International Strategy

Build Relationships

...and the rest will follow

• Build international goodwill
• Strengthen partnerships
• Promote coalition interoperability
• Avoid technological surprise
• Accelerate S&T achievement and transitions to the US

Basic Science is a Foundation of International Collaboration
Mission
• Develop and foster S&T relationships with Australian Principal Investigators by leveraging national networks.

Strategy
• Leverage Australian investments under the National Collaborative Research Infrastructure Strategy (NCRIS) in order to engage research networks such as the Australian National Fabrication Facility (ANFF). ANFF is comprised of 18 Australian universities and CSIRO as member institutions and allows for US S&T organizations to reach a broad group of Australian academic researchers to explore and develop collaborations.
• Harness Australian national strength in sensing to leverage interdisciplinary engagement into multiple scientific areas including lasers, photonics, structural mechanics, nanoelectronics, MEMS devices, micro-mechanical testing, medical devices and biosensors.

Selected Collaborations
• Quantum microrheology research by Prof Warwick Bowen at the University of Queensland is funded by AFOSR and involves collaboration that includes a student research visit with the 711 HPW at Armstrong lab.
• Graphene on silicon research by Prof Francesca Iacopi at Griffith University is funded by AFOSR and involves collaboration with AFRL/RX. Included in the collaboration is a CRADA in development between AFRL and Griffith University and a student research visit to the US.

Interagency Partnerships
Interagency Efforts

AFOSR
• Quantum Microrheology (University of Queensland)
• High-Temperature Superconductivity in Diamond Films (University of Melbourne)
• Fundamental Properties of Transfer-Free, Wafer-Level Graphene on Si (Griffith University)
• Linear Quantum Systems: Non-Classical States and Robust Stability (Australian National University)

AFRL
• Graphene via 3-C SiC Growth on Silicon Graphene Characterization on SiC – (La Trobe University and Australian Synchrotron)
• Graphene via 3-C SiC Growth on Si (Griffith University)

NIH
• Blood Microenvironment Interactions (Monash University)
• Biomechanical Properties of Cellular Building Blocks (University of New South Wales)

NASA
• Microfluidic Systems in Microgravity for Ammonia Fuel Cell Applications (University of South Australia)
• Space Act Agreement on Space Communication Systems (University of Queensland)

Interagency
• Researcher Exchange Effort in FY14 – Creating Research Opportunities for Australian students/postdocs to perform research with USAF, NIH and NASA collaborators
Mission
• Develop S&T relationships with African Principal Investigators and build a network of top PIs in the continent

Strategy
• Utilize multi-agency coordination on joint basic science effort that leverages interagency capabilities and build linkages with research networks throughout Africa
• Harness research performed in the region and leverage multidisciplinary nature of materials science to bridge into other scientific areas including sensors, electronic warfare, lasers, quantum information, and structural mechanics

Grants
• Quantum Feedback Control of Trapped Ions Using Unsharp Measurement (CSIR, South Africa)
• Nanoparticle Solutions for Printed Electronics Applications (University of Cape Town, South Africa)
• Zinc Oxide Materials for Photovoltaic Applications (Makere University, Uganda)
• Multiscale Modeling and Multifunctional Composites (British University, Egypt)

Activities
• 2011 CSIR/Dept. of State & Joint Services Workshop
• 2012 Joint US DoD S&T Visit
• 2013 US/RSA Joint Commission Meeting
• 2014 Joint Services & OSD Africa Technical Exchange

Interagency Collaborations

Building Ties with African S&T Community
Interagency Activities

AFOSR
- Quantum Feedback Control of Trapped Ions Using Unsharp Measurement with CSIR
- Development of TiPt-based HTSMA for Actuator Applications at 1000°C with CSIR
- Synthesis of Crystalline Thin-films using Electrochemical Atomic Layer Deposition Technique with CSIR
- Nanoparticle Solutions for Printed Electronics Applications with the University of Cape Town
- Multiscale Modeling and Multifunctional Composites with the British University in Egypt
- Zinc Oxide Materials for Photovoltaic Applications in Makere University

AFRL
- AFRL Research Contract with University of South Africa for Data Analysis and Zulu Language Translation Work

USACE
- Cooperative Research and Development Agreement with CSIR on water science
- Joint manuscript with CSIR, “Modeling the Fate, Behavior and Toxicity of Engineered Nanomaterials in Aquatic Systems”

ONRG
- Exploration of project on Sensor Networks that Bring Together Ocean Data Networks and MDA Networks, “Global Open Source Ad-Hoc Maritime Sharing (GOAMS)”
- Ocean Science Project with UCT
AFOSR Italy Initiative

Activities
- 2013 US-Italy Defense S&T Dialogue
- 2014 AFOSR/CNR/NFH Technical Exchange
- 2014 AFOSR/DARPA/NCI Strategic Workshop
- Researcher Exchanges
- Advanced Materials Working Group
AFOSR Program Reviews

Access
• Discussions within the public domain
• Open to any researcher

Intersection
• Convergence of the basic research enterprise (government, academic, small business, international)
• Opportunity to build partnerships and leverage resources

Mission
• Integrates multiple stakeholders within USAF/DOD technical areas
• Enables US innovation

Materials for Extreme Environments Program Review
Quantum Microrheology Partnership with University of Queensland

Description of Research

- Develop and apply quantum techniques for faster, higher precision, measurements of biological systems

- Collaborating with the teams of Dr. Hope Beier and Dr. Bennett Ibey at AFRL San Antonio.

- Travel support from AFOSR Windows on Science program and the Australian Academy of Sciences.
AFRL Collaboration and Researcher Exchanges with Griffith and La Trobe

John Boeckl
Air Force Research Laboratory

Francesca Iacopi
Griffith University

Paul Pigram
La Trobe University

Chris Pakes
Australian Synchrotron

Sima Dimitrijev
La Trobe University

Surface Graphene Characterization Experiments
Researcher Exchanges

**Blood Microenvironment Interactions (NIH)**
- Dr Elizabeth Gardiner – Monash University
- Dr Owen McCarthy – Oregon Health Science University

**Biomechanical Properties of Cellular Building Blocks (NIH)**
- Dr Peter Gunning – University of New South Wales
- Dr Paul Janmey – University of Pennsylvania

**Fuel Cells in Microgravity (NASA)**
- Dr Craig Priest – University of South Australia
- Dr Carlos Cabrera – University of Puerto Rico

**Feedback Control of Quantum Systems (AFOSR)**
- Dr Matthew James – Australian National University
- Dr Hideo Mabuchi – Stanford University
- Dr Bill McEneaney – UC San Diego

**Quantum Rheology (AFOSR)**
- Dr Warwick Bowen – University of Queensland
- Dr Hope Beier – AFRL Human Performance Directorate

**Superconducting Phases of Diamond (AFOSR)**
- Dr Steven Prawer – University of Melbourne
- Dr Dmitry Budker – UC Berkeley

**Information Processing and Transmission (AFOSR)**
- Dr William Moran – University of Melbourne
- Dr Daniel Koditschek – University of Pennsylvania

**Graphene Growth on Si (AFOSR)**
- Dr Francesca Iacopi – Griffith University
- Dr John Boeckl – AFRL Materials & Manufacturing Directorate

**Design and Optimization (AFOSR)**
- Dr Lucia Parussini – University of Trieste
- Dr Daniele Venturi – Brown University

**Electromagnetics (AFOSR)**
- Dr Vincenzo Galdi – University of Sannio, Benevento
- Dr Andrea Alu – University of Texas, Austin

**High-Temperature Materials (AFOSR)**
- Dr Diletta Sciti – Institute of S&T for Ceramics, CNR
- Dr Rishi Raj – University of Colorado, Boulder
Basic Research is the Foundation

2013 US-Italy Defense S&T Dialogue

2013 AFOSR/Italy Technical Exchange

2015 Int’l Basic Research Infrastructure Mtg

2014 AFOSR/National Research Council of Italy Tech Exchange

- Communication
- Access
- Engagement
Build the Relationships and the Rest Follows