Australian Nanotechnology Network

Annual Report 2015

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ANNUAL REPORT 2015

Australian
Nanotechnology
Network

MISSION STATEMENT AND OBJECTIVES

Mission Statement

The Mission statement of the Australian Nanotechnology Network is to enhance Australia's Research in Nanotechnology and related areas, by effectively promoting and drawing together collaborations in this field.

This innovative network was created in 2004 by four seed funding networks joining together in order to cover the broader areas and to create a larger more effective network.

The Australian Research Council funding came to an end in 2010. ANN received funding from the Department of Innovation, Industry, Science and Research towards the continuation of network operations until the end of 2013.

The following institutions are also contributing to the funding of the network operations which will be continuing.

Australian National University, CSIRO, DSTO, Deakin University, Flinders University, Griffith University, LaTrobe University, Monash University, Queensland University of Technology, RMIT, University of Melbourne, University of Newcastle, University of New South Wales, University of Queensland,University of South Australia, University of Sydney, University of Technology Sydney, University of Western Australia, University of Wollongong

Objectives

The Nanotechnology field is one of the fastest growing areas of research and technology. The Australian Nanotechnology Network is dedicated to substantially enhancing Australia's research outcomes in this important field by promoting effective collaborations, exposing researchers to alternative and complementary approaches from other fields, encouraging forums for postgraduate students and early career researchers, increasing nanotechnology infrastructure, enhancing awareness of existing infrastructure, and promoting international links. The ANN will achieve these goals through its dedication to bringing together all the various groups working in the field of Nanotechnology and related areas within Australia.

The Network aims to:

1. bring together key groups working in this area to communicate, innovate, share and exploit mutual strengths and facilities to make a major impact internationally
2. identify new areas of research
3. highlight the infrastructure that is available in Australia and promote use and sharing of these facilities
4. identify infrastructure needs to strengthen research
5. leverage off and interact with other networks for mutual benefit
6. develop industry and international links
7. interact with the wider community
8. encourage postgraduate students and early career researchers to enhance their skill base and training
9. become a national resource for industry, research and educational institutions, government and policy developers

2015 in Review

The work in 2015 was focused on enhancing the funding of programs and events related to Nanotechnology around the country.

Membership of 1767, participants including 1185 post graduate students and Early Career Researchers. More than 447 research groups are participating in the Network.

Over 8,500,000 Website hits

Held the Nanotechnology Entrepreneurship Workshop for Early Career Researchers

3 Young Nano Ambassador Awards

3 Short Term Visits

10 Overseas Travel Fellowships

8 Events Sponsored by ANN

Structure and Management

The Australian Nanotechnology Network is managed by a Management Committee.

This management committee represents the wider membership and is chaired by an independent chair. The committee determines the priorities for each activity and allocates the budget for the network. A Network Manager manages the day to day administrative tasks under the Guidance of the Network Convenor.

Management Committee Chair

The duties of the Chair are to chair Management committee meetings, provide advice to the Network, confirm meeting minutes for circulation to Management committee members, represent the network at important meetings and provide general guidance to the network management. The current chair is Professor Erich Weigold.

Convenor

The convenor has overall responsibility for the Network operations and for meeting ARC requirements and guidelines. Represent the network at key Nanotechnology meetings in Australia and key International network meetings. Supervise Network staff and provide overall direction to the network activities. The network Convenor is Distinguished Professor Chennupati Jagadish.

Management Committee Members

The management committee members participate in committee meetings. They serve on the Working Group sub committees, represent the Network and publicise network activities, organise and actively participate in the management of network activities, act as ambassadors for the Network and provide advice to the network members about network programs.

Working Groups

Committee members form into working groups that assess funding applications and other issues prior to the matter going to the full Management committee for voting. There are four working groups and their areas comprise.

Events Working Group *– evaluates all applications for sponsorship funding for Conferences, Workshops, summer and Winter Schools and Short Courses.*

Visits Working Group *– evaluates all applications for Short and Long Term Visits and Overseas Travel Fellowships.*

Outreach Working Group *– evaluates outreach proposals such as Public Lectures, Distinguished Lecturers visits, Outreach and Webpage.*

Education Working Group *– evaluates applications for student, ECR and Entrepreneur Forums and educational activities.*

The Convenor fills in if a working group member is unavailable or when there is a conflict of interest.

The Management Committee (MC) comprises of the following members, representing 6 States, students and early career researchers and chaired by an Independent chair. The MC has representatives from ANSTO, CSIRO, DSTO and industry.

Chairman – Emeritus Professor Erich Weigold – Australian National University

Convenor- Prof Chennupati Jagadish - Australian National University

Events Working Group

Prof. Laurie Faraone	**University of Western Australia**
Prof. Paul Mulvaney	**University of Melbourne**
Dr Tan Truong	**Defence Science and Technology Organisation**
Prof. Peter Majewski	**University of South Australia**
Prof Michael James	**Australian Nuclear Science and Technology Organisation**
Prof Ian Gentle	**University of Queensland**

Visits Working Group

Dr Adam Micolich	**University of New South Wales**
Prof. Deb Kane	**Macquarie University**
Prof Gordon Wallace	**University of Wollongong**
Ms Siobhan Bradley	**University of South Australia**

Outreach Working Group

Dr Adam Micolich	**University of New South Wales**
Prof. Deb Kane	**Macquarie University**

Education Working Group

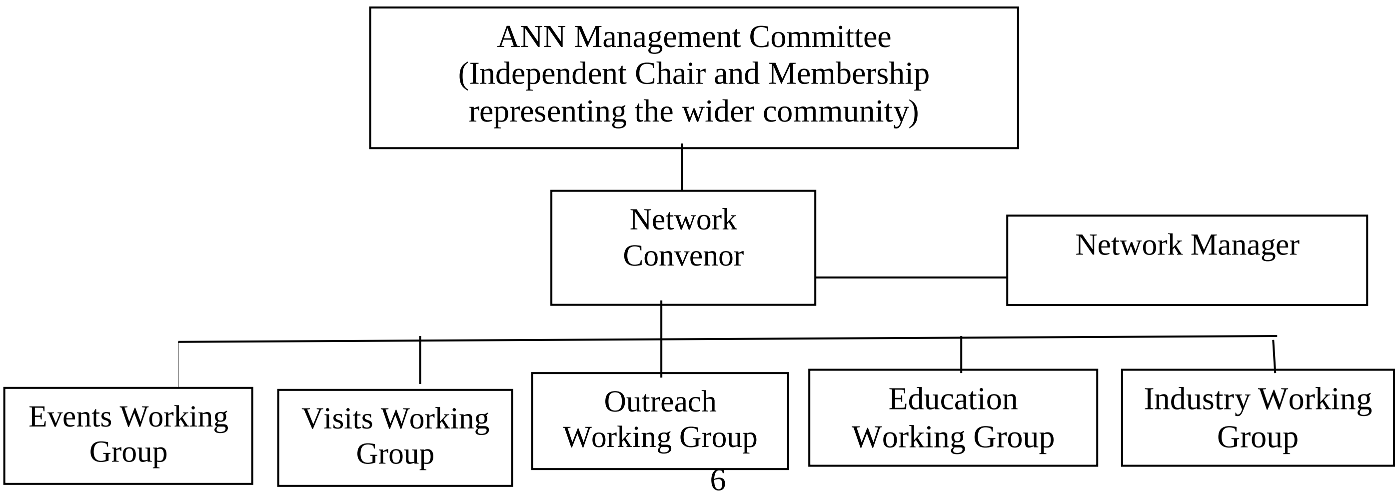
Prof. Max Lu	**University of Queensland**
Prof Terry Turney	**Micronisers Pty Ltd and Monash University**

Industry Working Group

Dr Anita Hill	**Commonwealth Scientific and Industrial Research Organisation**
A/Prof Paul Wright	**RMIT-University, convenor of NanoSafe Australia**
Prof David Lewis	**Flinders University**
Dr Stefan Herrar	**IBM**

Ms Liz Micallef	**Network Manager**

ANN Structure



ACTIVITIES UNDERTAKEN BY ANN

List of Activities funded / organized by ANN

- Nanotechnology Entrepreneurship Workshop for Early Career Researchers, Griffith University - Gold Coast Campus 10/06/2015 - 11/06/2015

Young Nanotechnology Ambassadors program

- Western Australia - Ms Jessica Kretzmann – The University of Western Australia
- South Australia – Mostafa Rahimi Azghadi – The University of Adelaide

Short Term Visits

- Mr Damon Carrad – University of New South Wales
- Mr Michal Zawierta from the University of Western Australia
- Dr Gino Putrino from the University of Western Australia

Overseas Travel Fellowships

- Mr Mitchell Nothling from the University of Melbourne visit to the University of California, Santa Barbara for a period of six months
- Ms Karina Hudson from the University of New South Wales visit to the University of Cambridge for a period of eight weeks
- Mr Thomas Shiell from the Australian National University visit to the Carnegie Institution of Washington for a period of six weeks.
- Mr Julius Zieleniecki from Flinders University visit to the National Institute of Standards and Technology in Washington, DC for a period of six weeks
- Ms Leonie Van T Hag from the University of Melbourne visit to ISA centre for storage ring facilities in Aarhus, Denmark for 25 days
- Mr David Waddington from the University of Sydney visit to the Martinos Centre at Massachusetts General Hospital for a period of six weeks
- Mr Hamish Brown from the University of Melbourne visit to the University of Tokyo for a period of three months
- Ms Solmaz Jahangir from the University of New South Wales visit to the School of Material Science and Engineering at MIT and North Carolina State University for a period of three months
- Dr Daniel Sando from the University of New South Wales visit to the Institute of Physics at the Taiwanese National Laboratory for a period of one month.
- Mr Jason Brenker from Monash University visit to the Paul Scherrer Institute (PSI) in Villigen Switzerland for a period of four months

Workshops and Events Sponsored by ANN

- 7th Biennial Australian Colloid and Interface Symposium (ACIS2015) 01/02/2015 - 05/02/2015 - Hotel Grand Chancellor, Hobart

- 6th International Nanomedicine Conference - 06/07/2015 - 08/07/2015 - Coogee, Sydney

- 35th Polymer Australasian Symposium 12/07/2015 - 15/07/2015 - QT Hotel, Gold Coast

- 2nd Asia Oceania Conference on Neutron Scattering, 19/07/2015 - 23/07/2015 - Novotel
- Manly Pacific, Sydney

- 9th International Mesostructured Materials Symposium (IMMS-9) - 17/08/2015 - 20/08/2015 - Brisbane Convention and Exhibition Centre

- Conference on Laser Ablations COLA 2015 - 31/08/2015 - 04/09/2015 - Pullman International, Cairns, Queensland

- NanoS-E3 2015 - International School and Workshop on Nanotechnology 27/09/2015 - 02/10/2015 - Peppers Salt Resort, NSW

- Recent Progress in Graphene and Two-dimetional Materials Research(RPGR2015) 25/10/2015 - 29/10/2015 - Lorne, Victoria

Nanotechnology Entrepreneurship Workshop for Early Career Researchers
Griffith University - Gold Coast Campus 10/06/2015 - 11/06/2015

The aim of this symposium was to provide a forum for early career researchers (ECRs) and postgraduate students working on nanotechnology research to interact with industry leaders and learn about how to commercialise Nanotechnology. Industry leaders shared their experiences in commercialising technologies and ECR/PhD got the chance to present their ideas about commercialising their research.
This workshop was chaired by A/Prof.Francesca Iacopi (Griffith University), and co-chaired by Dr.Tim Gould (Griffith University) and Miss Siobhan Bradley (University of South Australia).

Demographics: Attendees and Invited Speakers

The workshop was very successfully conducted over 2 full days at Theatre 3, Gold Coast Campus of Griffith University. It has attracted a total of 129 attendees, 14 of which Early Career Researchers and 101 PhD or students, with wide representation from the major Universities all over Australia, and including a few early career researchers from CSIRO and IBM Research.
Together with the three chairs, Ms Sharon Ding from the Dept of Science and Industry, Prof.Jagadish and Ms Liz Micallef from ANN made up the organizing team. The workshop was also complemented by the participation of 10 invited speakers knowledgeable in the area of Entrepreneurship in Science. These included 8 Australian and 2 USA –based speakers, and were a good mix of Academics who have founded own start-ups, or with close collaborations with Industry, as well as Industrial scientists speakers (Duvall, Chalamala and Harrer), plus Dr.Hazell from Accelerating Commercialisation and Ms Hicks, CEO of the Australian National Fabrication Facility, an NCRIS initiative very successful in supporting Australian start- ups in Nanotechnology.

Structure of the workshop

The workshop was conducted through 4 main components:

1) Invited Speakers presentations

   Each of the invited speakers contributed 20min inspiring presentations focusing on their own experience in transforming their own ground-breaking research (from innovative vaccine delivery to helping the international oil industry) into industrial endeavours, either through substantial joint partnerships, patent licensing or by founding their own start–ups. Dr.Hazell and Dr.Simpson explained the long path between University research and commercialisation, and the important aspects in this endeavour that are often overlooked. Dr.Hazell and Ms Hicks talked about how the Australian government can help throughout this delicate path through specific grants and access to hi-tech infrastructure.

2) Lunch Poster Sessions

   The students and ECRs presented their own research (related to their submitted abstract in the booklet) through poster presentations, held over the lunch breaks of the first and second day. This encouraged discussions with the knowledgeable invited speakers. The best posters of the first and second days were awarded a cash prize at the end of the workshop.

3) Group practical work sessions

   The attendees were divided into ten groups, making sure there was the right mix of students and ECRs, different University affiliations and research backgrounds. Each of those groups was assigned a) a pre-selected public patent in Nanotechnology and b) a mentor from the invited speakers. The groups received instructions on how to assign internal tasks such as the background idea and market research, funding plan and pitch preparation to prepare a "business plan/case" for the industrial panel. The attendees had about 3 official hours to work on their pitches, plus informal after hours' time.

4) Group "pitches" sessions
5) The final afternoon of the workshop was dedicated to the pitches of the 10 students/ECRs groups. Each of the groups was given 10min (strictly timed) presentation and 5 min questions from the "industrial panel", comprising of Prof. Senden (ANU), Prof.Jagadish (ANU), Ms Hicks (ANFF), Dr.Harrer (IBM), Prof.Eden (U of Illinois), Dr.Chalamala (Sun Edison), and Ms Ding (Dept of Science and Industry). Each group had one or two spokespersons, and answered questions as a group. At the end of the sessions, the panel and the moderator met in a separate venue to deliberate on the 3 best pitches, which were awarded cash prizes.

Outcomes and feedback

The workshop has been extremely successful, as concluded from the actual pitching presentations, the informal oral feedback from attendees and invited speakers at the event, and the formal follow-up survey where the inputs from attendees were solicited after the conclusion of the event.

This has been the first workshop run in such interactive way, with having "Entrepreneurship" rather than pure Science as its focus, this formula received very enthusiastic feedback, from both mentors and mentees. Most significantly, this result was achieved despite many initial worries of the attendees who were hesitant in participating in group sessions and who declared to be only a little interested in entrepreneurship.

The survey outputs were filled in by a little less than half of the attendees (49 responses). Of these, over 50% were extremely satisfied with the workshop and about 70% declared that the event exceeded expectations. They particularly valued the interaction with the invited speakers, as well as the pitching sessions. In particular, one attendee comment from the survey sums up the value of this interactive workshop:

"*Opportunity to interact with a senior, invited speaker. This meant we were given a reason to talk to this person, and they were given a reason to talk to us. It made networking a lot less daunting! And actually successful!"*

Invited Speakers

Prof Gary Eden - University of Illinois, Dr Babu Chalamala -SunEdison Inc, Dr Steve Duvall- Silanna Ltd
Dr Stefan Harrer- IBM, Prof Mark Kendall -University of Queensland , Prof Tim Senden- Australian National University, Prof Ron Quinn - Griffith University, Ms Rosie Hicks - Australian National Fabrication Facility
Dr Benjamin Simpson- Griffith University, Dr Stuart Hazell - Department of Industry and Science

Participants at the workshop

List of student and Early Career Researchers

Title	First Name	Last Name	Company	Abstract Title
Mr	Shuai	Li	Australian National University	Low power, frequency-tunable oscillator based on the metal-insulator transition in NbOx thin films
Mr	Sanjoy	Nandi	Australian National University	NbO2 based ReRAM-Selector and Neuristor Circuit Elements
	Dinesh Kumar	Venkatachalam	Australian National University	
Dr	Ravichandar	Babarao	CSIRO	Metal organic frameworks for gas storage and separation: what we learned from molecular modelling
Mr	Hector	Barron Escobar	CSIRO	Dynamic evolution of catalytic sites on Pt nanoparticles
Ms	Rhiannon	Clark	CSIRO	A self-actuating optical sensor based on luminescent nanoparticles
Dr F	Tu	Le	CSIRO	Accelerating the discovery and optimisation of novel materials using evolutionary methods
Mr	Samuel	Yick	CSIRO	From Wastes to Goods- Valorisation of Biomass with Bimaterial Catalysts
Mr	Paul	Atkin	CSIRO, RMIT University	Carbon Dots for Intelligent Sensing Systems
Mr	Vishal	Chaturvedi	Curtin University	Atomic Force Microscopy: a novel technique with applications in Matrix Biology

Mr	Baris	Demir	Deakin University	Improving Composite Materials via Molecular Simulations of Epoxy Cross-linking at Carbon Fibre Interfaces
Mr	Chunfang	Feng	Deakin University	Stretchable Graphene-based Materials of High Conductivity
Mr	Zhifeng	Yi	Deakin University	Functionalised Mesoporous Silica Nanoparticles with Redox Responsive Short-Chain Gatekeepers for Agrochemical Delivery
Dr M	Xinjun	Liu	The Australian National University	Synchronization of niobium oxide coupled oscillators for the application of neuro-inspired computing
Mr	Oskar	Majewski	Flinders	Towards Tuneable Nanoparticles - the direct functionalization of silica nanoparticles for RAFT polymerization
	Zahrah	Alhalili	Flinders University	Paclitaxel-Gold Nanoparticles Conjugates designed for Breast Cancer Treatment
Mr	Daniel	Mangos	Flinders University	Formation of patterned calcium rich scaffolds for Orthopaedics
Mr	Rowan	McDonough	Flinders University	Tethered NAD+ Bioreactor: Towards Biological Factories
Mr	Cameron	Shearer	Flinders University	Scanning probe microscopy investigation of carbon nanomaterials
Ms	Vanessa	Thompson	Flinders University	Modification of urinary catheters with antimicrobial coatings
Mr	Mohsin	Ahmed	Griffith University	A thin film approach for SiC?derived graphene as an on-chip electrode for supercapacitors
Mr	Zulfiqar	Khan	Griffith University	
Mr	Sheng	Li	Griffith University	
	Porun	Liu	Griffith University	
Mr	Neeraj	Mishra	Griffith University	Graphene on silicon wafers: perspectives as metal replacement
Miss	Aiswarya	Pradeepkumar	Griffith University	
Ms	Atieh	Ranjbar Kermany	Griffith University	Optimized Micromechanical Resonators for Sensing Application
	Zhijin	TAN	Griffith University	
Mr	Shujun	Wang	Griffith University	Aromatic hydrocarbon sensing with partially-ring terminated graphene quantum dots
	Yun	Wang	Griffith University	
Mr	Zhiqing	Wu	Griffith University	Fabrication of Graphene/Cu_2O nanowires Composites with Enhanced Photocatalytic Performance
	Jitendra	Pal	Griffith University	
	Mohammad	Al-Mamun	Griffith Universiy	
Dr M	Sridhar	Kannam	IBM Research Australia	Diffusion of proteins under nanopore confinement
Ms	Gayathri	Rajeev	Mawson Institute, University of South Australia	Biosensor based on porous substrates to detect flightless protein in chronic wound fluid
Mr	Bartlomiej	Kolodziejczyk	Monash University	Light Sensors and Opto-logic Gates Based on Organic Electrochemical Transistors

Mr	Julian	Lloyd	Monash University	A simple electrostatic assembly process for gold nanolens arrays
Mr	Soon Hock	Ng	Monash University	Nano-wells as a template for self-assembly of gold nanoparticles
Mr	Kae Jye	Si	Monash University	Nanoparticle superlattice as soft SERS substrate for drug identification
Mr	Thibaut	Thai	Monash University	Self-assembly of vertically aligned gold nanorod arrays on patterned substrates
	tiffany	tang	Monash Universiy	
	Ehsan	Eftekhari	Griffith University	Development of fluorescent core/shell colloidal particles based on polystyrene spheres core and Rhodamine B shell
		Shahbazi	Queensland University of Technology	Nanowire of Bismuth Oxycholoride for Solar Cell Application
Dr	Sarvesh	Soni	RMIT University	Self-assembled functional nanostructure of plasmid DNA with Ionic Liquid [Bmim][PF6]:Enhanced efficiency in bacterial gene transformation
Ms	Martina	Abrigo	Swinburne University of Technology	Micro/Nanofibrous Meshes as Smart Dressings for Chronic Wound Care
Miss	Timothy T.Y.	Chow	Swinburne University of Technology	Plasmonic Random Media Characterization via Image Correlation Spectroscopy
Mr	A S M	Mohsin	Swinburne University of Technology	Gold Nanoparticle Uptake and Aggregation Dynamics Study Using Image Correlation Spectroscopy
Mr	Behnam	Akhavan	Sydney University	Nano-structured carbon and nitrogen-containing plasma polymer films on zirconium surfaces: Control of surface chemistry and surface free energy
Mr	Mahdieh	Nemati	The University of Adelaide	A Label-Free Gelatine-Based Interferometric Sensor to Detect Enzymatic Cancer Biomarkers
Dr	Sheng	Chen	The University of Adelaide	Graphene-based electrocatalysts for water splitting
Ms	Jingjing	Duan	The University of Adelaide	A Three-Dimensional Hybridized Film as Hydrogen Evolution Catalyst Electrodes
Ms	Gretel	Png	The University of Adelaide	Far-infrared spectroscopic study of fibrillation in peptides associated with amyloidosis
Mr	Jingrun	Ran	The University of Adelaide	Porous P-doped g-C3N4 nanosheet for high performance visible-light photocatalytic H2 production
Mrs	Masoumeh	Zargar	The University of Adelaide	Thin Film Nanocomposite Membranes Integrated with Modified Silica Nanoparticles: a Structure- Performance Correlation Study
	Michel	Nieuwoudt	The University of Auckland	Gold sputtered PDMS microwells as effective SERS substrates for sensing low concentrations of melamine in milk

	sanjaya	Kc	The University of Queensland	Hybrid magneto-fluorescent particles for bio-sensing applications
Mr	Anjaneya	Ravipati	The University of Queensland	Discovery, mechanistic studies and applications of cyclotides
Mr	Jonathan	Wei	The University of Queensland	Translating micro-medical devices from small to large animal models and ultimately humans; understanding the key mechanics of skin that matter
Ms	Hamideh	Elekaei Behjat	University of Adelaide	On the Dynamics of Immiscible Liquid-Liquid Flows in Microchannels
Mr	Moein	Kashani	University of Adelaide	Pressure drop study of microfluidic flows in micro-packed bed
Mr	ye	wang	University of Adelaide	Pharmacological targeting of autophagic and endoplasmic reticulum stress signaling networking by a nanotube-based delivery system
Ms	Asma	Khalid	University of Melbourne	Silk coated Nanodiamonds for Bioimaging applications
Ms	Natalita	Nursam	University of Melbourne	Gold sputtered PDMS microwells as effective SERS substrates for sensing low concentrations of melamine in milk
Ms	Jeannie Ziang Yie	Tan	University of Melbourne	TiO2 of tunable crystal phase grown on PVDF membranes
Dr	Hamid	Arandiyan	University of New South Wales	Ag NPs embedded in 3DOM La0.6Sr0.4MnO3: Highly active nanocatalyst for the oxidation of methane
Mr	Hamdan	Awan	University of New South Wales	Impact of the Number of Receptors on Performance of Molecular Communication Networks
Mr	Yooun	Heo	University of New South Wales	Resistive Switching Properties of Epitaxial BaTiO3-Thin Films
Mr	Minsu	Jung	University of New South Wales	Cu-Pt Nanostructures on TiO2 for Photocatalytic Hydrogen Evolution
DrF	Fehmida	Kanodarwala	University of New South Wales	Deposition of CdSe and Silicon quantum dots on Graphene sheets
Mr	Jincheol	Kim	University of New South Wales	What makes a good methylammonium iodide for perovskite solar cell?
Ms	sara	mesgari	University of New South Wales	Highly stable carbon nanofluids for solar thermal collectors
Miss	Yiming	TANG	University of New South Wales	Frequency-regulated Pulsed Electrodeposition of CuInS2 on ZnO Nanorod Arrays for Light Energy Conversion
Mr	Wen Jun	Toe	University of New South Wales	Anomalous trapping behaviour of high refractive index nanowires
Ms	Peng	Wang	University of New South Wales	Enhancement of charge carrier density and charge transport in Cu2O-based thin films for solar energy conversion
Mr	Nasim	Amiralian	University of Queensland	High Performance Cellulose Nanofibrils From Spinifix, An Australian Arid Grass
Mr	Rishabh	Bhatia	University Of South Australa	Plasma activated hydrogel wound therapy

Mr	Ashraful	Alam	University of South Australia	Graphene-Polymer Composite Hydrogels being Electrically Conductive, Mechanically Robust and pH-sensitive
Mr	akash	bachhuka	University of South Australia	Effect of nanotopography on cell-surface interaction
Miss	Siobhan	Bradley	University of South Australia	Fluorescence Lifetime Analysis of Graphene Quantum Dots
Mr	Alex	Cavallaro	University of South Australia	Concentration gradients of immobilised quaternary ammonium compounds for bio-burden reduction
Ms	Melissa	Dewi	University of South Australia	Hybrid NaGdF4:Eu3+ nanoparticles for multimodal contrast agents.
Dr	Renee	Goreham	University of South Australia	Folic Acid Functionalised Graphene Quantum Dots for Photodynamic Cancer Therapy
Mr	M Altaf	Hossain	University of South Australia	Investigation of Natural Antifungal Compounds and Surface Coatings
Mr	Yatin	Mange	University of South Australia	Quantum Dots as sensitizers for TiO2 coated with metal clusters as photocatalyst for CO2 reduction
Ms	Neelika	Roy Chowdhury	University of South Australia	Biocompatible synthesis of silver nanoparticles from cacao extract: its effect on microorganisms and human dermal fibroblasts
Mr	Sam	Rudd	University of South Australia	The Evolution of Charge Transport in Conducting Polymers
Dr M	Binoy	Sarkar	University of South Australia	Preparation and Characterisation of Organoclay-Carbon Nanotube Composite for Environmental Application
Ms	Kathryn	Schroeder	University of South Australia	Folic acid functionalised graphene quantum dots for photodynamic therapy
Mr	Bastian	Stoehr	University of South Australia	Easy-to-clean- Coatings: Unlocking the Structure-Property Relationship for Cleanliness
	Roya	Yadollahi	University of South Australia	Engineering optical properties of nanocomposite
Mr	Shaikh Nayeem	Faisal	University of Sydney	Three-Dimensional Nanostructured Nitrogen-Doped Graphene/Carbon Nanotube Composites for Fabricating High Volumetric Flexible Supercapacitor
Ms	jieun	lee	University of Sydney	Carbon nanotube enhanced membrane for water purfication
Mr	Ehsan	Pourazadi	University of Sydney	A Comparison of Electrochemical ORR Activity of Boron in Graphene Ox-ide; Incorporated as a Charge-adsorbate and/or Substitutional p-Type Do-pant
Mr	Fabricio	Borghi	University of Sydney / CSIRO	Label-free biomarker detection using vertically oriented graphene nanowalls
Mr	Kerem	Bray	University of Technology Sydney	Enhanced photoluminescence from single nitrogen-vacancy defects in nanodiamonds coated with phenol-ionic complexes
Dr M	Shuangqiang	Chen	University of Technology Sydney	3D hyperbranched hollow carbon nanorod architectures for high performance lithium-sulfur batteries

Mr	Mehran	Kianinia	University of Technology Sydney	Selective attachment of nanodiamonds on pre-patterned carbon templates
Mr	Bing	Sun	University of Technology Sydney	Porous graphene nanoarchitectures an efficient catalyst for low charge-overpotential, long life and high capacity lithium-oxygen batteries
Mr	Toan	Tran	University of Technology Sydney	Facile Self-Assembly of Quantum Plasmonic Circuit Components
Mr	Amanuel	Berhane	University of Technology, Sydney	Electrical excitation of silicon-vacancy centers in single crystal diamond
Mr	James	Bishop	University of Technology, Sydney	Controlling Nanostructure Geometry by Modulating Adsorbate Depletion During Electron Beam Induced Deposition (EBID)
Mr	Sunim	Choi	University of Technology, Sydney	Zinc oxide nanophotonics
Mr	Daniel	King	University of Technology, Sydney	High entropy alloys for the next generation of nuclear reactors
Mr	Russell	Sandstrom	University of Technology, Sydney	Study of narrowband single photon emitters in polycrystalline diamond films.
Mr	Jinqiang	Zhang	University of Technology, Sydney	Enhancement of stability for lithium oxygen batteries by employing electrolytes gelled by poly(vinylidene fluoride-co-hexafluoropropylene) and tetraethylene glycol dimethyl ether
Miss	Yufei	Zhao	University of Technology, Sydney	CoO nanoparticles confined by porous graphene for highly efficient oxygen evolution
Mr	Chris	Leung	University of Western Australia	Hydrogenation sensitivity enhancement of Pd/Co bi-layers films for magnetic hydrogen gas sensor
Ms	KAVIYA	SOMASUNDARAM	University of Western Australia	Sequential detection of Fe^{3+} and As^{3+} ions by bio-inspired gold nanoparticles: A study of aggregation and dis-aggregation processes
Mr	Chandrasekar	M Subramaniyam	University of Wollongong	Higher Voltage Li-rich Cathode Materials for Lithium-ion Battery Applications
Ms	Ana	Andres-Arroyo	UNSW	Nanorod Dynamics Characterization Using Optical Tweezers Combined With Localised Surface Plasmon Resonance Spectroscopy
	Alaa	Munshi	UWA	Fe_3O_4-Au nanoparticles coreshell catalysts for three-component coupling reaction
	Conor	Burke-Govey	Victoria University of Wellington	Hierarchical ZnO nanowires for use in field-effect transistors
Mr	Shyamal	Prasad	Victoria University of Wellington	Benchtop Nanosecond Transient Absorption Spectrophotometer

YOUNG NANO AMBASSADOR AWARDS

YOUNG NANOTECHNOLOGY AMBASSADOR AWARDS

The Young Nanotechnology Ambassador Awards were set up to promote science and science education in state and territory schools. Two awards are provided per state/territory and each award is valued up to $2000.

The young nanotechnology ambassadors are required to visit a minimum of four schools (preferably at least one regional school) to inspire students about nanotechnology, and more broadly science education. It is up to the ambassadors to decide which schools they visit and to arrange these visits with the schools. The ambassadors are encouraged to present a talk which could include visual demonstrations or simple experiments, slide shows or other multimedia presentations.

The following are the Young Nanoscience Ambassadors for 2015

South Australia - Mr Jakob Andersson from the Chemical and Physical Sciences at Flinders University

I would like to thank the ANN for giving me this opportunity during my honours studies in 2013. Unfortunately due to difficulty in contacting teachers and arranging visits, this has taken two years to complete.

In those two years I have visited Mount Barker Waldorf School in June 2014, Glenunga International High School on the 11th of August 2014 and Westminster School on August 27th 2015. Two presentations were delivered at Westminster as there were several classes of students that were interested in the presentation. The Westminster science teacher, Mr Peter Walwyn, was in touch after the presentations:

Thank you for taking the time to come and talk to our classes. The students were very interested to hear of the latest developments in nanotechnology and enjoyed the opportunity for the hands-on activities at the end of the talk. After you left, the class had some very interested and animated discussions about some of the topics and ideas you raised – always a good sign that they were listening and thinking about the ideas presented. I would be happy to recommend your presentation to other schools who may be thinking of touching on this subject as part of their science course.

-Peter Walwyn, Science teacher at Westminster School in Adelaide, South Australia

My final presentation was to the year 12 students of the Edward John Eyre High School in Whyalla, South Australia. Due to the remote location of Whyalla (about 300 km north of Adelaide), the teacher and I decided that a video conference might be preferable because it would not necessitate a long journey by car or flying. The infrastructure was in place and a sufficiently fast broadband connection was also available, and with the help of the Flinders IT department I gave the presentation on the 24th of September 2015 via teleconference from Flinders directly to the classroom in Whyalla. I received the following feedback after the presentation

"It was nice to know that things could be done with what we're learning now"

-Lachlan Richard, student at Edward John Eyre High School

Figure 1: Locations of the Schools that were visited as part of the Young Nanotechnology Ambassador Program

Jakob presented an informative and engaging video conference which presented some recent developments in nanotechnology. He used good analogies and macro-examples to explain nanocomposites, ferrofluids and invisible sunscreens to the year 11 students at Edward John Eyre High School. His sequencing was logical and his answers to student questions were well-pitched.

Lewis Williams, Science teacher at Edward John Eyre High School

In addition to the four schools I visited, I also gave a general presentation about nanotechnology at a common closure day of the Northern Adelaide State Secondary Schools (NASSSA) at the Paralowie R-12 School on the 5th of June 2015. Figure 1 shows the distribution of the schools I presented to as part of this program.

These visits consisted of a 30 minute presentation and about 10 minutes time for student questions. The presentations I gave began with a general explanation of what nanotechnology is and put the scale we're working at in perspective (i.e. each student is roughly 2 billion nanometres tall). This was followed by an explanation of the change in properties that materials undergo from macro- to nano-scale. I gave a few examples such the colour of bulk gold compared to gold nanoparticles and explained how and why something commonly thought of very solid and sturdy (Aluminium) becomes highly reactive when turned into nanoparticles. This general outline was followed by more specific examples of nanotechnology already being used such as ferrofluids, composite materials and sun screens. I also gave a brief overview of medical areas that nanotechnology is set to revolutionise.

The presentations concluded with an explanation of why science is such an interesting field to work in and a brief outline of how a course at Flinders in science and nanotechnology would look and the career options the students would have after completing such a degree.

The presentations were followed by some hands-on examples of Nanotechnology including a vial of ferrofluid (and a strong magnet), liquid crystal sheets able to change colour when touching skin, water-proof shirts and hydrophobic sand. In addition, videos were presented showing self-cleaning surfaces, ferrofluids and a video produced by IBM called "A Boy and his Atom" showing how single atoms were moved around on a surface to create the world's smallest cartoon.

The presentations were all very successful in engaging the students attention (there was very little or no chatting between students during the presentations). Furthermore, I was asked brilliant questions about a wide variety of topics ranging from why I am personally doing science to the ethical aspects of nanotechnology, health and safety and how nanotechnology might change our society in the future. Furthermore, there were many creative applications of nanotechnology students had come up with during the talks based on the examples I gave, so the presentation had successfully captured their imagination and increased their interest in the field of nanotechnology.

The imagination of the students appeared to be particularly captured by the videos I showed (especially a video showing dirt-repelling surfaces) and the hands-on examples of nanotechnology.

I think the most important parts of the presentations were firstly that nanotechnology was put into a relatable context for the students (sunscreens and self-cleaning surfaces as opposed to quantum effects for example) and that they were able to see and interact with nanotechnology for themselves after the presentations.

The primary difficulty I encountered was to arrange the presentations with the teachers due to their busy schedules, and arranging extra activities for their students requires time and energy they might not have.

Initially I was very nervous about presenting to a classroom full of students, but as I completed more visits, I found myself growing much more comfortable presenting to a room full of people and able to vary the content and discussion points depending on student questions and as time allowed.

The most significant benefit I gained personally in terms of professional development was an ability to explain the sometimes very complicated concepts of science and nanotechnology to an audience not familiar with these topics. I think having done these presentations contributed to becoming a university finalist in the Three Minute Thesis Competition at Flinders University in 2015 as this experience has significantly enhanced my ability to communicate with others.

Jakob Anderrsson

Victoria –Mr Bartlomiej Kolodziejczyk- Monash University

Nanotechnology School Visits around Victoria

1. Introduction

Nanotechnology is relatively new, but emerging field of science. Many high school students are aware of nanotechnology; however they don't consider it as a future career. It is therefore important to promote interest and encourage high school students to pursue this interesting field.

While many students are keen to pursue further education by obtaining science or engineering related degrees, most consider traditional fields such as mechanical, electrical and civil engineering or chemistry. For many school students research science does not have the greatest public image. This is mostly due to lack of understanding of the field and related career prospects.

The aim of my school visits was to discuss my research as well as other nanotechnology topics and encourage high school students to consider a career in science and especially nanotechnology as an exciting and interesting opportunity.

I have discussed pros and cons of being researcher and making innovative discoveries that one day may contribute to the society. The feedback I got during my visits was amazing and very encouraging, I personally feel that the need for outreach into schools from scientists is integral to ensure the best and brightest minds continue in the sciences. It was a challenge for me to make it suitable for the audience as I had to exclude scientific jargon and technical terms whilst still conveying the complexity and advance scientific concepts of the topic.

2. Finding a school

This is the most challenging part of the whole process, I am writing this part mostly to help other future ambassadors to find a host.

I have tried many different approaches to organize the school visit. However, it wasn't easy. Most of the schools were simply not interested.

Contacting random schools doesn't really work that well. However, finding high school teachers on LinkedIn and contacting them directly works much better. Additionally, you may ask your colleagues who are teachers (if you have any). Before contacting any school or a teacher I highly encourage you to write a short cover letter where you explain the purpose of your visit and topics that will be covered. Many schools require visitors to have a *Working With Children Check*, you should obtain one before making any contact. A support letter from your supervisor is also beneficial. Ask your supervisor to clarify that the experiments you're planning to perform are completely safe. Once the school or teacher agrees to host you, it should be very straightforward.

I would highly encourage future Young Nanotechnology Ambassadors to identify and contact potential schools before applying for the award.

3. Methodology

The ANN Young Nanotechnology Ambassador Awards is was able to develop a short school program for students. My approach was to deliver four topics (described below) that consisted both basic information as well as hands-on-experience to familiarize students with nanotechnology. Each of the four topics was followed by a short practical presentation, experiments and questions. At the end of the presentations, students had an additional 10 to 15 minutes for any further questions that they have.

4. Covered topics

The stations included the following topics:

Topic 1. *Nanotechnology and energy – hydrogen production, fuel cells and hydrogen cars.*

A short presentation on importance of sustainable energy, hydrogen production and utilization and a role of nano-structured materials in hydrogen production, utilization, and storage.

The hydrogen production and utilization process has been shown using the i-H_2GO demonstration kit. i-H_2GO is the most technologically advanced toy car on the market. The hydrogen refueling station generates hydrogen through water electrolysis, refuels the car and charges the super capacitor. Transparent casing and LED lights are designed to highlight all these electrochemical processes— the same processes as in real-scale hybrid vehicles. A PEM fuel cell converts hydrogen to electrical energy and the super capacitor engages when the car accelerates.

Topic 2. *Shape memory alloys (Nitinol) and piezomaterials.*

Short presentation on shape memory alloys, Nitinol and basics of piezo- and pyroelectric materials. How do they work? What's the nano-structure like in those materials and in what possible applications can be used? Nitinol alloy and piezoelectric transducer were used to demonstrate two effects and familiarize students with the nanoscience phenomenon.

Topic 3. *Carbon allotropes and their properties.*

Students got familiar with different forms of carbon (carbon allotropes), including diamond, graphite, buckyball, amorphous carbon and carbon nanotubes. Relation between properties and the structure, as well as possible applications of carbon allotropes have been explained. The presentation was supported by multiple SEM images. Lastly, different allotrope samples have been provided to students for examination to show how structural differences affect color and other properties. A portable microscope with USB connection was used to examine the samples on the micro-scale.

Topic 4. *Conducting polymers and their applications.*

A basic introduction to conducting polymers. Students get familiar with polymers, their manufacturing routes and properties. They also learn that some polymers can conduct electricity.

5. School visit schedule

Four schools were visited over a period of few months. All four schools were located around Victoria. Additionally, presentations were given to high school students visiting Monash University for the University Open Day. Presentations were given to mainly science extension year 10, 11, and 12 students.

***Thursday 11th June 2015-* John Monash Science School**

39 Innovation Walk, Monash University VIC 3800 - http://www.jmss.vic.edu.au/

***Sunday 3rd August 2015-* Monash University – University Open Day**

Clayton campus, Wellington Road, Clayton, VIC 3800

***Tuesday 25th August 2015* - Geelong Grammar School**

50 Biddlecombe Avenue, Corio VIC 3214- https://www.ggs.vic.edu.au/

Thursday 27th August 2015 - **Robinvale P-12 College**
186 Latje Rd, Robinvale VIC 3549, Australia- www.robinvalep12college.vic.edu.au/

Monday 12th October 2015- **Roxburgh College**
60-70 Donald Cameron Dr, Roxburgh Park VIC 3064- www.roxburghcollege.vic.edu.au/

Appendix A
Feedback form

Please use your experience in your workshop to rate the following statements. Your feedback will help me to ensure that I continue to meet your expectations. The feedback will also be used as evaluation of my work.

Training Design

1. The topic was clearly communicated. **Disagree** | 1 | 2 | 3 | 4 | 5 | **Agree**

2. The class activities and exercises assisted me in learning. **Disagree** | 1 | 2 | 3 | 4 | 5 | **Agree**

3. The topics were well organized. **Disagree** | 1 | 2 | 3 | 4 | 5 | **Agree**

4. The course length was appropriate for the information presented. **Disagree** | 1 | 2 | 3 | 4 | 5 | **Agree**

Facilitator

5. The facilitator created a professional and comfortable learning environment. **Disagree** | 1 | 2 | 3 | 4 | 5 | **Agree**

6. The facilitator displayed confidence in the subject matter. **Disagree** | 1 | 2 | 3 | 4 | 5 | **Agree**

Comments

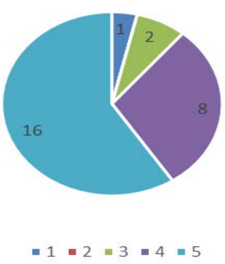
7. Any other feedback or comments. (Please write below.)

Appendix B
Feedback results

Please note that due to the time limitations presentation feedback survey have been performed only in two schools. The total number of respondents was 27.

Training Design

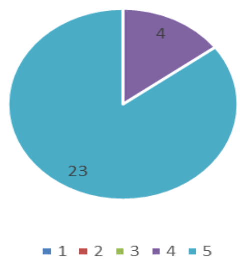
The topic was clearly



Disagree	
1	1
2	0
3	2
4	8
5	16
Agree	
Total	27

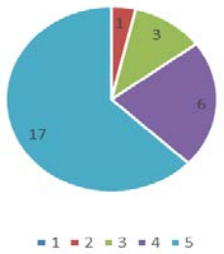
communicated.

1. The class activities and exercises assisted me in learning.



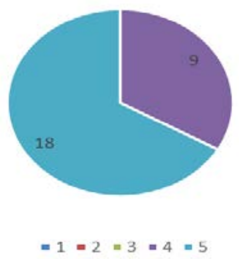
Disagree	
1	0
2	0
3	0
4	4
5	23
Agree	
Total	27

2. The topics were well organized.



Disagree	
1	0
2	1
3	3
4	6
5	17
Agree	
Total	27

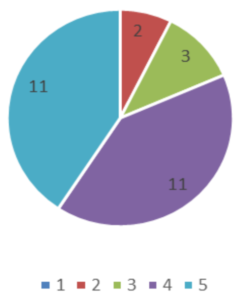
3. The course length was appropriate for the information presented.



Disagree	
1	0
2	0
3	0
4	9
5	18
Agree	
Total	27

Facilitator

4. The facilitator created a professional and comfortable learning environment.



Disagree	
1	0
2	2
3	3
4	11
5	11
Agree	
Total	27

5. The facilitator displayed confidence in the subject matter.

Disagree	
1	0
2	0
3	2
4	7
5	18
Agree	
Total	27

WA - Jessica Kretzmann from the University of Western Australia

Nanotechnology: getting to the bottom of things

Jessica Kretzmann

Introduction

It is the unfortunate truth that students in regional schools have fewer science- related educational opportunities than those in metropolitan areas. In addition to a lack of understanding about science-related careers and opportunities, there is still a stigma associated with being openly passionate about science. The combination of these factors means that students often perceive science subjects as merely something one has to do – a prerequisite for other areas of study – without being aware of the careers in science itself. I say this through my own knowledge, as a former student in both regional and metropolitan areas, and through my conversations with teachers and students during my recent school visits as ANN ambassador.

Nanotechnology has been recently introduced into the National Australian Curriculum in secondary schools. Through discussions with the staff at each of the schools visited, it was clear that they too face difficulties in promoting careers in science particularly nanotechnology, as it is both a broad and a new learning area.

Discussion with students from Busselton Senior High School about how ferrofluids work, and how they might be applied.

ANN Young Nanotechnology Ambassador Award

By visiting schools in regional WA, my aim was to show students that anyone with a fundamental curiosity of how things work is already interested in science, and to show them some of the amazing opportunities that a career in science can provide. I conveyed this message by drawing on my own experiences from the time I was in school, through to my current situation as a PhD student at the University of Western Australia. I gave particular emphasis to the exciting opportunities I have now as a PhD student, such as the opportunity to travel around the world to attend conferences (not surprisingly, the students particularly liked the idea of travelling to Hawaii for the Pacifichem conference). I firmly believe that outreach programs in schools are crucial to increase awareness of science-based careers.

Schools Visited

Four schools were visited over the period of four days. The schools visited were all situated in the south west of Western Australia as I felt it was important to ensure regional students were given the opportunity to see these resources. Presentations were given to upper school students (years 10, 11 and 12). We felt this was an important target audience with subject selection occurring in year 10, learning about nanotechnology in the school curriculum in year 11 chemistry, and with university course selection in year 12.

With the support of the ANN through the nanotechnology student ambassador award I was able to develop and update hands-on nanotechnology-related resources and demonstrations which students experienced. Many of the staff took note of the demonstrations and activities that the students participated in during my visits, with the intention of using them to teach students in later years. The outreach program is just as important to teachers at this time with the introduction of nanotechnology to the school curriculum, as it is to students. Furthermore, by engaging the teachers as well, the ANN fundied projed will have lasting effects for future students.

Above: students from Margaret River Senior High School getting hands-on with ferrofluids (left) and

quantum dots and gold

Left: students from Busselton Senior High School at the Hydrophobic surface coatings' demonstration, comparing the differences between hydrophilic and hydrophobic surfaces of a range of materials.

The activity stations were as follows

1. Magnetics and Ferrofluids - students compared the interactions of large iron filings (in water) with a magnetic field, and the interactions of a ferrofluid (iron nanoparticles in water) in a magnetic field

2. Hydrophobic surfaces - students looked at a variety of hydrophobic surface coatings (Teflon on glass slides, hydrophobic coatings on materials, and hydrophobic sand). Students learn that 'like dissolves like', but find it difficult to relate this knowledge to applications. The aim of this activity was to show that surfaces and materials can be modified to be either hydrophilic or hydrophobic, and to get students thinking about potential applications.

3. Imaging with gold nanoparticles and quantum dots - the aim of this display was to show how we can change the properties of nanoparticles in a controlled manner. There were gold nanoparticles at a range of different sizes, so the students saw how you can change the colour of gold with size. They also had a sample of quantum dots, which they could put under the UV light to observe the fluorescent properties of semiconductor nanoparticles.

4. Surface area to volume ratio, and smart metals - in this activity students compared heating a steel nail and steel wool, and they saw a difference in reactivity - steel wool burns due to the increased surface area to volume ratio. The students also had pieces of a smart metal alloy ('nitinol'). They were able to bend this metal out of its original shape, then watch it restore itself with gentle heating.

In addition to the above activities, the students also watched a series of short introductory videos from the NanoYou series (http://nanoyou.eu/), and I gave a short presentation on my own insights into studying science at university and what I am doing now in my PhD. The students engaged with the presentation, and I was asked questions about my research and what I studied through school and my undergraduate degree to get where I am now.

A full house! Students from Busselton Senior High School watching a short film of the NanoYou series

To conclude, I firmly believe that outreach programs are necessary to increase awareness of science-related career opportunities, especially in regional areas. With the support from the ANN and DIISRTE I was able to visit schools and engage with both student and teachers, and give them some further insight into nanotechnology. By doing so, I believe the project will have lasting effects for future students.

Monday 31st August 2015 - Bunbury Senior High School

Haig Cres, Bunbury WA 6230 http://www.bunburyshs.wa.edu.au/

Tuesday 1st September - Eaton Community College

Recreation Drive, Eaton WA 6232 http://www.eatoncc.wa.edu.au/

Wednesday 2nd September- Margaret River Senior High School Bussell Hwy, Margaret River http://www.margaretrivershs.wa.edu.au/

Friday 4th September- Busselton Senior High School

Bussell Hwy, Busselton WA 6280 http://www.busseltonshs.wa.edu.au/

Queensland - Mr Amirali Popat from the Australian Institute for Bioengineering and Nanotechnology University of Queensland

Amirali will be finishing the school visits in 2016

New South Wales- Ms Katherine Mc Donnell – University of Sydney

Visits to Schools will take place in 2016

South Australia - Dr Mostafa Rahimi Azghadi from the School of Electrical and Electronic Engineering at the University of Adelaide

Mostafa will be visiting the schools in 2016

Short Term Visits

SHORT TERM VISITS

Funding support is also available to **postgraduate students** and **early career researchers** (within 5 years of award of PhD degree) for travel and accommodation expenses associated with Short Term Visits to research Institutions within Australia. Up to $1,000 is provided for travel and accommodation to a location(s) within Australia.

Mr Michal Zawierta from the University of Western Australia visit to the University of Queensland, National Measurements Institute, Sydney and the University of Newcastle

The outcomes of this award are as follows:

The visit was divided into three parts:

1) The visit to the University of Queensland aimed to conduct experiments with xenon difluoride (XeFz) etching of a silicon sacrificial layer for microelectromechanical systems (MEMS). The visit allowed us to verify the capabilities of available equipment to fabricate miniAFM devices as well as allowed us to develop a process which will meet the requirements of the miniAFM project.

   During the visit a set of samples were processed to tune the recipe to the requirements of the miniAFM project and prove that xenon difluoride etching process is suitable for use as a part of the MEMS fabrication. The results from the work provide the basis for the further development of the project using a silicon sacrificial layer in MEMS design.

   The second part of the visit at University of Queensland was to view their shot-noise limited microdisk resonator displacement measurement system, which led to better understanding of measurements needed for the optical read-out technique for the miniAFM project.

2) The visit to the National Measurement Institute aimed to broaden understanding of the issues of fabrication and measurements using their Scanning Probe Microscope (SPM). The visit was focused on the Metrological Scanning Probe Microscope (mSPM)- principles of operation as well as preparation of SPM probes. The process for preparation of the probes has significant influence on a fabrication part of miniAFM device. The visit helped to accelerate work on the final device fabrication and solve some fabrication uncertainty.

3) The visit to the University of Newcastle aimed to initiate cooperation in a collaborative project, which will lead to progress on the UWA miniAFM project (LP130100185). The nanopositioning systems, developed at University of Newcastle have the potential to be integrated with the UWA miniAFM devices. The cooperation with University of Newcastle will lead to integration of a miniAFM sensor to a standard AFM setup and perform measurements using that system, which will lead to further publication.

I would like to thank the Australian Nanotechnology Network for selecting me for this award and for providing the funding that has helped me to successfully conduct that work.

Michal Zawierta

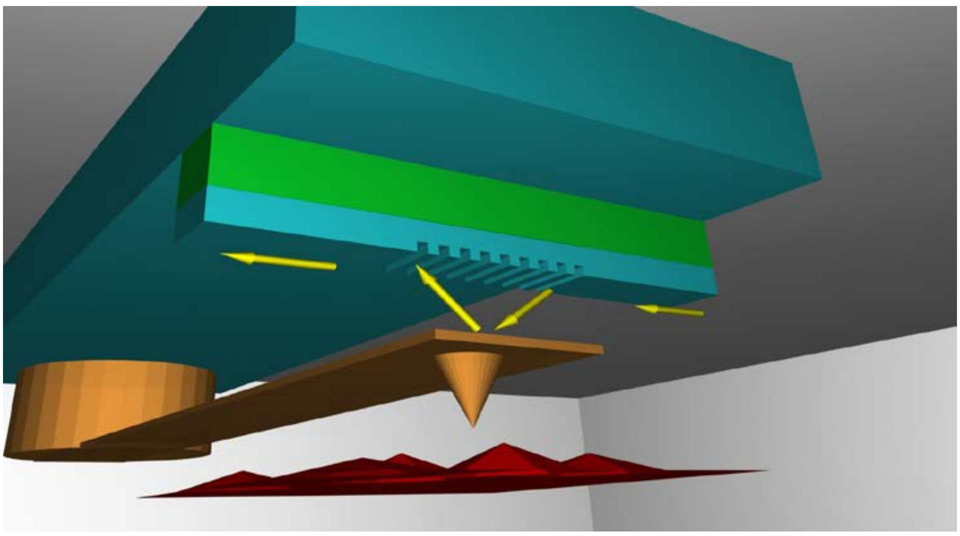
Dr Gino Putrino from the University of Western Australia visit to the University of Queensland, National Measurements Institute, Sydney and the University of Newcastle

This trip involved visits to three destinations over four days: the University of Queensland (UQ), the National Measurement Institute (NMI), and the University of Newcastle (UoN). The overarching purpose of these visits was to progress a University of Western Australia (UWA) led project aiming to develop a miniaturised atomic force microscope (miniAFM). The aim of this project is to integrate an on-chip silicon photonic position sensor into an AFM cantilever tip. This device integration is intended to lead to the creation of low-cost, compact, robust and portable AFM devices. A schematic of the miniAFM concept is shown in Figure 1.

The visit to UQ involved going to the ANFF node and utilizing their xenon difluoride (XeF2) etching process on a number of sample chips containing cantilever devices. The XeF2 etching process selectively removes silicon, while leaving many materials commonly used in microelectromechanical systems (MEMS) processing, such as SiO2 or SixNy untouched. MEMS cantilever samples were fabricated at UWA at the ANFF-WA node. These samples involved the use of a sacrificial silicon layer deposited using plasma enhanced chemical vapour deposition (PE- CVD). These samples were taken to UQ, and trialled with the XeF2 process. After some tweaking of certain process parameters, the silicon layer was successfully removed using the XeF2 process, leaving free-standing cantilevers. This process will be used in future runs for creating AFM cantilevers for this project.

The visit to NMI was to meet with the nanometrology research group to discuss their specific needs in relation to the measurement infrastructure that they require, and how the miniAFM technology platform developed at UWA can be adapted to fit their needs. Specifically, the application of our MEMS/photonics technology to the task of 1) weighing biomolecules, and 2) integration into a metrological scanning probe microscope.

The visit to UoN was to assess the capabilities of the AFM team, and find ways to collaborate in order to test the miniAFM technology. This was successful, and with the greater understanding of UoN facilities achieved, we are now designing the integration components to test the miniAFM technology at UoN.



Mr Damon Carrad from the University of New South Wales visit to the University of Queensland.

The ANN short travel visit funding was used to support a two week visit to the University of Queensland to work with Dr Bernard Mostert and Prof Paul Meredith on the influences of ionic separation and surface charge traps in our polymer electrolyte gated nanowire transistors.
We have recently been working on field-effect transistors where the conducting channel is a nanowire and the gate dielectric s a patterned polymer electrolyte consisting of polyethylene oxide (PEO) doped with $LiClO_4$. The device operates because Li^+ and ClO_4 ions traverse the polymer backbone in response to an external electric field provided by the trnsistor's gate electrode. The advantage of this configuration over traditional gate insulators e.g. silicon oxide, is that this ionic motion effectively transfer the gate charge to within I nm of the transistor channel giving a massive increase in dielectric constant, and thereb reduced operationg voltage and power consumption.

I recently developed a nanoscale patterning technique for this polymer electrolyte material. In the process of doing control experiments for this work, I found evidence tghat undoped PEO, i.e. without $LiClO_4$, could facilitate gating of InAs nanowire transistors just as effectively as doped PEO. Our suspicion was that H_2O uptake and subsequent H^+/OH^- transport was responsible for the observed behaviour. In a previous visit to UQ in March 2014 we characterised the transistor properties of my PEO-gated devices under different levels of water content using equipment at UQ designed for electrical measurements under carefully controlled humidity comditions.

During this visit we also measured the conductivity of ions in the PEO, which is central to understanding ion dynamics and determining the transisior switching speed. We did this using voltage pulse studies; we can extract the conductivity from the relaxation time for the channel current following a step in gate voltage, However, the relaxation curves had a double exponential form, stropnly suggesting that charge traps at the InAs nanowire surface also paly an important role.

The aim of this visit to UQ was to better understand and quantify the respective infulences of surface traps andionic traspprt in the PEO. To isolate the surface stafte effect, I made PEO-gated GaAs nanowire transistors, The surface states in GaAs pin the surface Fermi energy at mid-gap, unlike those in InAs, which pin the surface Fermi energy at the conduction band edge.Our data in this visit enabled us to clearly indentify the relatve contributioons to the voltage plse data: the ionic motion contribut9ijhon was independedt of channel material while the surface trap conrubution depededn on channel material, This understanding the surface response of different nanowires may be usedful for sensing applications.

Surface traps can degrade stability and performance in traditional transistor applications. We found we could overcome this in our devices by applying square-wave pulse trains to the gate at frquescioes faster that the typical trappoing time. The idea is that the charge traps can't respond quickly enough to the gate voltage, enabling the switching speed and device stability to be entirely governed by the ionic conductivity of the dielectric, We were able to turn the transistors fully on and off for speeds of up to around 10Hz. Fidelity at higher frequencies was limiited by the low ionic conductivity, but a switching sugnal was still useable at 50 Hz. This is quite high for polymer electrolyte-gated devices, and we expect that geometry optimisastions would lead to kHz operation.

The measurements were repeated at increasing levels of water content from vacumm to saturation enalbling us to calculate the ionic conductivity over the full spectrum of hydration level. We observed a stronger trend for devices with undoped PEO than for devices with $LiClO_4$. This adds further evidence that H^+/OH transport is the dominant mechanism in these devices.

In all, my visit to UQ was very successful. The results will form the basis for a publication we intend to submit to a high impact journal such as *Nano Letters* or *Advanced Functional Materials,* and will contrivbute a chapter to my PhD thesis. Capturing the switching speed measurements required us to develop an experimental method and construct the electrical measurement set-up from scratch; doing so has added a number of skills to my experimental tool-kit. The visit also forged a stronger relationship between our two groups, as discussions gave rise to ideas for future work together; I thank the Australian Nanotechnoloyg Network very much for their support.

OVERSEAS TRAVEL FELLOWSHIPS

OVERSEAS TRAVEL FELLOWSHIPS

Opportunities for Five to six Overseas Travel Fellowships valued at up to $5,000 each are offered every 6 months. This is a mechanism whereby Australian students and early career researchers can visit overseas laboratories to gain new skills and training in this emerging field of research. These fellowships are also offered for attending International Summer Schools of minimum one week duration, or longer.

Applications are ranked and Fellowships awarded to the top 5-6 ranked applications.

Ms Karina Hudson from the University of New South Wales visit to the University of Cambridge for a period of eight weeks

Overseas Travel Fellowship visit to the Semiconductor Physics Group, Cavendish Laboratory, University of Cambridge, U. K., August – September 2015

Collaborative Partners

- Professor David Ritchie's Semiconductor Physics group at the University of Cambridge in the United Kingdom, who provide the expertise in growing semiconductor heterostructures using Molecular Beam Epitaxy methods.
- Professor Alex Hamilton's Quantum Electronic Devices group with expertise in fabricating low-dimensional p-type devices.

Overview

Aim: The aim of this project was to investigate methods of fabricating in-situ back-gated GaAs heterostructures. Electrically isolated back-gates have traditionally been a challenging area of semiconductor fabrication, and there is not yet a reliable and widely used method. During my visit, I worked with the Molecular Beam Epitaxy (MBE) group to trial a method of growing and processing GaAs wafers with in-situ doped back-gates.

A day out punting on the River Cam with PhD candidates Ugo Siciliani and Egle Tylaite from the Semiconductor Physics Group.

What I did: The Molecular Beam Epitaxy growth group at Cambridge grew 4 wafers for my work – one control wafer without a back-gate, and 3 with in-situ back-gates and a diffusion barrier structures to isolate the conducting region from the back-gate. In several rounds of processing I optimised the ohmic fabrication step and provided feedback to the MBE on the behaviour of each wafer.

Outcomes: At least two of the diffusion barrier structures are promising candidates for electrically isolating an in-situ back-gate from metal ohmic contacts. I brought the wafers back to Australia to pursue further optimisation of the ohmic processing and will continue to collaborate with the Semiconductor Physics Group on this project. While in Cambridge I had the opportunity to present a poster for a 2-day internal University of Cambridge and University College London conference, and gave a talk to the Semiconductor Physics Group on recent work done at UNSW Australia.

Background

My research interest is in the emerging multi-disciplinary field of p-type or hole-based Spintronics [1-3], in particular the fabrication and measurement of tuneable quantum point contacts. The spin-orbit properties of valence band heavy holes make them of particularly high interest due to being able to electrostatically manipulate their spin [4]. Holes also have quadrupole and octopole magnetic moments in addition to the dipole moment, which can be accessed via electrostatic confinement and/or magnetic fields [5]. These properties offer some tantalizing possibilities for spin-based electronics that cannot be achieved in more familiar charge-based systems. Quantum point contacts are an ideal structure in which to measure the spin properties of holes as they allow direct readout of the spin, and their fabrication on gallium arsenide (GaAs) heterostructures is a well-developed technology within the UNSW Quantum Electronic Devices (QED) group.

In recent years, much theoretical work has focused on the how 2D confinement and crystal inversion asymmetry affects the spin behaviour of holes [6-9]. However limitations in our fabrication techniques have affected the ability of experiment to keep pace with the theoretical predictions being made about hole behaviour and potential applications in spintronics and quantum processing.

Where this project fits in

This research visit formed part of my greater PhD research into the spin properties of holes using quantum point contact devices fabricated on GaAs/AlGaAs wafer. To be able to fully characterise hole spin behaviour, full control over the direction and symmetry of the electric fields within the GaAs crystal is necessary. Current fabrication technology enables top-gating of nanostructures to induce carriers – the limit of this being that the electric field applied through the crystal is asymmetric, as shown in figure 1 (a). Ideally, the addition of a back-gate would solve this asymmetry issue, as shown in figure 1 (b).

However reliable back-gating of devices remains a challenge. The top gate electrode is usually within the order of 100nm distance from the conducting region when deposited directly on top of the wafer. Difficulties arise when one attempts to deposit a metallic back-gate onto the underside of the wafer, as the electrode on this side is of order 500μm away from the conducting region. This means that undesirably large voltages must be applied to the back gate (of order 1000V) to achieve electric field symmetry about the 2D interface in the heterostructure.

The proposed solution is to develop a wafer growth process that included an in-situ back gate (in the form of a carbon-doped layer of GaAs) within the heterostructure. The result is a back-gate that is of order 100nm from the conducting region of the heterostructure. The challenge then becomes developing a method of fabricating ohmic contacts to the conducting region that do not short to the doped back-gate. This challenge is two-fold – optimising the ohmic fabrication process to allow the ohmic metal (AuBe for p-type devices) to make contact with the conducting region, but not the carbon-doped back gate region, and growing a diffusion barrier within the heterostructure that impedes ohmic metal diffusion through the crystal (illustrated in figure 2).

The primary aim of this visit was to investigate various wafer growth and processing techniques that would allow in-situ back-gating. In preparation for my visit, the Molecular Beam Epitaxy growers (Prof. Ian Farrer) grew four modulation-doped GaAs/AlGaAs heterostructures. The control wafer (catalogue number W1071) did not have a back-gate. The remaining three wafers (W1072, W1073 and W1074) were grown with in-situ back-gates. Separating the in-situ back-gate from the control structure was a diffusion barrier to prevent the ohmic metal from diffusing below the 2D hole interface. The diffusion barriers varied between wafers; W1072 used 80% AlGaAs buffer, W1073 used a GaAs and AlGaAs superlattice buffer and W1074 used a low-temperature GaAs buffer.

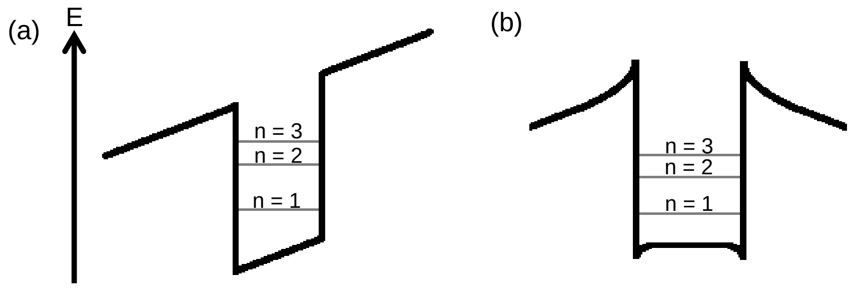


Figure 1. (a) Bandstructure diagram for a typical GaAs/AlGaAs heterostructure with top-gate electrode to induce carriers at the GaAs quantum well when a voltage bias is applied to the top gate. The first 3 energy levels are indicated. (b) Bandstructure diagram for a doped GaAs/AlGaAs heterostructure with both top and back gate electrodes to induce carriers at the GaAs quantum well when a voltage bias is applied to the ***top and back gates****, resulting in a symmetric potential.*

Results

The process of optimising ohmic fabrication for each wafer required several iterations to identify the best ohmic metal thickness, annealing temperature and annealing time for each of the three back-gated wafers.

It became apparent after several iterations of processing that two diffusion barrier structures are viable candidates for electrical isolation of an in-situ back-gate from ohmic contacts. The superlattice structure (W1073) and 80% AlGaAs structure (W1072) provide good resistance without compromising on carrier mobility at the 2D interface compared to the low-temperature GaAs structure (W1074), as shown in figure 3. An example of the I-V characteristics of the superlattice heterostructure (wafer catalogue number W1073) from one processing round with varying annealing parameters are shown in figure 4. I have brought these wafers back to Australia and will continue to pursue optimising to trialling diffusion metals and this method of further optimisation will pursued in further work.

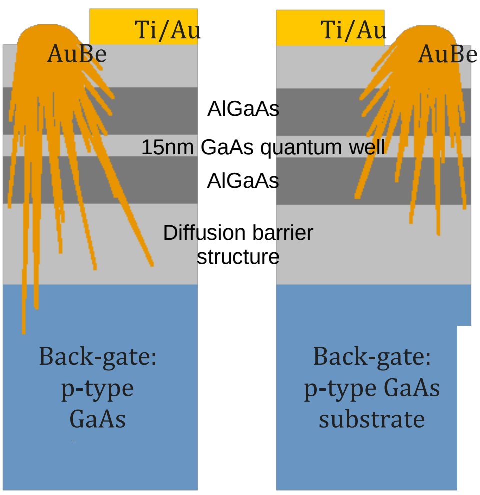


Figure 2. (a) Schematic of typical GaAs/AlGaAs heterostructure with ohmic metal diffusion in absence of diffusion barrier and undesirable shorting to the back-gate. (b) Schematic of GaAs/AlGaAs heterostructure with ohmic metal diffusion interrupted by an effective diffusion barrier.

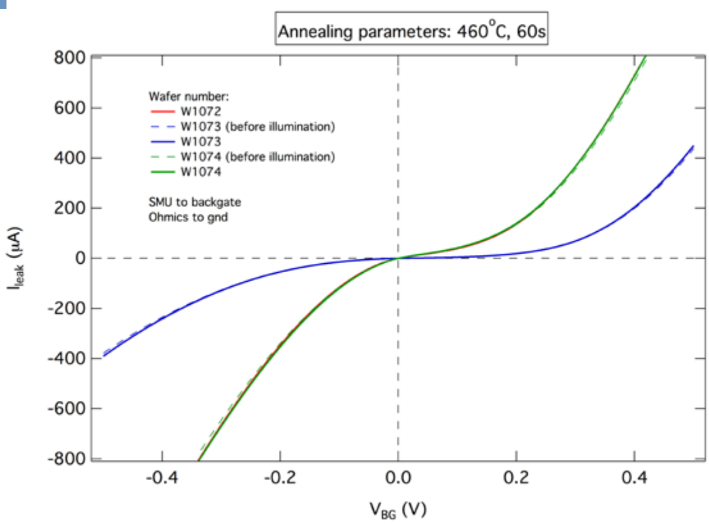


Figure 4. I-V characteristics at T = 4K of in-situ back-gate for wafers with a diffusion barriers in the form of 80% AlGaAs (W1072), GaAs and AlGaAs superlattice (W1073) and low-temperature GaAs (W1074) for a given set of ohmic annealing parameters).

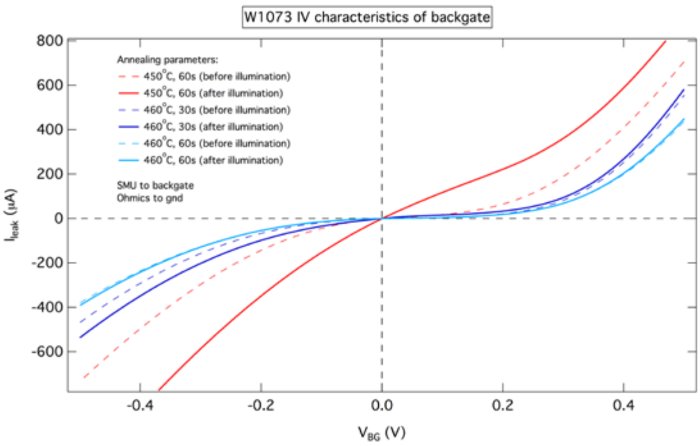


Figure 4. I-V characteristics at T = 4K of in-situ back-gate for wafer with a diffusion barrier in the form of a superlattice structure.

In the usual (inevitable?) manner of experimental physics, I encountered some technical difficulties with some equipment upon arrival. These apparent difficulties proved to be a great opportunity to familiarise myself further with the subtleties of semiconductor fabrication. The collaborative problem solving in a search for novel work-arounds to my difficulties resulted in me building a fantastic rapport with the laboratory managers and post-doctoral researchers.

A highlight of the visit was attending a 2-day internal conference hosted by Trinity Hall college for collaborating researchers from the University of Cambridge and the University College London to discuss developments within their research groups and ideas for future work. The conference included a poster session for students of the groups to present their PhD research. This provided an opportunity for informal discussion with senior researchers from the Cavendish Laboratory and UCL and strengthened ties between UNSW and Cambridge groups. I also had the opportunity to present some recent work done by the Quantum Electronic Devices group to the Semiconductor Physics Group's Journal Club.

Summary

This research visit was enormously beneficial to my skills as a researcher, my PhD project and the fabrication abilities of the Quantum Electronic Devices Group. The opportunity to work in the semiconductor fabrication cleanrooms of world-class research institution greatly broadened my knowledge of fabrication processes. Most significantly, the opportunity to work in conjunction with a Molecular Beam Epitaxy group and directly discuss wafer performance as results came through was one I would not have enjoyed at UNSW.

Acknowledgements

I would like to thank the Australian Nanotechnology Network and the Australian Research Council for jointly funding this research trip.

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Mr Majid Mortazavi from Monash University to visit the University of Pennsylvania, USA for a period of three months.

Australian Nanotechnology Network Overseas Travel Fellowship Report University of Pennsylvania, May – July 2015

Porous Aromatic Frameworks as Negative Electrode for Rechargeable Batteries: A First Principles Study

Majid Mortazavi
Department of Materials Engineering, Monash University

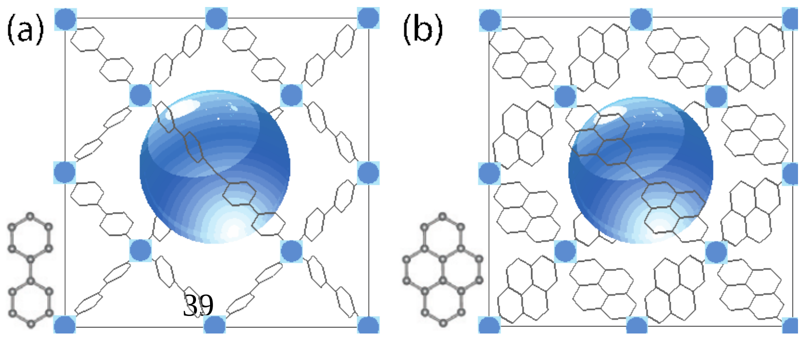
Background

Increasing dependence on fossil fuels has raised serious concerns about global warming. The situation has fueled an active research on utilization of renewable energy resources, and strategies to store them as they are intermittent in nature. Rechargeable batteries are proved to be the most sustainable and efficient energy storage solution. There has been an on-going research on development of high performance rechargeable batteries, by which it is hoped a large integration of green energies into the grid as well as addressing the need for electric vehicles and portable electronic gadgets, could be enabled. Vigorous exploration on identifying new anode materials has led to the recognition of various materials with potential application as an anode. In spite of the progress, the technology is at infancy and there are challenges involved with their use.

Porous frameworks are recently being explored as a viable new class of materials for active electrode materials. Among the most attractive candidates are metal-organic-framework, covalent organic frameworks, and the so-called Prussian Blue structures. They are reportedly forming anodes by storing Li^+ via conversion-reaction mechanism. The ultra-porous nature of these materials, through which a large number of ions can be accommodated, potentially can open access to large capacities. In addition, availability of open channels and externally accessible pores and facets may allow ultra fast mobility of ions of direct benefit to improving charge/discharge rate.

Inspired by one of the most stable structure in nature—diamond—a new class of ultraporous framework called porous aromatic frameworks (PAFs) is recently synthesized with exceptional properties. They can be readily designed through the replacement of the tetrahedral C-C covalent bonds in diamond with organic linkers. The diamond-like topology makes them structurally stable even at elevated temperature up to 500℃. Depending on the type of the linker, they are classified into four groups PAF30X, X=1–4, where X is the type of the linker. Recently, their role as a sacrificing host or buffer for Sulfur in Li-S batteries is studied to prohibit the detrimental shuttle phenomenon during the formation of polysulfide. To the best of our knowledge, their application as an active anode material for rechargeable batteries have not been studied yet.

Schematic Representation of PAFs and linkers under Study. (a) PAF- biphenyl (with biphenyl linker), (b) PAF- pyrene (with pyrene linker).



Aims

We study the intercalation behavior of two ions (M = Li, Na) into two types of PAF302s, i.e. PAF302-biphenyl and PAF302-pyrene (shown in Fig. 1), for LIBs and NIBs using the state-of-art density functional theory calculations. We chose PAF302s (which is also known as PAF-1) because they are the only synthesized PAFs in the laboratory. Hereinafter, we use the term PAFs when addressing the PAF302s used in this study, unless they addressed or mentioned specifically in the shortened form of PAF302-bi (PAF-biphenyl) and PAF302-py (PAF-pyrene).

We performed spin-polarized density functional theory (DFT) electronic structure calculations using the Vienna Ab initio Simulation Package. The optimized lattice parameters of 23.44 Å and 23.75 Å were obtained for PAF-bi, and PAF-py, respectively in good agreement with experimental and computational values. In addition, a band gap of 2.85 eV and 2.15 eV are found for the PAF-bi and PAF-py, respectively, again in reasonable agreement with experimental values. In order to study the concentration-dependent intercalation, we constructed a concentration range as M_xPAFs (M = Li, Na) for $0 \leq x \leq 1$ per formula unit by gradually filling up the adsorption sites.

Preliminary Results and Discussion

The energetic properties in the form of energy convex hull for M_xPAF-bi, and M_xPAF-py for a concentration range of $0 \leq x \leq 1$ per formula unit are shown in Fig.2. On the left axes the binding energies, and on the right axes the formation energies are given. The energies of all the distinct relaxed configurations including the ground-states (gs) as well as the metal stable (ms) phases are shown. It can be seen from Fig. 2a that the binding energies of Li_xPAFs are sufficiently lower than the cohesive energy of Li-bcc (-1:61 eV) suggesting to lithiation in favor of avoiding phase separation during the progressive lithiation. The negativity of the formation energies also indicates that these lithiation compounds are thermodynamically feasible to form over the entire concentration. On the contrary, sodiation in PAFs, as shown in Fig. 2b, is favorable against phase separation just beyond a certain concentration ($x \geq 0.60$ as in Na_xPAF-bi), with respect to the cohesive energy of Na-bcc (-1.1 eV). Similarly, a partial formation of the sodiated PAF-bi intercalation compounds is seen from the formation energy results.

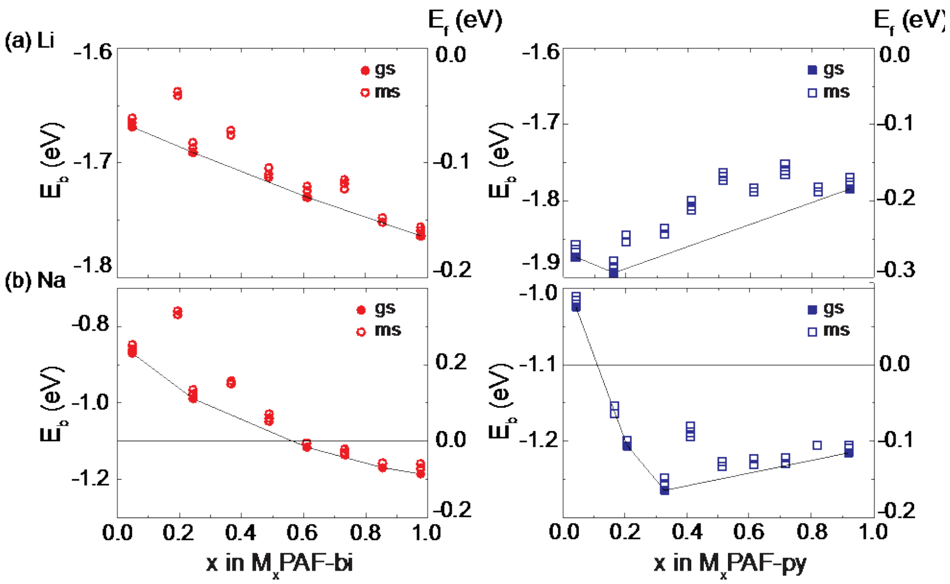


Fig. 2 Energetic Properties During Lithiation and Sodiation in PAF-py. Energy convex hull for MxPAFpy (a) Li, (b) Na

The Visit

The visit proved me an opportunity to learn indispensable skills face-face in nanoscale simulations at Prof Shenoy's group who has worked on this field over 20 years resulted in a wide range of in-house programs/facilities. Weekly discussions I have had over this project with him and his group members had given me a great deal of knowledge transfer to shape up this work during final stage of my PhD study. In addition, I grabbed the opportunity to meet some outstanding research groups in this field in USA, e.g. Prof. Ceder's group in MIT University, and Yi Cui Group in Standard University. On top of all these, I have gained a valuable experience working in a new environment interacting with many researchers in the field, which I have found quite beneficial for my future career growth.

Acknowledgements
I would like to thank Australian Nanotechnology Network for giving me this opportunity via Travel Fellowship scheme enabling me to extend my skills and gain valuable experience during final stages of my PhD study. Also many thanks to Prof. Vivek Shenoy's group at Department of Materials in University of Pennsylvania (USA) for having me during my short visit. Last not the least, special appreciation to my supervisor, Dr. Nikhil Medhekar, and Department of Materials Science and Engineering in Monash University for their constant support on this matter.

Outcome
The project significantly extended in terms content, i.e. analyses and discussions. I managed to finalize the manuscript shortly after return. It is currently under back-and-forth revisions between co-authors. It is expected to be submitted for publication prior to mid this year.

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Dr Anthony Chesman from CSIRO to visit Columbia University, USA for a period of twelve weeks

***Dr Anthony S. R. Chesman* - 12 January 2015 – 30 March 2015**

Owen Group, Chemistry Department, Columbia University (New York, USA)

The Owen Group at Columbia University has developed a class of chalcogenide sources that can be utilised in the synthesis of metal sulfide and metal selenide nanocrystals. The functionalisation of these precursors offers a means of controlling their decomposition kinetics. This control permits an experimentalist to finely tune the resultant nanocrystal size and shape, without changing other reaction parameters, eliminating a number of sources irreproducibility that can arise during nanocrystal synthesis. The use of these chalcogenide sources has also been shown to produce nanocrystals on large scales, which is typically not possible with syntheses employing a "hot-injection" approach.

My work in the Owen Group focussed predominantly on the synthesis of $CuInSe_2$ nanocrystals, which are fluorescent and may find future application in display and medical diagnostic technologies. While I was able to synthesise $CuInSe_2$ nanocrystals using their new class of precursor, there were significant issues in ensuring the particles remained colloidally stable in solution, resulting in the formation of insoluble aggregates. $CuInSe_2$ is a system that is well known to exhibit instability in solution, a property that may be attributed to the fact that the system consists of elements that display disparate coordination chemistry, requiring the use of a number of different ligands to sufficiently stabilise the surface of the nanocrystals. Further efforts will be required to determine what set of reaction conditions and co-ligands can be used to increase the stability of this material.

While in the Owen Group I also learned how to synthesise these chalcogenide sources for use in future nanocrystal syntheses. As these precursors can be synthesised using relatively cheap reagents in the presence of air, I believe they will soon become widely adopted by the nanocrystal community after the initial results of the Owen Group in this area are published in the coming months.

In an additional side project, I worked with Dr Octavi Semonin on a proposal at the Bragg Institute for beamline time on Koala, the single crystal neutron diffractometer. If the proposal is successful we will look at the crystalline structure of organic inorganic lead halide perovskites over a variety of temperature ranges with different cations present in the cavities of the Pb–I lattice. It is hoped that the use of neutron diffraction will offer greater insight into the positioning of the cations in the lattice, as that method is better able to differentiate between C and N atoms and locate the position of hydrogen atoms for hydrogen bond determination. As the field of lead halide perovskites has recently undergone explosive growth due to their incorporation into high-efficiency thin film solar cells, the results of these experiments may be of interest as they offer an insight into how to further improve the fabrication of these materials.

I wish to thank the ANN for the funding provided through the Overseas Travel Fellowship. In addition to participating in the studies that I have described above, the trip allowed me interact more broadly with a group of enthusiastic graduate students and postdoctoral fellows that are engaged in a number of other fascinating areas of nanotechnology. It is my belief that the connections and collaborations this trip helped foster will yield exciting advances in the field of nanocrystal synthesis and characterisation in the future.

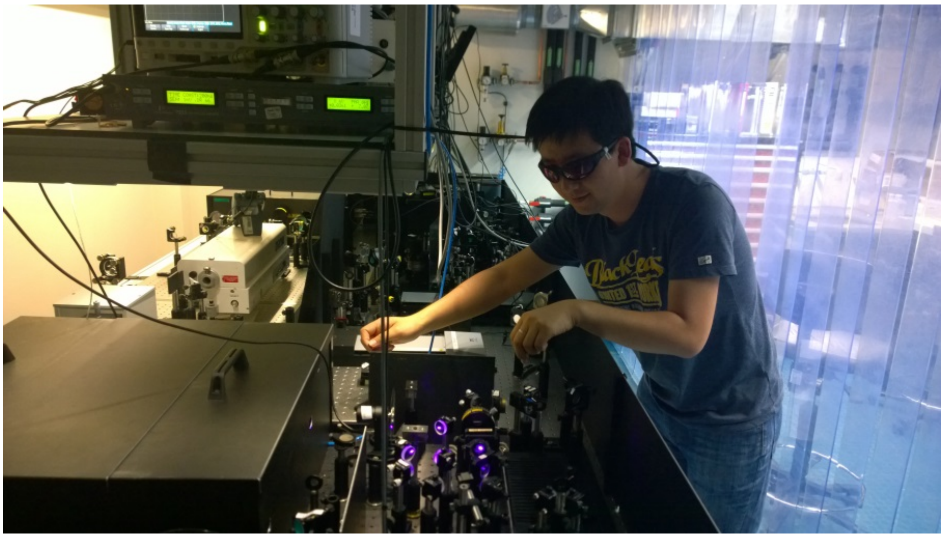
Mr Fenlong Wang from the Unversity of New South Wales to visit the Max Plank Institute for Polymer Institute, Germany for a period of one month

Mr. Fenglong Wang from UNSW visit to the Max Plank Institute for Polymer Research, Germany
Travel date: From 1st of March, 2015 to 31st of July, 2015.

Host supervisors: Dr. Ellen Backus, Prof. Mischa Bonn.

Thanks to the financial support of the ANN Overseas Travel Fellowship, I was able to exchange to the Department of Molecular Spectroscopy at the Max Plank Institute for Polymer Research (MPIP) in Germany. In MPIP, I worked as a visiting PhD student under the supervision from Dr. Ellen Backus and Prof. Mischa Bonn. The purpose of this research stay is to investigate the water splitting process on the surface of TiO_2 thin films with sum frequency generation (SFG) spectroscopy and probe the dynamics of the photo-induced charge carriers with optical pump THz probe (OPTP) technique. Since the SFG is only sensitive to the interfacial species between two bulk bodies, it provides a powerful route to understand the surface processes. In photocatalytic water splitting process, the water molecules adsorb on the surface of the catalysts and decompose into hydrogen and oxygen. Upon the irradiation from the light with larger energy than the band gap, the free charge carriers will be created. The photo-induced electrons will be involved into the water reduction reaction and the holes in the valence band will participate into the oxidation reactions. TiO_2-based nanocatalysts have been studied for more than 40 years as the water splitting media, but the process of the water molecules splitting is still not clear. In this project, we mainly focus on how the water molecules adsorb on the surface the prepared TiO_2 thin films. Through investigation, we found there are two types of water molecules at the interface: loosely hydrogen-bonded water molecules and tightly hydrogen-bonded water molecules. The investigation on the water molecules splitting process is still undergoing.
Besides, during those five months stay in MPIP, I got the chance to collaborate with Dr. Zuanming Jin on the OPTP measurement on In_2S_3/Pt-TiO_2 nanocomposites. Our results indicated that the electron transfer from the conduction band of In_2S_3 to that of TiO_2 and further into Pt nanoparticles can take place within 5 ps. This finding is very important for us to understand the enhanced activity on the nanocomposites and the results will be submitted to Journal of Physical Chemistry Letters for publication.

In addition, with this fellowship, I also managed to attend the Spring Meetings of European Materials Society 2015 in Lille, France. On this conference, I got the chance to talk to a lot of the researchers from all over the world and learn a lot of knowledge by attending to the lectures. Besides, I presented my work on the Au embedded B-doped TiO_2 catalysts for photocatalytic hydrogen generation (which was published in ACS Catalysis) in the session of Environmental Materials. And I was quite honoured to obtain the Young Scientist Award of EMRS, which fully recognized our work. This also offered me an opportunity to show the recent important research output in Partcat Group led by Prof. Rose Amal, UNSW.



In the THz lab

In summary, the research exchange to MPIP for 5 months is meaningful. I got the chance to understand the photocatalytic water splitting process with more depth, especially the valuable discussions with the researchers in Germany enriched my understanding on the dynamics of the photo-induced charge carriers.

I am very grateful for getting the financial support from ANN and good luck for every successful winner of this prestigious fellowship.

Mr Thomas Shiell from the Australian National University visit to the Carnegie Institution of Washington for a period of six weeks.

Mr Thomas Shiell
The Australian National University

Destination: Carnegie Institution of Washington, Geophysical Laboratory, Washington DC (supervised by Dr Reinhard Boehler)

Travel Dates: October 16th 2015 – December 12th 2015

The primary focus of this trip was to use the high-pressure laser heating facilities at Geophysical Laboratory (Carnegie Institute of Washington), to induce phase transformations in nanocrystalline and amorphous carbon precursors. The objectives were to both gain expertise in the field of experimental high pressure laser-heating, and to create a new higher order phases of carbon with ultra-hard materials applications.

There were two major research goals of this trip:

1. Investigate the transformation boundary between graphite and diamond.

2. Attempt to access higher order phases of carbon by subjecting nanocrystalline carbon precursor materials to extreme pressures and temperatures.

Motivation and background:
Although there have been many studies [1-3], on the high-pressure high-temperature transformation process between sp^2 bonded graphitic precursor materials to the more industrially-useful sp^3 bonded diamond phase of carbon, a complete understanding of this phase transformation process remains elusive.

Crystalline materials are often stable materials with high energy barriers and hence require a significant boost to transform to other phases. In this set of experiments is postulated that if the precursor material is nanocrystalline or amorphous in nature it may be able to access higher order phases under less extreme conditions of pressure and temperature. Simulations of the P-T behaviour of carbon suggest that the high pressure, high temperature conditions required are in the order of 1000 GPa and temperatures of ~7000 K. Under these conditions carbon is predicted to form a new, as yet experimentally unseen, ultra-hard phase, the so-called bc8 phase [5]. It is possible that subjecting the precursor material to these extreme conditions may transform and act as seed layers from which growth of higher order phases will nucleate.

The samples used in these experiments have different initial bonding states and varying level of structural order. They include natural graphite flakes, 'glassy' carbon, and tetrahedral amorphous carbon (ta-C) grown via a vacuum cathodic-arc technique.

Facilities:
At Geophysical Laboratory I had access to diamond-anvil-cells (DACs) specially-designed (non-standard) for the extreme high pressure high temperature experiments to be

Figure 1: Diamond-anvil-cell.

conducted. An example of a DAC is shown in Fig. 1. All diamonds were cut and polished on site to adhere to my specific pressure and temperature requirements. To compliment these state of the art DACs I had access to prototype high pressure Argon gas loading system which allowed me to pressurise and heat the carbon samples in a hydrostatic environment. Once gas loaded hydrostatically the sample were then focused upon by a 100 W YLF laser which is used to heat small portions of the samples to several thousand degrees without compromising the structural integrity of the diamond anvil cell. The unique laser heating system built at GL, seen in Fig. 2, is designed to accurately deliver millisecond pulses and automatically record temperature to within ± 10°K [4, 6].

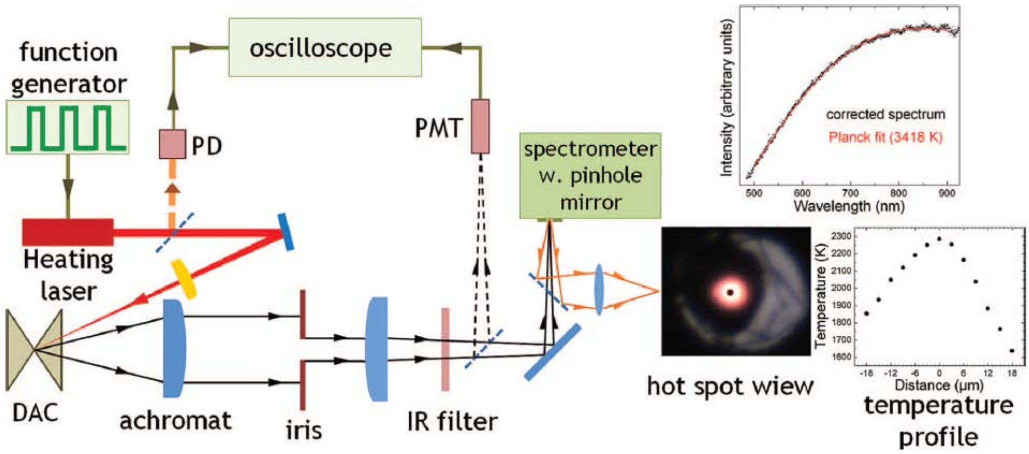


Figure 2: Schematic of the optical setup for laser heating in a diamond anvil

Results:

Sample type	Pressure (GPa)	Laser heated (Y/N)
Glassy carbon	24	N
	32	N
	40	N
	52	N
	21	Y
	43	Y
ta-C	28	N
	55	N
	68	N
	21	Y
	54	Y
	55	Y
	76	Y
Graphite	24	N
	53	N

Table 1: Pressure-temperature parameters of the experiments for all recovered samples.

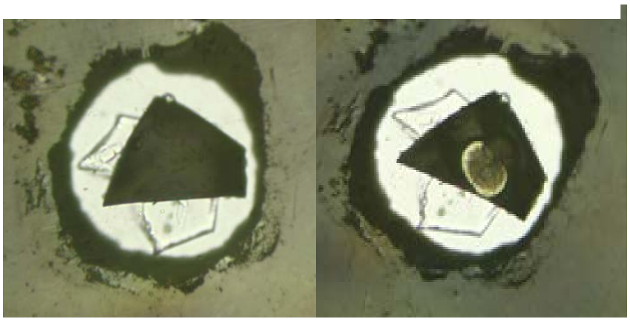


Figure 3: Glassy carbon before and after a 20 millisecond pulse.

As it is difficult to attain quality data from in-situ high pressure measurements of carbon materials in diamond anvil cells, the approach was to subject the samples to a range of extreme temperatures and pressures, and then recover them for later analysis using Raman spectroscopy and electron microscopy.

Over 30 samples were successfully loaded and tested and 15 were successfully recovered and are awaiting further analysis.

All laser-heated samples were loaded into DACs on top of a 10 µm thick piece of sapphire. All laser heated samples received one 20 millisecond pulse (the laser power and focus levels vary).

Several pieces of natural graphite and glassy carbon were laser heated at pressures ranging from 20-55 GPa and temperatures up to 5000°K, in hydrostatic and non-hydrostatic environments (see table 1). Figure 3 shows a piece of glassy carbon before and after laser heating. The clear centre has not been ablated by the laser spot. From this image it appears that the centre material has transformed into a diamond-like material that is transparent to visible light. Raman spectroscopy and electron microscopy will be applied to investigate the transformation front between the graphitic glassy carbon (opaque) and the diamond-like spot (transparent).

Multiple tetrahedral amorphous carbon samples were laser heated and recovered after experiencing pressures ranging from 25-80 GPa and temperatures up to 5000°K (see table 1). Images of a ta-C flake in a diamond anvil cell before and after laser heating are shown in Fig. 4. The sample already started off in an amorphous diamond-like state, the energy absorbed by the laser pulse has caused the material to crystallise, effectively annealing out defects, making the colour appear lighter.

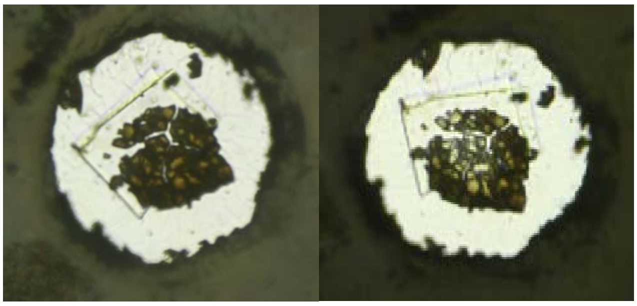


Figure 4: ta-C before and after a 20 millisecond pulse.

Future direction of the research:

All recovered sample are now undergoing Raman spectroscopic analysis where the structures and bonding types will be analysed. Any interesting regions will be imaged using an SEM and sectioned using a FIB. High resolution images and diffraction patterns will be taken to investigate bond lengths and crystallinity. Electron energy loss spectroscopy will also be used to investigate any permanent changes to bonding composition and density.

A personal note:

I would like to personally and formally thank the Australian Nanotechnology Network and the Australian National University for providing me with the funding to undertake this trip. The facilities at Geophysical Laboratory are amazing and I feel my research was given a real 'kick-start' by undertaking this research trip.

The staff at Geophysical Laboratory were very their kind and welcoming, especially my host Dr Reinhard Boehler. I was very fortunate that he gave me free reign on his own uniquely designed laser heating system, diamond-anvil-cells and other prototype equipment. I made the most of my time at GL by attending as many of the seminars as possible. I also had the opportunity to participate and contribute to a weekly post-doc journal club focused on cutting edge experimental techniques.

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Mr Julius Zieleniecki from Flinders University visit to the National Institute of Standards and Technology in Washington, DC for a period of six weeks
Email. Sent 14/01/2016

ANN Report:

Mr Julius Zieleniecki from Flinders University visiting NIST Washington D.C. (September – November 2015)

Supervisors: NIST supervisor: Dr. Joseph Robertson; PhD Supervisors: Dr. Ingo Koeper and Prof. Joe Shapter.

Funding:

- ANN Overseas Travel Fellowship
- Flinders University Overseas Field Trip Grant
- Flinders Nano Centre for Nano Scale Science and Technology

Overview: The current understanding of the interaction and operation of membrane proteins with antigen molecules is developing slowly. Integral membrane proteins (IMP) are inherently difficult to study [1, 2] in part because they exist in the amphiphilic environment at the interface between lipid membrane and up to two asymmetric aqueous fluids [3, 4]. Because of the complex environment where IMPs function, it is difficult to impossible to guarantee that the structures derived from traditional analytical methods (such as crystallography) match the functional form of the protein. To overcome this obstacle and provide new complimentary analytical methods the tethered lipid membrane was developed [5]. They are a unique class of synthetic substrates with naturally derived lipids organised into a double-layer. They are able to provide a biomimetic interface to study membrane-protein interactions using electrical as well as high-energy particle methods [6]. This research initially began looking at simplified interactions of drugs with membranes using Electrochemical Impedance Spectroscopy as well as Neutron Reflectometry. It has since developed into looking at the effect of moieties on proteins embedded in membranes, elucidating the effects of specific drug moieties, in this case hydroxyl groups on different length alkane backbones.

The experiments at NIST were a collaborative project between two groups. The first being that of John Kasianowicz and Joseph Robertson which studies membrane proteins in membranes and in Nano-pores, and the other headed by Kin Cheung, specialising in electrical engineering, studying fast switches (GHz electronics), noise filtering, specialised insulating surfaces, instrument development, and failure modes of silicon electronics. Cheung's group also developed High-Definition Electron Paramagnetic Resonance (HD-EPR) Spectrometer to study Si-Si single bond breakage. The second generation (prototype) HD-ESR instrument, was used to study the interaction of ethanol with lipids in membranes at different positions in the membrane.

A commonly used tethered membrane (DPhyTL-DPhyPC) organised on top of a metallic surface such as gold is able to be measured electrically, however the output of the data has little vertical resolution. Neutron reflectometry, though more specific, is limited by the quality of the data and model. EPR on the other hand, is specific to the position and perturbation of the tag. By only having the tags visible, EPR is able to collect physical properties and dynamics of membrane changes over time.

Aims of the visit:

- To redesign a custom flow cell which would be useable with both Electrochemical Impedance Spectroscopy and EPR concurrently which includes a template stripped gold surface, appropriate for tethered Bilayer Lipid Membrane (tBLM) research.
- To determine the limit of detection (LOD) of the EPR at various probe-spin concentrations
- To introduced ethanol at various concentrations and characterise the changes to the membrane at different heights
- To determine the effect of ethanol on membranes under different circumstances
- Give a presentation to individuals at NIST about tBLMs and future EPR experiments

Experimental Design:

tBLM: TSG or evaporated gold surfaces were coated with DPhyTL from a solution of DPhyTL in ethanol (0.2 $mg.ml^{-1}$) over the period of 24 hours. DPhyPC-5,9, or 12,DOYL-PC lipids were used during EPR experiments.

EIS: EIS tests were taken on an Autolab PGSTAT302. Frequency range: 0.2 mHz to 0.5 MHz in 5-sine mode using 45 data points. Analysis was completed in Z-View 3.2b.

EPR: A custom built 8 GHz EPR instrument was fitted with a liquid flow cell where a DPhyTL lipid monolayer was already organised atop a TSG gold substrate. After the quality of the background was established and spectrum taken, bilayers were organised and further spectra taken.

Results:

Flow-cell design: Considerable time was spent redesigning the manufacture process as well as design of flow-cell such that its shape and required EPR properties would be applicable in conjunction with a TSG surface along with a deposited monolayer of DPhyTL prior to buffer incorporation and bilayer deposition. An early version of the cell can be found in Figure 1.

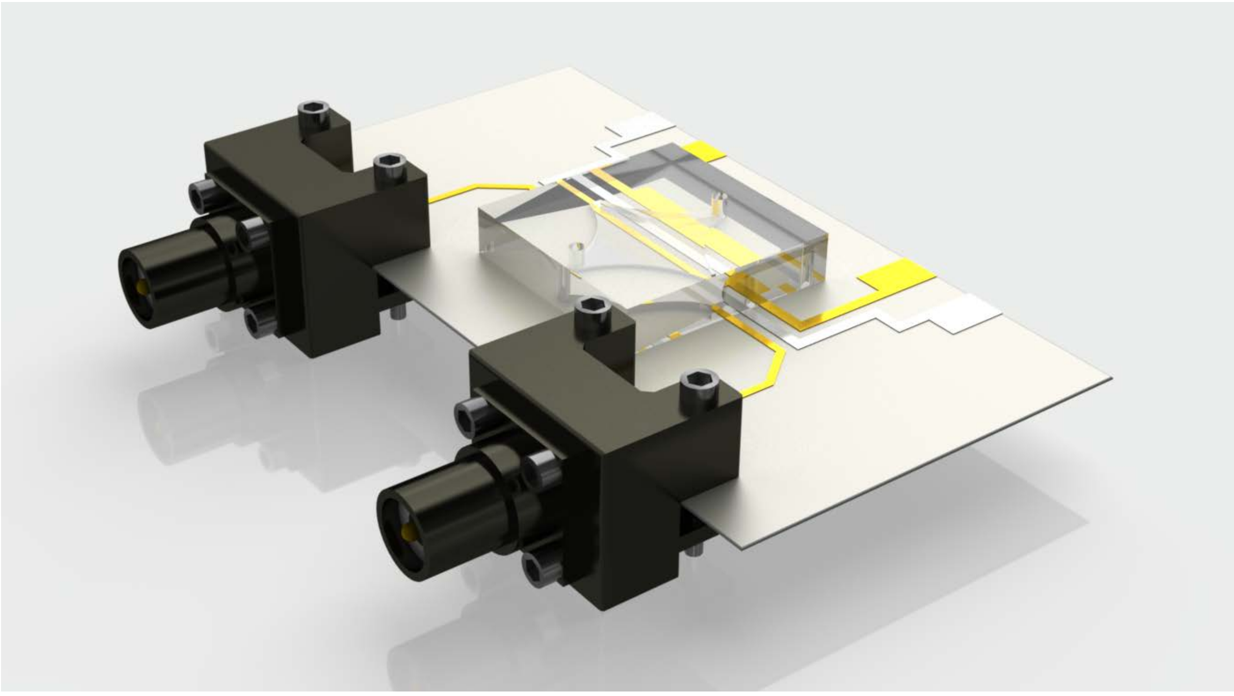

Figure 1: Initial prototype flow-cell design for combined HD-ESR and EIS.

LOD tests: Initial experiments were generally insensitive to the spin-label of Doxyl-PC lipids. By developing a set of standard dilutions, the experiments limit was able reached and instrument sensitivity needed to be improved. Standards were also made and tested against commercial instruments. Repeated improvements to the custom instrument lead to increased sensitivity and better peak resolution, however this came late in the study process meaning future experiments are underway.

Bilayer functionality: Bilayers using DoxylPC groups were not only successfully formed on top of DPhyTL, a unique method of bilayer formation was developed for these experiments. As the DOXYL group is known to be sensitive to ethanol, catalysing the oxidation of the OH group, the bilayer formation process required significant adjustments.
Ethanol introduction: Ethanol experiments were initially started however due to flow-cell improvements and extended sensitivity issues, ethanol's effects were not rigorously tested, even at a single height within the membrane. To this end, spins at different heights were not tested.
Presentations: I gave a presentation at the Biweekly Membrane Research meeting at the NIST Center for Neutron Research. The work was well critiqued and received.

Conclusion: Development of the flow-cell, measuring surface, and instrument is ongoing. The flow-cell's surface was refined until TSG-EPR lines were successfully organised with DPhyTL and DPhyPC (or DOXYL-PC) lipids. The EPR flow-cell volume and working surface area was iterated and improved, and the EPR instrumental setup was re-adjusted and modified to improve spin sensitivity. Protocols were developed for future experiments, which with a little further development should lead to successful repeated experiments and many future articles.

References:

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Ms Leonie Van T Hag from the University of Melbourne visit to ISA centre for storage ring facilities in Aarhus, Denmark for 25 days

Australian Nanotechnology Network Travel Fellowship Report – Leonie van't Hag

I am very grateful for the contribution of the Australian Nanotechnology Network towards the costs of my research visit to ISA centre for storage ring facilities in Aarhus, Denmark for Synchrotron-Circular Dichroism Spectroscopy Experiments. The research at ISA took place from September 6th – October 3rd, 2015 with the exemption of September 14-18th because of conference attendance in Berlin, Germany.

My PhD looks at the secondary structure of peptides in nanostructured lipidic cubic mesophases with different bilayer thicknesses. We need to understand the effect of the lipid mesophases on the membrane protein structures; structural changes may be small but they could affect membrane protein and peptide function. This needs to be investigated in order to confirm that the active form of the proteins and peptides is used for structure determination, drug delivery or in biosensors.

Extensive preliminary experiments to study the secondary structures of membrane proteins and peptides were performed at the lab-based Circular Dichroism (CD) spectroscopy instrument at the Bio21 institute in Melbourne. The study of membrane proteins in lipid mesophases using conventional CD is made difficult by the large background absorbance of the lipids (Figure 1A), as indicated by the limited wavelength range of the data with the bulk cubic phase of monoolein (MO, 210 – 260 nm) as shown in red.

Synchrotron-Circular Dichroism Spectroscopy (SR-CD) has the great advantage that it can cover a much wider wavelength range and has a much higher flux than lab-based CD. An example of the SR-CD spectra measured at ISA in Aarhus (Denmark) of a peptide in detergent solution (OG) and in MO cubosomes (175 – 280 nm) showed that the secondary structure of the peptide was significantly different when embedded in a lipid bilayer compared to the detergent solution (Figure 1B). I was able to perform measurements on three different peptides in four different lipid systems, temperature scans on one peptide in three different lipid systems, and two different peptides in oriented lipid bilayers formed by four different lipids.

The development of the methods and the actual measurements went really well with the help of the beamline scientists Nykola Jones and SØren Hoffman. I was able to measure enough data to add to at least one or two papers, and a large amount of data analysis was also performed with the help of Nykola and Søren. It was a really good experience to visit an overseas synchrotron and the methods that we developed at ISA can also be applied to improve our lab-based measurements in Melbourne since Nykola and Søren are very experienced in CD measurements. All together this was a really successful trip and it will help me a lot to finish my PhD in the next year.

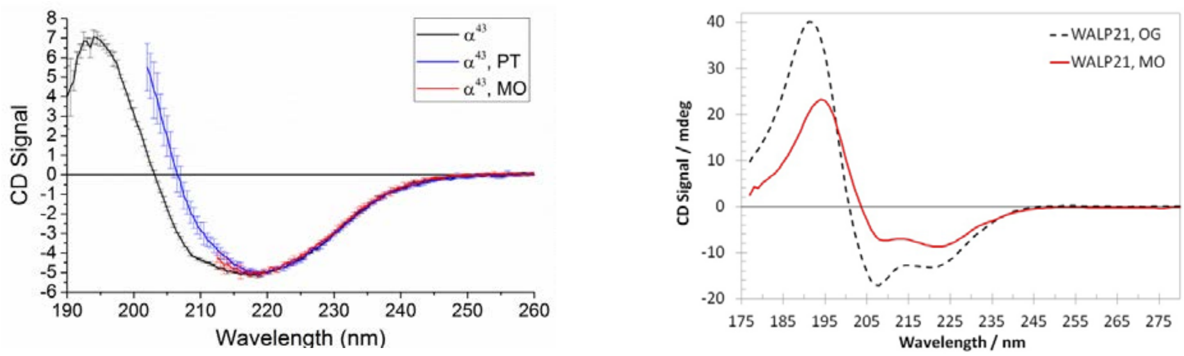


Figure 2. Example of (A) results from a lab-based CD instrument on a β-barrel membrane protein in detergent (α^{43} in black) and in the monoolein cubic phase (α^{43}, MO in red), compared to the results from (B) the synchrotron-CD instrument at ISA for an α-helical peptide in detergent solution (WALP21, OG in black) and the monoolein cubic phase (WALP21, MO in red). There is a significant improvement in the available wavelength range if you compare the data in (B) compared to (A).

Ms Solmaz Jahangir from the University of New South Wales visit to the School of Material Science and Engineering at MIT and North Carolina State University for a period of three months

Ms Solmaz Jahangir from university of New South Wales visit to Massachusetts Institute of Technology and North Carolina State University (1st Sep-30th Nov 2015)

Purpose of the visit:

The aim of my visit was to acquire competence in making patterned single crystal nickel films by using fabrication facilities available at MIT (mainly electron beam evaporation and photolithography systems). Furthermore, I was able to exchange knowledge and observations with the expert scientist in the field of thin film dewetting which allowed me to design a new patterning mask and gave me insight for my future experiments in UNSW. The result will elaborate a model to predict the morphological evolution in anisotropic systems.

Research background:

We study thermal instabilities in solid state dewetting of anisotropic metallic thin films. We have recently proposed the possibility of guiding the templated instability to fabricate nano structures with regular but complex shapes. This is of both fundamental scientific and technological interest. From the point of view of basic science, this is a unique example of templated instabilities in anisotropic systems. From the point of view of technology, the ability to control the evolution that results from this instability leads to the ability to control the reproducible formation of regular features having a higher degree of complexity and having much smaller feature sizes than the original patterned structure.

Conducting this search involves fabricating the patterned metallic films (at MIT labs) and monitoring the dewetting process (at UNSW labs).

Research findings:

The experimental work performed at MIT labs allowed me to find the optimum parameters for patterning the Ni film via photolithography technique. We were able to troubleshoot the excessive hole formation during the dewetting by changing the surface cleaning technique to oxygen plasma cleaning.

I also had the opportunity to anneal the samples in a reducing environment and compare the result with the one obtained at UNSW in vacuum condition. In both environments dewetting via fingering instability was observed. The finger spacing was comparable to the intended wavelength above some characteristic length, which suggests the possibility of templating the fingering.

Visit outcomes:

The visit has been extremely fruitful and productive. We achieved most of the research aims and submitted a paper to Acta Materiala based on our findings during the last two years of collaboration.

Furthermore, I had a chance to attend in MIT's materials day symposium 2015 and present a poster. During my time spent in the United States, I also gave two seminars to our collaborators' research team at North Carolina State university and MIT which enabled me to introduce my area of research and the capabilities that we have in UNSW which can lead to further future collaborations.

Overall this visit enabled me to obtain international recognition, build network and experience the work environment in the United States; Having that insight will help me to decide about my career path.

Mr Hamish Brown from the University of Melbourne visit to the University of Tokyo for a period of three months

Hamish will be visiting the University of Tokyo in 2016.

Mr Mitchell Nothling from the University of Melbourne visit to the University of California, Santa Barbara for a period of six months

Mitchell will be travelling in 2016

Dr Daniel Sando from the University of New South Wales visit to the Institute of Physics at the Taiwanese National Laboratory for a period of one month.

Daniel will be visiting the Taiwanese National Laboratory in 2016

Mr Jason Brenker from Monash University visit to the Paul Scherrer Institute (PSI) in Villigen Switzerland for a period of four months

Jason will be visiting the Paul Scherrer Institute in 2016

Mr David Waddington from the University of Sydney visit to the Martinos Centre at Massachusetts General Hospital for a period of six weeks

David will be visiting the Martinos Centre in 2016

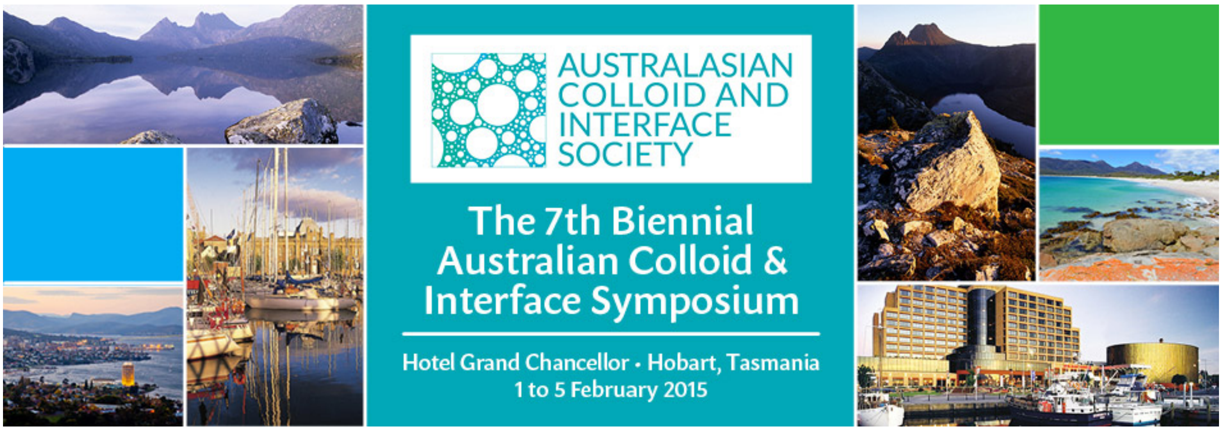
WORKSHOPS, CONFERENCES AND EVENTS

WORKSHOPS, CONFERENCES AND EVENTS

The purpose of the workshops, Conferences and Events is to take stock of the status of the field nationally and internationally, identify emerging areas of research and exchange information and to identify opportunities for collaboration and training. A Large number of ECRs and students have been supported to attend these events.

7th Biennial Australian Colloid and Interface Symposium (ACIS2015) 01/02/2015 - 05/02/2015 - Hotel Grand Chancellor, Hobart

The Australian Colloid and interface Symposium is the principal Australasian conference for researchers in the field of Colloid and Interface. It is held biannually and brings together the Australian research community as well as attracting significant researchers from overseas. ACIS 2015 was held from 1st-5th of February in Hobart Tasmania. A total of 181 delegates attended including 43 students.



We had two outstanding plenary lectures for this year's conference. Prof Paul Mulvaney (U Melb) who spoke on the optical properties of nanocrystals (plasmonics) and Prof Julian Eastoe (Bristol, UK) described the nanoscale organisation of molecules in self-assembled systems using neutron scattering. Additionally, we had 8 keynote speakers who presented on a range of themes, all of which involve nanotechnology. These included

Professor Nicholas Abbott
Professor Thomas Beck
Professor Simon Biggs
Professor Sung-Min Choi
Professor Stefan Bon
Professor Lei Jiang
Professor Martin Leser
Professor Ralph Nuzzo
Professor Ryohei Seto
Professor Takayuki Uchihasi

As an example, Professor Nuzzo presented a novel approach for producing very high efficiency solar cells using a concept known as four dimensional printing. This approach allows patterns to be developed that have applications in nanotechnology. In the example expounded high performance solar cells can be produced with a minimal amount of semiconducting material by spatially separating the materials and concentrating the solar irradiation. This leads to increases in performance and minimises the challenges of dispersing the heat from concentrated solar sources.

We surveyed the attendees of the conference about their experience. The responses were overwhelmingly positive. 96% of respondents rated the overall content of the scientific program as good to excellent and over 80% of delegates rated their overall conference experience as excellent. Informally, I spoke to many delegates and the feedback on the conference and the invited speakers was very positive. One international delegate sought me out to tell me that the conference demonstrated that the field in Australia was very vibrant and he was delighted by the openness of the speakers and their willingness to talk about challenges that remained unresolved.

The funds ANN provided was used to support ECR (within 5 years of submitting their PhD) and students working on nanotechnology to attend and present at our meeting. The funds were used as bursaries to cover the full registration fees of a selected number of ECR's and students.

The following attendees were recipients of the funding in a competitive process.

Liam Scarratt	University of Sydney
Anna Cifuentes Rius	University of South Australia
Tim Mapperson	University of Melbourne
Joanne Du	Monash University
Leonie van t'Hag	RMIT
Joshua Willot	Newcastle Uni
Timothy Duignan	ANU
Mikael Larsson, postdoc	Uni SA
Linda Hong	Monash Uni

6th International Nanomedicine Conference - 06/07/2015 - 08/07/2015 - Coogee, Sydney

6th International Nanomedicine Conference Report

Prepared for the Australian Nanotechnology Network

6 - 8 July 2015 || Crowne Plaza Hotel, Coogee Beach || Sydney, Australia

The organising committee of the 6th International Nanomedicine Conferece, and our co-hosts the Australian Centre for NanoMedicine (ACN) and the ARC Centre of Excellence for Convergent Bio-Nano Science and Technology (CBNS) would like to thank the Australian Nanotechnology Network (ANN) for their sponsorship and for providing funds to assist students and ECRs in attending the conference.

The conference attracted more than 240 delegates from around Australia and internationally to discuss key themes in the field of nanomedicine: Delivery of Therapeutics; Diagnostics and Imaging; Tissue Regeneration and Repair; Bioactive Materials; Nanotoxicology; Social Aspects; and Clinical Challenges. Over the course of three days, 5 plenary, 30 invited, and more than 60 oral presentations (from submitted abstracts) were given along with 60 posters. Through the funding provided by the ANN, the conference was able to provide sup- port for 19 students and ECRs from 8 different universities (see table next page).

Of the delegates supported by ANN funds, three won prizes for their presentations at the conference:

Ms. Khairunnisa Abdul Ghaffar - 2nd Place Poster Prize for her presentation on "Lipid Core Peptide Nanoliposome-based Peptide Vaccine Candidate against Group a Streptoccocus"

Mr. Joshua Glass - 1st Place Poster Prize for his presentation on "Immune cell-targeted nanoparticles – implications for improved HIV-1 vaccines"

Ms. Qiong (Ada) Dai - Best Oral Presentation by a PhD Student for her presentation on "Monoclonal Antibody-Functionalized Multilayered Particles: Targeting Cancer Cells in the Presence of Protein Coronas"

Qiong (Ada) Dai receives her prize for Best Oral Presentation by a PhD Student from A/Prof. Grainne Moran (Executive Director of the Mark Wainwright Analytical Centre) and Prof. Mary O'Kane (NSW Chief Scientist & Engineer).

The ANN's sponsorship was acknowledged throughout the proceedings including verbally during the conference opening and closing ceremonies, and on slides in all conference rooms between sessions. In addition, the ANN logo was linked to the ANN website on the conference website, and background and contact information for the ANN was printed in the conference program booklet.

ANN sponsorship provided $250 in funding for each of the following PhD students and ECRs.

Delegate	Presentation Title
Mr. Hazem Abdelmaksoud *University of South Australia*	Application of nanoporous germanium nanostructures as novel substrates in nanostruc- ture-assisted laser esorption/ionisation mass spectrometry
Ms. Khairunnisa Abdul Ghaffar *The University of Queensland*	Lipid Core Peptide Nanoliposome-based Peptide Vaccine Candidate Against Group A Streptoccocus
Dr. Maria Alba-Martin *University of South Australia*	Silica Microtubes for Target-Specific Delivery of Anticancer Drugs
Mr. Abu Ali Ibn Sina *The University of Queensland*	Methylsorb: A simple method for quantifying DNA methylation using gold-DNA affin- ity interaction
Ms. Saranya Chandrudu *The University of Queensland*	Synthesis, Physicochemical Characterization and Immunogenicity of Vaccine Candi- dates against Group A Streptococcus (GAS)
Mr. Weiyu Chen *The University of Queensland*	Clay nanoparticles as potential adjuvants for antigen Intimin β from diarrheagenic E. coli
Dr. Roey Elnathan *University of South Australia*	Next-generation cancer therapies based on multistage delivery nanovectors
Ms. Qiong (Ada) Dai *The University of Melbourne*	Monoclonal Antibody-Functionalized Multilayered Particles: Targeting Cancer Cells in the Presence of Protein Coronas
Mr. Joshua Glass *Monash University*	Immune cell-targeted nanoparticles - implications for improved HIV-1 vaccines
Mr. Karan Gulati *University of Adelaide*	Nano-engineered titanium wires for enhanced in-bone therapeutic action
Dr. Ove Gustafsson *University of South Australia*	Mass spectrometry assay for detection of micro-projection enriched biomarkers
Mr. Diwei Ho *The University of Western Australia*	Aspect ratios of gold nanorods and their effects on the inflammatory response in an in vitro placental syncytiotrophoblast model
Mrs. Noushin Jaberolansar *The University of Queensland*	Lipid core peptide-based vaccine against respiratory syncytial virus harboring antigenic site II on RSV F protein
Ms. Tang Li *Monash University*	'Pregnant' liposomes and their potential in oral drug delivery
Dr. Yang Liu *Curtin University*	Voltammetric Study of Drug Transfer and Ion Diffusion at Nanoscale Liquid–Liquid
Dr. Chiara Paviolo *Swinburne University*	Nanoparticle-enhanced neural regeneration
Dr. Amirali Popat *University of Queensland*	Novel Gastroretentive tablets based on Mesoporous Silica
Mr. Ye Wang *The University of Adelaide*	A study of nanotoxicity and targeting of autophagic and endoplasmic reticulum stress signaling networking by a nanotube-based delivery system
Ms. Huali Zuo *The University of Queensland*	Modifying layered double hydroxide nanoparticles with targeting peptide for enhanced gene delivery

On behalf of the Conference Organising Committee, thank you again for your support

Professors Maria Kavallaris and Justin Gooding,
Co-Chairs of the 6th International Nanomedicine Conference,
Co-Directors, Australian Centre for NanoMedicine

35th Polymer Australasian Symposium 12/07/2015 - 15/07/2015 - QT Hotel, Gold Coast

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Dear Prof. Jagadish

Thank-you for the funds provided to support travel of PhD students and ECR's to attend the 35 Australasian Polymer Symposium (APS). The 35th APS took place on the Gold Coast, Queensland, from the 12th – 15th of July 2015, and encompassed three and a half days of stimulating talks from numerous areas of polymer and materials science. There were 270 delegates from Australia and around the world in attendance, with six plenary speakers and 24 keynote speakers, five of whom were Early Career Researchers. Also, as is commonly seen at the APS meetings, there was a large proportion of the session talks being presented by research higher degree students. The follow link was published by Wiley in "Material Views" - http://www.materialsviews.com/conference-report-35th-australasian-polymer- symposium/.

The first day started with two opening plenary lectures. The first was from Prof. Mitch Winnick from the University of Toronto, talking about his work investigating metal-chelating polymers and their potential for biological applications of sensing and imaging. The second plenary was given by Prof. Yanlei Yu from Fudan University, and was an introduction into the field of liquid crystal polymers: crystalline aromatic polyesters that form areas of highly ordered structures when in the liquid phase. Prof. Bjorn T Stokke from Norwegian University of Science and Technology initiated the first of three full days of presentations with a plenary lecture on responsive polymer hydrogels. Prof. Benjamin Hsiao from Stony Brook University delivered a plenary demonstrating an example of translation of laboratory to industry with his work on carbon nanofibrous membrane filters for high-flux water purification. Prof. Werner Joseph Blau from Trinity College Dublin began the final day by describing his interdisciplinary work with materials science and physics in the development of nanocarbons and atomic crystals. The final plenary speaker, Prof. Mats Andersson from the Future Industries Institute, discussed his work on polymeric materials for energy and conducting applications.

Below are the individuals that received funding from the ANN to attend the conference. This covered all or part of their airfares. All acknowledgment was given to the ANN for these awards

First Name	Surname	Organisation	Title Presentation
Joseph	Collins PhD	University Of Melbourne	Biodegradable Polyethylene Glycols
Wei Sung	Ng PhD	University Of Melbourne	Dual temperature- and redox/pH-responsive polymers
Mitchell	Nothling PhD	University Of Melbourne	Bioinspired catalysts- Mimicking the active site of enzymes
Renzo	Fenati PhD	Flinders University	Optimisation of Hybridisation & Displacement on Magnetic Bead Surfaces
Caitlin	Langford PhD	Monash University	Emulsion Templating: A Versatile Route to the Preparation of Biodegradable and Biocompatible Scaffolds for Tissue Engineering
Jean-Baptiste	Lena PhD	University Of Canterbury	Quantitative Solution-State NMR Analysis of Branching in Poly(Acrylic Acid)
Melanie	MacGregor-Ramiasa ECR	UniSA - Future Industries Insitute	Plasma Polymerised PolyOxazoline Thin Films: Unique Properties for Biomedical applications
Oskar	Majewski PhD	Flinders University	Towards RAFT agents with photoswitchable reactivity
Steven	Shirbin PhD	University Of Melbourne	Polypeptide-based block copolymer scaffold for targeted drug delivery
Jonathan	Sierke PhD	Flinders University	Blending trifluoropropyl POSS in PVDF membranes
Michael	Wilson PhD	Flinders University	Nucleotide Functionalised Synthetic Polymers

I would like to sincerely thank you again for your support. This enabled some very talented young scientists to attend our conference and add to its success.

Kind Regards

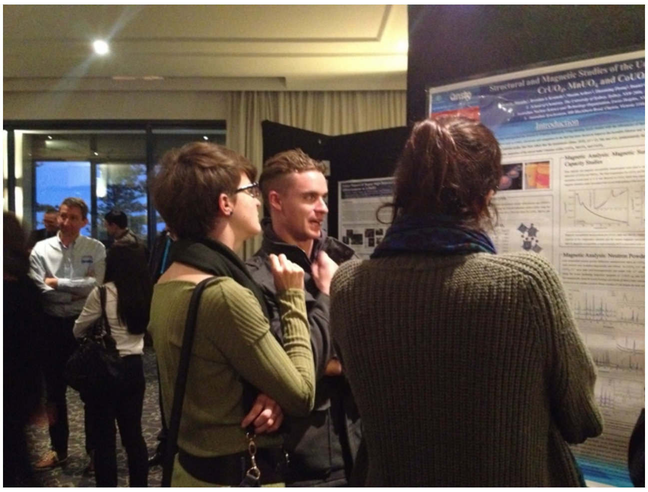
Prof. Amanda Ellis

2nd Asia Oceania Conference on Neutron Scattering, 19/07/2015 - 23/07/2015 - Novotel Manly Pacific, Sydney

AOCNS-2015

The 2nd Asia Oceania Conference on Neutron Scattering (AOCNS-2015) took place in Manly, on Sydney's north shore, from July 19-23. This venue provided the opportunity for the 377 delegates to take the iconic ferry across Sydney Harbour on their way from the airport, providing a sightseeing tour viewing Sydney's famous Opera House and Harbour Bridge on the way.

The meeting was officially opened on the morning of Monday July 20 by Mary O'Kane, the Chief Scientist and Engineer of New South Wales (NSW), followed by opening remarks of Wen-Hsien Li, the President of AONSA. Many participants had already gathered on Sunday July 19 for the pre-conference Instrument Scientists Workshop as well as meetings of the AONSA Executive Committee and Facility Directors. The welcome reception that followed set the scene for the next few days, not only for an engaging conference with excellent food and drinks, but also stimulating discussions throughout the sessions and into the breaks. Another noticeable feature of the conference was the encouragement of young and mid-career researchers, evident in the various oral sessions as well as at poster presentations, with the poster awards (one for each session) being taken by young researchers on the last day.



At the poster session

Talks covered a wide range of topics, presented in six themes: biological sciences and technology; condensed-matter physics; engineering and industrial; materials science and chemistry; soft-matter systems; and new sources, methods and techniques. These included six plenary talks and keynotes at the beginning of each oral session. Morning and afternoons had talks in four parallel sessions and there were two poster sessions (see photo). For more details of the programme, see http://www.aocns-2015.com/index.html.

The AOCNS Student Night saw research students, postdocs as well as a few young-at-heart participants converge on the streets of Manly to enjoy the relaxed atmosphere which was on tap at many of the local hotels and bars. International visitors were treated to local craft beers, scattering techniques were refined on the snooker table. Thanks to the AOCNS Student Committee for organising and chaperoning such an eventful and successful night.

At the AOCNS Student Night

In October 2014, it was announced that John White (Australian National University, ANU, Canberra) was recipient of the AONSA prize, and the award of the prize was made at the AOCNS. After receiving the award (certificate, $5000 and a medal), he gave an inspiring lecture in his plenary "Neutrons for Chemistry", which started with photos of the beautiful sunrises over Manly beach recalling the dawn of neutron scattering in this region, explained how he first became involved in neutron scattering, and how his studies changed with new techniques coming into force, in particular the use of selective deuteration as well as new neutron techniques such as reflectometry.

John White receives the AONSA Prize from Sung-Min Choi

The Exhibition area was well attended. Sponsors included companies as well as facilities. Particularly striking was HANARO's booth advertising the next ICNS in Daejeon in Korea in 2017 demonstrating traditional Korean dress.

A harbour cruise was the ideal setting for the conference dinner and stimulated exciting discussions over science, different cultures, reminiscing about old times, progressing current collaborations and planning new experiments. Finally, participants had the opportunity to visit the neutron-scattering facility at ANSTO's OPAL reactor on Thursday afternoon after the conference.

Delegates at the conference dinner

ANN Funding

Travel support from the Australian Nanotechnology Network was distributed as follows:

Houman Alipooramirabad (U. of Adelaide
Henry Kirkwood (La Trobe University)
Huazhen Li (Monash University)
Josie Auckett (University of Sydney)
Grace Causer (U of Wollongong

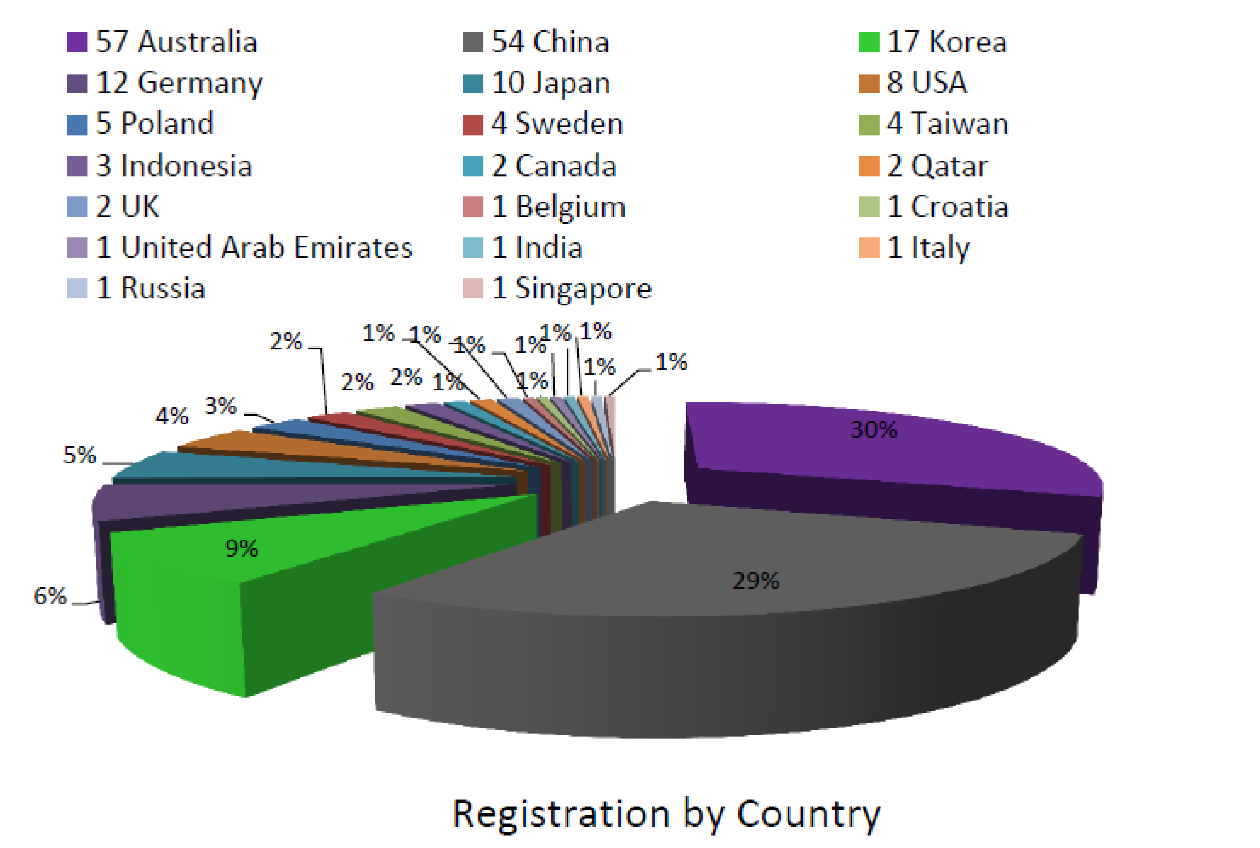
9th International Mesostructured Materials Symposium (IMMS-9) - 17/08/2015 - 20/08/2015 - Brisbane Convention and Exhibition Centre

The 9th International Mesostructured Materials Symposium (IMMS-9) was successfully held in Brisbane Australia during 17-20 August 2015. Members of the organising committee sincerely thank all speakers, sponsors, delegates, and the organizing committee. Your efforts and strong support made IMMS-9 a great meeting of the mesostructured materials community.

A brief summary follows:

ATTENDEES:

Delegates from 18 countries travelled to Australia to attend the IMMS-9 conference.



STUDENT REGISTRATIONS:

In total 57 students registered. The IMMS-9 program included a 'speedy session' with student oral presentations featured in a fast paced format.

PRESENTATIONS:

There were 7 plenary, 13 keynote and further 33 oral presentations.

POSTER PRESENTATIONS:

Of the 129 poster abstract submissions, 84 were selected and presented at IMMS-9.

IMMA AWARDS

THE IMMA LIFETIME ACHIEVEMENT AWARD

Professor Kazuyuki Kuroda, Waseda University, Japan

THE IMMA AWARD

Professor Shunai Che, Shanghai Jiao Tong University, China

IMMS-9 Poster Awards

Wiley Best Poster Prize   Xiaowei Li, East China University of Science and Technology

Royal Society of Chemistry (RSC): Journal of Materials Chemistry:
Best Poster Prize

Zhingang Xiong, The University of Queensland

Runners up

Sung Soo Park, Pusan University, Korea
Tobias Weller, Justus Liebig, University Glassen

Advanced Porous Materials Best Poster Prize $500

Biao Kong, Fudan University

Scientific Reports - Nature Publishing Group
3 Best Poster Awards

Emelie Nilsson, Lund University
Hao Song, the University of Queensland
Geoffrey Lawrence, the University of Queensland

ANN Sponsorship covered non UQ students/ECR's as follows

Mr Alfonso Ballestas Barrientos – University of Sydney
Dr Faegheh Hoshyargar – Queensland University of Technology
Dr Xiaobo Li – University of Sydney
Dr Mahnaz Shafiei – Queensland University of Technology

An additional $1,000 was provided by the ANN in support of the industry function hosted on the first night of the conference.

We are extremely grateful for the support provided by the Australian Nanotechnology Network (ANN).

Conference on Laser Ablations COLA 2015 - 31/08/2015 - 04/09/2015 - Pullman International, Cairns, Queensland

Laser ablation encompasses a wide range of processes of laser interaction with matter, from delicate atomic motion in transient states to acceleration of particles to extreme energies. These processes present many challenging problems for scientists to study and understand. At the same time, laser ablation is of significant commercial importance in material processing, constituting today a multi-billion dollar industry. These topics, together with new emerging physics of laser interaction with matter and its applications for laser modification of material properties were widely addressed at the 13th International Conference on Laser Ablation which was held in Cairns, on 31 August – 4 September 2015.

Conference topics included:

- Fundamentals of Laser-Material Interactions
- Ultrafast Phenomena and Phase Transformations
- Emerging Trends in Photoexcitations and New Applications
- Laser-based Analytical methods
- Pulsed Laser Ablation and Deposition
- Promising New Laser and Optical Technologies
- Lasers in Nanoscience – Photonic Fabrication at Nanometer Scale
- Laser Interactions with Organic and Biological Materials

The conference was opened on Monday morning by the chair of the conference, Prof Andrei Rode, Australian University in the Grand Ballroom at the Pullman Cairns International. Associate Professor Yves Bellouard from the Ecole Polytechnique Federale de Lausanne, Switzerland gave the opening invited speaker presentation.

The conference continued over five days in full plenary, closing on Friday afternoon with a final closing ceremony including awards and presentations for future conferences. Included in the 5 day program were 3 catered poster sessions (with a total of 190 posters) held on Monday, Tuesday and Thursday. The poster sessions were of a relaxed nature with drinks and food platters served throughout the 2 hours. These sessions were very conducive to networking.

A total of 211 participants including International Invlted speakers attended the conference.

Invited Speakers included:

- A/Prof Yves Bellouard, Ecole Polytechnique Federale de Lausanne, Switzerland
- Prof Min Gu, Swinburne University of Technology, Australia
- Prof Alessandro De Giacomo, University of Bari, Italy
- Prof Martin Wolf, Fritz Haber Institute of the Max Planch Society, Germany
- Prof David Villeneuve, National Research Council, Canada

- Prof Roberto Osellame, Institute for Photonics and Nanotechnology-CNR, Itlay
- A/Prof Ariando, National University of Singapore
- Prof Masakatsu Murakami, Institute of Laser Engineering, Osaka University, Japan
- Prof Ion Mihailescu, National Institute for Lasers, Plasma and Radiation
- Prof Henry Chapman, Center for Free-Electron Laser Science, DESY Synchrotron, Germany
- Prof Nadezhda Bulgakova, HiLASE Centre, Insitute of Physics AS, Czech Republic
- Prof Stefan Nolte, Friedrich-Schiller-Universitat Jena, Germany
- Prof Ya Cheng, Shanghai Institute of Optics and Fine Mechanics, China
- Prof Jean-Philippe Colombier, Laboratoire Hubert Curien, France
- Dr Vassilia Zorba, Lawrence Berkeley National Labroatory, USA
- A/Prof Stephen Madden, Australian National University, Australia

The conference was sponsored by the following organisations:
Platinum (co-sponsors): Research School of Physics and Engineering (RSPE), Australian National University
Laser Physics Centre, Research School of Physics and Engineering (RSPE), Australian National University
Gold: Agilent
Student Prize Sponsor: CUDOS (Centre for Ultrahigh Bandwidth Devices for Optical Systems)
Exhibitors
Agilent, Coherent Scientific, Lastek, Stratpharma
Student and Early Career Researcher Sponsor: Australian Nanotechnology Network

The ANN Funding went towards free registration and some travel support for the following students/ECRs
Mr Robert Donaldson, Queensland University of Technology
Mr Young-Joon San, Australian National University
Mrs Dinithi Namarathne, Queensland University of Technology
Ms Atia Tul Noor, Griffith University
Ms Kavya Hemantha Rao, Griffith University

Participants at COLA2015

On behalf of the COLA Committees I would like to thank the ANN for the support of this conference.
Andrei Rode
Chair COLA2015

NanoS-E3 2015 - International School and Workshop on Nanotechnology 27/09/2015 - 02/10/2015 - Peppers Salt Resort, NSW

The 5th NanoS-E3 International Workshop and School brought together nanotechnology specialists to advance knowledge and research, focusing on sensors, electronics, energy and the environment. The three-day workshop has been preceded by a two-day school for PhD and masters students. The event took place at the Peppers Salt Resort located at in the NSW.
The rapidly growing field of nanoscale science is widely recognised as a critical component of the world's future economy. New advances are predicted to transform a wide range of scientific and engineering disciplines.
This initiative, in partnership with the Italian and Australian governments built on existing nanotechnology networks and fostered new collaborations. In 2015, the workshop has welcomed scientists from Hong Kong, Canada and the USA.

Participants Numbers
Lecturers: 7, Keynote speakers: 9 Invited speakers: 30 Students/ECRs: 24

Chairs
Prof Nunzio Motta, Queensland University of Technology
Prof John Bell, Queensland University of Technology
Dr Paolo Falcaro, CSIRO

Organising Committee
Prof Oscar Moze, Embassy of Italy, Canberra, Australia
Prof Francesca Iacopi, Griffith University, Brisbane, Australia
Dr Giuseppe Tettamanzi , The University of New South Wales (UNSW), Sydney, Australia
Dr Antonio Tricoli, Australian National University (ANU), Canberra, Australia
Dr Jennifer MacLeod, Queensland University of Technology (QUT), Brisbane, Australia
Dr Josh Lipton Duffin, Queensland University of Technology (QUT), Brisbane, Australia
Dr Mahnaz Shafiei, Queensland University of Technology (QUT), Brisbane, Australia
Prof YuanTong Gu, Queensland University of Technology (QUT), Brisbane, Australia

In addition to ANN sponsorship, the event was sponsored as well by:
Embassy of Italy, Institute for Future Environments (IFE-QUT), CSIRO, ScientaOmicron, Scitek and Plasma-Therm.

SCHOOL

The two-day school, attended by 24 students coming from several universities in Australia and overseas, was a very successful introduction to physics and chemistry of new materials and nanostructures, ranging from self-assembly of organic molecules to use of nanomaterials for sensing, down to the fascinating quantum computing realm.

POSTER SESSION

At the end of school, a poster session allowed the students to present their own work. As the poster session continued in a welcome cocktail and barbecue starting the workshop, all participants to the workshops attended the poster session.

A prize of iPad sponsored by Oxford Instruments Omicron Nanoscience and an award certificate for the best poster was granted to a young postdoctoral researcher, Dr Federica Rigoni from University of Brescia, Italy.

List of Students/ECRs Funded by ANN

Carlo	Piloto	QUT
Mojtaba	Amjadi Pour	QUT
Yalong	Jiao	QUT
Fengxian	Ma	QUT
Aizhu	Wang	QUT
Guoping	Gao	QUT
Baolin	Huang	QUT
Nasser	Alotaibi	Flinders University
Ming	Tang	QUT
Edmund	Pickering	QUT
Kang	Xia	QUT
Tom	Grace	Flinders University
Leping	Yu	Flinders University
Gabriele	Motta	UQ
William	Lawrie	University of Melbourne
Haydn	Bowers	University of Melbourne
Hawazn	Abuhasha	Flinders University
Zahrah	Alhalili	Flinders University
Noushin	Nasiri	ANU
Nima	Khoshsirat	QUT
shengli	zhang	QUT
Arixin	Bo	QUT
Bahrati	Gupta	QUT
Naseem	Alghamdi	Flinders University

The three-day workshop focused on the following topics

- Quantum Electronics;
- Surface and 2D materials;
- Emerging Applications; Nanomaterials; Electronics;
- Photonics; Synthesis

Conference Outcomes

It is difficult to evaluate now the networking outcome of the event, as networking activities will require a few months to produce fruits, however the interaction has been very effective, thanks to the many opportunities offered during the common meals and free time.

I have been informed of Post Doc positions in Australia and overseas offered by some of the lecturers or invited speakers to the PhD students.

Brisbane, 7 December 2015
Nunzio Motta & Mahnaz Shafiei

Recent Progress in Graphene and Two-dimetional Materials Research (RPGR2015), 25/10/2015 - 29/10/2015 - Lorne, Victoria

The 7[th] International Conference on Recent Progress in Graphene and Two-dimensional Materials Research (RPGR2015 – rpgr.physics.monash.edu.au) was held in Lorne, Victoria on 25-29 October 2015. RPGR has become the premier conference focused on graphene and other novel two-dimensional materials in the Asia-Pacific region, and it was the first time that RPGR was held in Australia.

Organised by the Monash Centre for Atomically Materials (MCATM - monash.edu/mcatm), RPGR2015 welcomed 239 delegates from 22 countries. RPGR2015 reflected the rapidly growing field of two-dimensional materials, covering graphene and graphene oxide as well as new materials phosphorene, transition metal dichalcogenides, layered oxides, silicene, germanene and topological insulators. The 4-day technical program included 89 oral presentations and 112 poster presentations, which discussed the electrical, optical, mechanical, chemical, thermal, and other properties of these novel materials, as well as wide-ranging applications from optoelectronic devices to biomedical implants and water filtration.

This sponsorship received from the ANN supported registration costs for 11 early career researchers and higher degree research students from multiple institutions. Details of recipientsand their work are repesented in the table below:

Name	**Institution**	**abstract Title**	
Yuefeng Yin	Monash University	Tunable hybridization between electronic states of graphene and physisorbed hexacene	Poster
Dong Han Seo	CSIRO	Single-Step, Plasma-assisted Transformation of Natural Precursors into Vertical Graphene Electrodes with High Areal Capacitance	Poster
Shafique Pineda	CSIRO	Single-Step Ambient-Air Synthesis of High Quality Graphenes from Renewable Biomass	Poster
Neeraj Mishra	Griffith University	Mechanism for the synthesis of alloy-mediated bilayer graphene on 3C-SiC on Si	Poster
Mohsin Ahmed	Griffith University	SiC derived Graphene as Electrode for On-chip Supercapacitor	Poster
Mark Edmonds	Monash University	Air-stable doping of Bi2Se3 by MoO3 into the topological regime.	Oral
Jack Hellerstedt	Monash University	In Situ Thin Film Growth and Characterization of Topological Dirac Semimetal Na3Bi	Poster
Changxi Zheng	Monash University	Profound Effect of Substrate Hydroxylation and Hydration on Electronic and Optical Properties of Monolayer MoS2	Oral
Yu Lin Zhong	Monash University	Scalable production of graphene via wet chemistry: progress and challenges	Oral
Fei-Xiang Xiang	University of Wollongong	Multiple Fermi pockets revealed by Shubnikovde- Haas oscillations in WTe2	Oral
Jun Ma	University of South Australia	Development of graphene derivatives for elastomer composites	Oral

WEBSITE

NANOTECHNOLOGY FACILITIES AND CAPABILITIES REGISTER

NEWSLETTER

MEMBERSHIP

PLANNED 2016 ACTIVITIES

WEBSITE

http://www.ausnano.net

The ANN Website is a very popular website and as at the end of 2015 it received more that 8,590,000 hits to the site, and it is believed that a significant amount of these are from Australia, and there is also interest from a number of other countries.

Website contains among other things:

- the lists of members and Research Groups affiliated with the network,
- online applications for members
- Online applications for grants
- Nanotechnology Facilities and Capabilities Register
- Reports from Young Nano Ambassadors
- Employment Opportunities
- Links to other websites and events

The website is continually being maintained and updated and there are links to various sites including various surveys, other networks and related activities.

NANOTECHNOLOGY FACILITIES AND CAPABILITIES REGISTER

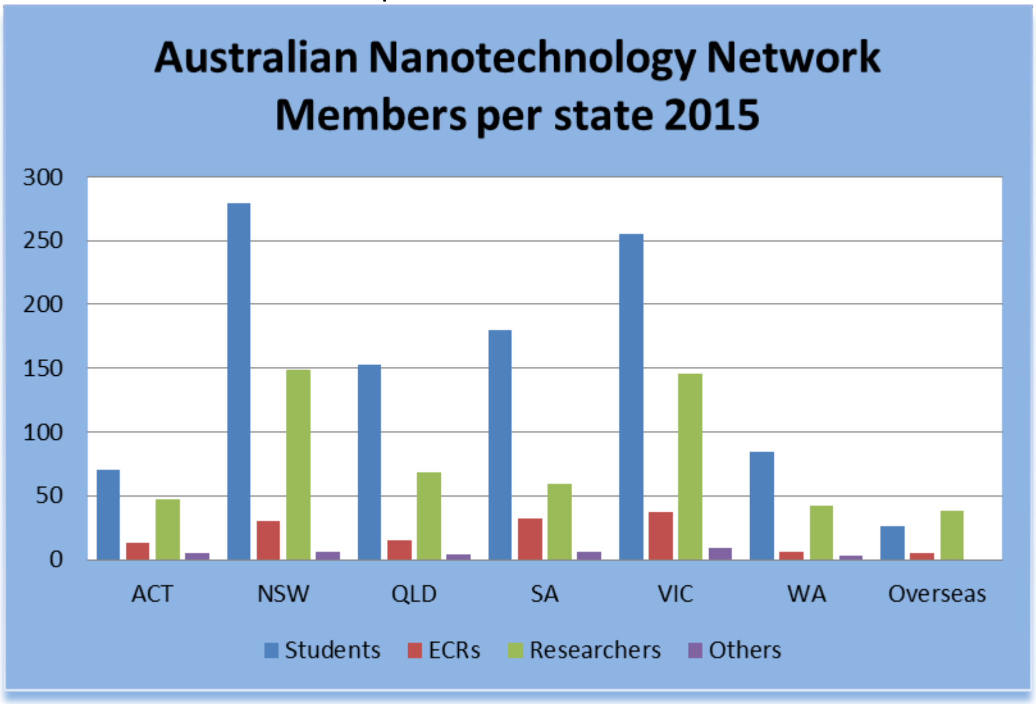
The Nanotechnology Facilities and Capabilities Register was established at the end of 2006 and the list of registered facilities and their capabilities can be accessed on the following page http://www.ausnano.net/index.php?page=facilities
Members and visitors to the site are able to access specific nanotechnology facilities and expertise that is available across Australia.

NEWSLETTER

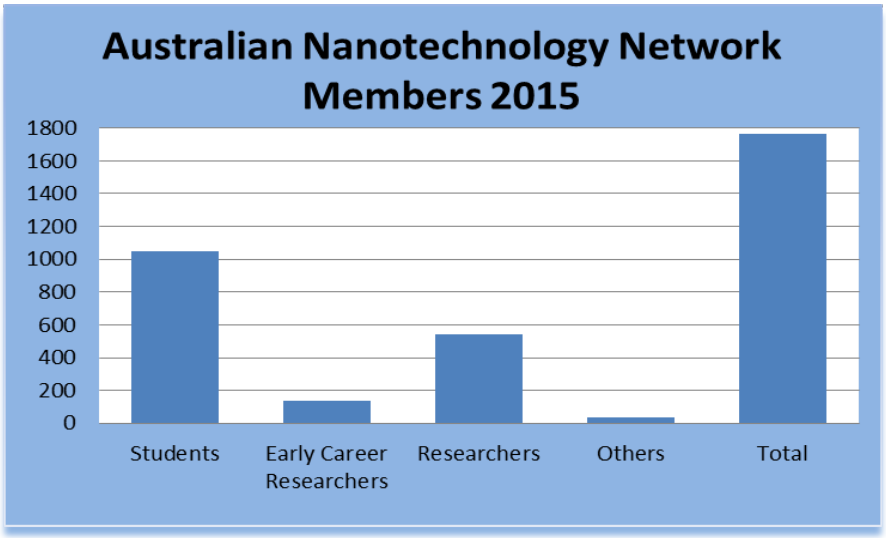
A newsletter which is sent to all members is another means of communication that ANN uses as an information management tool. The newsletter is sent out every six months and details information and events held in the field on Nanotechnology in Australia. Newsflashes are released in between newsletters to make members aware of events with a short deadline.

MEMBERSHIP

The ANN membership consists of established researchers, Early Career Researchers, PhD students whose research field is in the area of Nanotechnology. It also consists of members from Government departments and business.



State	Students	Early Career Researchers	Researchers	Others	Total
ACT	70	13	47	5	135
NSW	279	30	149	6	464
QLD	153	15	68	4	240
SA	180	32	59	6	277
VIC	255	37	146	9	447
WA	84	6	42	3	135
Overseas	26	5	34	4	69
TOTAL	**1047**	**138**	**545**	**37**	**1767**



PLANNED 2016 ACTIVITIES

The Australian Nanotechnology Network (ANN) plans to continue funding Workshops, Conferences, Forums, encouraging and supporting participants in getting together and networking for the growth in the research of Nanotechnology in Australia.

The management committee has also been involved in preparing for the

- **International Conference on Nanoscience and Nanotechnology(ICONN2016)** which will be held at the National Convention Centre in Canberra on the 7-11th February 2016

There will be a continuation of the successful Overseas Travel Fellowships, Short and Long Term visits and Young Nanoscience Ambassador Awards.

To encourage collaborations among its members the Following Events are planned to be sponsored:

- **7th International Nanomedicine Conference 27/06/2016 - 29/06/2016 - Coogee Beach, Sydney.**

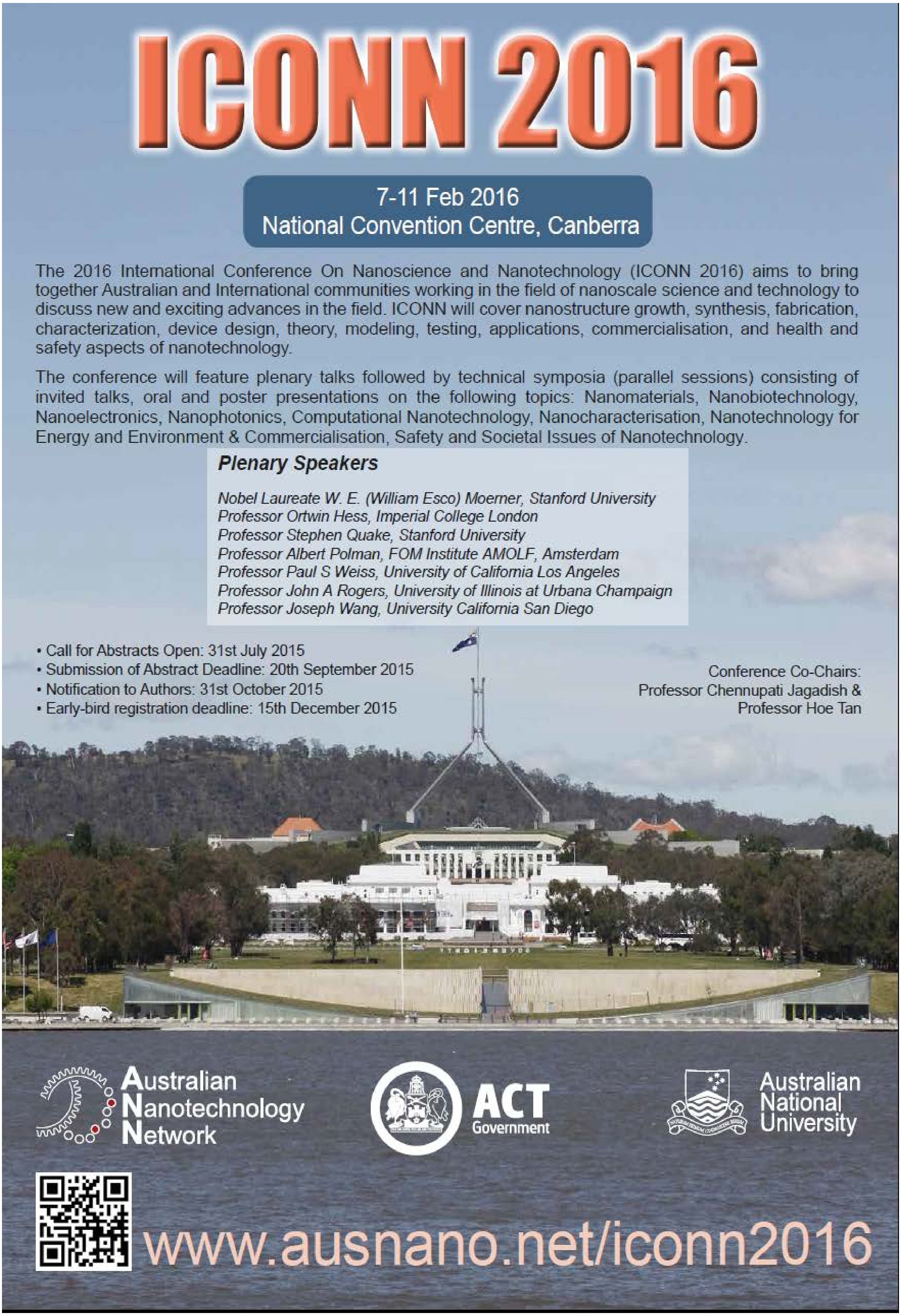
The purpose of the conference is to bring together leading clinicians and science researchers in the field of nanomedicine to share results and build collaborations based on this year's theme: Sensors & Imaging, Drug Delivery, Vaccines, Systems Biology, Bioactive Materials and Clinical Challenges.

- **5th International Symposium on Graphene Devices (ISGD-5) 11/07/2016 - 14/07/2016 - Griffith University – Southbank.**

The 5th International Symposium on Graphene Devices (ISGD-5) is the principal meeting addressing advanced graphene applications, offering a unique forum to review the present status, the latest developments, future prospects and related fundamental studies covering both state-of-the-art experimental and theoretical discoveries.

- **8th International Symposium on Nano and Supermolecular Chemistry 13/07/2016 - 16/07/2016 – Brisbane.**

We aim to bring 150-200 delegates to the symposium from all over the world, working in nano- and supramolecular chemistry and the applications of functional materials in diverse areas. This conference will also be a dedication symposium to celebrate the 8 more info


ICONN 2016
7-11 Feb 2016
National Convention Centre, Canberra
The 2016 International Conference On Nanoscience and Nanotechnology (ICONN 2016) aims to bring together Australian and International communities working in the field of nanoscale science and technology to discuss new and exciting advances in the field. ICONN will cover nanostructure growth, synthesis, fabrication, characterization, device design, theory, modeling, testing, applications, commercialisation, and health and safety aspects of nanotechnology.
The conference will feature plenary talks followed by technical symposia (parallel sessions) consisting of invited talks, oral and poster presentations on the following topics: Nanomaterials, Nanobiotechnology, Nanoelectronics, Nanophotonics, Computational Nanotechnology, Nanocharacterisation, Nanotechnology for Energy and Environment & Commercialisation, Safety and Societal Issues of Nanotechnology.
Plenary Speakers
Nobel Laureate W. E. (William Esco) Moerner, Stanford University
Professor Ortwin Hess, Imperial College London
Professor Stephen Quake, Stanford University
Professor Albert Polman, FOM Institute AMOLF, Amsterdam
Professor Paul S Weiss, University of California Los Angeles
Professor John A Rogers, University of Illinois at Urbana Champaign
Professor Joseph Wang, University California San Diego
• Call for Abstracts Open: 31st July 2015
• Submission of Abstract Deadline: 20th September 2015
• Notification to Authors: 31st October 2015
• Early-bird registration deadline: 15th December 2015
Conference Co-Chairs:
Professor Chennupati Jagadish &
Professor Hoe Tan
Australian Nanotechnology Network
ACT Government
Australian National University
www.ausnano.net/iconn2016