

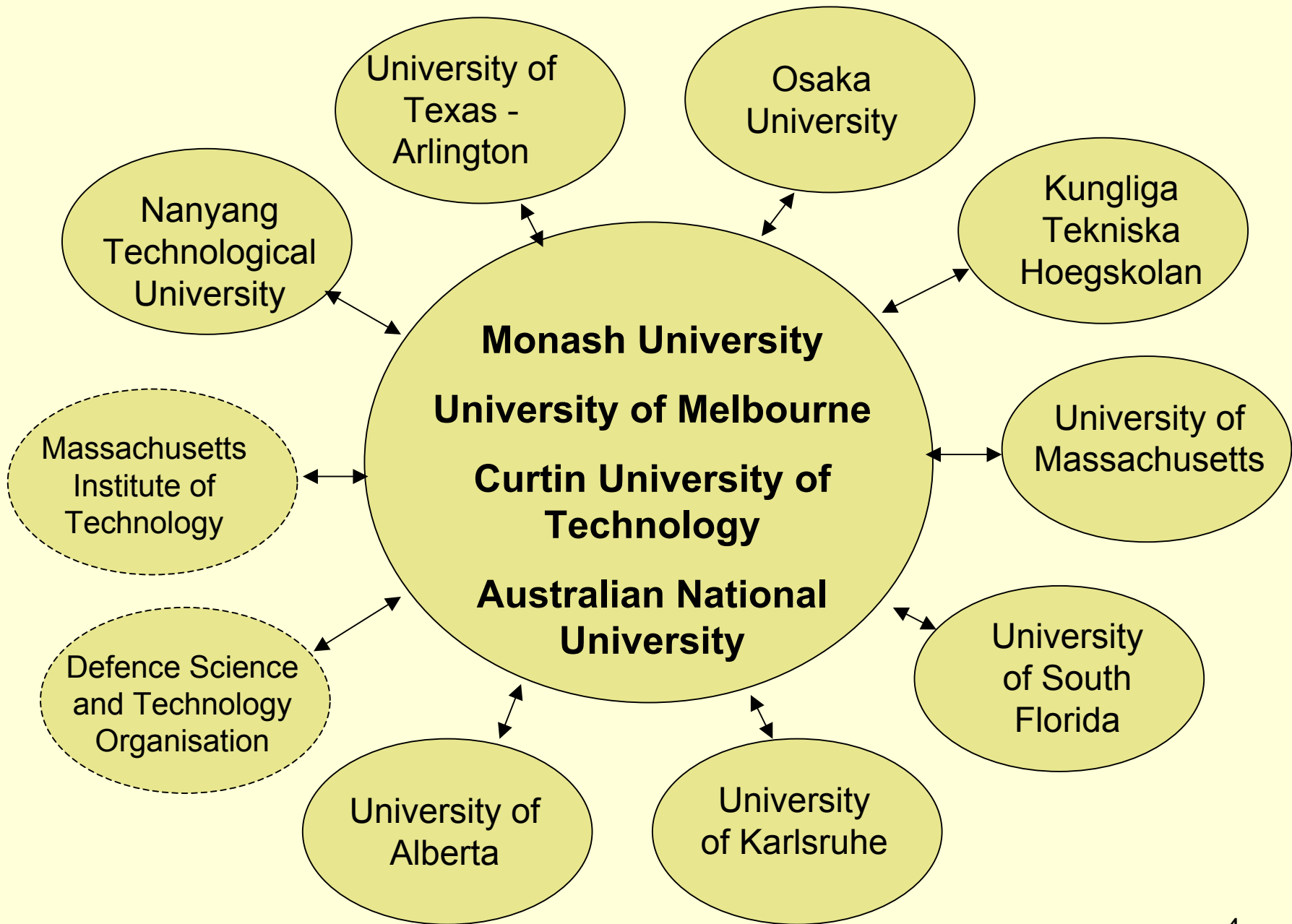
ARC Centre of Excellence
for
**Perceptive and Intelligent
Machines in Complex
Environments**

ARC Priority Areas

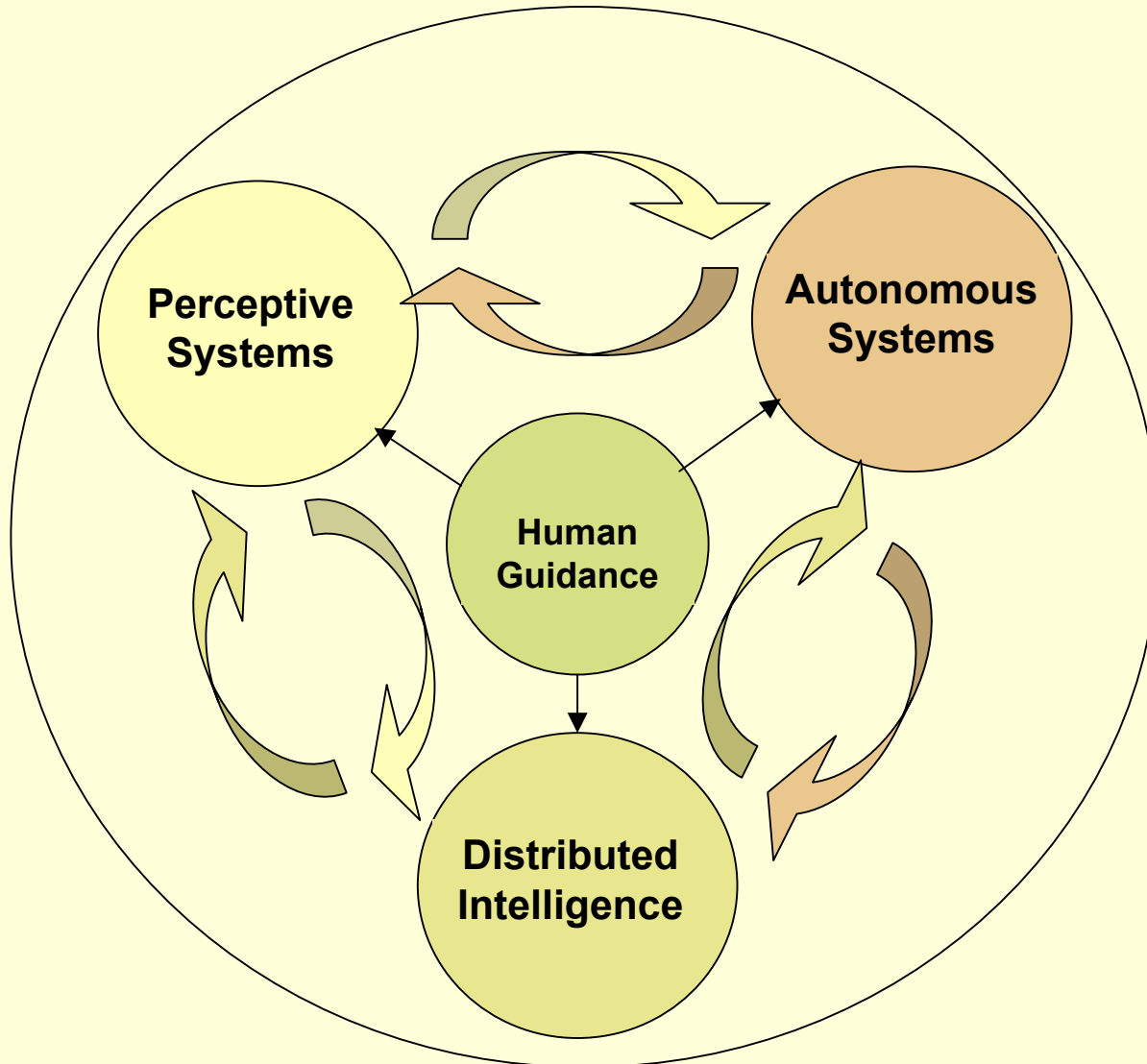
Complex / Intelligent Systems

Major Research Themes

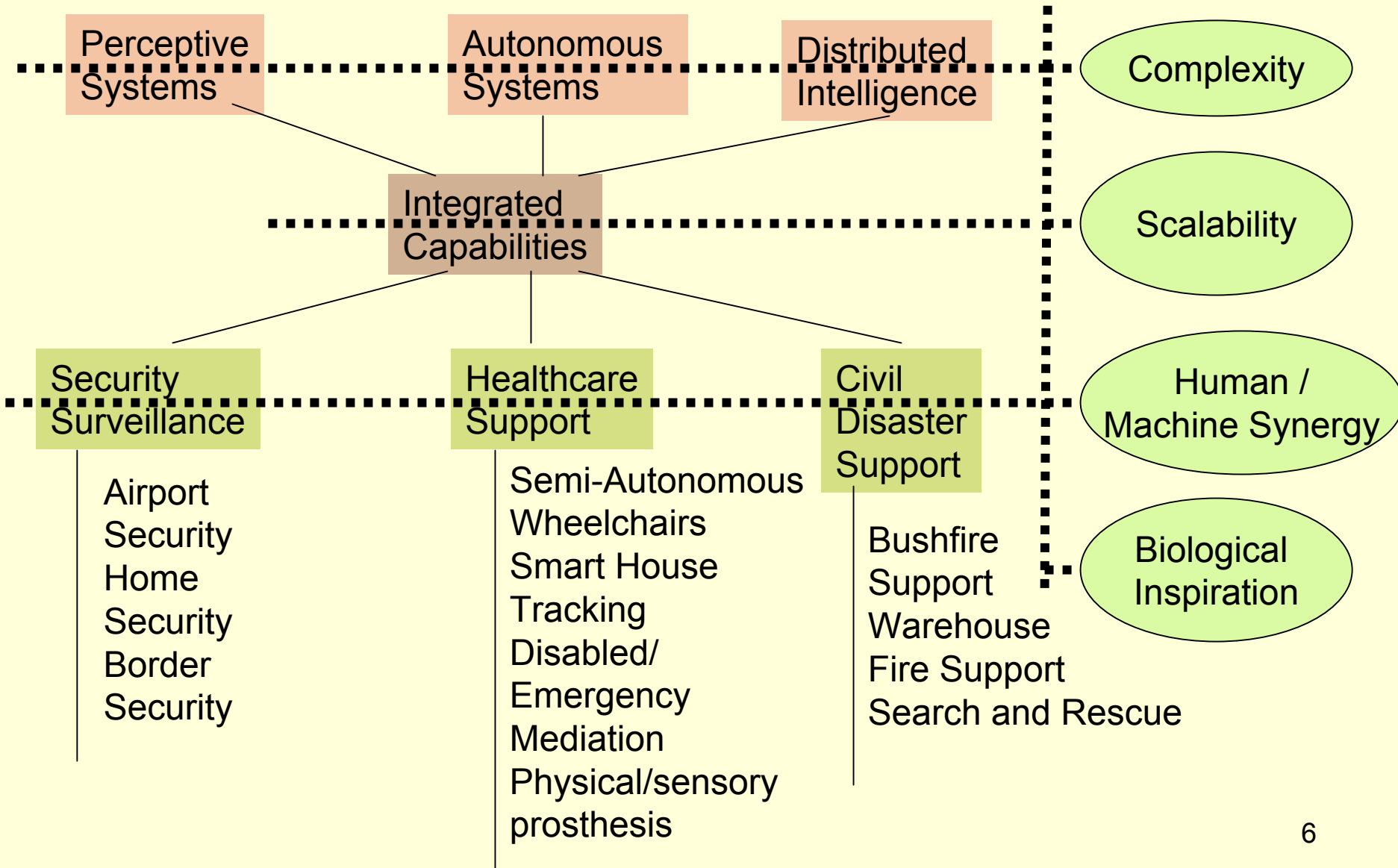
- **Perceptive Systems**
- **Autonomous Systems**
- **Distributed Intelligence**



Interactions



Center of Excellence in Perceptive and Intelligent Machines in Complex Environments



Advisory Board

Management Board

**Center of Excellence for Perceptive
and Intelligent Machines in Complex Environments**

**Research
Program**

**Postgraduate Training
Program**

**Industrial Affiliates
program**

Perceptive systems

Autonomous systems

Distributed Intelligence

Application domains

**Security/Surveillance
Healthcare support
Civil Disaster Support**

Overarching Considerations

- Complexity
- Scalability
- Human / Machine Synergy
- Biological Inspiration

Application Scope

- Security/ Surveillance
- Healthcare Support
- Civil Disaster Support

Perceptive Systems

“Perceptive systems are concerned with the acquisition, analysis and interpretation of sensory data of any kind and the provision of the appropriate physical sensors.”

Perceptive Systems: Sub-Themes

- Large Scale Pattern Recognition/ Distributed Sensor Intelligence/ Multi-modal Event Extraction
- Personnel Recognition/ Verification
- Biologically Inspired Sensing and Algorithms
- Machine Perception

Autonomous Systems

“Autonomous systems operate with varying degrees of independence from human intervention to complete useful tasks with the support of sensory intelligence, planning and mechanism control strategies.”

Autonomous Systems: Sub-Themes

- Mobile Robot Navigation
- Robotic Humanoids
- Physical and Sensory Prosthesis
- Speech Recognition and Natural Language Understanding

Distributed Intelligence

“The specification, capture, analysis, integration and interpretation of diverse and complex knowledge sources spread over space, time and representation modalities”

Distributed Intelligence - Sub Themes

- Providing rapid access to relevant knowledge from a variety source such as civil and commercial databases for taking appropriate actions.
- Storing and maintaining useful knowledge in a form that is amenable for reasoning. This information includes pre-processed, compressed sensor data at remote sites.
- Discovering correlations between significant events and sensor states over massive numbers of distributed multi-modal sensors.

Example Application Domains

- Border Protection
- Homeland Security
- Civil Disaster Support
- Healthcare Support
- Robotic Home Server

Prototype System Targets

- Distributed situation assessment using border security as the application domain.
- Multi-modal biometric identification booth.
- Intelligent wheelchair and prosthetic support for the aged at home and in the street
- A robotic home server.
- Bush fire fighting support.
- Limited capability multi-sensory humanoid.

Investigators

- Chief Investigators
- Partner Investigators
- Associated Researchers

Chief Investigators

Monash University

Professor Ray Jarvis
Assoc. Professor Lindsay Kleeman
Assoc. Professor Andy Russell
Assoc. Professor David Suter
Assoc. Professor Ingrid Zukerman
Dr David Morgan

Curtin University

Professor Svetha Venkatesh
Professor Geoff West

Australian National University

Professor Mandyam Srinivasan

University of Melbourne

Professor Rao Kotagiri
Professor Alistair Moffat
Professor Leon Sterling
Assoc. Professor Peter Stuckey

Partner Investigators (International)

Professor Yoshiaki Shirai – Osaka University

Professor Behrooz Shirazi – University of Texas, Arlington

Assoc. Professor Han Wang – Nanyang Technological University

Professor Henrik Christensen – Kungliga Tekniska Hoegskolan

Professor Terry Caelli – University of Alberta

Dr Mohan Kumar – University of Texas, Arlington

Professor Ruediger Dillmann – University of Karlsruhe

Assoc. Professor Robin Murphy – University of South Florida

Professor William Croft – University of Massachusetts

Associated Researchers

Professor Alex (sandy) Pentland – Media Lab –
Massachusetts Institute of Technology

Professor Steven Dubowsky – Massachusetts
Institute of Technology

Dr Jaavan Chahl – Defence Science and Technology
Organisation

Other International Links

- Carnegie Mellon University
- University of Tokyo
- Stanford Research Institute
- Helsinki University of Technology
- Electrotechnical Laboratories
Tsukuba, Japan

Postgraduate Training

- Centre Scholarship
- Scholarship Top-ups
- Travel prospects
- Joint Supervision/ Interchange
- Forward Looking Research Projects
 - Theoretical Developments
 - Mission Oriented

Governance Structure

- **Director**
 - Professor Ray Jarvis
- **Management Board**
 - Professor Ray Jarvis (Autonomous Systems)
 - Professor Svetha Venkatesh (Perceptive Systems)
 - Professor Rao Kotagiri (Distributed Intelligence)
 - Professor Alistair Moffat (Postgrad Studies/ Visitors Programme)
- **Advisory Board**
 - Director
 - One other key researcher
 - Three industrial representatives
 - Two internationally recognised researchers

Modus Operandi

- Joint Supervision of Postgraduates
- Exchange Visits both within and outside Australia
 - Academics, students, RFs
- Tele-conferenced workshops/ seminars
- Open days/ Performance Demonstrations
- Strict Reporting Regime
- Balance between Long Term and Mission Oriented Projects
- Joint Responsibility for Performance
- Project Teams over Multiple Nodes
- Project Managers Nominated

Management of Research

- Workshops every 6 months to report progress and exchange ideas
- Set up new directives in year end workshop in conjunction with advisory board
- Teleconference seminars every week

Budget and Resources

- **University**

- Cash Contribution \$600,000 per annum
- In-Kind Salary Related \$748,000 per annum
- In-Kind Indirect \$935,000 per annum
- Equipment \$500,000 (once off)

Budget and Resources (Round Figures)

Universities' Contribution

Cash	\$600,000 per annum
In Kind – Salary	\$748,000 per annum
In Kind – Indirect	\$935,000
In Kind – Equipment	\$500,000 once off

Partner Investigators Contribution

In Kind – Salary	\$61,000 per annum
In Kind – Indirect	\$77,000 per annum

State Governments

WA	Cash	\$100,000 per annum
Vic	Support anticipated (after election)	

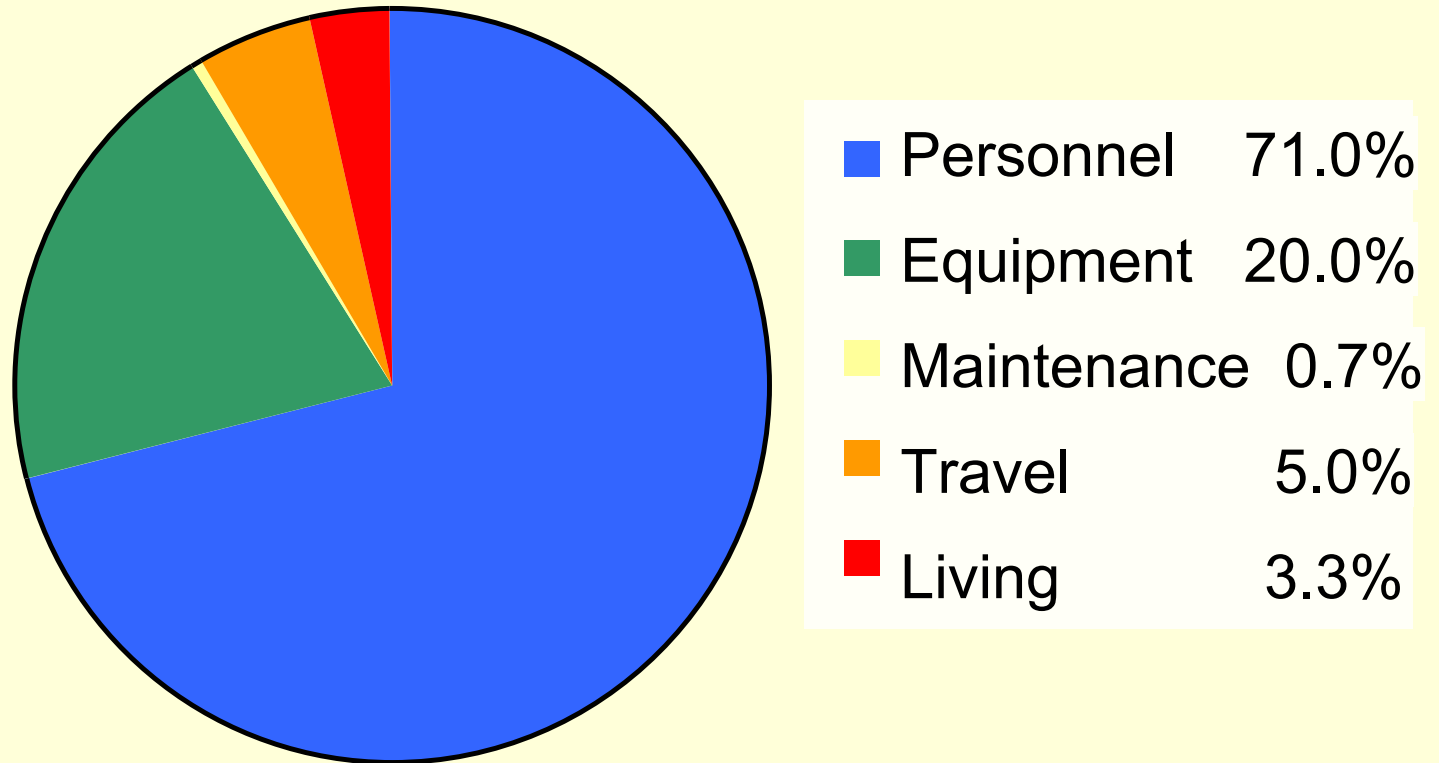
Budget and Resources (cont...)

Requested Grant from ARC	\$2,400,000 per annum
TOTAL CASH CONTRIBUTION	\$3,100,000 per annum
TOTAL IN KIND CONTRIBUTION	\$1,821,000 per annum + \$500,000 once off

Budget and Resources (cont...)

Cash Component Budget Allocation (pa)	Personnel	\$2,126,000
	Equipment	\$600,000
	Maintenance	\$20,000
	Travel and Living	\$250,000
TOTAL		\$2,996,000
CASH BALANCE		\$4,000

Budget Allocation



End User Links

- **Security**
 - CoastWatch
 - Aerosonde Pty. Ltd.
 - Surveillance Australia Pty. Ltd.
- **Healthcare**
 - Rehabilitation Centre
 - Austin Hospital
 - Silver Chain (WA)
- **Civil Defense**
 - Country Fire Authority
 - Emergency Management Australia

Commercial Prospects

- Proof of Concept
- Commercial Partnerships
- (MIT) Media Lab Model
- International Scope

Why us?

- Research Excellence
- Potential national benefit
- Capacity to scale and focus, critical mass in priority area
- Commitment / Collaboration
- Potential to deliver significant economic and social benefits to the community (Quality of life outcomes)
- Next generation training

