication Technology Centre (NICTA)	Professor Paul Compton School of Computer Science and Engineering 9385 6939 p.compton@unsw.edu.au Dr Rob Bursill School of Physics 93855713 ph1rb@phys.unsw.edu.au
	Defence & Homeland Security	critical infrastructure protection defence policies defence technologies finance and economics intelligent systems risk analysis surveillance technologies	Australian Defence Studies Forum Australian Hypersonics Initiative ARC Research Network for a Secure Australia DSTO Centre of Expertise in Control and Guidance DSTO Centre of Expertise in Helicopter Structures and Diagnostics	Professor Joseph Lai ADFA University College - School of Aerospace and Mechanical Engineering 02 6268 8272 j.lai@adfa.edu.au Dr Andrew Lynch, Gilbert & Tobin Centre of Public Law - Terrorism and Law Project. 9385 2259 a.lynch@unsw.edu.au Dr John Milthorpe, ADFA University College - School of Aerospace and Mechanical Engineering 02 6268 8263 j.milthorpe@adfa.edu.au