JSPS
ALUMNI ASSOCIATION IN AUSTRALIA

Fourth JSPSAAA annual symposium

CATALYSING AUSTRALIA-JAPAN SCIENCE AND INNOVATION

SMC CONVENTION CENTRE
SYDNEY, AUSTRALIA

29 - 30 March 2022

INFORMATION & ABSTRACT BOOKLET

Australian Academy of Science

Australian Government

豪日交流基金
Australia-Japan FOUNDATION

Japan Society for the Promotion of Science · Founded 1932 ·

Hosts:

DR TAMIM DARWISH
ANSTO

PROF ASHRAF GHANEM
UNIVERSITY OF CANBERRA

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Tuesday 29th March 2022

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Introductory Session			
8:00-8:30	**Registrations & RAT (self-testing)**	Registration	Registration
8:30-8:35	**Prof Ashraf Ghanem & Dr Tamim Darwish**	Welcoming Message	JSPSAAA
8:35-8:45	**Dr Ruth Eriksen**	Introduction of JSPSAAA	JSPSAAA
8:45-8:50	**Mr Hisashi Kato**	Message from JSPS Tokyo	JSPS-Tokyo
8:50-8:55	**Mr Akihiko Sunami**	Message from the Embassy of Japan in Canberra	Embassy of Japan in Canberra
8:55-9:00	**Ms Wendy Holdenson**	Message from AJF	Australia-Japan Foundation
9:00-9:05	**Prof Maxwell J. Crossley**	Message from AAS	Australian Academy of Science
9:05-9:10	**Break**		
Session 1 Chair: Prof Shokoofeh Shamsi (Charles Sturt University)			
9:10-9:30 (20 min)	**Prof Pall Thordarson Invited**	Recent Developments in the Australian RNA Ecosystem	University of New South Wales
9:30-9:45 (15 min)	**Ms Sara Jose**	Therapeutic targeting of Bruton tyrosine kinase	University of Queensland
9:45-10:00 (15 min)	**Dr Anna Guller Invited**	Potential anti-cancer and immunomodulatory effects of TMS-like magnetic fields	Macquarie University
10:00-10:20 (20 min)	**Prof Thomas Preiss Invited**	Remarks on the history of Australian RNA science	Australian National University
10:20-10:35 (15 min)	**Dr Pingping Han**	Salivary exosome for diagnosing periodontitis	University of Queensland
10:35-10:50 (15 min)	**Dr Sohel Julovi**	Thrombospondin-1 drives cardiac remodelling in chronic kidney disease	Westmead Institute For Medical Research
10:50-11:10 (20 min)	**Prof. Rachel Codd Invited**	New Methods and Collaborations to Expand the Scope of Biomolecule Discovery	University of Sydney
11:10-11:40	**Morning tea**		
Session 2- Chair: Prof Tamaki Nakano (Hokkaido University)			
11:40-12:00 (20 min)	**Prof Hironao Sajiki Invited**	Development of Continuous Chemical Conversion Methods- Applying New Devices	Gifu Pharmaceutical University
12:00-12:15 (15 min)	**Ms Namrata**	Synthesis of diamine functionalised graphene oxide and its application in the fabrication of electrically conducting reduced graphene oxide/polymer nanocomposite films	University of New South Wales
12:15-12:30 (15 min)	**Dr Vipul Agarwal**	Manipulating the Properties of Polymer/Graphene Oxide Nanocomposites Using In Situ Emulsion-based Polymerisation	University of New South Wales
12:30-12:50 (20 min)	**Prof Michael Breadmore Invited**	Continuous Autonomous Environmental Monitoring by Capillary Electrophoresis	University of Tasmania
13:00-14:00	**Lunch**		

Program Day 1 | Sessions 3 & 4

Tuesday 29th March 2022

Time	Presenter	Title	Affiliaton
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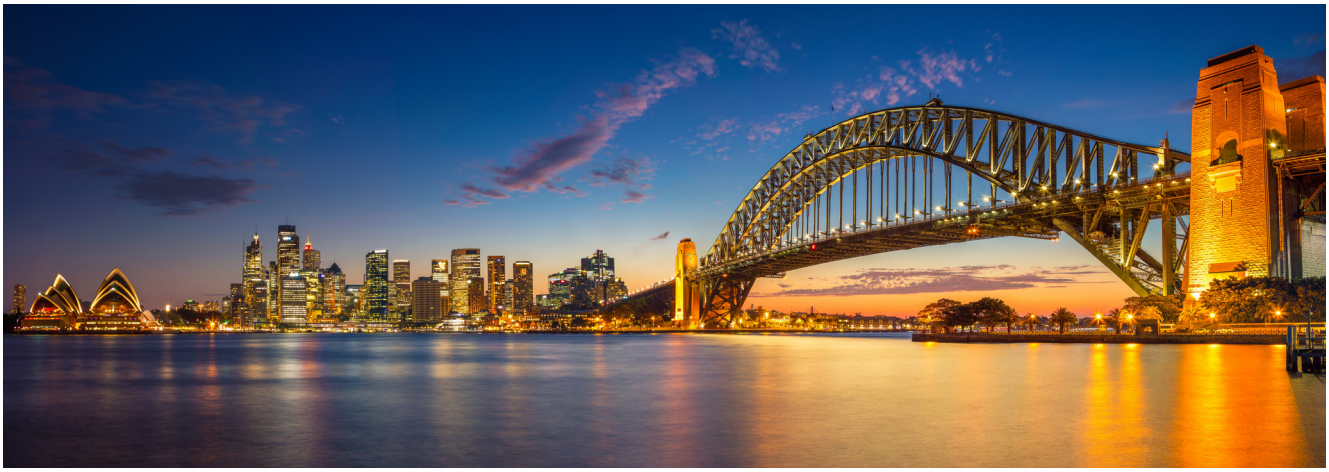
14:00-14:20 (20 min)	**Dr Miles Apperley Invited**	Enabling world-class research with ANSTO Research Infrastructure	ANSTO
14:20-14:35 (15 min)	**Prof Gordon Thorogood**	The Australian Nuclear Science and Technology Organisation and the Nagaoka University of Technology, Over 20 Years of Partnership	ANSTO
14:35-14:50 (15 min)	**Ms Karyn Wilde**	ANSTO's National Deuteration Facility: facility overview, diversity of capabilities, user program and impact.	ANSTO
14:50-15:10 (20 min)	**Dr Jamie Schulz Invited**	Japan & Australia - Regional Leaders and Partners in Neutron Scattering	ANSTO
15:10-15:30 (20 min)	**Ms Michelle Durant Invited**	Existing programs and new opportunities for international collaboration with AINSE	AINSE
15:30-16:00 (30 min)	**Prof Brian Schmidt Invited**	Next Generation Astronomical Observatories and Japan-Australia Collaboration	Australian National University
16:00-16:15	**Afternoon tea**		
Session 4 Chair: Prof Richard Banati (ANSTO)			
16:15-16:35 (20 min)	**Prof Kazuhiro Nogita Invited**	New Colombo Plan Mobility Program "Advanced Manufacturing in Japan – Creating Opportunities for Australia's Future Engineers"	University of Queensland
16:35-16:55 (20 min)	**Mr Izuhara Takero Invited**	SoftBank Artificial Intelligence technology in Australia	ST Solutions Australia PTY LTD
16:55-17:10 (15 min)	**Prof Graham Durant Invited**	Australia-Japan innovation in science communication	Questacon
17:10-17:30 (20 min)	**A/Prof Nenad Naumovski Invited**	The role of food science and human nutrition on psycho-cardiological outcomes	University of Canberra
17:30-18:30	**Poster Session & Networking**		
19:00-22:00	**Gala DinnerSMC Venue**		



Program Day 2 | Sessions 1 & 2

Wednesday 30th March 2022

Time	Presenter	Title	Affiliation
8:30-8:40	**Prof Ashraf Ghanem & Dr Tamim Darwish**	Housekeeping	JSPSAAA
Session 1 Chair:			
8:40-9:00 (20 min)	**Prof Tamaki Nakano Invited**	Construction of Chiral Conformation of Polymers and Small Molecules Using Circularly Polarized Light	Hokkaido University
9:00-9:15 (15 min)	**Dr Alan Xu**	Micro-Tensile Study of Alpha Damage within Materials for Fission and Fusion Reactors	ANSTO
9:15-9:30 (15 min)	**Dr Aditya Rawal**	NMR Platform for Characterization of Materials in Energy Environment and Health	UNSW
9:30-9:45 (15 min)	**Dr Marina Pervukhina**	Digital permeability upscaling and Carbon dioxide hydraulic fracturing for underground Energy storage and gas enhancement production: JOGMEC, CSIRO, Kyushu, Yamaguchi, Kyoto and Curtin Universities collaborations	CSIRO
9:45-10:00 (15 min)	**Dr Steven Phipps**	Achieving net zero together: The potential for Tasmania and Japan to collaborate on decarbonisation	Ikigai Research
10:00-10:15 (15 min)	**Mr Keith Sweatman**	Value from Collaboration- A Case Study	Nihon Superior Co Ltd
10:15-10:35 (20 min)	**Mr Hirofumi Kawazoe & Mr Shinichi Hiroi; Invited**	Hydrogen Energy Supply Chain (HESC)- Japan-Australia partnership and Situation of Hydrogen in Japan	Hydrogen Engineering Australia Pty Ltd & Iwatani Australia
10:35-10:50	**Morning Tea**		
Session 2 Chair: TBA			
10:50-11:05 (15 min)	**Dr Jitendra Mata**	Small and Ultra Small Angle Scattering for Nano- and Micro-Structural Characterisation at ACNS, ANSTO	ANSTO
11:05-11:20 (15 min)	**Dr Debashish Mazumder**	Iso-elemental fingerprinting technology for food provenance	ANSTO
11:20-11:35 (15 min)	**Mr Jiaqiang Luo**	Can variation in wine preference amongst consumers be explained by salivary protein composition?	University of Melbourne
11:35-11:50 (15 min)	**Dr Yoshitaka Nakayama**	Corynebacterium glutamicum mechanosensitive channels for developing amino acids-selective nanovalves.	Victor Chang Cardiac Research Institute
11:50-12:05 (15 min)	**A/Prof Andreea Molnar**	The role of games in combating antibiotic resistance	Swinburne University Of Technology
12:05-12:20 (15 min)	**Dr Jason Whyte**	Beyond “Safe Until Sorry” Management of Emerging Contaminants via Data Science Applied to a Publication Database	University of Melbourne
12:20-12:35 (15 min)	**Dr Tsuyoshi Kobayashi**	Collaborative research on the ecology of inland floodplain wetlands	NSW Department of Planning and Environment
12:35-12:50 (15 min)	**Dr Damith Herath**	Robotic Art in Health Care	University of Canberra
12:50- 13:05 (15 min)	**Dr Cindy Kok**	Development of adeno-associated virus vectors for cardiac gene therapy	Westmead Institute for Medical Research
13:05-14:05	**Lunch**		

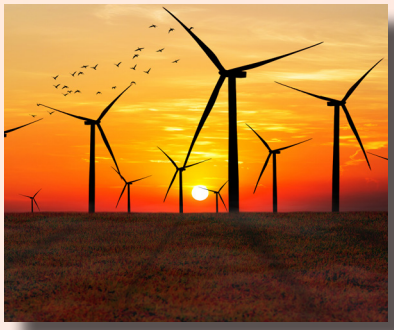
Welcome

In this year's symposium, JSPSAAA would like to celebrate the collaborative links between Australia and Japan and to provide a networking event to foster further interactions between the two countries in the field of science. Speakers from both countries will showcase their research, promoting collaboration and networking. The event aims to give researchers the opportunity to present the collaborative work between Australia and Japan and explore the possibilities that can benefit their research through this bilateral collaboration. We are bringing researchers together from diverse backgrounds and fields of research to catalyze the collaborations needed to enrich the strong bilateral science and research relationship between Australia and Japan in areas of research priorities of both countries.

We would like to thank Australia-Japan Foundation, Australian Academy of Science (Theo Murphy initiative) and JSPS-Tokyo for their generous support. We hope you enjoy our fourth annual symposium and benefit from this networking event.

Health

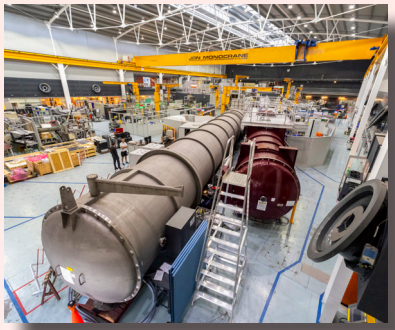
Advanced materials & manufacturing



Energy

Food

Environment



Large research infrastructures

Relationships, institution & society

JSPSAAA would like to thank our partners and sponsors for their support

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NIHON SUPERIOR

ANSTO

UQ-KU Project 九州大学 研究教育交流拠点

Code of Conduct

Recording, taking photos of the presentations without the explicit permission from the individual delivering them is not permitted.

All participants should treat each other with respect and consideration. Personal attacks directed toward other participants, harassment, intimidation, or discrimination in any form will not be tolerated. Disruption of talks at oral or poster sessions will also not be tolerated.

Examples of unacceptable conduct include, but are not limited to, verbal comments related to gender, sexual orientation, disability, physical appearance, body size, race, religion, national origin, inappropriate use of nudity and/or sexual images in Zoom meetings or in presentations, or threatening or stalking any participant.

Consequences for Violating the Code of Conduct: Anyone requested to cease unacceptable behaviour will be expected to comply immediately. The event organisers may take any action deemed necessary and appropriate, including immediate removal from the event. JSPSAAA organisers may also prohibit attendance for anyone violating this code of conduct at any future meetings.

Reporting Violations of the Code of Conduct: If you are the subject of unacceptable behaviour or have witnessed any such behaviour, please immediately notify us. This can be done in person, or by writing to jspsaaa@ansto.gov.au

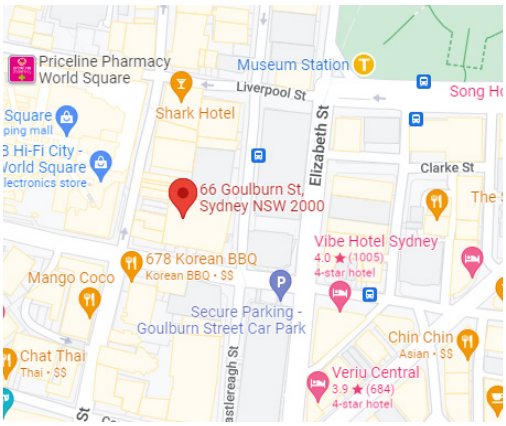
Venue Details

SMC Conference & Function Centre
66 Goulburn Street (Cnr Castlereach St)
Sydney NSW 2000

We will be using the Ionic room located on the Goulburn Street level for the day activities.

Rapid Antigen Tests (RAT) will be provided for self testing before entering the hall

Paid parking and public transport is also located a short walk from the venue.



Presenters Information

Presenters
We ask all presenters to visit the registration table with their talks on **USB only** at least one session prior to their scheduled talk

Computer
Computers and slide changes will be supplied for all presentations; the use of personal computers will not be permitted for talks due to the tight schedule

Please ensure that all video are embedded. You are welcome to view your presentation at the break prior with one of our tech support people

MAC Users
There is no facility to accommodate MAC all presentations will need to save as a ppt or pptx file
Select ***File > Export to > Powerpoint***

ANSTO Tour

A tour of the ANSTO facility will take place on day 2, all delegates that wish to take part are required to pre register their details no later than Monday 28th March. Transport via bus is provided.

ANSTO's educational tour is aimed to inform participants about the research infrastructure available at ANSTO for Australian researchers and the international research communities. The tour will involve visits to the following ANSTO's facilities:

Australia's Open Pool Australian Lightwater (OPAL) reactor; Australian Centre for Neutron Scattering; Centre for Accelerator Science; National Deuteration Facility. ANSTO's tour bus is proudly sponsored by UQ-KU project.

Time	Group 1	Group 2
2:00	Arrive at ANSTO Discovery Centre	
2:15	OPAL	ACNS
2:40	ACNS	OPAL
3:05	Travel	Travel
3:10	NDF Lab 1	CAS
3:35	NDF Lab 2	Afternoon Tea
4:00	Afternoon Tea	NDF Lab 1
4:25	CAS	NDF Lab 2
4:50	Return to Discovery Centre and depart site	

KYUSHU UNIVERSITY
UQ-KU Project
九州大学
研究教育交流拠点

INVITED SPEAKERS

Invited Speakers

Dr Miles APPERLEY

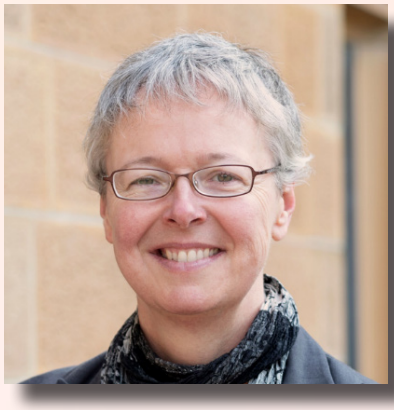
Head of ANSTO Research Infrastructure

Title: Enabling world-class research with ANSTO Research Infrastructure

Prof Michael BREADMORE

Director of ACROSS

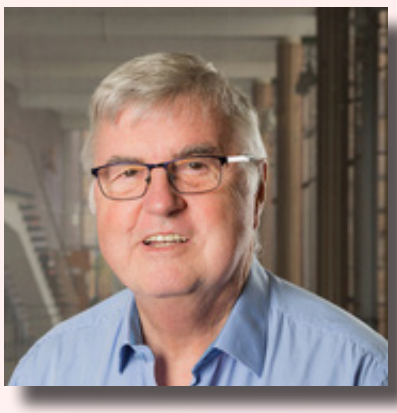
Title: Continuous Autonomous Environmental Monitoring by Capillary Electrophoresis



Prof Rachael CODD

Director of Molecular Biomedicine Research Theme

Title: New Methods and Collaborations to Expand the Scope of Biomolecule Discovery

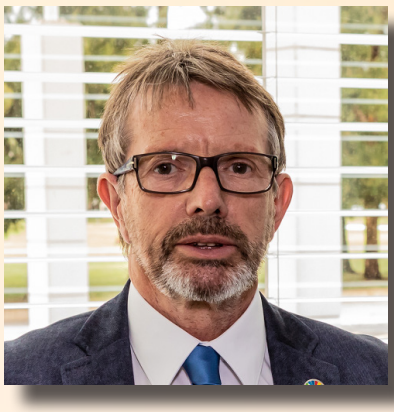


Prof Emeritus Maxwell CROSSLEY

NSW convenor of the Australian Academy of Science

Title: Message from AAS

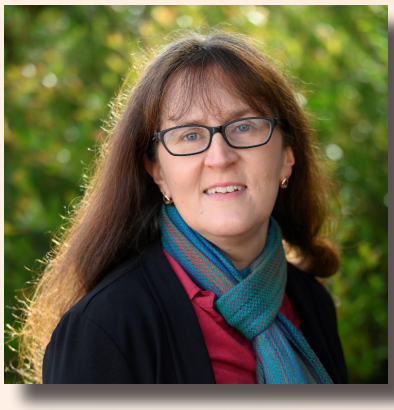
Invited Speakers



Prof Graham DURANT

Director

Title: Australia-Japan innovation in science communication



Ms Michelle DURANT

Managing Director

Title: Existing programs and new opportunities for international collaboration with AINSE

Mr Shinichi HIROI

Hydrogen Technical Manager

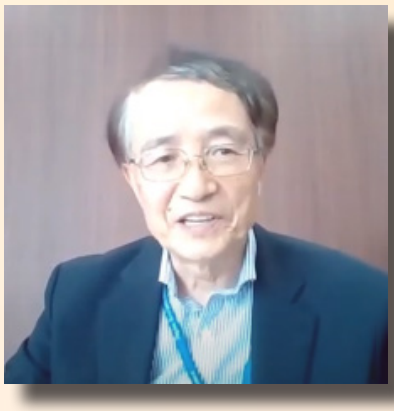
Title: Hydrogen Energy Supply Chain (HESC)- Japan-Australia partnership and Situation of Hydrogen in Japan

Ms Wendy HOLDENSEN

Australia-Japan Foundation Board Member

Title: Message from AJF

Invited Speakers



Mr Hisashi KATO

Advisor for International Affairs JSPS Tokyo

Title: Message from JSPS Tokyo

Mr Hirofumi Kawazoe

General Manager

Title: Hydrogen Energy Supply Chain (HESC)- Japan-Australia partnership and Situation of Hydrogen in Japan

Hydrogen Engineering Australia Pty Ltd

Prof Tamaki NAKANO

Director, Collaborative Catalysis Research Center
Institute for Catalysis (ICAT)

Title: Construction of Chiral Conformation of Polymers and Small Molecules Using Circularly Polarized Light

HOKKAIDO UNIVERSITY

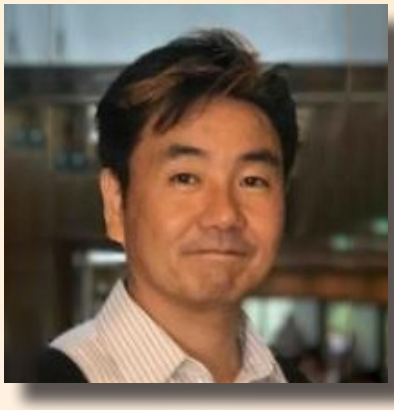
A/Prof Nenad NAUMOVSKI

Nutrition Science

Title: The role of food science and human nutrition on psycho-cardiological outcomes

UNIVERSITY OF CANBERRA

Invited Speakers



Prof Kazuhiro NOGITA

Director

Title: New Colombo Plan Mobility Program "Advanced Manufacturing in Japan – Creating Opportunities for Australia's Future Engineers

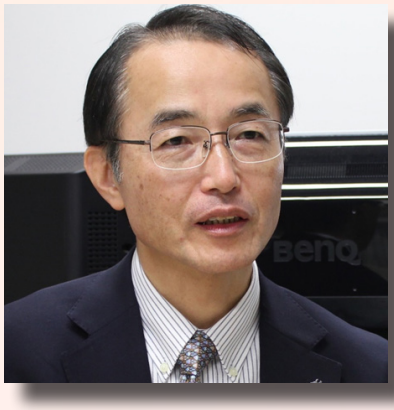
The University Of Queensland
AUSTRALIA

Prof Thomas PREISS

Director Shine-Dalgarno Centre for RNA Innovation

Title: Remarks on the history of Australian RNA science

Australian National University

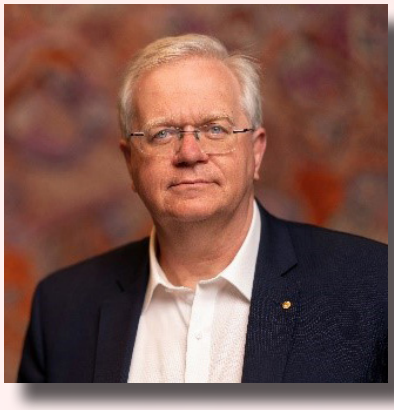


Prof Hironao SAJIKI

Vice-president

Title: Construction of Chiral Conformation of Polymers and Small Molecules Using Circularly Polarized Light

岐阜薬科大学
Gifu Pharmaceutical University



Prof Brian SCHMIDT

Nobel Laureate and Vice Chancellor

Title: Next Generation Astronomical Observatories and Japan-Australia Collaboration

Australian National University

Invited Speakers

Dr Jamie SCHULZ

Leader- Australian Centre for Neutron Scattering

Title: Japan & Australia - Regional Leaders and Partners in Neutron Scattering

ANSTO

Mr Ahihiko SUNAMI

Minister

Title: Message from the Embassy of Japan in Canberra

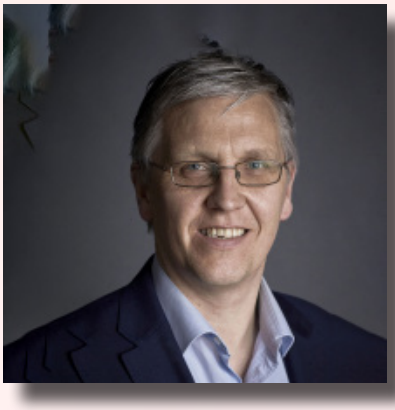
Embassy of Japan

Mr Izuhara TAKERO

Director

Title: SoftBank Artificial Intelligence technology in Australia

ST Solutions Australia



Prof. Pall THORDARSON

Director, UNSW RNA Institute

Title: Recent Developments in the Australian RNA Ecosystem

UNSW SYDNEY

ORAL PRESENTATIONS

Manipulating the Properties of Polymer/Graphene Oxide Nanocomposites Using In Situ Emulsion-based Polymerisation

Authors

Vipul Agarwal, Yasemin Fadil, Bich N. Tran, Namrata Maslekar, Per B. Zetterlund (Cluster for Advanced Macromolecular Design (CAMD), School of Chemical Engineering, University of New South Wales, Sydney, NSW 2052, Australia)

Ever since the discovery of graphene in 2004, graphene-based electrically conducting nanocomposite substrates have been drawing considerable attention due to their application in various research areas including coatings, sensing, catalysis, energy storage, batteries and bioengineering. However, the limited dispersibility of the graphene in the polymer matrix has been a major challenge owing to its high hydrophobicity. Graphene oxide (GO), an oxidised form of graphene has high dispersibility in polymer solutions. Despite considerable research in the field of polymer/GO nanocomposites, there is a persistent interest in developing approaches to regulate and control the arrangement of GO sheets within the polymer matrix to achieve desirable physicochemical, mechanical and electrical properties. The problem of restacking of the GO sheets within the polymer matrix restricting the control over their distribution within the resulting films remains a considerable scientific challenge.

Here we will showcase that in situ emulsion-based polymerisation techniques can be adopted to design and fabricate two dimensional (2D) and three dimensional (3D) polymer/GO nanocomposites. By careful selection of the polymer matrix, we were able to synthesise nanocomposite matrix with innate ability to undergo film formation at ambient temperature. However, surprisingly same matrix when processed can also lead to 3D foam formation. This unexpected behaviour of the polymer/GO nanocomposites will be discussed and their potential in different applications will be explored.

The developed approach allow unprecedented control over the distribution and arrangement of GO sheets within the nanocomposite films and consequently on the intrinsic properties of the resulting films.

Presenter

Vipul
AGARWAL

Australia-Japan innovation in science communication

Authors

Prof. Graham Durant (Questacon)

At a time when it is critical to develop public support for scientific research and encourage young people into STEM careers, science centres in Australia and Japan play a key role in public engagement with science. As Australia's National Science and Technology Centre Questacon was founded in 1988 as a Joint Australia-Japan project and has been undertaking innovation in science communication since that time. Questacon and Miraikan have a long history of cooperative activity with both organisations playing a leadership role in the Asia-Pacific region. Organisations in both countries have much to gain through further cooperation in innovative science communication for the benefit of school students, teachers, researchers and the wider community.

Presenter

Graham
DURANT

Potential anti-cancer and immunomodulatory effects of TMS-like magnetic fields

Authors

Anna Guller (Faculty of Science and Engineering, Macquarie UniversityThe Graduate School of Biomedical Engineering, University of New South WalesARC Centre of Excellence for Nanoscale Biophotonics
Faculty of Medicine and Health Sciences, Macquarie University
The Institute for Regenerative Medicine, Sechenov University)
Sandhya Clement (The Graduate School of Biomedical Engineering, University of New South Wales & ARC Centre of Excellence for Nanoscale Biophotonics, Australia)
Benjamin Heng (Faculty of Medicine and Health Sciences, Macquarie University
Paul Sowman (Faculty of Medicine and Health Sciences, Macquarie University)
Gilles Guillemin (Faculty of Medicine and Health Sciences, Macquarie University)
Ewa Goldys (The Graduate School of Biomedical Engineering, University of New South Wales & ARC Centre of Excellence for Nanoscale Biophotonics, Australia)

Transcranial magnetic stimulation (TMS) is a non-invasive pain-free medical technology clinically approved for the treatment of drug-resistant depression. Conventional TMS uses non-heating strong (≤4 T) pulsed (≤300 Hz) magnetic fields (MF) to induce electric currents in the cortical neurons and control their activity. However, the effects of the TMS-like MF on non-neuronal cells and artificial systems are almost unknown. We hypothesized, that repetitive magnetic stimulation (RMS) by TMS devices can have anti-cancer and immunomodulatory effects. These effects rely on alternative biophysical (magnetically-induced) mechanisms and may help to overcome the problem of cancer drug- and radioresistance.

Aim. This study explores the potential and feasibility of RMS as an adjuvant/allied treatment in oncology.

Methods. We examined effects of 22 RMS regimes designed de novo on viability and phenotype of tumour and immune cells, including glioblastoma (GBM), pancreatic ductal adenocarcinoma (PDAC), hepatocellular carcinoma (HCC) and colorectal cancer (CRC) cells, microglia (BV2 cell line) and human primary peripheral macrophages. We also tested the effect of PRMS on a drug release from polymer nanoparticles in aqueous environment. A standard TMS device “Magstim Rapid2” with AFC70 coil was applied to the cell cultures spatially configured to correspond to a peak MF of 0.6-0.8 T, 0.25-50 Hz frequency, with sessions of 300 or 600 pulses.
Results. RMS selectively modulated the viability and functional polarisation of immune-stimulated microglia and macrophages in a frequency/intensity-dependent manner and affected the proliferation/viability of cancer cells (cancer type, frequency- and pulse number-dependent up- and downregulation). The triggering of the drug release from polymer nanoparticles by the 50 Hz/2 min RMS mode was observed.
Conclusions. Our pioneering findings demonstrate the potential of RMS performed with using of re-purposed TMS equipment for immunomodulation, cancer treatment, and treatment aided with nanomedicines.

We thank Sydney Vital (for seed grant) and Medilink Australia (for providing the “Magstim”).

Presenter

Anna
GULLER

Salivary exosome for diagnosing periodontitis

Authors

Pingping Han (School of Dentistry, The University of Queensland)
Sašo Ivanovski (School of Dentistry, The University of Queensland)

Introduction: Periodontitis, or gum disease, affects around 50 percent of the global population and is the sixth most prevalent disease. Early detection and diagnosis of periodontitis would allow timely interventions and appropriate treatments. A non-invasive, biologically based diagnostic technique is yet to be developed and it may improve clinical diagnosis for routine periodontal screening and monitoring of periodontitis patients.

Body:
Objectives: This study aims to investigate whether salivary biological nanoparticles - small extracellular vesicles (sEVs, or named exosomes) could act as potential biomarkers for periodontal diseases.
Methods: This study was approved by the University of Queensland (HREC No. 2018001225) and Metro North Hospital and Health Service (approval No. 54584). Whole unstimulated saliva was collected from healthy, gingivitis, and periodontitis patients. Small extracellular vesicles were isolated by size exclusion chromatography (SEC), and characterized by morphology with Transmission Electron Microscopy (TEM), by sEVs surface markers with Western Blot and by size distribution with a Nanoparticle Tracking Analysis (NTA). The concentration of sEVs, global DNA methylation and miRNAs profile were correlated with periodontal clinical parameters.
Results: The results showed that the SEC isolation method could lead to more pure and concentrated sEVs particles compared to the ultracentrifuge (UC) method. Furthermore, periodontitis-sEVs significantly increased global 5mC and m6A methylation compared to the healthy group; while there was no change regarding sEVs h5mC methylation between all three groups (Figure 1). The results also demonstrated that periodontitis salivary sEVs contain higher levels of periodontal pathogens. Furthermore, three significantly increased miRNAs (hsa-miR-140-5p, hsa-miR-146a-5p and hsa-miR-628-5p) were only detected in sEVs in periodontitis when compared to that of healthy controls.

Conclusion: The results indicate that salivary sEVs is a more sensitive sampling method compared to the whole saliva for differentiating various periodontal disease states.

Presenter

Pingping
HAN

Robotic Art in Health Care

Authors

Damith Herath (University of Canberra)

This talk will discuss our recent work in non-rehabilitative, receptive-focused creative robotics in health care. The project was intended to engage and enliven a hospital community through a novel robotic art intervention. The initial findings indicate that such interventions are essential and should be part of a holistic health care program.

Presenter

Damith
HERATH

Therapeutic targeting of Bruton tyrosine kinase (BTK) in neurodegenerative diseases

Authors

Sara Jose
(Translational Neuroscience Laboratory, UQ Centre for Clinical Research, The University of Queensland)
Natalia Birch (Translational Neuroscience Laboratory, UQ Centre for Clinical Research, The University of Queensland)
William D. Godfrey (Translational Neuroscience Laboratory, UQ Centre for Clinical Research, The University of Queensland)
Richard Gordon (Translational Neuroscience Laboratory, UQ Centre for Clinical Research, The University of Queensland)
Natalie Groves (Translational Neuroscience Laboratory, UQ Centre for Clinical Research, The University of Queensland)
Katerina Z. Hanton (Translational Neuroscience Laboratory, UQ Centre for Clinical Research, The University of Queensland)
Robert D. Henderson (Translational Neuroscience Laboratory, UQ Centre for Clinical Research, The University of Queensland)
Nanthini Jayabalan (Translational Neuroscience Laboratory, UQ Centre for Clinical Research, The University of Queensland)
Pamela A McCombe (Translational Neuroscience Laboratory, UQ Centre for Clinical Research, The University of Queensland)
Shyuan T. Ngo (Australian Institute for Bioengineering and Nanotechnology (AIBN) , Queensland Brain Institute, (QBI))
Kerry Roper (Translational Neuroscience Laboratory, UQ Centre for Clinical Research, The University of Queensland)
Fredrick J Steyn (Translational Neuroscience Laboratory, UQ Centre for Clinical Research, The University of Queensland and UQ School of Biomedical Sciences)
John Sullivan (Translational Neuroscience Laboratory, UQ Centre for Clinical Research, The University of Queensland)
Trent Woodruff (UQ School of Biomedical Sciences)

Persistent neuroinflammation and the accumulation of toxic misfolded protein aggregates is a pathological hallmark of most neurodegenerative diseases such as Parkinson's disease (PD) and Motor Neuron Disease (MND). Neuroinflammation can be observed early in the disease process and still strongly evident in post-mortem analyses of both PD and MND patient brains. Persistent immune activation has thus been closely linked to disease progression based on a wealth of accumulating evidence in clinical studies and experimental models. Therefore, blocking this inflammation cycle is an attractive therapeutic approach to slow or halt disease progression. Herein, we demonstrate that Bruton's Tyrosine Kinase (BTK) is activated in animal models of both PD and MND. Further, pharmacological inhibition of BTK signalling prevented inflammasome activation in primary microglia and human peripheral blood mononuclear cells. BTK inhibition also reduced glutamate neurotoxicity in NSC34 motor neuron cells. Additionally, daily oral dosing with BTK inhibitors effectively reduces NLRP3 inflammasome activation markers and neuropathology in pre-clinical models of PD. Together, our results indicate that BTK could be a potential druggable therapeutic target to mitigate inflammasome activation and provide neuroprotection in these diseases.

Presenter

Sara
JOSE

Thrombospondin-1 drives cardiac remodelling in chronic kidney disease

Authors

Sohel M Julovi (Kidney Injury Group, Centre for Transplant and Renal Research, Westmead Institute for Medical Research)
Natasha M. Rogers (Kidney Injury Group, Centre for Transplant and Renal Research, Westmead Institute for Medical Research)

Background: Patients with chronic kidney disease (CKD) are at significantly greater risk of cardiovascular disease (CVD), but targeting standard risk factors fails to improve patient outcomes. Additional "uremia-specific" factors, particularly accumulating toxins, are implicated in the excessive burden of CVD. The cell stress-response protein thrombospondin-1 (TSP1) is elevated in CKD, however its mechanism of action in uremic CVD remains undefined.

Methods: We analysed publicly available gene datasets of human myocardium to analyse variations in TSP1 expression. Human left ventricle (LV) samples were analysed for TSP1. Plasma TSP1 concentrations were correlated with echocardiography findings. We also used a model of 5/6 nephrectomy (5/6-Nx) to simulate CKD in C57BL/6 or TSP1KO mice, followed by metabolic caging, echocardiography and tissue analysis after 12 weeks. Human cardiomyocytes were incubated with the uremic toxin indoxyl sulfate with/without intact TSP1 signalling to investigate the effects on cell senescence, proliferation and hypertrophy.

Results: TSP1 expression was significantly increased in left ventricle (LV) from patients with cardiomyopathy and plasma TSP1 correlated significantly with LV mass index identified on echocardiography. TSP1 was also found to be differentially expressed in datasets of patients with CKD-related heart disease. Both indoxyl sulfate and TSP1 produce cardiomyocyte hypertrophy, senescence-associated secretory phenotype, and mitogen activated protein kinase/extracellular signal-regulated kinase (ERK). However the effects of indoxyl sulfate require intact TSP1 signalling. A murine model of CKD produced characteristic of left ventricular hypertrophy and fibrosis, pro-inflammatory cytokine production, increased oxidative stress and upregulated myocardial TSP1 expression. Mice deficient in TSP1 were protected from these features of cardiovascular stress.

Conclusion: Characteristic maladaptive cardiac effects seen in CKD in the presence of uremic toxin are attributable to TSP1. Manipulation of TSP1 signalling may be an attractive target to reduce the burden of CVD in CKD patients.

Presenter

Sohel
JULOVI

Collaborative research on the ecology of inland floodplain wetlands

Authors

Debashish Mazumder (ANSTO)
Tsuyoshi Kobayashi (NSW Department of Planning and Environment)

Inland floodplain wetlands are ephemeral but provide complex and productive habitats for diverse plants and animals in Australia. Multidisciplinary approaches are essential in understanding how the ecosystem of such wetlands functions.

Over the last 10 years, we have been working collaboratively on selected iconic inland floodplain wetlands of New South Wales to understand flow-trophic interactions using stable isotopes.

Our work contributed to the management of significant inland wetlands in NSW through adopting ecosystem response. The research highlights the benefits of long-term collaboration, including multiple peer-reviewed journal publications.

Presenter

Tsuyoshi
KOBAYASHI

Development of adeno-associated virus vectors for cardiac gene therapy

Authors

Cindy Kok (Westmead Institute for Medical Research)
Ian Alexander (Children's Hospital at Westmead)
Eddy Kizana (Westmead Hospital)
Leszek Lisowski (Children's Medical Research Institute)

Presenter

Cindy
KOK

Gene therapy using recombinant adeno-associated virus (rAAV) has been proposed as a treatment for heart disease. In particular, we aim to design gene therapy to vectors to protect against anti-cancer drug toxicity. Gene therapy technology based on rAAV has an excellent safety profile and enables efficient delivery of therapeutic molecules to the target organ. It has been used extensively by researchers in both Australia and Japan.

Targeted delivery is conferred by the capsid serotype used to package rAAV. However, successful rAAV gene therapy in pre-clinical models has not translated to the same therapeutic benefit in humans. This is due to inherent differences between animal models and humans, and highlights the importance of testing new therapies in the target cell population as well as the target species.

Also, it is important to ensure that the protective treatment is only delivered to the heart, so that we can prevent unwanted side effects arising from off-target activity of the rAAV.
We therefore aimed (1) to generate novel rAAV capsids designed and selected for efficient entry into human cardiomyocytes, and (2) to design strategies for treating cardiotoxicity, which is a known side effect of some anti-cancer drugs.

This technology has evolved over time and has been further developed specifically in the heart via collaboration with research groups across Australia. These collaborations have facilitated the generation of novel therapies, as well as the clinically relevant model systems which are used to test the utility of our gene therapy vectors in human cardiac cells.
The innovative technologies outlined here make gene therapy a promising proof of principle, with potential application to non-anthracycline chemotherapeutics also.

Can variation in wine preference amongst consumers be explained by salivary protein composition?

Authors

Jiaqiang Luo (The University of Melbourne)
Xinwei Ruan, Ching-seng Ang, Philip Marriott, Pangzhen Zhang, Kate Howell

Introduction: Groups of consumers display different preference for flavours and aromas. Results from our laboratory showed that Chinese wine consumers preferred different styles of Shiraz wine to Australian consumers. This variability could be explained by cultural background, genetics, upbringing and personal taste. One of the direct determinants of wine preference is the in-mouth perception of the wine which is contributed by the retronasal olfaction, modulated by saliva. We hypothesise that the differences between salivary protein compositions between two groups of consumers will vary the release of wine aroma, influencing their wine preferences as given in sensory analysis.

Methods: The sensory evaluation sessions were performed in formal surroundings. Free-description based and perceived sensory intensity data of the two groups of participants were obtained using the Pivot Profile® and continuous scale assessment, respectively. Participants' saliva samples were collected before the sensory evaluation and subjected to the protein composition profiling using LC-MS/MS.

Results: The consumer groups preferred different wines. Australian consumers tended to prefer wine with stronger floral and fruity tastes while the Chinese group preferred earthy, umami and spicy wines. We found statistically significant variations in the concentrations of specific proteins (e.g. proline-rich salivary proteins and lipocalin-1, $p < 0.01$) between the two groups.

Significance: This project will provide information about how individual sensory preferences are determined in high value products. Personal taste may be associated with cultural factors, but also determined by dietary, genetic or dental health. Salivary proteins which are closely associated with preferences may act by helping to release particular aromas during wine tasting. This information could start to explain the cultural preferences for particular food and beverage and allow targeted products to be released on the market.

Presenter

Jiaqiang
LUO

Synthesis of diamine functionalised graphene oxide and its application in the fabrication of electrically conducting reduced graphene oxide/polymer nanocomposite films

Authors

Namrata Maslekar, Rabiatul A. Mat Noor, Rhiannon P. Kuchel, Yin Yao, Per B. Zetterlund and Vipul Agarwal
(Centre for Advanced Macromolecular Design (CAMD), School of Chemical Engineering, University of New South Wales (UNSW), Sydney and Mark Wainwright Analytical Centre, University of New South Wales (UNSW)).

The focus of research in diamine functionalised graphene oxide (GO) has been limited to the use of diamines either as crosslinker or to achieve simultaneous functionalisation, reduction and stitching of GO sheets, especially in the case of ethylene diamine (EDA). Controlling the extent of stitching and functionalisation has to date remained a challenge. In particular, synthesis of colloidally stable monofunctionalised GO–NH2 with dangling amine groups using diamines has remained elusive. This has been the limiting factor towards the utility of EDA functionalised GO (GO–NH2) in the field of polymer-based nanocomposites. We have synthesised colloidally stable GO–NH2 with dangling amine groups and subsequently demonstrated its utility as a surfactant to synthesize colloidally stable waterborne polymer nanoparticles with innate affinity to undergo film formation at room temperature. Thermally annealed dropcast polymer/GO–NH2 nanocomposite films exhibited low surface roughness (1 μm) due to the homogeneous distribution of functionalised GO sheets within the polymer matrix as observed from confocal laser scanning microscopy, scanning electron microscopy and transmission electron microscopy. The films exhibited considerable electrical conductivity (0.8 S m−1), demonstrating the potential of the GO–NH2/polymer nanocomposite for a wide range of applications.

Presenter

Namrata
MASLEKAR

Small and Ultra Small Angle Scattering for Nano- and Micro-Structural Characterisation at ACNS, ANSTO

Authors

Liliana de Campo (ANSTO)
Elliot Gilbert (ANSTO)
Robert Knott
Jitendra Mata (ANSTO)
Anna Sokolova (ANSTO
Andrew Whitten (ANSTO)
Kathleen Wood (ANSTO)
Chun-Ming Wu (NSRRC)

Presenter

Jitendra
MATA

Small angle X-ray and neutron scattering (SAXS, SANS, ultra-SANS) are versatile techniques for investigating the nanoscale and microscale structure of hard and soft condensed materials such as minerals, alloys, magnetic materials, food, surfactants, polymers, proteins, colloids and emulsions. These techniques have been exceptionally useful for studying complex materials of industrial importance in recent years. The use of small angle scattering (SAS) in combination with traditional techniques offers a unique insight into the structure, size, shape and morphology of materials. Different processes like aggregation, structural transitions, crystallization and phase separation can be directly studied. SAS techniques are well-established for characterisation at the 1 nm to 20 μm length scales, are mostly nondestructive, and particularly useful to study systems, in-situ, and within complex sample environments. The use of deuterated molecules and partial deuteration has also enhanced the applicability of these methods for soft materials using SANS/USANS. We discuss the advantages and limitations of these techniques, and provide examples of recent applications in various areas of science in this talk.

Australia is the home of state-of-the-art reactor-based SANS and USANS instruments known as QUOKKA, BILBY, and KOOKABURRA (at the ACNS, ANSTO). Combining these with on-site lab-based SAXS instrument provides a versatile characterization suite to study complex materials. ANSTO is known for its high class neutron scattering based science, and associated exceptional sample environment options, as well as outstanding deuteration facility.

Reference:

https://www.ansto.gov.au/research/facilities/australian-centre-for-neutron-scattering

Iso-elemental fingerprinting technology for food provenance

Authors

Debashish Mazumder (ANSTO)

Australia has a reputation as a safe and sustainable producer of quality food in the domestic and international market. Recent reports outline fraudulent activities in the supply chain to increase profits by deceiving consumers. Australian Nuclear Science and Technology Organisation (ANSTO) is collaborating with industry and university partners and developed an iso-elemental fingerprinting technology which has been accurately tracing the source of origin of food with over 85% accuracy. The uptake and dissemination of this technology will strengthen the deterrent against food fraud, hence protecting the end users and securing supply chains.

Presenter

Debashish
MAZUMDER

The role of games in combating antibiotic resistance

Authors

Andreea Molnar (Swinburne University of Technology)

Antimicrobial resistance is one of the most pressing problems in medical systems [1]. It is estimated that, by 2050, antimicrobial resistance could become to top cause of death [2] and could cause an annual reduction of 3.8% of the global domestic product [3]. Discovery of new drugs helps, however in order for their impact to last changes in how the antibiotics are used need to be achieved [4]. Therefore, educating people about the responsible use of antibiotics and the risk involved could represent a solution, if not for eradicating antibiotic resistance completely, at least for slowing it down. There have been globally healthcare campaigns aiming to improve antibiotic stewardship with mixed results in their effectiveness [5] showing the need to use complementary tools to engage people and games are suggested as an alternative method [6]. This presentation will discuss the results of a literature review performed on games that aim to promote responsible antibiotic use. It will focus on areas of concerns, segments of population the games address and their effectiveness in promoting responsible antibiotic use and changing behaviour.

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Presenter

Andreea
MOLNAR

Corynebacterium glutamicum mechanosensitive channels for developing amino acids-selective nanovalves

Authors

Yoshitaka Nakayama (Victor Chang Cardiac Research Institute)
Prof Boris Martinac (Victor Chang Cardiac Research Institute)

After the discovery of the human fifth basic taste “Umami”, Japan innovated the industrial production of monosodium glutamate (MSG) with bacterial fermentation by Corynebacterium glutamicum. As a microbial cell factory, Corynebacterium glutamicum has been developed enormously to produce various amino acids, not only L-glutamate, for animal feed, pharmaceuticals, and cosmetics. To determine the mechanisms underlying how bacterial cells overproduce amino acids, mechanosensitive channels have been considered as key transporters.
We have developed novel electrophysiological methods with bacterial giant spheroplast and liposomal reconstitution for recording mechanosensitive channels from Corynebacterium glutamicum. Corynebacterium glutamicum has three different types of mechanosensitive channels (MscCG, MscCG2, and MscL). These channels are activated by pressure with different activation threshold and channel conductance in the cell membranes (Nakayama et al, Scientific reports 2018). Patch-clamp analysis with asymmetric buffer revealed that the mechanosensitive channel MscCG is a glutamate exporter with slight cation-selectivity and current rectification. Structural analysis of MscS-like channels has suggested that unlike other ion channels, MscS-like channels do not have ion selectivity filter in the pore domain. Instead, there is a potential ionic pathway in the cytoplasmic cage domain as molecular conduit (Cox et al, Nature communications 2013),

Bacterial mechanosensitive channels release non-selectively intracellular molecules including amino acids upon hypoosmotic shock as osmotic nanovalves. Therefore, cells can avoid dangerous cell lysis in the mechanical fluctuating environments, however, in the industrial production, the non-selective amino acids release is problematic by impairing purity of the products. Understanding the selectivity mechanisms of bacterial mechanosensitive channels will lead developing amino acids selective nanovalves for biotechnological applications, such as industrial amino acid production.

Presenter

Yoshitaka
NAKAYAMA

Digital permeability upscaling and Carbon dioxide hydraulic fracturing for underground Energy storage and gas enhancement production: JOGMEC, CSIRO, Kyushu, Yamaguchi, Kyoto and Curtin Universities collaborations

Presenter

Marina
PERVUKHINA

Authors

Esteban, L., Giwelli, A., Kovalyshen, Y., Dautriat, J., Pervukhina, M., Seyyedi, M., White, C., Shulakova, V., Jackson, S., Sarout, J. and Aryana, A.(CSIRO – Energy Resources)
Lebedev, M., Sarmadivaleh, M. (Curtin University)
Kato, Y., Shimokawara, M., Kitamura, R., Kato, M., Kuramoto, D (JOGMEC– Oil & Gas Upstream Unit – Chiba Japan)
Tsuji, T., Ikeda, T. (Kyushu University – Fukuoka, Japan)
Jiang, F (Yamaguchi University – Ube, Japan)
Chen, Y., Ishida, T. (Kyoto University)

Over the last 2.5 years, JOGMEC, CSIRO, Kyushu, Kyoto, Yamaguchi and Curtin Universities have initiated collaboration to tackle several industrial challenges using deep learning technologies and advanced rock physics and geomechanics laboratories, aiming to improve our understanding in underground energy storage, carbon capture, utilisation and storage (CCUS), gas production enhancement and other associated reservoir risks evaluations.

Two main research projects were developed:

(i) Deep learning approach to use multi-scale X-ray CT images for permeability prediction and upscaling (CSIRO-JOGMEC-Kyushu, Yamaguchi and Curtin Universities). Rock permeability is a pivotal input for fluid flow simulations in various geological settings and impacts a broad range of applications in the fields of energy security, gas underground storage, water and mineral resources utilisation, to name a few. Recent technology improvements allow gaining a digital 3D replica of natural rock using fast and non-destructive tomographic techniques. Combining 3D images from medical and micro-CT scanners, natural rocks were scanned at three scales from meter-long to centimetre to millimetre scale from the same initial core material. Brine permeability measurements under reservoir conditions were successful benchmarked at those three scales using advanced core flooding laboratories in order to calibrate and quality check the deep learning approach to upscale permeability from microscale to meter-scale. The current next stage is now to apply this validated digital rock images up-scale modelling of permeability to field scale in an Australian basin targeted as CCS in cost and time-efficiency manner.

(ii) The use of carbon dioxide (CO2) as an alternative fluid for hydrofracturing shale reservoirs for gas production enhancement. Cost-effective production of natural gas from onshore gas shale reservoirs requires hydraulic fracturing (HF) stimulation to enhance formation conductivity and increase gas production. Currently, slickwater-based fluids are widely used for HF operation due to their low cost and availability. However, in some regions there are concerns about water scarcity and a desire to limit the water use when developing shale gas resources. Controlling the fate and environmental impact of HF fluids in the subsurface is also a pivotal underlying motivation. These issues have driven significant research efforts to develop more effective HF fluids and stimulation methodologies. Therefore, CSIRO- JOGMEC and Kyoto University are working together to explore the possibility of using carbon dioxide (CO2) as an alternative fluid. A new technique is in development to better interpret, and process micro-seismic events evolution of the CO2 generated hydraulic fracture.

Achieving net zero together: The potential for Tasmania and Japan to collaborate on decarbonisation

Authors

Steven J. Phipps (Ikigai Research)

Japan recently pledged to achieve a reduction of 46% in its carbon emissions by 2030, in addition to the existing target of achieving net zero carbon emissions by 2050. Imported green hydrogen and ammonia will be critical to meeting these targets, accounting for 1% of domestic power generation by 2030 and 10% by 2050. The Japanese Government has indicated that Australia is their preferred supplier and is working to develop a hydrogen supply chain between the two countries.

With abundant opportunities to produce renewable energy, Tasmania is uniquely positioned to form part of such a supply chain. Tasmania now generates more than 100% of its electricity from renewables, and has legislated targets to increase this to 150% by 2030 and to 200% by 2040. Excess electricity is currently exported to the Australian mainland via the Basslink undersea cable, but ample opportunities exist to use surplus power to produce green hydrogen and ammonia for export. Tasmania aims to produce hydrogen by 2022-24 for domestic use and by 2025-27 for export, including to Japan. Four separate projects are currently proposed for the Bell Bay Advanced Manufacturing Zone in Tasmania's north, including two projects proposed by joint consortia of Australian and Japanese companies. With abundant supplies of cheap and reliable hydroelectricity and wind power, Tasmania has the potential to generate green hydrogen and ammonia at prices 10-15% cheaper than mainland locations in Australia.

Japan's commitment to net zero therefore represents a unique and compelling economic opportunity for Tasmania. This presentation will explore the opportunities for collaboration between Tasmania and Japan on achieving net zero emissions, including the potential economic benefits for Tasmania and the potential for Tasmania to contribute towards reductions in Japanese carbon emissions.

Presenter

Steven
PHIPPS

NMR Platform for Characterization of Materials in Energy Environment and Health

Authors

Aditya Rawal (UNSW)

Elucidating the molecular structure-property relationships is key to the development of materials for applications in energy, environment and health sciences. Nuclear Magnetic Resonance (NMR) spectroscopy is a powerful tool to understand the underlying short and long range chemical structures that guide the synthesis and properties of materials. The versatile nature of NMR spectroscopy is due to the extremely high spectroscopic resolution afforded by the technique, its capability to characterize both ordered and disordered materials, and to determine material structure and assemblies over three orders of magnitude length scale from 0.1 nm to ~ 100's nm.

Here, we demonstrate the capabilities of the NMR technique with specific examples in the fields of nano-materials, energy storage materials, high performance biomaterials, environmental materials and drug delivery systems.
(i) In the first instance we discuss the comprehensive structural determination of graphene oxide a single atom thick material that is used in applications such as water filtration, energy storage as well as a surfactant.
(ii) In the case of energy systems, we will discuss understanding of structure and electrochemical mechanisms in novel high energy density Lithium -Sulfur battery systems, and solid state hydrogen storage systems.
(iii) We will demonstrate in structure property characterization in coupling NMR spectroscopic measurements with detailed mechanical property measurements to characterize spider silk and allied biomaterials.
(iv) We will demonstrate utility of NMR to assess environmental materials such as biochar that is used for soil remediation and zirconium phosphonate materials that are used to purify nuclear waste streams.
(v) Finally we will demonstrate how NMR spectroscopy addresses questions of structure and efficacy in various drug delivery systems.

Presenter

Aditya
RAWAL

Value from Collaboration- A Case Study

Authors

Keith Sweatman (Nihon Superior Co., Ltd.)
Xin Fu Tan (University of Queensland)
Kazuhiro Nogita (University of Queensland)
Tetsuro Nishimura (Nihon Superior Co., Ltd.)

That a contact that began with a need for a metallurgical insight into a newly invented solder alloy led to a 20-year relationship that has yielded benefits for both an Osaka SME and a research group at the University of Queensland is a practical demonstration of the value that can emerge from a Japan/Australia collaboration. Although triggered by a need for technical input that was not immediately available to a small Osaka company that initial collaboration has led to strong and ongoing relationships between the University of Queensland and multiple Japanese universities/institutes, including SPring-8 synchrotron, Kyushu Synchrotron, Osaka, Kyoto and Kyushu Universities. In the way that these things work, those relationships have in turn resulted in relationships developing between the University of Queensland and Imperial College London and Universiti Malaysia Perlis. In this presentation the authors will report the steps in the development of this relationship and identify the benefits that have accrued to each party. This network of relationships will be presented as an example of the benefits both Australia and Japan can enjoy from relationships of the type promoted by the JSPSAAA.

Presenter

Keith
SWEATMAN

The Australian Nuclear Science and Technology Organisation and the Nagaoka University of Technology, Over 20 Years of Partnership

Authors

Gordon Thorogood (ANSTO)
Makoto Nanko (Nagaoka University of Technology)
Hisayuki Suematsu (Nagaoka University of Technology)
Yuichi Otsuka (Nagaoka University of Technology)
Dhriti Bhattacharyya (ANSTO)
Alan Xu (ANSTO)
Mihail Ionescu (ANSTO)

The collaboration between ANSTO and NUT was begun by Prof. Kozo Ishizaki and Dr Dan Perera over twenty years ago with more than 25 students working at ANSTO in that period to satisfy their on the job training (OJT) course requirement. In that time both organizations have changed and grown and have affected each other to their mutual benefit. In this presentation I will outline some of the projects the students have been involved in and what the goals were apart from research. I will also outline what research is currently underway in the Nuclear Fuel Cycle (NFC) research theme at ANSTO how facilities are being developed that NUT OJT, Masters and PhD students will access along with their supervisors. Recently due to the success of the partnership between ANSTO and NUT, ANSTO has been awarded a grant by the Australian Department of Industry, Science, Energy and Resources to partner with a consortium led by NUT to study self-healing ceramic coatings for the NFC. Over the next two years this will be the focus of the NUT students that will work at ANSTO, and I will give summarize the types of activities they will be involved in and give an update on the progress so far.

Presenter

Gordon
THOROGOOD

Beyond "Safe Until Sorry" Management of Emerging Contaminants via Data Science Applied to a Publication Database

Authors

Jason M. Whyte (Centre of Environmental and Economic Research (CEER), School of BioSciences, University of Melbourne & Centre for Anthropogenic Pollutant Impact and Management (CAPIM), School of BioSciences, University of Melbourne)

Introduction:
Modern economies produce thousands of chemicals. History leads us to expect that a number will show themselves to be "emerging contaminants", having some (currently unknown) adverse effect on human or environmental health (more concisely, AE). Regulators aim to prevent AEs by conducting risk assessments, typically informed by experimental determination of chemical properties. However, this approach is impractical given regulators' limited ability to gather data. Consequently, regulation may occur "reactively", that is, only after an accumulation of AE evidence. The time between the introduction of certain emerging contaminants and their regulation has led to global concerns around chemical concentrations in soil and water.

Body:
We would expect to apply timelier regulation if we could anticipate risk without requiring scarce laboratory data. We propose such a "proactive" approach to the problem. We hypothesise that keyword data in publications on regulated chemicals exhibit particular features in chemical-AE associations over time. Recognising these features in publications for other chemicals may indicate those similarly proceeding towards regulation. Such insights may encourage a regulator to scrutinise certain chemicals, making them better able to anticipate AEs.
We investigate our hypothesis by considering some regulated chemicals, and some believed safe under current conditions. We query Web of Science over a fixed publication year range to find publication metadata featuring a particular chemical. Data processing yields a time series of counts of papers associating a chemical with keywords of interest.

Conclusion:
Our preliminary investigation shows that keyword data from chemicals associated with AEs does have features not seen in other chemicals. Given this support for our hypothesis, we will extend this study by considering a greater number of chemicals. We will aim to produce an automated system which can reliably use publication records to classify chemicals as emerging contaminants, or otherwise.

Presenter

Jason
WHYTE

ANSTO's National Deuteration Facility: facility overview, diversity of capabilities, user program and impact.

Presenter

Karyn
WILDE

Authors

Karyn Wilde (National Deuteration Facility, ANSTO)
Marina Cagnes (National Deuteration Facility, ANSTO)
Anthony Duff (National Deuteration Facility, ANSTO)
Anwen Krause-Heuer (National Deuteration Facility, ANSTO)
Michael Moir (National Deuteration Facility, ANSTO)
Carl Recsei (National Deuteration Facility, ANSTO)
Agata Rekas (National Deuteration Facility, ANSTO)
Rob Russell (National Deuteration Facility, ANSTO)
Rao Yepuri (National Deuteration Facility, ANSTO)
Tamim Darwish (National Deuteration Facility, ANSTO)

Deuterium (2H or D) is a naturally occurring stable isotope of hydrogen (1H or H). Deuteration, substitution of 2H for 1H, can provide contrast and improved resolution to assist investigations into the relationship between molecular structure and function of molecules of both biological and synthetic origin. Molecular deuteration of organic compounds and biomolecules significantly increases options available in characterisation and complex structure function investigations using neutron scattering and reflectometry, nuclear magnetic resonance (NMR), mass spectrometry (MS) and other techniques and creates functional materials with superior properties in life sciences, pharmaceutical and advanced technology applications.

The National Deuteration Facility (NDF) at the Australian Nuclear Science and Technology Organisation (ANSTO) is the only facility of its type in the Southern Hemisphere with the specialised expertise and infrastructure to provide deuteration through both biological and chemical techniques for a diversity of molecules and range of applications.

NDF has developed a suite of capabilities in both chemical deuteration of small organic molecules and in vivo deuteration of biomolecules providing access to a broad range of deuterated molecules for research and industry. A wide range of deuterated organic molecules produced using tailored deuteration approaches provides bespoke deuterated molecules generally unavailable commercially, widening the range of systems that can be investigated and applications possible across multiple research fields. These include a range of lipids, unsaturated phospholipids (e.g. POPC and DOPC), heterocyclics, aromatics, surfactants, ionic liquids, saturated and unsaturated fatty acids, sugars and detergents. Isotopically labelled proteins (variably deuterated, multiply-labelled - 2H, 13C, 15N) and cholesterol-d45 are produced through bacterial recombinant expression and bio-engineered yeast growth respectively.

An overview and update on the NDF will be provided in this presentation including details on the NDF User Program and modes of access, capabilities and brief highlights of research and innovation enabled through utilisation of deuterated molecules produced by the NDF.

Micro-Tensile Study of Alpha Damage within Materials for Fission and Fusion Reactors

Authors

Alan Xu (ANSTO)

During the operation of future fusion reactors, alpha damage is expected to embrittle divertors, a component that plays a role of filtering helium ash from the deuterium-tritium plasma. Currently, tungsten is the candidate material for the divertor being one of few materials with optimal combination of high melting point, thermal conductivity and low activation requirements. Whilst tungsten has a relatively high degree of radiation damage resistance than most metals, it is still prone to transmutation into Re under neutron irradiation. The presence of Re can accelerate embrittlement as previous studies involving neutrons have identified formation of irradiation induced precipitates that harden the material significantly. Similarly, alpha damage is also anticipated to affect the structural integrity of components for molten salt fission reactors. Ni-Mo-Cr alloys are candidate materials expected to contain thorium dissolved within a molten salt, so it is expected to withstand a combination of corrosive, high temperature and irradiation damage conditions. During the operation of a future GEN IV fission reactor, the Ni will undergo alpha decay as it is transmutated by neutrons. Thus, for both Tungsten and Ni-Mo-Cr materials, bubble formation as a result of alpha damage is a point of concern for the integrity of future reactor components. In this presentation, the results of in-situ micro tensile testing of W, W-5Re and Ni-Mo-Cr alloy as irradiated by helium ions are presented.

Presenter

Alan

XU

Poster Schedule

Affilitation	Title	Presenter
University of Queensland	Re-analysing existing clinical genomic information: an effective way to increase diagnostic yield for patients	**Mr Alan Robertson**
University of Melbourne	The age of epidemics: acute infectious disease and economic development in historical perspective	**Dr John Tang**
Deakin University	Bond properties at the softwood to hardwood interface	**Dr Mahbube Subhani**
ANSTO	Neutron crystallography of the transition state of RuBisCO	**Dr Anthony Duff**
ANSTO	Scientific opportunities for high-resolution neutron spectroscopy at ANSTO	**Dr Nicolas de Souza**
CSIRO	Tintinnids in the Southern Ocean –agglutinating communities with a focus on diatom and coccolithophorid consortia	**Dr Ruth Eriksen**
University of Melbourne	Effects of sugarcane flavones and fiber on short-chain fatty acids production by gut microbiota during in vitro pig fecal fermentation	**Mr Yit Tao Loo**
Charles Sturt University	Bonsai growing in Australia: Practicing Ikigai and Kodawari within a hobby	**Dr Yazdan Mansourian**
University of New South Wales	Covalently Bonded Cucurbit[n]uril as Hydrogel Structural Components and as Drug Delivery Vehicles in Hydrogels	**Mr Ahmed Abdulrahman**
University of Melbourne	Biological modelling, and rarely asked question of the 21 century	**Dr Jason M Whyte**