23RD AUSTRALIAN INSTITUTE OF PHYSICS CONGRESS

JOINT WITH

AUSTRALIAN OPTICAL SOCIETY (AOS) CONFERENCE;

43RD AUSTRALIAN CONFERENCE ON OPTICAL FIBRE TECHNOLOGY (ACOFT);

2018 CONFERENCE ON OPTOELECTRONIC AND MICROELECTRONIC MATERIALS AND DEVICES (COMMAD 2018)

9-13 December 2018

Perth, Western Australia

Congress Handbook

aip AUSTRALIAN INSTITUTE OF PHYSICS www.aip.org.au

THE AUSTRALIAN OPTICAL SOCIETY

ACOFT

Australian Nanotechnology Network

ANFF

Image credit: LIGO/R. Hurt (Caltech-IPAC)

23RD AUSTRALIAN INSTITUTE OF PHYSICS CONGRESS

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AIP CONGRESS COMMITTEE WELCOME

This week's proceedings comprise the 23rd Australian Institute of Physics Biennial Congress, the Australian Optical Society (AOS) Conference, the 43rd Australian Conference on Optical Fibre Technology (ACOFT), the Conference on Optoelectronic and Microelectronic Materials and Devices (COMMAD 2018). On behalf of all of these, welcome to Perth!

The scientific program reflects the breadth of physical sciences and technology in Australia, with topics ranging from the very fundamental to the very applied. The program also reflects the value placed on all facets of the physics-related activities – encompassing academic research, teaching and education, and industrial and technological applications.

In planning this year's congress, the program and organising committees have had a particular view towards diversity and inclusivity. We are pleased that the program achieves a good gender balance amongst the keynote and plenary speakers, and we reaffirm our commitment to the principles of diversity, gender balance and inclusivity. This commitment clearly reflects current priorities amongst our registered participants: the 'Diversity and Equity Group in Australian Physics' session was booked out in next to no time! Our apologies to those who missed out.

Please take kind note of our sponsors and exhibitors, listed on page 45. This week's special sessions, plenary presentations and networking events – free to all participants – have been made possible by their generous support which we gratefully acknowledge.

Physics, and science in general, have a lot to offer to the society we live in. Few doubt the evident contributions of our discipline to scientific advances and its relevance to our technology-based industries – and we are here to celebrate these. Yet, surely, the discerning and quantitative way of thinking on which we pride ourselves is a crucial element not just of a more productive society, but more broadly of a smarter society. "To think like a physicist" should be a badge of honour that is worn with pride, not just within the confines of the research lab or lecture theatre but in the arena of public debate, where our society's future direction is at stake. Alongside the in-depth scientific programme, we hope to see elements of this broader discussion about the role of our discipline in society in the lecture theatres or during the social events!

On behalf of all members of the organising and program committee, I would like to wish you an enjoyable time at the congress, and hope you take away some new and profound scientific insights during your time here in Western Australia.

Gerd Schröder-Turk

AIP Congress Organising Committee Chair

AIP PRESIDENT'S WELCOME

Welcome to the 23rd Australian Institute of Physics Congress, held jointly with the Australian Optical Society Conference, the 43rd Australian Conference on Optics and Fibre Technology and the 2018 Conference on Optoelectronic and Microelectronic Materials and Devices.

The Congress provides one of the best local opportunities for physicists from a wide range of research, education, government and industry to share ideas, network and hear talks from our distinguished plenary and keynote speakers as well as from other colleagues presenting in the broader program.

It is great to see Congress held in Perth – the first time this millennium! And it is great to see the strength of the program, which between the astronomy and gravitational wave streams and the joint optics conferences is very well aligned with recent Nobel prizes. Both these geographic and topical alignments are surely signs of the strength and interest in the physics community in Australia.

That strength is matched by the efforts of all those involved in organising this Congress.

On behalf of the Australian Institute of Physics, thank you to all those involved, particularly to the local organising committee. We hope all delegates enjoy an informative and rewarding Congress.

Andrew Peele and Jodie Bradby
President and Vice-President, Australian Institute of Physics

AOS PRESIDENT'S WELCOME

I would like to start by welcoming you all to the ACOFT / AOS Conference stream of this Congress.

The AOS is delighted to partner again with AIP in this congress to hold our annual conference. We hope that the Australian and New Zealand optics and photonics community will benefit from this excellent opportunity, not only to renew contacts within our community, but to engage with the wider physics community.

Our conferences in this Congress are the 43rd Australian Conference on Optical Fibre Technology (ACOFT) and the AOS Conference, held biennially with the AIP Congress for many years now. AOS also runs ANZCOP and ACOLS, and we are actively reviewing ways to streamline these conferences to provide the best support for the Australasian optics community. Supporting conferences is a major activity of AOS, and I encourage you to get involved in AOS to help steer future events.

I congratulate the organizers on bringing together such a strong program. The invited speakers are especially exciting, covering some of the hottest topics in optics and photonics. It is particularly pleasing to see good diversity in this group.

It's great to be in Perth again, only the third time we have held a conference here (ANZCOP 2013 and ACOFT 1985).

I would like to thank everyone who has contributed to making this event a success: the organising committee and the members of the TPC whose expertise and time is so important. I particularly want to thank Robert McLaughlin who has so ably chaired the TPC for the AOS/ACOFT stream and coordinated so many aspects of our involvement in this Congress.

Enjoy the event and Perth, be inspired by the great speakers, renew old friendships and make new ones. Make the most of this annual congregation of Australasian optics and photonics researchers, and physicists.

Simon Fleming
AOS President

UNIVERSITY OF WESTERN AUSTRALIA PHYSICS HEAD'S WELCOME

We are very pleased to be hosting the 23rd Australian Institute of Physics Congress and the Australian Optical Society Conference (AOS), the 43rd Australian Conference on Optical Fibre Technology (ACOFT), and the 2018 Conference on Optoelectronic and Microelectronic Materials and Devices (COMMAD) in our leafy campus, overlooking the picturesque Matilda Bay. The conference venue is conveniently situated about 8 minutes from Perth CBD, 10 minutes from the stunning Cottesloe beach, with nearby Kings Park and Botanic Garden, leisure and dining. We take great pride in welcoming you all to the University of Western Australia.

The biennial AIP Congress, the AOS, ACOFT and COMMAD Conferences, are the premier national forums to present and discuss progress in physics related research in both fundamental and applied areas. This is an exciting time for physics and this grand event brings together leading researchers in almost all fields of physics. We are delighted to have such an eminent list of speakers from many different countries. This will be a great opportunity to network, to exchange inspiring new ideas, to strengthen existing collaborations and to forge new partnerships.

We look forward to seeing you in Perth, and hope you will find the conferences informative and valuable.

Jingbo Wang
Head of Physics Department, University of Western Australia

COMMAD CHAIR WELCOME

Welcome to the 2018 Conference on Optoelectronic and Microelectronic Materials and Devices, held jointly with the 23rd Australian Institute of Physics Congress, the Australian Optical Society Conference, and the 43rd Australian Conference on Optics and Fibre Technology. COMMAD is delighted to partner for the first time with AIP and AOS. It is great to welcome you at this joint conference event in the beautiful Perth on the Indian Ocean coast of Australia.

COMMAD would like to thank the Australian Nanotechnology Network for supporting the attendance of students and early career researchers and The University of Western Australia for hosting the meeting. In addition, we are very delighted to be able to partner with the Australian National Fabrication Facility and offer a Short Course on Nanofabrication Technologies with a motto of Engineering your Imagination.

Please enjoy the event, the beautiful campus of UWA, Perth and Western Australia.

Mariusz Martyniuk
COMMAD

ACKNOWLEDGEMENTS

CONGRESS ORGANISING COMMITTEE

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PO Box 6150, Kingston, ACT, 2604
P: 02 6281 6624
E: conference@conlog.com.au
W: www.conferencelogistics.com.au

For assistance during the Congress, please phone the registration desk on 0498 435 169.

ACKNOWLEDGMENT OF COUNTRY

The Australian Institute of Physics Congress 2018 Committee acknowledges that the Congress is being held on Noongar land, and that Noongar people remain the spiritual and cultural custodians of their land, and continue to practise their values, languages, beliefs and knowledge.

AIP CONGRESS CODE OF CONDUCT

Our congress is dedicated to providing a harassment-free experience for everyone, regardless of gender, gender identity and expression, age, sexual orientation, disability, physical appearance, body size, race, ethnicity, religion (or lack thereof), or technology choices. We do not tolerate harassment of congress participants in any form. Sexual language and imagery is not appropriate for any Congress venue, including talks, workshops, parties, Twitter and other online media. Congress participants violating these rules may be sanctioned or expelled from the congress without a refund at the discretion of the congress organisers.

USEFUL INFORMATION

VENUE AND REGISTRATION

Congress venue

University of Western Australia
Crawley Campus
Stirling Highway, Perth WA

Registration

The registration desk is located at the rear entrance of the University Club of Western Australia, in front of Seminar Rooms 1 and 2. The registration desk will be open for the duration of the congress and will be your main point of contact for all congress related enquiries.

You can contact the congress organisers on 0498 435 169 for the duration of the congress 9-13 December.

The registration desk will be open at the following times:

Sunday 9 December:	8.30am to 6.30pm
Monday 10 December:	7.00am to 6.30pm
Tuesday 11 December:	7.30am to 6.00pm
Wednesday 12 December:	7.30am to 7.30pm
Thursday 13 December:	7.30am to 6.00pm

Name badges

Your official Congress name badge must be worn at all times as it is your entry to all congress sessions, the Exhibition Hall and social functions. Entry may be refused to anyone not wearing their name badge.

Catering and special requirements

All catering served will be an informal stand-up buffet. Please note the locations for catering during the congress below as there will be a change on the last day:

Monday 10 December – Wednesday 12 December:
Morning, afternoon teas and lunches will be served in the Banquet Hall at the University Club.

Thursday 13 December:
Morning, afternoon teas and lunch will be served on the outdoor Terrace at the University Club.

Dietary requirements noted on your registration have been passed onto the catering staff for all congress related activities, including the main congress, workshops and social events.

Delegates who requested specific dietary requirements will have a special diet card included in the back of their name badge holder, and a separate table to pick up food. Please ask the catering staff to assist if required.

NOTE: *Dietary requests will be catered for to the best of the venue's ability. Individuals with severe allergies are requested to advise Conference Logistics prior to the congress of their requirements, and bring any allergy medication (EpiPen, Phenergan, etc.) as prescribed by your doctor to the congress and any associated function. Whilst due care is taken by the organisers and venue, individuals must take primary responsibility for their own health.*

Internet access

Delegates should access their Eduroam accounts for Wi-Fi during the Congress. For any delegates who do not have Eduroam accounts there will be a limited number of Unifi guest network (UWA Wi-Fi network) passes available at the registration desk

Please note the Unifi network will be undergoing maintenance on Sunday 9 December and disruptions to the Wi-Fi network are expected. The rest of the week should not be affected.

Special requirements

Every effort has been made to ensure people with special needs are catered for. If you have not previously advised the secretariat of any special dietary requirement or accessibility requirements, please see the staff at the registration desk as soon as possible.

FUNCTIONS, WORKSHOPS AND EXHIBITION

Congress functions

All programmed congress functions are ticketed events and require registration to attend. Please see the staff at the registration desk if you wish to purchase additional tickets. Your function tickets (except for the Welcome Reception) can be found in your name badge holder.

Workshops

Various workshops will run over the course of the congress and require registration to attend. All functions are now full. Please refer to the workshop ticket in your name badge holder for workshop details.

Exhibition hours

The exhibition will be held in the Banquet Hall at the University Club during the following days:

Monday 10 December:	7.30am to 6.30pm
Tuesday 11 December:	7.30am to 5.30pm
Wednesday 12 December:	7.30am to 3.30pm

Sundowner poster session

Posters are located in the Banquet Hall, Lower Colonnade and the Banquet Hall foyer and will be available for viewing from Monday - Wednesday. An official Sundowner Poster Session will be run on Monday 10 December with drinks and snacks. During the poster session on Monday we invite delegates to vote on their favourite poster, after which a People's Choice Poster Competition, sponsored by IEEE, will be awarded.

Poster presenters will be available near their posters during this Sundowner Poster Session. Please refer to the poster program on page 53 for more information on presenting posters.

Poster Session

Date:	Monday 10 December
Time:	5.30pm – 6.30pm
Location:	Banquet Hall

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OSA The Optical Society | 100 Since 1916

GENERAL

Delegate list

A delegate list with name, organisation and state is available to be viewed on the congress app. Delegates who opted out of being included on the delegate list will not appear.

Dress code

The dress for all congress sessions and social functions is smart casual.

Lost and found

Please report any lost or found property to the registration desk.

Cloak room

There will be a cloak room available throughout the congress at the registration desk. Please note in regards to luggage there will be a limited amount of storage available so please confirm luggage store options with your hotel upon check in.

Mobile phones

As a courtesy to other delegates and speakers, please ensure all mobile phones are turned off or in 'silent' mode during all sessions and social functions.

Parking

There is a limited amount of paid parking available at the University of Western Australia. Delegates are recommended to park in long term parking spots along Hackett Drive and parking spots in and around the University Club P3. Please ensure you read all signage for fees and the maximum duration you can park.

For full details on venue parking please visit *www.transport.uwa.edu.au/car-pooling/visitor*

A car parking map can be found here: *www.web.uwa.edu.au/__data/assets/pdf_file/0007/148948/UWA-PARKING-MAP_2017.pdf*

Social media

Join the conversation by using the in-app social media page and adding the **#AIPCongress2018** to your tweets, Facebook or Instagram posts.

Recording and photography

Unauthorised audio taping, video recording, digital taping or any other form of recording is strictly prohibited in congress sessions. Speakers who do not wish to have photographs taken of their slides must state this at the start of their presentation. The plenary sessions may be filmed or photographed for future educational opportunities by the Australian Institute of Physics.

By attending the congress, you agree to be photographed and/or filmed and give permission to the Australian institute of Physics and their affiliates, to use your likeness in commercial promotional and/or marketing materials. This permission is granted without expectation of compensation or other remuneration, now or into the future. Please contact Conference Logistics if you require further information.

Evaluation survey

An online evaluation survey will be available through the congress app at the end of the congress. It will also be emailed to all delegates following the congress. Delegates are encouraged to complete the congress evaluation as it assists in planning for future congresses.

Travel

Airlines

Qantas 13 13 13

Virgin 13 67 89

Taxis

Black and White Cabs 13 32 22

Swan Taxis 13 13 30

Uber

Download the Uber app or visit the Uber website at www.uber.com

CONGRESS APP

The AIP2018 app offers you a range of great ways to maximise your Congress experience, including:

- Creating your own program for ease of reference
- Viewing all the presenter's abstracts and biographies
- Taking part in the in-congress social media stream
- Direct messaging other attendees, exhibitors and the event organisers
- Receiving alerts of any changes
- And much more!

To download the app follow these steps:

1. Go to your device's store and search for the ***Conlog*** app.
2. Download the Conlog app to your device (free to download).
3. Log in using the appcode ***(AIP2018)*** and your unique pin you received via email

If you have misplaced your unique pin, please see the friendly staff at the registration desk for assistance.

SOCIAL FUNCTIONS

Welcome Reception

Date: Sunday 9 December

Time: 6.00pm – 8.00pm

Venue: Ground Floor Terrace, the University Club, University Western Australia

One ticket included with full registrations. Additional tickets available from the registration desk at $45 inc GST.

Sponsored by

Centre for Nanoscale BioPhotonics ARC CENTRE OF EXCELLENCE

Sundowner Poster Session

Date: Monday 10 December

Time: 5.30pm – 6.30pm

Venue: Terrace, The University Club, University Western Australia

All delegates welcome, refer to the Sundowner Poster Session program on page 53 . A People's Choice Poster Competition, sponsored by IEEE, will be run during the Sundowner Poster Session. Delegates are invited to vote via the Congress App for their favourite poster.

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Congress Dinner

Date: Wednesday 12 December

Time: 7.30pm – 10.00pm

Venue: Ground Floor Terrace, the University Club, University Western Australia

The Congress Dinner will be a stand up, casual event within the grounds of the University of Western Australia. The dinner includes the presentation by Dame Julia Higgins.

One ticket included with full registrations. Additional tickets available from the registration desk at $75 inc GST.

WORKSHOPS

Engineering your Imagination: ANFF Short Course on Nanofabrication Technologies

Date: Sunday 9 December

Time: 10.00am – 4.30pm

Venue: Auditorium, the University Club, University Western Australia

Delegates must register for this workshop, limited tickets available.

Diversity and Equity Group in Australian Physics (DE-GAP) Workshop (including brunch)

Date: Tuesday 11 December 2018

Time: 10.00am - 1.00pm

Venue: Seminar Room One, the University Club

Workshop FULL. Only registered delegates can attend. If you are on the waitlist, please see registration desk.

Sponsored by

EQUS

Discussion: Theoretical and Mathematical Physics in Australia

Date: Tuesday 11 December

Time: 12.45pm – 1.15pm

Venue: Arts Building, Room 10 [1.62]

Open to all delegates, spaces limited.

Physics in Education Group (PEG) Workshop (including High Tea)

Date: Tuesday 11 December

Time: 3.30pm - 4.30pm

Venue: Club Restaurant, the University Club

Tickets: $38 per person, limited tickets available

Sponsored by

IOP Publishing

The Secrets of Scientific Publishing

Workshop One

Date: Tuesday 11 December

Time: 1.30pm – 3.00pm

Venue: Arts Building, Room 6 [G.62]

Workshop Two

Date: Wednesday 12 December

Time: 1.30pm – 3.00pm

Venue: Arts Building, Room 6 [G.62]

Workshop FULL. Only registered delegates can attend. If you are on the waitlist, please see registration desk.

Teaching Nexus: Evolving Physics Education in our schools, Workshop One

Date: Wednesday 12 December

Time: 9.00am – 10.30am

Venue: Physics Lab, University of Western Australia

Facilitator: Jason Dicker

Open to all delegates, spaces limited.

Teaching Nexus: Evolving Physics Education in our schools, Workshop Two

Date: Wednesday 12 December

Time: 11.30am - 12.30pm

Venue: Computer Lab, University of Western Australia

Facilitator: Dr David Hoxley

Open to all delegates, spaces limited

Teaching Nexus: Evolving Physics Education in our School - PEG Workshop 3

Date: Wednesday 12 December

Time: 3.30pm – 5.00pm

Venue: Physics Building, 215 Lecture Theatre

Facilitator: Professor David Blair

Open to all delegates, spaces limited

Decadal Plan Town Hall Meeting

Date: Thursday 13 December

Time: 12.45pm – 1.15pm

Venue: Arts Building, Room 6 [G.62]

Open to all delegates, spaces limited

External events of interest – Public Lecture

In addition to the AIP 2018 program, the Australian Institute of Physics together with the Institute of Advanced Studies are co-sponsoring a Public Lecture on the grounds of the University of Western Australia. The Public Lecture will feature Marcus Aspelmeyer and Professor Rainer Weiss.

IMPORTANT NOTE: Attendance at the Public Lecture is not included in AIP Congress registration. You must confirm your free registration with the Institute of Advanced Studies.

Date: Tuesday 11 December

Time: 5.45pm – 6.15pm: Presentation by Markus Aspelmeyer, What is a Phonton?

6.30pm – 7.30pm: Lecture by Professor Rainer Weiss, Gravitational Waves

Venue: Octagon Theatre, University Western Australia

Tickets: Free, must register at www.ias.uwa.edu.au/lectures/physics

Co-sponsored by the Australian Institute of Physics and the Institute of Advanced Studies

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PLENARY AND KEYNOTE SPEAKERS

Professor Julia Yeomans

University of Oxford, UK

Julia Yeomans obtained her DPhil in Physics from the University of Oxford. She spent two years as a post-doc at Cornell University, then returned to the UK to become a Lecturer at the University of Southampton. Soon after that, she joined the Rudolf Peierls Centre for Theoretical Physics at Oxford. She is currently Professor of Physics at Oxford and was instrumental in founding the Oxford Centre for Soft and Biological Matter. Julia works in theoretical and computational physics, particularly statistical physics, hydrodynamics, soft condensed matter and biological physics. Among her current research interests are active systems, complex fluids and the interactions of fluids with structured surfaces. She has been awarded the EPJE-Pierre Gilles de Gennes lecture prize and was elected a Fellow of the Royal Society in 2013.

ABSTRACT

Active Matter

Active materials such as bacteria, molecular motors and self-propelled colloids are Nature's engines. They extract energy from their surroundings at a single particle level and use this to do work. Active matter is becoming an increasingly popular area of research because it provides a testing ground for the ideas of non-equilibrium statistical physics, because of its relevance to the collective behaviour of living creatures, from cells to starlings, and because of its potential in designing nanomachines.

Dense active matter shows mesoscale turbulence, the emergence of chaotic flow structures characterised by high vorticity and motile topological defects. The chaotic nature of active turbulence means that it is likely to be difficult to harness its energy. Hence it is interesting to consider ways to `tame' the turbulence, channelling the energy input into coherent flows. This can be done by screening hydrodynamics through confinement or friction, and I will describe flow patterns and defect trajectories in active matter in confined geometries.

Moreover, the ideas of active matter suggest new ways of interpreting cell motility and cell division. In particular recent results indicate that active topological defects may help to regulate turnover in epithelial cell layers and contribute to controlling the structure of bacterial colonies.

Nobel Laureate Professor Rainer Weiss

Massachusetts Institute of Technology, USA

Rainer Weiss (NAS) is a Professor Emeritus at Massachusetts Institute of Technology (MIT). Previously Dr. Weiss served as an assistant physics professor at Tufts University and has been an adjunct professor at Louisiana State University since 2001. Dr. Weiss is known for his pioneering measurements of the spectrum of the cosmic microwave background radiation, his inventions of the monolithic silicon bolometer and the laser interferometer gravitational wave detector and his roles as a co-founder and an intellectual leader of both the COBE (microwave background) Project and the LIGO (gravitational-wave detection) Project. He has received numerous scientific and group achievement awards from NASA, an MIT excellence in teaching award, the John Simon Guggenheim Memorial Foundation Fellowship, the National Space Club Science Award, the

Medaille de l'ADION Observatoire de Nice, the Gruber Cosmology Prize, and the Einstein Prize of the American Physical Society. Dr. Weiss is a fellow of the American Association for the Advancement of Science, the American Physical Society, The American Academy of Arts and Sciences; and he is a member of the American Astronomical Society, the New York Academy of Sciences, and Sigma Xi. He received his B.S. and Ph.D. in physics from MIT. Dr. Weiss is a member of the NAS and has served on nine NRC committees from 1986 to 2007 including the Committee on NASA Astrophysics Performance Assessment; the Panel on Particle, Nuclear, and Gravitational-wave Astrophysics; and the Task Group on Space Astronomy and Astrophysics.

Sponsored by

Woodside

ABSTRACT

The beginnings of gravitational wave astronomy

The first detection of gravitational waves was made in September 2015 with the measurement of the coalescence of two ~30 solar mass black holes at a distance of about 1 billion light years from Earth. The talk will provide a review of more recent measurements of black hole events as well as the first detection of the coalescence of two neutron stars and the beginning of multi-messenger astrophysics. The talk will end with a discussion of some prospects for the field.

Professor Michael Wiescher

University of Notre Dame, USA

Michael Wiescher, received his PhD in 1980 at the University of Münster, Germany. After postdoctoral positions at Ohio State University (USA), Caltech (USA), and the University of Mainz (Germany), he joined the faculty at the University of Notre Dame (USA) to build a program in experimental nuclear astrophysics. In 2003 he founded the Joint Institute for Nuclear Astrophysics (JINA), which is now an international research organization including more than 100 research institutions worldwide. For the period of 2003 to 2014, he served as JINA director. In 2010 he became also the director of the Notre Dame Nuclear Science Laboratory (NSL) at Notre Dame. Wiescher's research focuses on the experimental and theoretical study of stellar reaction rates for quiescent and explosive stellar environments. More recently Wiescher was instrumental in the installation of CASPAR, the first US deep underground accelerator at Homestake Mine in South Dakota which concentrates on the study of reactions important for stellar helium burning.

In 2003 Wiescher was awarded with the Hans Bethe Prize of the American Physical Society for his work on the rapid proton capture process that drives thermonuclear explosions in accreting binary systems. In 2018 he was awarded the 2018 Prize for Laboratory Astrophysics by the American Astronomical Society for "his leading contributions to the experimental foundation of nuclear astrophysics". Presently he serves as the Heraeus Guest Professor for Physics at the University of Frankfurt, Germany.

ABSTRACT

Neutron Sources in Stars and the Laboratory

Neutrons play a critical role for the origin of the elements above iron. Next to the r-process in explosive stellar environments, the s-process in quiescent stellar burning is key for the heavy element nucleosynthesis.

Reliable modelling of these processes requires a detailed understanding of stellar neutron sources, the cross section and the impact of hot stellar plasma conditions on the reaction rate. A number of experiments will be presented which aim at the study of the most critical stellar neutron sources at the CASPAR deep underground accelerator

laboratory and the NIF National Ignition Facility for studying these reactions at stellar burning conditions.

Professor Chandralekha Singh

University of Pittsburg, USA

Chandralekha Singh is a professor in the Department of Physics and Astronomy and the Director of the Discipline-based Science Education Research Center at the University of Pittsburgh. She obtained her Ph.D. in theoretical condensed matter physics from the University of California Santa Barbara and was a postdoctoral fellow at the University of Illinois Urbana Champaign, before joining the University of Pittsburgh. She has been conducting research in physics education for two decades. She was elected to the Presidential-line of the American Association of Physics Teachers and is currently serving as the Vice-President. She was one of the two team leaders of the US team to the 6th International Conference on Women in Physics (ICWIP) in Birmingham UK in 2017 and is an editor of the 6th ICWIP Proceedings. She held the Chair-line of the American Physical Society Forum on Education from 2009-2013 and was the chair of the editorial board of Physical Review Special Topics Physics Education Research from 2010-2013. She has co-organized two physics education research conferences in 2006 and 2007 and was the co-chair of the 2010 Gordon Conference on Physics Research and Education. She co-chaired the first conference which brought together physicists, chemists and engineers from various engineering departments to discuss the future of materials science and engineering education in 2008. She was the co-organizer of the first and third conferences on graduate education in physics in 2008 and 2017 and chaired the second conference on graduate education in physics in 2013. She is a Fellow of the American Physical Society, American Association of Physics Teachers and the American Association for the Advancement of Science.

ABSTRACT

Chandralekha Singh[1]*

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How to strengthen physics by making it inclusive

The field of physics has historically lacked diversity, and efforts to make it inclusive have been limited in their success. Despite some efforts to encourage women to pursue a career in physics, the percentage of women majoring in physics remains low. There are several frameworks that focus on the dearth of women in physics, which take into account motivational characteristics, e.g., interest in physics, self-efficacy, mindset about intelligence, sense of belonging, and identity as a physicist. We performed a longitudinal analysis of these motivational characteristics of female and male college students in large physics courses along with their performance in those courses. Among other findings, our data suggest that female students had lower physics self-efficacy than male students, even when controlling for performance. Moreover, this self-efficacy gap continued to grow throughout the college introductory physics course sequence. Based upon these findings, we implemented short in-class activities that were designed to improve the inclusivity in the physics courses and address issues related to students' sense of belonging, self-efficacy and intelligence mindset. We found that female students in physics classes who participated in these activities performed significantly better than those who did not, and they were also less likely to withdraw from the courses.

Professor Susan Scott

Australian National University

Professor Susan Scott is Professor of Theoretical Physics at The Australian National University (ANU). She has a BSc (Hons) majoring in Pure Mathematics from Monash University and a PhD in Mathematical Physics from The University of Adelaide. As the recipient of a Rhodes Fellowship, she then spent 4 years at The University of Oxford working with the research group led by Prof Sir Roger Penrose, before returning to Australia to take up a research fellowship at the ANU. She has been a faculty member in Physics at the ANU since 1998.

Susan's research field is general relativity and gravitational physics. She is a leading international expert in the singularity structure of space-time, including the singularities at the heart of black holes as well as cosmological singularities at the beginning and end of the Universe. In 1998 she initiated and led the Australian endeavour in gravitational wave data analysis forming a collaboration with LIGO ultimately leading to participation in the discovery of gravitational waves in 2015. Susan is an author of more than 250 research papers and a definitive book on black holes. She is a fellow of the Australian Academy of Science and the European Academy of Sciences and a former President of the Australasian Society for General Relativity and Gravitation. She is a Chief Investigator with the ARC Centre of Excellence for Gravitational Wave Discovery (OzGrav).

Dr Paul Lasky

Monash University

Paul Lasky is a Senior Lecturer and ARC Future Fellow in the School of Physics and Astronomy at Monash University. He earned his PhD from Monash University in 2008, before being granted an Alexander von Humboldt Fellowship, which he took up at the University of Tuebingen, Germany. He then spent three years as a postdoctoral research fellow at the University of Melbourne, before returning to Monash. Paul's research field is gravitational physics and high-energy astrophysics. He is an active member of the LIGO Scientific Collaboration that, in 2015, made the first discovery of gravitational waves from colliding black holes. In 2018, Paul won the Australian Academy of Sciences Pawsey medal, recognising outstanding research in physics by scientists up to ten years post PhD.

ABSTRACT

Susan Scott[1]* and Paul Lasky[2]*

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The Advanced LIGO gravitational wave detectors have so far undertaken two observing runs, O1 and O2, with spectacular results. At the start of O1 in September 2015 the hundred year quest to directly detect gravitational waves on Earth was quickly realised with the detection of a clear and strong gravitational wave signal coming from the cataclysmic collision of two large black holes in a binary system some 1.3 billion years ago. Towards the end of O2 in August 2017 we achieved the long- anticipated discovery of two orbiting neutron stars in a binary system in the final moments of inspiral leading up to their violent collision. Within 1.7 seconds of the coalescence a gamma-ray burst was detected immediately confirming the long-held hypothesis that neutron star collisions are the progenitors of our almost daily detections of short gamma-ray bursts. Neutron stars are matter, so unlike when two black holes collide, they broadcast electromagnetic as well as gravitational radiation, and the alert sent out by LIGO caused an avalanche of telescopes and satellites around the world to interrupt their observing schedules to attempt to pinpoint and image the event. This was the birth of the era of multi messenger gravitational wave astronomy.

Since the end of O2, and while upgrading the instruments in preparation for O3, we have had the opportunity to analyse, in greater depth, the data from both O1 and O2 searching for coalescences

of binary systems of black holes and neutron stars. In this talk we will announce the full catalogue of these results from both observing runs and explain the significance of these discoveries for physics.

Professor Monika Ritsch-Marte

Medical University of Innsbruck, Austria

Monika Ritsch-Marte received her M.Sc. in Physics from the University of Innsbruck in 1984 and her PhD in Quantum Optics from the Waikato University in New Zealand (under the supervision of D.F. Walls) in 1988. After several PostDoc projects (Boulder/Colorado, Milano, Helsinki), and after completing her Habilitation at the Institute of Theoretical Physics in Innsbruck, she accepted the Chair of Biomedical Physics at the Medical University in Innsbruck in 1998 where she founded a Biomedical Optics group. Her current research interests include holographic optical tweezers, digital holographic microscopy and linear and non-linear Raman microscopy. She has received numerous research grants and awards, including an ERC Advanced Grant and the Boltzmann Award of the Austrian Physical Society. She is a member of the Austrian Academy of Science and a Fellow of the Optical Society of America.

ABSTRACT

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In recent years optical wavefront shaping by means of spatial light modulators (SLMs), such as deformable mirrors, digital micro-mirror devices or liquid crystal (LC) panels, has become a powerful tool in Biophotonics [1-2]. "Holographic optical tweezers" are well-known and widespread. But an SLM can also be integrated into optical imaging systems, making the microscope programmable and adaptable with respect to the needs of a specific sample. Iterative search algorithms are used to find the desired phase mask patterns.

A particular strength of the Synthetic Holography [3] approach with programmable phase masks is the possibility to multiplex, which means that one can 'pack' several tasks into one computer-generated hologram. One can, for instance, create images which are composed of sub-images belonging to different microscopy modalities, to different depths inside the volumetric sample, or to different parameter settings. Diffractive phase masks normally operate in the modulation range of 0 to 2π. If one relaxes this condition, allowing for multiple-2π phase shifts, several computer- generated holograms can be read out at different wavelengths from one and the same voltage pattern applied to the LC panel. In this way holographically modified imaging (in the visible) can be accommodated in the same phase mask that is used for holographically controlled trapping (in the near-infrared).

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Professor Jian-Wei Pan

University of Science and Technology of China

Jian-Wei Pan, born on March 11, 1970 in Dongyang, Zhejiang province. He obtained his Bachelor and Master degrees of Theoretical Physics from University of Science and Technology of China (USTC) in 1992 and 1995. In 1996, he went abroad for studying in Austria, and obtained his Ph.D. degree of Experimental Physics from the University of Vienna in 1999. In 2001, he was appointed as the full professor of physics by USTC. In 2011, he was elected as the academician of Chinese Academy of Sciences (CAS). In 2012, he was elected as the World Academy of Science (TWAS) Fellow. The research of Jian-Wei Pan focuses on quantum optics, quantum information and quantum foundations. As one of pioneers in experimental quantum information science, he has

accomplished a series of profound achievements. Due to his numerous progresses on quantum communication and multi-photon entanglement manipulation, quantum information science has become one of the most rapidly developing fields of physical science in China in recent years.

Sponsored by

ABSTRACT

Breaking the Wall to Quantum Engineering

Quantum information science and technology are emerging and fascinating technologies formed by combining coherent manipulating of individual quantum systems and information technology, which enables secure quantum cryptography (quantum communication), super-fast quantum computing, revealing laws of complex physical systems (quantum simulation), and improving measurement precision (quantum metrology) etc., to beat classical limits. This presentation will highlight a few of our progress along quantum communication, quantum computing, quantum simulation and quantum metrology, based on photons and atoms.

For fundamental aspect, one is led to the conception of quantum entanglement when apply quantum superposition principle to multi-party system. The appeared 'spooky action at a distance' phenomena referred by Einstein, is often explained by seemingly reasonable assumptions of "local realism". The inequalities proposed by John Bell and others provide immediate tests for correctness of quantum mechanics. Many efforts are addressing loophole-free tests of Bell inequalities, which tries to close various loopholes, in which some of loopholes are still needed to be addressed including freedom of choice loophole, the collapse locality loophole. Well, the final test is on-going, many developed ground-breaking technologies for coherent manipulation of quantum systems offers elegant and feasible solutions for satisfying increasing needs of computational power and information security.

Based on state-of-the-art fiber technology and rich fiber resources, we have managed to achieve prevailing quantum communication with realistic devices in real-life situation. This constitutes demonstrations by developing decoy state scheme over 100km firer extending its employment in the metropolitan area network, as well as maintaining Measurement Device Independent QKD (MDI-QKD) over 400km. At the meantime, we are also developing practically useful quantum repeaters that combine entanglement swapping, entanglement purification, efficient and long-lived quantum memory for the ultra-long distance quantum communication. Another complementing route is to attain global quantum communication based on satellite. We have spent the past decade in performing systematic ground tests for satellite-based quantum communications. Our efforts finally ensure a successful launch of the Micius satellite. Three major scientific missions have been finished, which includes achieving QKD between satellite and ground station at thousand kilometer scale, achieving satellite-based entanglement distribution between two ground stations separated by a distance of 1200 km, achieving quantum teleportation from ground to satellite over 1400 km. Very recently, using Micius satellite as a trustful relay, the intercontinental QKD between Beijing and Vienna over a distance of 7600 km has also been realized.

In the areas of optical quantum information processing, we have maintaining a series of technological advances for generating, manipulating and applications of multi-photon entanglement. Over the past decade, we have performed proof-of-principle demonstrations for a number of key quantum algorithms including the Grover's searching algorithm, Shor's factoring algorithms, quantum machine learning, topological quantum error correction, and particularly a recent photonic quantum computer to solve the Boson sampling problem.

Future Prospects include building a global quantum communication infrastructure with satellite and fiber networks, quantum computing by employing manipulating coherently more than 50 qubits to exceed the simulating power of

the current best supercomputers and reaching "quantum supremacy", Bell-test experiment with human-observer at a distance on the order of one light-second.

Professor Willie Padilla

Duke University, USA

Willie Padilla has been in the metamaterials field since 2000, when he co-authored the first paper on negative index materials with Smith. Padilla is particularly well known for his work at terahertz (THz) frequencies, as well as in the area of active and dynamically controlled metamaterials. While working under a Director's Postdoctoral Fellowship at Los Alamos National Laboratory, Padilla led efforts to demonstrate dynamic tuning of a semiconductor hybrid metamaterial by photodoping and voltage control. Both of these key experiments are now widely recognized and cited. Padilla's lab specializes in the THz, infrared, optical and magneto-optic properties of novel materials utilizing various spectroscopic methods, including Fourier transform spectroscopy and ellipsometry. Padilla's recent interests include tailoring the emissivity of objects with metamaterial coatings, and the use of active metamaterial arrays as components in THz and infrared imaging systems.

ABSTRACT

Exotic Physics with All-Dielectric Metasurfaces

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All-dielectric metasurfaces are a useful platform to investigate a myriad of unconventional physical scattering responses ranging from high absorption and Huygens' reflect arrays to bound-states-in-the-continuum (BIC). We experimentally demonstrate several all-dielectric metasurfaces which realize: high transmission Huygens' structures, high absorptive devices for imaging, and dynamic surfaces with optical control. The all-dielectric metasurfaces we explore consists of arrays of high dielectric geometrical shapes, and may support a number of eigenmodes of either odd or even symmetry. [1,2] We show that the geometry of the array may be used to tune the oscillator strength and resonant frequency location of the modes. The physics underlying the nature of the electromagnetic responses is described with temporal coupled mode theory and waveguide analysis.

1. Simulation

The metasurface is simulated using full-wave 3D electromagnetic software, and use the frequency domain solver (finite element method). We use the two-port simulations, where the two ports were set symmetrically with respect to the mid-plane of the unit cell, and periodic boundaries were used on all sides. Eigenvalue simulations are also performed permitting extraction of the modes complex frequency. Metasurfaces may be simulated with and without material loss, which permits us to determine the individual pieces of scattering and dissipative loss in the structures. We use silicon as the base material for our all-dielectric metasurfaces, and – in some studies – use a slight boron doping. The metasurfaces were fabricated by reactive deep ion etching and we use pdms (polydimethylsiloxane) as a support substrate. The all-dielectric metasurfaces are characterized by various methods including a vector network analyser, terahertz time-domain spectroscopy, and Fourier transform spectroscopy.

2. Tunable Metasurfaces

We also demonstrate dynamic control of the amplitude and phase of transmitted light. Two different optical sources are used – a 980nm LED and an ultra-fast titanium sapphire laser producing radiation at a wavelength of 800nm. We obtain a transmitted phase of 120 degrees with transmission modulation of over 99.9%. Theoretical analysis and numerical simulations

coupled with temporal coupled mode theory indicate that the tuning is due to a substantial increase in the material dissipation rate of the odd eigenmode of the structure. This serve to lift the degeneracy of the odd and even eigenmodes, while simultaneously destroying the critical coupled state.

Our all-dielectric metasurface is an ideal platform to investigate unconventional physics in electromagnetic wave absorbing systems. The demonstration of a dynamic all-dielectric structure highlights a new strategy for controlling metasurfaces, and highlights a potential path to achieve reconfigurability for future applications.

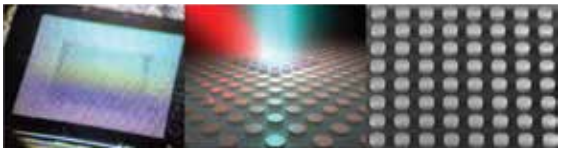

Figure 1: Left panel show a photograph of the suspended silicon metasurface array. Middle panel shows a computer rendered depiction of optical photodoping of the array. Right panel show an SEM image of the fabricated silicon metasurface array.

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Professor Teri Odom

Northwestern University, USA

Teri W. Odom is Charles E. and Emma H. Morrison Professor of Chemistry, Professor of Materials Science and Engineering, and Associate Director of the International Institute for Nanotechnology (IIN) at Northwestern University. She is an expert in designing structured nanoscale materials that exhibit extraordinary size and shape-dependent optical properties. Odom has received numerous honors and awards. Select ones include being named a U.S. Department of Defense Vannevar Bush Faculty Fellow; a Radcliffe Institute for Advanced Study Fellowship at Harvard University; an NIH Director's Pioneer Award from the National Institutes of Health; the MRS Outstanding Young Investigator Award; an Alfred P. Sloan Research Fellowship; an NSF CAREER Award; and a David and Lucile Packard Fellowship in Science and Engineering. She is a Fellow of the American Chemical Society, Materials Research Society, and the Royal Society of Chemistry. Odom is the founding Executive Editor of ACS Photonics.

ABSTRACT

Reconfigurable Flat Nanoparticle Optics

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Over the past decade, significant progress in controlling light-matter interactions at the nanoscale has been achieved. Most of the advances, however, have relied on fixed systems limited to the as-fabricated or as-synthesized dielectric or metallic nanostructures. This talk will discuss how the ability to program or realize a plasmonic response on demand may address key challenges in future nanoscale optics. We will highlight how the fabrication and scalability of responsive nano-optical flat optics can be used in diverse applications from stretchable nano-lasing to reconfigurable lensing and imaging.

Professor Thomas Krauss

University of York, UK

Prof Thomas Krauss is Professor of Photonics at the University of York, UK. He is interested in fundamental and applied concepts of light-matter interaction in photonic nanostructures and he has led a number of EU and EPSRC projects in various aspects of photonic crystal devices, such as slow light, optical interconnects and, more recently, novel photonic concepts for biosensing. He has published 300 refereed journal articles and 6 patents. Prof Krauss is a Fellow of the Institute of Physics, the Royal Society of

Edinburgh and the Optical Society. In 2015, he was awarded a Royal Society Wolfson Merit Award.

ABSTRACT

Photonic Crystals and Nanostructures – Phoenix of Photonics?

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Photonic crystals were invented in the late 1980's as a tool for exercising spontaneous emission control. By introducing the language of solid state physics into photonics, they have transformed the way we think about diffractive optics. As a result, there was much excitement and a lot of new activity emerged in the 1990's and 2000's. Photonic crystals were eventually replaced by other "hot topics", yet many of these topics are actually founded on similar principles. In particular, the Bloch mode formalism, which is a key feature of the bandstructure description of the photonic crystal paradigm, underpins many modern research areas, including metalenses, label-free resonant imaging and nanostructures for light trapping.

The idea of Bloch modes dates back to 1929, when they were first described in the context of electron wavefunctions in crystal lattices [1]. Bloch modes can be understood as interference patterns arising from multiply Bragg-scattered waves. Formally, they are described as follows,

$$E_k = u_k(r)e^{-ikr} \quad with \quad u_k(r) = \sum_{n=-\infty}^{\infty} E_n\, e^{inG}$$

So, a Bloch mode describes the interference pattern between a plane wave with wavevector k and the sum over all possible lattice vectors G.

1. Metasurfaces

Metasurfaces are nanostructured thin films that can imprint an arbitrary phase profile onto a given beam; they can do this by creating localised resonances or by adding specific wavevectors to the beam, thereby invoking the Bloch formalism. Metalenses in particular open new possibilities in miniaturised optical systems with the smartphone market in mind [2], especially since high performance silicon-based structures have now also been demonstrated in the visible [3, 4].

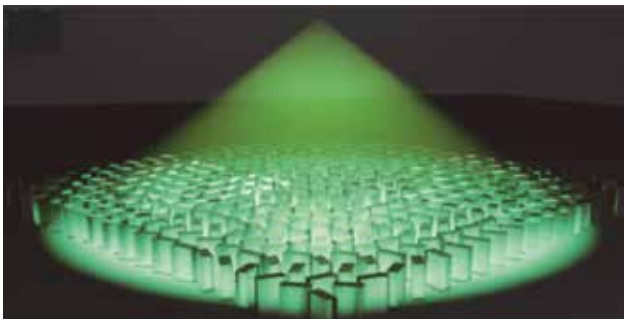

Figure 1. Illustration of a silicon metalens with ultra-high numerical aperture [4].

2. Sensing and Imaging

Metasurfaces have now also entered the sensing domain; sensing often relies on spectral information, be it via fluorescence, absorption spectroscopy or by tracking resonances. By recognising the equivalence of wavelength

and lattice constant that is inherent in the Bloch mode formalism, it is possible to translate spectral information into spatial information. This ability has been demonstrated with the chirped guided mode resonance approach [5] and the "molecular barcoding" method [6]. The related technique of resonant imaging tracks resonances locally to extract information on e.g. cell adhesion [7] or the secretion of proteins [8], all in real time and with the possibility to use clinical samples because of the label-free nature of the process.

3. Light trapping

The final example comes from yet another domain, namely light trapping, which is used to enhance the absorption in thin film solar cells. By exploiting Bloch modes and manipulating their respective phases, we can selectively excite the modes that most effectively contribute to the absorption of sunlight [9].

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Professor Garth Illingworth

UC Santa Crus/Lick Observatory

Garth Illingworth is a Professor at the University of California, Santa Cruz. He was a Miller Fellow at UC Berkeley, the Deputy-Director of the Space Telescope Science Institute, and in 2010 was awarded an honorary Doctor of Science degree at the University of Western Australia. He is the recipient of the 2016 American Astronomical Society Lancelot M. Berkeley New York Community Trust Prize for his work on The most-distant galaxies viewed with Hubble.

He has been exploring for the earliest galaxies in the first 1-2 billion years of the Universe with the world's most powerful telescopes, the Hubble and Spitzer space telescopes and the Keck telescope on Mauna Kea. Central to his research has been to use Hubble to look back through 96% of all time to find and measure incredibly faint, young galaxies that are the seeds that have grown into galaxies today, like our Milky Way.

A recent highlight of this research is the discovery of the most distant, and earliest, galaxy ever seen, just 400 million years after the Big Bang at redshift z=11.1. The publications from this research on the most distant and earliest galaxies, with an international team of scientists, have consistently been among the most highly cited papers on galaxies in the early universe (see firstgalaxies.org). The latest results on the sizes of distant galaxies and on the star formation rate density at z~10, combined with the latest Planck results that indicate that reionization began around redshift z~10, have significant implications for the detectability of the "first galaxies" with the James Webb Space Telescope (JWST). He recently gave the Lancelot M. Berkeley Prize plenary talk at the 2017 meeting of the American Astronomical Society.

ABSTRACT

Garth Illingworth Department of Astronomy University of California Santa Cruz

The Hubble Space Telescope has revolutionized the discovery and study of the earliest galaxies through its exploration of the Universe in the first billion years after the Big Bang. I will discuss what we have learned about galaxies during that epoch at redshift z>6 from the remarkable Hubble and Spitzer Space Telescope imaging surveys, as well as detections of gravitationally-lensed galaxies behind massive clusters of galaxies. Lensing clusters provide extraordinary opportunities for characterizing the faintest earliest galaxies, but also present extraordinary challenges. Analysis of early galaxies found in deep cluster images reveal compact star-forming regions that, remarkably, can be as small as today's globular clusters and dwarf galaxies.

The results from deep surveys with Hubble, combined with the recent results on the Cosmic Microwave Background from the Planck space telescope, indicate that galaxies dominated the UV ionizing flux that reionized the Universe. One of the greatest surprises came from the Hubble discovery of very luminous galaxies at redshifts z~11 to z~8, just 400 to 650 million years after the Big Bang. Hubble and Spitzer have encroached on James Webb Space Telescope (JWST) territory by looking back through 97% of all time to confirm a z~11.1 galaxy. This is far beyond what we ever expected Hubble and Spitzer could do.

Twenty years of astonishing progress with Hubble and Spitzer leave me looking to JWST to provide

even more remarkable exploration of the realm of the first galaxies. I will give an update on JWST's progress towards its launch, and then I will discuss how the latest Hubble and Spitzer results on the sizes of star-forming regions in distant galaxies, on the star formation rate at redshift z~10, and from Planck indicating that reionization began around z~10, together have significant implications for the detectability of the "first galaxies" with JWST.

Maureen Frank

Diversity and Equity Group in Australian Physics Keynote

Leading international business woman – former head of Mergers and Acquisitions for Aon in UK and Australia, Telstra Business Woman of the Year, BRW Rising Star and founder of emberin 10 years ago.Diversity and inclusion expert – Maureen, with her ROI obsession has established over a dozen diversity councils in major organisations (most of which were the executive team), personally coached CEO's on their journey and supported her client to achieve results, including supporting a number of organisations increase the number of women in senior leadership in record time: a telco (from 6% to 31% in 2 years), a mining company (from 8% to 23% in 2 years), a bank (from 11% to 33% in 3 years), a waste management business (from 8% to 19% in 1 year) and many more examples.

Speaker, entertainer and thought leader – she has spoken at conferences in five continents around the world.Bestselling author, writer and creator – her books, publications and programs have been used by over 50,000 people worldwide. Global Award winner – her clients have won multiple awards, acknowledging emberin as the cornerstone of success, including two global Catalyst Awards in New York. Pioneer and challenger – Maureen pioneered the scalable engagement of men in the diversity and inclusion conversation globally, supported founding the Male Champions of Change (CEO's of major companies supporting gender diversity) and engages CEO's and leaders every week in understanding how inclusion enables not just diversity – but also engagement, innovation and collaboration.

Tara Fortier

National Institute of Standards and Technology, USA

Dr. Tara Fortier is a Project Leader at the National Institute of Standards and Technology and serves as Graduate Faculty at the University of Colorado, Boulder. Her research is focused on the development and application of optical frequency combs for high precision atomic clock comparisons and ultra low-noise microwave generation. She received her Ph.D at JILA/ University of Colorado on the development of phase-stabilized ultra-fast lasers for quantum coherent control experiments. As a Postdoctoral Director's Fellow at Los Alamos National Laboratory she performed optical atomic clock comparisons as a means to search for time variation of fundamental constants and violations of physical laws. She was awarded the 2009 European Time and Frequency Forum Young Scientist Award for her contributions to optical frequency comb development, was a successful champion in the DARPA PULSE Program, and has served as the government evaluator for the DARPA EPHI and STOIC programs. Finally, Dr. Fortier serves on the NIST board of directors for Women in STEM and is committed to serving

and advancing the representation of women and minorities in physics and photonics.

BIO/ABSTRACT

Optical networks and clock comparisons at the 18th-decimal place

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The generation of frequency references from quantum mechanical systems have been instrumental in enabling a timing stability and resolution that are unattainable using classical architectures. Atomic clocks, which produce frequency in a deterministic way, are used as precision time-keepers in atomic time-scales, as frequency references in precision physical measurements, and are necessary for positioning, timing and synchronization in global networks [1]. Atomic clock transition frequencies are now being reported with an uncertainties approaching 1 part in 10^18, achieved by harnessing the decreased uncertainty and instability of optical as opposed to microwave transitions [2]. This exquisite resolution and the transition frequencies' dependence on physical laws and fundamental constants make atomic clocks elegant systems for tests of fundamental physics. In this talk I will discuss the results from recent measurement campaigns between the National Institute of Standards and Technology and the University of Colorado to compare optical atomic clock frequencies to the 18th digit. I will also describe the optical networks that connect and facilitate the precision measurements and describe how the clock network is being used for searches of ultra-light dark matter [3].

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Professor Philippa Browning

University of Manchester, UK

Philippa Browning is a Professor at the Jodrell Bank Centre for Astrophysics at the University of Manchester in the UK. Following a degree in Mathematics at Cambridge and a PhD at St Andrews, she became the first woman appointed to lecture in Physics at Manchester. Her research is concerned with the mysterious fourth state of matter – plasma. She uses mathematical modelling and computer simulation to understand the complex interactions between plasmas and magnetic fields, with application both to the atmosphere of the Sun and to the generation of energy by nuclear fusion. A main focus of her research is to exploit synergies between these apparently very different fields. Philippa enjoys teaching undergraduates and postgraduates in physics and astronomy, conveying the excitement of the subject to the next generation. She is also passionate about communicating to the general public and is involved in many public talks and events. She was awarded the Chapman Medal of the Royal Astronomical Society in 2016.

ABSTRACT

Self organisation by magnetic reconnection in solar and fusion plasmas

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Magnetised plasmas in the laboratory and astrophysics are complex systems, and the concept of "self-organisation" provides a powerful tool for understanding and predicting many phenomena. Magnetic reconnection is a process which reconfigures the magnetic field topology and allows rapid release of free magnetic energy. A magnetised plasma undergoing turbulent

reconnection is predicted to relax to a state of minimum magnetic energy whilst conserving magnetic helicity [1]. Recent advances in relaxation theory shed new light on how solar flares are triggered and accelerate charged particles to high energies, and how the solar corona is heated to high temperatures, as well as how spherical tokamak plasmas can be formed, and the nonlinear development of instabilities in the edge of tokamaks. This talk focuses on reconnection and self-organisation in twisted magnetic flux ropes, which are fundamental structures in fusion and astrophysical plasmas.

1. Relaxation and reconnection in twisted flux ropes: solar flares and tokamak edge-localised modes

Magnetic energy may be stored in twisted magnetic flux ropes in the solar corona, and the release of this stored energy may result in large-scale solar flares or smaller "nanoflares" associated with heating of the solar corona. The ideal kink instability in a twisted flux rope triggers relaxation, through reconnection in fragmented current sheets during the nonlinear phase of the instability.

This results in plasma heating and acceleration of non-thermal particles as the magnetic field relaxes to a lower energy state [2]. Building on idealised models of relaxation in cylindrical flux ropes, a realistic model of an unstable twisted coronal loop is developed, representing a confined solar flare [3]. Exploiting a combination of 3D magnetohydrodynamic (MHD) simulations and test- particle modelling, the observational signatures of both thermal plasma and energetic non-thermal particles can be predicted, providing a means to detect twisted magnetic fields through X-ray and radio observations. Similarly, current-driven instabilities during Edge Localised Modes in tokamaks may trigger localised relaxation of the edge plasma, and a relaxation-based model of this process explains some surprising experimental observations [4].

2. Self organisation of multiple flux ropes in spherical tokamaks and the solar corona

Two or more twisted flux ropes may interact and merge, leading to magnetic self-organisation. Models of merging plasma flux ropes using Hall-MHD simulations and analytical relaxation theory provide good agreement with experimental observations of merging-compression formation in the MAST spherical tokamak [5]. An avalanche of heating events in stable twisted flux ropes may be triggered by instability of a single unstable flux rope, with implications for solar coronal heating. For the first time, such a heating avalanche, predicted by cellular automaton models, is demonstrated from first principles by 3D MHD simulations [6]. This may be described through a relaxation model, showing that multiple flux ropes self- organise into a large-scale coherent structure [7]. Recently, this model has been extended to consider energetic particles and external driving.

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PROGRAM

AIP Congress Code of Conduct

Our congress is dedicated to providing a harassment-free experience for everyone, regardless of gender, gender identity and expression, age, sexual orientation, disability, physical appearance, body size, race, ethnicity, religion (or lack thereof), or technology choices. We do not tolerate harassment of congress participants in any form. Sexual language and imagery is not appropriate for any Congress venue, including talks, workshops, parties, Twitter and other online media. Congress participants violating these rules may be sanctioned or expelled from the congress without a refund at the discretion of the congress organisers.

Sunday 9 December 2018

0830-1830	**Registration open**	*Conference Foyer, University Club*
1000-1630	**ANFF Short Course on Nanofabrication Technologies: Engineering your Imagination** This workshop includes lunch and afternoon tea	*University Club Auditorium*
1800-2000	**WELCOME RECEPTION**	*Ground Floor Terrace, University Club*

Monday 10 December 2018

0700-1830	**Registration open**	*Conference Foyer, University Club*
0845-0855	**Official Opening - Prof Peter Klinken (Chief Scientist of WA)**	*Octagon Theatre*
0855-0900	**WELCOME TO COUNTRY**	
	PLENARY SESSION 1	
0900-0945	**Prof Julia Yeomans FRS (Oxford University) – Active Matter** **Chair:** Evelyne Deplazes	
0945-1035	**Prof Jian-wei Pan (University of Science and Technology of China) Quantum Foundation, Quantum Optics, Quantum Information** Introduced by Prof Lloyd Hollenberg (Centre for Quantum Computation and Communication Technology) **Co-Chairs:** Jingbo Wang and Lloyd Hollenberg	
1035-1100	**Morning Tea**	*Banquet Hall, University Club*

1100-1230	**CONCURRENT SESSION 1**							
Session:	**1A - AIP Gravitational Waves & Relativity**	**1B - AIP Nuclear & Particle Physics**	**1C - AIP CMM**	**1D - AIP ATMOP**	**1E - AIP QUICC**	**1F - AOS/ACOFT**	**1G - AOS/ACOFT**	**1H - COMMAD**
Topic:			Semiconductors	Bose gases	Quantum neurosceince, metrology and imaging	Nanostructures and metasurfaces	Biophotonics and imaging	Wide bandgap semiconductors
Chair:	**Daniel Terno**	**Anthony Thomas**	**Hannah Joyce**	**Meera Parish**	**Tom Stace**	**Ben Eggleton**	**Robert McLaughlin**	**Fouad Karouta**
Room:	**Arts Building Room 8 [1.60]**	**Arts Building Room 9 [1.61]**	**Arts Building Room 5 [G.61]**	**Physics Building Ross Lecture Theatre [G.41]**	**Physics Building Clews Lecture Theatre [2.43]**	**Arts Building Fox Lecture Theatre [G.59]**	**Arts Building Austin Lecture Theatre [1.59]**	**University Club Auditorium**
1100-1130	Technology Development for Next Generation Gravitational Wave Detectors **Li Ju**	Neutron Sources in Stars and Laboratory **Michael Wiescher**	Semiconductor Nanowires for Optoelectronics Applications **Chennupati Jagadish**	Evolution of large-scale flow from turbulence in a two-dimensional superfluid **Kristian Helmerson**	Quantum Processing in the Brain? **Matthew Fishe**	Mie-resonant meta-optics, metasurfaces, and topological photonics **Yuri Kivshar**	Intravascular polarimetry with catheter-based optical coherence tomography **Martin Villiger**	GaN Power Electronics: From Lateral to Vertical **Shu Yang**
1130-1145	An heuristic approach to understanding spinors using Maple software with applications to general relativity **Peter Huf**		Fixing up the holes -- p-GaAs nanowire transistors with near-thermal limit gating **Jan Gluschke**	Giant vortex clusters in a 2D superfluid **Tyler Neely**	Spin-Qubit Molecular Microscopy **Viktor Perunicic**	A Novel Hybrid Plasmoni Nano-Focusing Mode Converter **Oliver Bickerton**	Endoscopic optical coherence tomography in dental and otolaryngological research **Julia Walther**	Psuedo-Hall effect in an AlGaN/GaN van der Pauw device under mechanical strain **Quan Nguyen**
1145-1200	Early Earthquake Detection with the TorPeDO Sensor **David McManus**	Radiation measurements in Australia's deepest mines in view of the construction of an underground physics laboratory **Francesco Nuti**	Electronic Structure and Electron Dynamics in Single-Layer Semiconducting and Metallic Transition Metal Dichalcogenides **Antonija Grubiscisc-Csabo**	Roton-induced features of a Bose polaron in the presence of spin-orbit coupling **Jia Wang**	Ab-initio optical phase estimation at the exact Heisenberg limit **Sergei Slussarenko**	Giant third-harmonic emission based on mirror-enhanced anapole resonator **Lei Xu**		Nitrate ion detection using GaN/AlGaN/GaN-based reference-electrode-free sensors with triodal receptor functionalisation **Jianan Wang**
1200-1215	GOTO: a new telescope network for transient detection **Duncan Galloway**	Higgs physics with the ATLAS experiment, and the upgrade for the high luminosity LHC **Elisabetta Barberio**		Impurity-induced multi-body resonances in a Bose gas **Zheyu Shi**	Quantum trilateration by photon measurement: Finding two particles with three measurement locations **Josef Worboys**	Optical phased array on a chip using scalable silicon waveguides **David Gozzard**	Imaging genetically-modified airway cells with a miniaturised multimodal optical coherence tomography + fluorescence probe **Jiawen Li**	Lithography-free microfabrication of silicon carbide on insulator using UV laser ablation **Hoang-Phuong Phan**
1215-1230	Low Frequency Squeezing Measurement with Double Carriers and High Frequency Squeezing Injection **Jue Zhang**	Origin of neutrino masses at the ATLAS experiment **Frederico Scutti**	Quantum correlated photons from strongly interacting semiconductor cavity polaritons **Guillermo Munoz Matutano**	Building time crystals with ultracold atoms **Peter Hannaford**	Robust symmetry-protected metrology with the Haldane phase **Gavin Brennen**	Tunable optical spin Hall effect in a liquid crystal microcavity **Wiktor Piecek**	Early caries detection by depolarization imaging based on PS-OCT **Jonas Golde**	Single crystal diamond membranes containing germanium vacancy color centers **Blake Regan**
1230-1330	**Lunch**							*Banquet Hall, University Club*
1245-1415	**AOS Annual General Meeting**							*Seminar Room 1, University Club*

1330-1500	CONCURRENT SESSION 2							
Session:	2A - AIP Gravitational Waves & Relativity	2B - AIP Nuclear & Particle Physics	2C - AIP CMM	2D - AIP ATMOP	2E - AIP QUICC	2F - AOS/ACOFT	2G - AOS/ACOFT	2H - COMMAD
Topic:			Organic and carbon based materials	Atomic superfluids	Quantum metrology, algorithms and simulation	Nanostructures and plasmonics	Optical fibres and sensing	Nanodevices
Chair:	**Magdalena Zych**	**Mahananda Dasgupta**	**Jamie Quinton**	**Peter Hannaford**	**Jingbo Wang**	**Mohsen Rahmani**	**Jiawei Li**	**Mariusz Martyniuk**
Room:	**Arts Building Room 8 [1.60]**	**Arts Building Room 9 [1.61]**	**Arts Building Room 5 [G.61]**	**Physics Building Ross Lecture Theatre [G.41]**	**Physics Building Clews Lecture Theatre [2.43]**	**Arts Building Fox Lecture Theatre [G.59]**	**Arts Building Austin Lecture Theatre [1.59]**	**University Club Auditorium**
1330-1345	Quantum effects in gravitational collapse **Daniel Terno**	Quarks to Nuclei and Neutron Stars **Anthony Thomas**	Local charge accumulation at iron-based trinuclear metal-organic nanostructures on a surface **Marina Castelli**	Ebb and flow of superfluids far from equilibrium **Matt Davis**	Ichtyosaurs (and other pets) in the quantum laboratory **Klaus Moelmer**	Engineering light-matter interactions at the nanoscale **Kenneth Crozier**	Simple fibre designs for complex photonics: what do nanoparticles, bubbles, and semiconductors have in common with lasers and Anderson localisation **John Ballato**	Nanodiamonds for imaging and sensing in biology **Philipp Reineck**
1345-1400			Carbon Surface Hybridisation Mapping with Auger Electron Spectromicroscopy **Jamie Quinton**					
1400-1415	Microresonators for optically diluted optomechanical filters **Xu Chen**	Nuclear reaction cross sections in hadron therapy **Edward Simpson**	Dense and Tunable 3D Graphene Networks from Carbide-Derived Carbons **Irene Suarez-Martinez**	Elementary excitations of a fermionic superfluid with strong interactions **Sascha Hoinka**	Encoding Electronic Spectra in Quantum Circuits with Linear T Complexity **Dominic Berry**	Vertically Stacked Silicon Nanowire Photodetectors for Spectral Reconstruction **Jiajun Meng**	Simultaneous measurement of temperature and refractive index using an exposed core microstructured optical fibre **Xuegang Li**	Metallic Nanoparticles-Embedded Glass towards Light Modulation **Jiangbo Zhao**
1415-1430	Progress on solving the Einstein-Dirac equations for a massive sterile neutrino **Malcolm Anderson**	Full reconstruction of leptonic and semileptonic B decays at the Belle II experiment **Kevin Varvell**	Loss of superelasticity in glassy carbon after high-pressure compressions **Carla de Tomas**	Low-momentum dynamic structure factor of a strongly interacting Fermi gas at finite **Hui Hui**	A quantum walk assisted approximate algorithm for bounded NP optimisation problems **Samuel Marsh**	Topological photonics meets Terahertz **Shakhik Atakaramians**	Drawn Optics - the Artistry of Spiders and their (Photonics) Webs **Douglas Little**	Chiral graphene plasmonic nanostructure for on-chip photodetection of MIR spin angular momentum **Jingyang Peng**
1430-1445	Commissioning of the Advanced LIGO Detectors for Observation Run 3 **Carl Blair**	Electron reconstruction and searches for new physics with the ATLAS experiment **Abhishek Sharma**	Spin Coherence and Dynamics of Singlet Fission in Molecular Dimers **Dane McCamey**	Breathing modes in strongly interacting Fermi gases **Brendan Mulkerin**	Graph comparison via nonlinear quantum search **Mitchell Chiew**	A novel nanocomposite based on rare-earth doped nanocrystals towards super-resolution optical data storage **Simone Lamon**	Asymptotic simulation of drawing Ge28Sb12Se60 chalcogenide glass microstructured optical fiber process including effects of pressure and surface tension **Shengling Wu**	Threshold Switching in NbOx and its Application as a Relaxation Oscillator **Robert Elliman**
1445-1500	Quantum Metrology in the Kerr Metric **Sebastian Kish**	Accelerator mass spectrometry measurement of the reaction 92Zr(n,y)93Zr and its relevance to nuclear astrophysics and nuclear technology **Stefan Pavetich**	Spatially Dependent Charging in a Single-Component Organic Nanofilm on a Metal **Dhaneesh Kumar Gopalakrishnan**	Negative-mass effects in spin-orbit coupled Bose-Einstein condensates **David Colas**	Controlled Quantum Search **Kooper De Lacy**	Free spectral range electrical tuning of a high quality double disk microcavity **Christiaan Bekker**	Towards Optical Filtering in Lithium Niobate On Insulator **Inna Krasnokutska**	High-Q cavity modes in a single dielectric nonspherical nanocavity **Lujun Huang**
1500-1530	**Afternoon Tea**							*Banquet Hall, University Club*

1530-1730	**CONCURRENT SESSION 3**							
Session:	**3A - AIP Gravitational Waves & Relativity**	**3B - AIP Nuclear & Particle Physics**	**3C - AIP CMM**	**3D - AIP ATMOP**	**3E - AIP QUICC**	**3F - AIP QUICC**	**3G - AOS/ACOFT**	**3H - COMMAD**
Topic:			Superconductors	Precision atomic physics	Quantum foundations and quantum time	Continuous variables quantum information	Biophotonics and imaging	Semiconductor and thin film devices ANFF
Chair:	**Sundae Chen**	**Michael Wiescher**	**Stephan Rachel**	**Dmitry Fursa**	**Gavin Brennen**	**Austin Lund**	**Peijun Gong**	**Philipp Reineck**
Room:	**Arts Building Room 8 [1.60]**	**Arts Building Room 9 [1.61]**	**Physics Building Clews Lecture Theatre [2.43]**	**Arts Building Room 5 [G.61]**	**Arts Building Fox Lecture Theatre [G.59]**	**Arts Building Austin Lecture Theatre [1.59]**	**University Club Auditorium**	**Physics Building Ross Lecture Theatre [G.41]**
1530-1600	Science Benefits of an Asia-Australian pair of Gravitational Wave Observatories **David Blair**	Heavy element nucleosynthesis in red-giant stars **Amanda Karakas**	Nature of the spin liquid in lightly doped cuprate superconductors **Oleg Sushkov**	Lifting the cloud on the hyperfine structure; a brighter future for atomic parity violation **Jacinda Ginges**	Hypercubes, drums, and single photons **Andrew White**	High-fidelity squeezing gate for continuous-variable quantum light field **Jie Zhao**	Recent developments in polarisation-sensitive optical coherence tomography for retinal imaging **Barry Cense**	III-V Solar Cells - present status and future prospects **N.J. Ekins-Daukes**
1600-1615	Numerical scalar curvature deformation and a gluing construction **Boris Daszuta**	The Belle II experiment at the SuperKEKB e+e- collider **Phillip Urquijo**	Dynamical admittance of Josephson junction arrays **Samuel Wilkinson**	Enhanced electronic-bridge coupling to the 76 eV U-235 nuclear transition in ions with chaotic spectra **Julian Berengut**	Causal Asymmetry in a Quantum World **Jayne Thompson**	Modular-qubit cluster states **Giacomo Pantaleoni**	Dynamic quantitative optical imaging of blood thrombus **Woei Ming (Steve) Lee**	CuI-TiO2 Composite Thin Film for Flexible Electronic Applications **Vidur Raj**
1615-1630	EPR induced Frequency Dependent Squeezing for Gravitational Wave Detectors **Min Jet Yap**		Modelling three-dimensional electron transport in tunnel junctions **Martin Cyster**	Keldysh-Rutherford Model for the Attoclock **Alexander Bray**	Quantum physics on indefinite causal structures: foundations and applications **Fabio Costa**	Restricted memory attacks in continuous-variable quantum key distribution **Nedasadat Hosseinidehaj**		Released all-porous-silicon microstructure for spectrometer applications **Xiao Sun**
1630-1645	Precession measurability in black hole binary coalescences **Grant Meadors**	60Fe and 244Pu on Earth – Access to the Solar Neighbourhood, Stars and the Past of Earth **Dominik Koll**	Factors affecting magnetic field sensitivity of one and two dimensional SQUID arrays **Emma Mitchell**	Spheroidal Convergent Close-Coupling calculations of electron scattering on the metastable c3Pu state of H2 **Jeremy Savage**	Tightening quantum speed limits for almost all processes **Felix Pollock**	Optimal estimation of joint parameters with Gaussian probes **Mark Bradshaw**	Radio-photoluminescence and optically stimulated luminescence in NaMgF3:Sm and NaMgF3:Mn suitable for novel optics-based dosimeters **Joseph Schuyt**	Using thermography to investigate thermal characteristics of porous silicon **Adrian Keating**
1645-1700	High Frequency Technology for Next Generation Gravitational Wave Detectors **Chunnong Zhao**	Forecasting the next fundamental discovery **Csaba Balazs**	Pressure dependant measurements of critical current density in iron-based superconductors **Gabriel Bioletti**	Measurement of the Characteristic Radiation of Copper Ka 1,2 **Jonathan Dean**	Witnessing quantum non-Markovianity **Christina Giarmatzi**	Quantum State Smoothing for Gaussian States **Kiarn Laverick**	A scintillating fibre array for medical imaging and dosimetry **Zhangkai Cheng**	Fabrication of free-standing, high-efficiency terahertz devices using cyclo olefin co-polymer **Rajour Tanyi Akov**
1700-1715	The role of Gravitational-Wave Optical Transient Observer (GOTO) in the era of advanced gravitational-wave detectors **Kendall Ackley**	Fusion dynamics in Super Heavy Element synthesis with atomic number Z = 114 **Kaushik Banerjee**	Effect of air annealing on the structure and magnetic properties of FeSe1-xTex **David Uhrig**	Isotope shift, non-linearity of King plots and the search for new particles **Amy Geddes**	Tensor Network Holography For A Family of Unitary Minimal Models **Nathan McMahon**	Multiparameter optimisation of a magneto-optical trap using deep learning **Aaron Tranter**	Gamma irradiation effects in photonic crystal fibre Bragg gratings **Steven Hinckley**	BREAK
1715-1730	Design, build and results of an Advanced Low Frequency Rotational Accelerometer 'ALFRA' for tilt measurement in gravitational wave detectors **Joshua McCann**	Decay properties of neutron-rich molybdenum isotopes **AJ Mitchell**	Impurity Induced Anomalous Thermal Hall Effect in Chiral Superconductors **Vudtiwat Ngampruetikorn**	Proton impact differential ionisation of atomic hydrogen **Ilkhom Abdurakhmanov**	Quantum satellites and tests of relativity **Daniel Terno**	Simulation of Gaussian channels via teleportation and error correction of Gaussian states **Spyros Tserkis**	Using low refractive index cladding materials to improve the imaging performance of a plastic scintillating fibre array detector in radiotherapy **Samuel Blake**	BREAK
1730-1830	**Sundowner Poster Session** OSA 100							*Banquet Hall, University Club*

Tuesday 11 December 2018 – AOS Partner Day

SPIE.

0730-1800	**Registration open**	*Conference Foyer, University Club*
0855-1030	**PLENARY SESSION 2**	*Octagon Theatre*

0855-0900 **Maryellen Giger** (SPIE 2018 President)
0900-0945 **Prof Teri Odom** (Northwestern University, USA) – Reconfigurable Flat Nanoparticle Optics
Chair: Robert McLaughlin
0945-1030 **Prof Willie Padilla** (Duke University, USA) – Exotic Physics with All-Dielectric Metasurfaces
Chair: Marius Martyniuk

EQUS

1030-1100 Morning Tea *Banquet Hall, University Club*

1100-1230 **CONCURRENT SESSION 4**

Session:	4A - Focus Session –Optical & Quantum Bio-Sensing	4B - Focus Session – Dark Matter Detection	4C - AIP CMM	4D - AIP ATMOP	4E - AIP QUICC	4F - AIP QUICC	4G - AOS/ACOFT	4H - COMMAD
Topic:			Strongly correlated electrons, Magnetism	Sending and dynamics	Optomechanics and hybrid systems	Quantum memories and networks	Biophotonics and intelligent algorithms	Quantum and Optical Devices ANFF
Chair:	**Liam Hall**	**Michael Tobar**	**Oleg Sushkov**	**Jacinda Ginges**	**Jason Twamley**	**Bill Munro**	**Robert McLaughlin**	**Shu Yang**
Room:	**Arts Building Fox Lecture Theatre [G.59]**	**University Club Auditorium**	**Arts Building Room 5 [G.61]**	**Arts Building Room 8 [1.60]**	**Physics Building Ross Lecture Theatre [G.41]**	**Physics Building Clews Lecture Theatre [2.43]**	**Arts Building Austin Lecture Theatre [1.59]**	**Arts Building Room 9 [1.61]**
1100-1130	Quantum sensing and imaging in biology using the nitrogen-vacancy centre **Lloyd Hollenberg**	A Southern Hemisphere prospective on Dark Matter **Elisabetta Barberio**	Correlated Nanoelectronics **Jeremy Levy**	Rapid optical measurement of $^{13}CO2$ and $^{12}CO2$ number density **Sarah Scholten**	Circuit optomechanics with carbon nanotubes and nm-thick membranes: towards quantum motion **Natalia Ares**	Hybrid quantum systems based on surface acoustic waves **Yasunobu Nakamura**	Quantitative Radiomics and Deep Learning in Breast Cancer Diagnosis **Maryellen Giger**	Quantum technologies with Hexagonal Boron Nitride **Igor Aharonovich**
1130-1145	Atom and Molecular Sensors for Biosensing **Andre Luiten**	The ORGAN Experiment, and other axion detection schemes at UWA **Benjamin McAllister**	Monolayer Topological Superconductivity and Quantum Design of Majorana Fermions **Stephan Rachel**	Time-dependent ionization processes in acetylene **Igor Litvinyuk**	Using Filter Functions to Improve Strong Measurements in Optomechanics **Chao Meng**	A passive on-chip, superconducting circulator using a ring of tunnel junctions **Tom Stace**	An artificial neural network for aberration compensation **Benjamin Cumming**	Next-generation single-photon sources in two-dimensional hexagonal boron nitride for space applications **Tobias Vogl**
1145-1200		Axion Detection with Precision Frequency Metrology **Maxim Goryachev**	The Fundamental Sharpness of Magnetic Interfaces Formed by Chemical Disorder Using a He+ Beam: Theory and Experiment **Grace Causer**	Emergence of relativistic non-dipole effects in strong field atomic ionization at moderate intensities **Nida Haram**	Coupling a high quality factor quartz bulk acoustic wave resonator to a microwave cavity **Jeremy Bourhill**	Chip-to-chip entanglement of transmon qubits using engineered measurement fields **Nathan Langford**	Towards rapid OCT imaging: iterative learning control of MEMS mirrors **Daniel Firth**	Effects of high energy electron irradiation on quantum emitters in hexagonal boron nitride **Ngoc My Hanh Duong**
1200-1215	Fluorescent nanodiamonds: from the creation and characterization of optical defects to applications in biology **Phillip Reineck**	Searching for ultra-light Dark Matter using clocks at the Paris Observatory **Peter Wolf**	Understanding the structural effects on magnetic order in the 2D quantum magnet atacamite, $Cu2Cl(OH)3$ **Kirrily Rule**	Dynamics of molecular excitons interacting with twisted light **Hugh Sullivan**	Fast and coherent mechanical squeezing with optomechanics **James Bennett**	Demonstration of a capacitively shunted superconducting granular aluminum **Yannick Schon**	Correction of peak tracking ripple in solid state spectrometers **Peter Cook**	Fabrication of Near-Identical Single Photon Emitters in Hexagonal Boron Nitride for Integrated Quantum Photonics **Noah Mendelson**
1215-1230	Nanoscale quantum sensing **Simon Schmitt**		Magnetoelectric Coupling Mechanism of Hexagonal Magnet $Co4Nb2O9$ with Large In-plane **Anisotropy Guochu Deng**	Isomer-specific action spectroscopy of molecular ions **Eduardo Carrascosa**	Phonon Confinement by the Force of Light **Xin (Eric) He**	Nonreciprocal device realized with quantum nonlinearity **Tom Stace**	First-order quasi-Bessel optical 'funnel' beam for trapping particles in air **Sebastian Lavin Varela**	Optical Modelling and Characterization of MEMS based filters for spectroscopic imaging applications **Dhiendra Tripathi**

1230-1330 Lunch *Banquet Hall, University Club*

1245-1315 Discussion – Theoretical and Mathematical Physics in Australia *Arts Room 10 [1.62]*

DE-GAP Workshop and Brunch
1000-1300
Seminar Room 1
Speaker: **Maureen Frank**

1330-1515	**CONCURRENT SESSION 5**									
Session:	**5A - AIP Combined GW and Astronomy session**	**5B - Focus Session – Dark Matter Detection**	**5C - AIP CMM**	**5D - AIP ATMOP**	**5E - AIP QUICC**	**5F - Education for Physics and Related Disciplines**	**5G - AOS/ACOFT**	**5H - COMMAD**	**Education for Physics and Related Disciplines Additional**	**Workshops**
Topic:			Materials and Characterisation	Precision measurement	Optomechanics, hybrid systems, quantum thermodynamics	Novel Approaches of Teaching Physics	Quantum optics	Quantum computing & spin ensembles ANFF		
Chair:	**Grant Meadors & Staveley-Smith**	**Maxim Goryachev**	**Gunther Andersson**	**Andre Luiten**	**Kae Nemoto**	**David Hoxley**	**Mikkel Andersen**	**N.J Ekins-Daukes**		
Room:	**Arts Building Room 8 [1.60]**	**Arts Building Room 9 [1.61]**	**Physics Building Ross Lecture Theatre [G.41]**	**Arts Building Fox Lecture Theatre [G.59]**	**University Club Auditorium**	**Physics Building Clews Lecture Theatre [2.43]**	**Arts Building Austin Lecture Theatre [1.59]**	**Arts Building Room 5 [G.61]**	**Physics Building Room 215**	**Arts Building Room 6 [G.62]**
1330-1345	Constraining the morphology of gamma-ray bursts with gravitational waves and gamma rays **Eric Thrane**	Search for dark matter with the ATLAS experiment at the LHC **Francesca Ungaro**	New frontiers in atom probe tomography **Julie Cairney**	Optical networks and clock comparisons at the 18th-decimal place **Tara Fortier**	Topological transport of phonons and photons **Florian Marquardt**	Design and evaluation of an innovative approach to teaching electric circuits **Jan-Philipp Burde**	Photonic Quantum Networks **Ian Walmsley**	Computing at the atomic scale with quantum dots **Konrad Walus**	**Teaching Nexus: Evolving Physics Education in our Schools** The forces and how physicists interpretations have changed over the centuries **Jason Dicker**	**Scientific Writing Workshop** The Secrets of Scientific Publishing **Igor Aharanovich** 1330-1500
1345-1400	The Smoking Gun of Inflation: searching for gravitational waves with the South Pole Telescope **Christian Reichardt**	Direct detection of Mirror Dark Matter **Robert Foot**								
1400-1415	Detecting the gravitational-wave background from the whole population of binary black hole mergers **Rory Smith**	The search for dark matter with the SABRE experiment **Ibtihal Mahmood**	Macroscopic Kelvin Probe Microscopy on Perovskites **Iain Baikie**	Ultracold Cs*Yb molecules by photoassociation in an optical dipole trap **John McFerran**	Quantum entanglement of the motion of massive objects **Matt Woolley**	Using colour and history to engage students with a thermal experiment **Aesha Bhansali**	Parallel quantum random number generation from homodyne measurements **Daniel Peace**	Single spin qubits for STM-fabricated donor devices in silicon **Ludwik Kranz**		
1415-1430	Unveiling the violent Universe with gravitational wave astronomy **Eric Howell**	Directional Dark Matter Detection with CYGNUS **Lindsey Bignell**	Theoretical Study of the Hydration of the Polar (0001) and (000$\bar{1}$) Surfaces of Wurtzite GaN with a Native Ga2O3 **Dino Spagnoli**		Evaporation of a giant quantum vortex **Yauhen Sachkou**	Paleolithic aerodynamics: the straight-flying boomerang **Timo Nieminen**	Reduction of Quantum Radiation Pressure Noise via Squeezed Light in the Audio-Frequency Band **Min Jet Yap**	Two-electron spin correlations and exchange between phosphorus donors in silicon **Sam Gorman**		
1430-1445	A search for continuous gravitational waves from H.E.S.S. sources **Deeksha Beniwal**	Radioimpurity characterisation of high-purity dark matter detector materials using Accelerator Mass Spectrometry **Anton Wallner**	Metal Clusters on Surfaces for Photocatalysis Applications **Gunther Andersson**	Giant Spin Squeezing for metrology using Geometric Quantum Gates **Jason Twamley**	Interconversion of finite-size quantum resources **Kamil Korzekwa**	Beyond Flipped! Challenged-Based learning in 1st year Physics and Chemistry **Jamie Quinton**	Integrated device for Continuous Variable quantum optics **Mirko Lobino**	Microsecond spin qubit readout with a strong-response single electron transistor **Daniel Keith**		
1445-1500	Inferring population properties of binary neutron stars with gravitational waves **Xingjiang Zhu**	Broadband Detection of Axion Wind using Magnons **Graeme Flower**	Plasmon-Coupling Theory of the Electron Inelastic Mean Free Path, energy loss functional and the dielectric function for LEEM, for low energy electrons **Christopher Chantler**	Compact Two-Photon Rubidium Clock **Chris Perrella**	Autonomous Quantum Heat Engine Using an Electron Shuttle **Behnam Tonekaboni**	Even better than the real thing? Improving remote access undergraduate experiments **Manuel Pumarole**	Survival resonances in a dissipatively driven atom optics system and their application to gravity measurements **Mikkel F Andersen**	Isotopically Pure Silcon-28 Whispering Gallery Mode Resonators: A Host for Narrow Linewidth Spin Ensembles **Michael Tobar**		
1500-1515			Defect engineering in graphene using ion irradiation **Robert Elliman**			Enhancing learning of physics concepts using interactive simulations **Margaret Wegener**				
1500-1530	**Afternoon Tea**									*Banquet Hall, University Club*

1530-1745	CONCURRENT SESSION 6								
Session:	6A - AIP Gravitational Waves & Relativity	6B - AIP Nuclear & Particle Physics	6C - AIP Plasma Physics	6D - AIP ATMOP	6E- AIP QUICC	6F - Focus Session –Optical & Quantum Bio-Sensing	6G - AOS/ACOFT	6H - COMMAD	AIP Education for Physics & Related Disciplines:
Topic:				Exotic cold-atom systems	Quantum foundations and quantum algorithms		Light sources	Nanowires and nano-structures ANFF	
Chair:	**Ju Li**	**Kevin Varvell**	**Matthew Hole**	**Sean Hodgman**	**Haline Rubinsztein-Dunlop**	**Liam Hall**	**Igor Aharonvich**	**Konrad Walus**	
Room:	**Arts Building Room 8 [1.60]**	**Arts Building Room 9 [1.61]**	**Arts Building Room 5 [G.61]**	**Arts Building Fox Lecture Theatre [G.59]**	**Physics Building Ross Lecture Theatre [G.41]**	**University Club Auditorium**	**Arts Building Austin Lecture Theatre [1.59]**	**Physics Building Clews Lecture Theatre [2.43]**	**University Club Club Restaurant**
1530-1600	Quantum optomechanics in gravity (quantum) experiments **Markus Aspelmeyer**	Recent results from the ATLAS Experiment at Run 2 of the CERN LHC **Paul Jackson**	On the fundamental of Rayleigh-Taylor instability and interfacial Rayleigh-Taylor mixingz **Snezharna I. Abarzhi**	Coherent microwave-to-optical conversion via six-wave mixing in Rydberg atoms **Wenhui Li**	Mesosopic steerable and superposition states of massive systems **Margaret Reid**	The blinking mechanisms in colloidal quantum dots **Gangcheng Yuan**	Emission from GeV, GaN and 2D heterostructures for light-matter interaction **Weibo Gao**	Engineering optoelectronic devices based on III–V nanowires: From growth to terahertz **Hannah Joyce**	**PEG High Tea** 3.30pm-4.30pm **Keynote: Chandrelakha Singh** *Club Restaurant, Uninversity Club* IOP Publishing
1600-1615	BILBY: A User-Friendly Package for Parameter Estimation in Gravitional Wave Astronomy **Moritz Huebner**	Probing astrophysical s-process and r-process in the laboratory **Michael Paul**	Ammonia production in atmospheric-pressure plasmas: progress and prospectsz **Tony Murphy**	Rapid Production of Large Quanta BEC Supercurrents **Thomas Bell**	Unifying nonlocality and contextuality as violations of classical causality **Eric Cavalcanti**	Quantum techniques for optical biosensing **Warwick Bowen**	Pure-quartic solutions under the perturbative effects of quadratic dispersion **Kevin Tam**	Stress Induced Bending of GaAs Nanowires by Metal Deposition **Fouad Karouta**	
1615-1630	A novel vibration isolation technique for future gravitational wave detectors **Joris van Heijningen**			Dressing ultra-cold atoms for control and quantum technology **Barry Garraway**	Bell's inequalities and EPR steering with metastable helium BECs **Sean Hodgman**		A superfluid Brillouin laser with ultra-high gain **Christopher Baker**	Multi-wavelengths Luminescence from Single InGaAs/InP Quantum Well Nanowire Light Emitting Diode **Inseok Yang**	
1630-1645	Possible physical signature of the quantum nature of time **Joan Vaccaro**	Quantifying dissipation in nuclear reactions en route to equilibration: experimental **Mahananda Dasgupta**	Completing the picture of linear energetic geodesic acoustic mode **Zhisong Qu**	Universality of an Impurity in a Bose-Einstein Condensate **Jesper Levinsen**	Quantum optical simulation of classical stochastic processes over multiple time stepsZ **Nora Tischler**	Tuning of Long-Range Hyperfine Interactions for Maximally Efficient Dynamic Nuclear Polarisation **Liam Hall**	Heterodyne fibre interferometer for frequency-noise reduction and rapid wide-band tunability of a conventional laser source **Philip Light**	Shape engineering of InP nanostructures grown by selective area epitaxy **Naiyin Wang**	Physics Building, 215 Lecture Room Chair: Maria Parapilly **Teaching tips - invited panel** **Moderator:** Jasmina Lazendic-Galloway **Panel:** Manju Sharma, Joe Hope, Jamie Quinton, Elizabeth Angstmann 1630-1730
1645-1700	Multi-stage Damper for Parametric Instability Suppression in Gravitational Wave Detectors **Hamedan Jaberian**	Exploring fundamental physics with gravitational waves **Archil Kobakhidze**		Superfluid dynamics of two-component BEC in a toroidal trap **Mark Baker**	Dirac quantum walks on triangular and honeycomb lattices **Gareth Jay**	Determining the quantum coherence of optically trapped nanodiamonds **Peter Reece**	Automatically optimising cavity transmission using 2 SLMs and digitally enhanced **Tarquin Ralph**	Effect of temperature heating rate and growth pressure on the morphology of CVD-grown two-dimensional Bi2Te3 nanostructures **Junliang Li**	
1700-1715	High reflectivity silicon nitride photonic crystals **Benjamin Neil**	Analysis of the first Belle II collision data **Jo-Frederik Krohn**	Highly symmetric interfacial coherent structures in Rayleigh Taylor instability with time-dependent acceleration **Desmond Hill**	Dynamics of a harmonically trapped Tonks-Girardeau gas under periodic driving **Karen Kheruntsyan**	Black-box quantum state preparation without arithmetic **Yuval Sanders**		Wavelength swept operation of an acousto-optically tuned semiconductor laser cavity **Adam Gambell**	Using ultra-thin parylene films as an organic gate insulator in nanowire field-effect **Jan Gluschke**	
1715-1730	Quantum formulation of the Einstein Equivalence Principle **Magdalena Zych**	The evolution of shape coexistence between doubly magic 40Ca and 56Ni through pair-conversion spectroscopy **Jackson Dowie**	Maximum initial growth-rate of strong-shock-driven Richtmyer-Meshkov instability **Arun Pandian**	Route to Observing Fulde-Ferrell Superfluids via a Dark-State Control of Feshbach Resonances **Xia-Ji Liu**	Assisted Macroscopic Quantumness **Austin Lund**	Quantum magnetic microscopy of biomineralisation in a marine mollusc **Julia McCoey**		Probing charge and energy transfer across the HIOS interface by electron transport in silicon nanowires **Mykhailo Klymenko**	

1730-1745						Laser threshold magnetometry with nitrogen-vacancy colour centres in diamond **Lachlan Rogers**			

Public Lecture - ***Must register with Institute of Advanced Studies to attend this event. Not included in AIP registration*** *Octagon Theatre*

1745-1825 **Markus Aspelmeyer** - What is a photon?
1825-1845 Interval
1845-1945 **Professor Rainer Weiss** - Gravitational Waves

Wednesday 12 December 2018 – Industry Day

IOP Institute of Physics

0730-1800 Registration open *Conference Foyer, University Club*

0900-1030 PLENARY SESSION 3 – *Octagon Theatre*

Physics Building: Magnetic Lab, Room 119

0855-0900 **Professor Dame Julia Higgins** (IOP President)
0900-0945 **Prof Thomas Krauss** (University of York, UK) – Photonic Crystals and Nanostructures – Phoenix of Photonics?
Chair: Almantas Pivrikas
0945-1035 **Prof Philippa Browning** (University of Manchester, UK) – Self organisation by magnetic reconnection in solar and fusion plasmas
Introduced by Andrew Peele (ANSTO)
Co-Chair: Richard Garrett and Andrew Peele

ANSTO

Teaching Nexus: Evolving Physics Education in Our Schools: Electricity and magnetism for years 11 and 12. Theory and demonstrations.
Presenter:
Mr Jason Dicker
0900-1030

1035-1100 Morning Tea *Banquet Hall, University Club*

1100-1230 CONCURRENT SESSION 7

Session:	7A - AIP Astron and Astro + Focus Next-gen Astro with new observatories	7B - AIP Biophysics & Soft Matter Physics	7C - AIP Geophysics, Solar, Terrestrial & Space Physics	7D - AIP Industrial & Applied Physics	7E - AIP QUICC	7F - Education for Physics and Related Disciplines	7G - AOS/ACOFT	7H - COMMAD	Education for Physics & Related Disciplines - Additional
Topic:					Quantum informaton processing	Creating Effective Learning Environments and Assessments	Biophotonics and imaging	Infrared detectors and II-VI semiconductors ANFF	
Chair:	**Stuart Wyithe**	**Henning Stumf**	**Brett Carter**	**Stuart Midgley**	**Nathan Langford**	**Maria Parappilly**	**Brendan Kennedy**	**Lorenzo Faraone**	
Room:	**Physics Building Ross Lecture Theatre [G.41]**	**Arts Building Room 8 [1.60]**	**Arts Building Room 5 [G.61]**	**Arts Building Room 9 [1.61]**	**Arts Building Fox Lecture Theatre [G.59]**	**Physics Building Clews Lecture Theatre [2.43]**	**Arts Building Austin Lecture Theatre [1.59]**	**University Club Auditorium**	
1100-1115	Cosmology with the Dark Energy Survey **Tamara Davis**	Mapping DNA target search in the nucleus of a living cell **Elizabeth Hinde**	Using physics-based ionospheric modelling to understand the daily variability in the equatorial ionosphere **Brett Carter**	Medical Physics: the science that saves lives **Natalka Suchowska**	Silicon photonic quantum computing **Jeremy O'Brien**	Facilitating thinking and learning in and beyond the classroom using evidence-based approaches **Chandralekha Singh**	Endoscopic optical coherence tomography for the detection, diagnosis and monitoring of pulmonary disease **Melissa Suter**	Recent advances in III-V semiconductor infrared detectors **David Ting**	
1115-1130			Satellite and debris characterisation with Adaptive Optics Imaging **Michael Copeland**						

Session:	7A - AIP Astron and Astro + Focus Next-gen Astro with new observatories	7B - AIP Biophysics & Soft Matter Physics	7C - AIP Geophysics, Solar, Terrestrial & Space Physics	7D - AIP Industrial & Applied Physics	7E - AIP QUICC	7F - Education for Physics and Related Disciplines	7G - AOS/ACOFT	7H - COMMAD	Education for Physics & Related Disciplines - Additional
1130-1145	TeV Gamma-Ray Astronomy with The Cherenkov Telescope Array (CTA) **Gavin Rowell**	Analysing E.coli behaviour in viscous medium using optical tweezers **Declan Armstrong**	Free-space quantum communication with adaptive optics **Francis Bennet**	Plasmonic colour sensors for digital camera pixels **Evgeniy Panchenko**	Towards high-fidelity two-qubit CNOT gates based on phosphorous donor qubits in silicon **Muhammad Usman**	Using online testing effectively in a large first year physics course **Elizabeth Angstmann**	Simultaneous imaging and temperature sensing within brain tissue by a miniaturised multimodal fibre-optic probe **Jiawen Li**	Recent advances in IR imaging focal plane arrays technology at UWA **Jarek Antoszewski**	**Physics Building, Old Spice Computer Lab (B48)** **Teaching Nexus: Evolving Physics Education in Our Schools** **Presenter:** Dr David Hoxley (La Trobe University)
1145-1200		A new dynamic optical tweezers toolbox **Isaac Lenton**	Geodetic VLBI, Earth Rotation and Sagnac effect **Oleg Titov**	Antireflection coating of barriers to enhance electron tunnelling: exploring the matter wave analogy of superluminal optical phase velocity **Zijun Zhao**	Using real Clifford gates to demonstrate fault tolerance in the IBM Q Experience **Robin Harper**	Gender Differences in Approach to a Competitive Examination **Umaira Malik**	Towards a smart surgical glove for the intraoperative detection of breast cancer **Rowan Sanderson**	Neutron transmutation doping of isotope enriched ZnO nanorods to produce p-type material **Charlie Ironside**	
1200-1215	Jets from stellar-mass black holes and neutron stars **James Miller-Jones**	Quantifying the response of Arabidopsis thaliana to applied pressure using nanoindentation **Jodie Bradby**	Secondary Observations Relevant to the Pioneer Anomaly **Craig Watkins**	Recent progress in terahertz spectroscopy and its applications **Krunal Radhanpura**	Statistical mechanical models for correlated noise in arbitrary stabiliser codes **Chris Chubb**	Self-assessment for learning: setting an assessment to encourage regulation in learning **Jasmina Lazendic-Galloway**	Mechanical and spectroscopic differences in prostate cancer cell lines **David McGloin**	Comparison of band engineering methods in HgCdTe nBn detector **Nima Dehdashti**	
1215-1230	Mid-Infrared Properties of compact Active Galactic Nuclei selected from the high-radio-frequency Australia Telescope 20 GHz (AT20G) Survey **Rajan Chhetri**	Manipulating zebrafish inner ear with Optical tweezers to trick the brain **Itia Favre-bulle**	Link acquisition and beam steering with a 7-emitter 1550nm optical phased array **James Spollard**	Blockage risk in subsea oil and gas pipelines: application of classical nucleation theory to experimental measurements of natural gas hydrate formation **Peter Metaxas**	Calderbank-Steane-Shor Holographic Quantum Error Correcting Codes **Rob Harris**	Reflection in physics multimedia: A comparison of a general audience to first year physics **Petr Lebedev**	The impact of feature size on resolution in compression optical coherence elastography **Matt Hepburn**	Optical property study of mid-wave infrared Hg0.79Cd0.21Se grown on GaSb (211) by molecular beam epitaxy **Wenwu Pan**	
1230-1330	**Lunch**						*Banquet Hall, University Club*		**Arts Room 6 [G.62]** **PEG Business** - Physics Education Medal invited talk **Maria Parappilly** (Flinders University)
1245-1315	**AIP Head of School meeting**							*Seminar Room 1, University Club*	
1330-1500	**CONCURRENT SESSION 8**								
Session:	**8A - AIP Astron and Astro + Focus Next-gen Astro with new observatories**	**8B - AIP Biophysics & Soft Matter Physics**	**8C - AIP Plasma Physics**	**8D - Focus Session – Nanostructures & Metamaterials**	**8E - AIP QUICC**	**8F - Education for Physics & Related Disciplines**	**8G - AOS/ACOFT**	**8H - COMMAD**	**Workshops**
Topic:					Quantum computation, hybrid qubits and applications	High School Physics	Optical fibres and sensing	Photonic Devices ANFF	
Chair:	**Hayley Bignall**	**Philipp Schönhöfer**	**Tony Murphy**	**Ann Roberts & Mohsen Rahmani**	**Barry Sanders**	**Elizabeth Angstmann**	**Daniel Gomez**	**David Ting**	
Room:	**Physics Building Ross Lecture Theatre [G.41]**	**Arts Building Room 8 [1.60]**	**Arts Building Room 5 [G.61]**	**Arts Building Room 9 [1.61]**	**Arts Building Fox Lecture Theatre [G.59]**	**Physics Building Clews Lecture Theatre [2.43]**	**Arts Building Austin Lecture Theatre [1.59]**	**University Club Auditorium**	**Arts Building Room 6 [G.62]**

1330-1400	Fast Radio Bursts - Astronomy's next great physical laboratory **Ryan Shannon**	The Effect of H3O+ on Membrane Structure, Hydrogen Bonding and Interfacial Water Layering in Phospholipid Bilayers **Evelyne Deplazes**	The Australian Coherence Imaging Diagnostic for ITER **Richard Garrett**	2D-Materials in Optical Coatings and high-Q Bragg Cavities: a Robust Platform for Strong Coupling, Quantum Emmission and Nonlinear Optics **Falk Eilenberger**	Building a Quantum Computer Using Quantum Dots in Silicon/ Silicon-Germanium Heterostructures **Susan Coppersmith**	**Jason Dicker**	Heavy metal oxide glass fibers: New opportunities for sensing **Heike Ebendorff-Heidepriem**	Towards Low-Power Reconfigurable Photonic ICs Based on MEMS Technology **Banafsheh Abasahl**	**Scientific Writing Workshop** The Secrets of Scientific Publishing **Igor Aharanovich** 1330-1500
1400-1415	Multi-messenger astronomy in the Gravitational Wave Detection Era **Matthew Bailes**	The impact of 3D surface curvature on tissue growth and organization **Sebastian Ehrig**	Systematic studies on Z dependence of extreme ultraviolet and soft X-ray spectra using high-temperature fusion plasmas **Chihiro Suzuki**	Practical Metamaterials Fabricated by Fibre Drawing **Simon Fleming**	A hybrid quantum memory for microwave photons **Mykhailo Savytskyi**	Public and Teacher Response to Einsteinian Physics in Schools **Alex Foppoli**	Rare-earth glass coatings on exposed core fibres for high spatial resolution temperature sensing **Daniel Stavrevski**	Temperature effects on microcantilever based hydrogen sensors **Jega Thisan Gurusamy**	
1415-1430		Alice in Wonderland: How to understand Dementia from fundamental X-ray Optics **Christopher Chantler**		Dynamically Switchable Colloidal Au Nanorod Plasmonic Pixels **Nicholas Greybush**	Exchange-based 2-qubit logic gates with donors in silicon **Mateusz Madzik**	The new HSC physics syllabus – what support do teachers need? **Lorna Jarrett**	Multi-wavelength third harmonic generation using exposed-core microstructured optical fibre **Stephen Warren-Smith**	A New Approach to Modelling the Coherence of Optical Feedback in Dynamical Semiconductor Laser Systems **Deb Kane**	
1430-1445	Positron annihilation in the Milky Way **Fiona Helen Panther**	Bridging the short and long term mechanics of articular cartilage extracellular matrix **Bruce Gardiner**	Energetic particle driven mode activity: advances in understanding from linear through hard nonlinear regime **Matthew Hole**	Realization of Complex-Valued Birefringence with Dielectric Metasurfaces **Shaun Lung**	Fidelity benchmarks for two qubit gates in silicon **Wister Huang**	Embedding high school Physics teachers within the university system – reflections by a 'Visiting Teaching Fellow' **Jessica Budden**	SPDC spectroscopy on a lithium niobate chip **Alexander Solntsev**	Focused electron beam induced processing for nanophotonic applications **James Bishop**	
1445-1500	Characterising "Hot Jupiter" Exoplanets **Graeme Melville**	Influence of hydration in molecular dynamics simulations of DOPC membranes with glycerol and DMSO **Christopher Malajczuk**	Mourou's very extreme CPA-Laser Pulses for Non-Thermal Laser Boron Fusion Reactor for Clean Electricity like Nuclear Fission **Heinrich Hora**	Meeting the challenges of accurate dimensional measurements at the nanoscale **Bakir Babic**	Fidelity benchmarks for two qubit gates in silicon **Stephen Bartlett**	General relativity in upper secondary school: Design and evaluation of an online learning environment using the model of educational reconstruction **Magdalena Kersting**	Thermally drawn polyurethane optical fibres for sensing applications **Simon Fleming**	Comparison of Si, SiGe and GaAs photovoltaic microcells for power-over-fibre **Steven Hinckley**	
1500-1530	**Afternoon Tea**							*Banquet Hall, University Club*	

1530-1745	CONCURRENT SESSION 9								
Session:	9A - AIP – Medical Physics Combined with AIP - Synchrotron Science, Scattering, Microscopy, Imaging	9B - Focus Session – Dark Matter Detection	9C - AIP Plasma Physics	9D - Focus Session – Nanostructures & Metamaterials	9E - AIP ATMOP	9F - Focus Session – Optical & Quantum Bio-Sensing	9G - AOS/ACOFT	9H - Focus Session – 50 years of Bicontinuous Cubic Phases	Education for Physics and Related Disciplines – Additional
Topic:					Scattering		Biophotonics & physiology		
Chair:	**Richard Garrett & Azin Azadi**	**Elisabetta Barberio**	**Snezharna I. Abarzhi**	**Ann Roberts & Mohsen Rahmani**	**Julian Berengut**	**David Simpson**	**Jiawen Li**	**Bodo Wilts Gerd Schroder-Turk**	
Room:	**Physics Building Clews Lecture Theatre [2.43]**	**University Club Auditorium**	**Arts Building Room 5 [G.61]**	**Arts Building Room 8 [1.60]**	**Arts Building Fox Lecture Theatre [G.59]**	**Arts Building Austin Lecture Theatre [1.59]**	**Arts Building Room 9 [1.61]**	**Physics Building Ross Lecture Theatre [G.41]**	**Physics Building Room 215 Lecture Theatre**
1530-1545	Use of novel pixelated semiconductor detectors in Targeted Alpha Therapy **Eva Bezak**	Heating up Neutron Stars with Dark Matter **Nicole Bell**	Materials under extreme plasma environments: Efficient one-step plasma synthesis of surface nanostructures **Cormac Corr**	Three-Dimensional Tuning of the Near-Field in Coupled Metal Nanostructures **Alison Funston**	Applications of the convergent close-coupling theory: from antihydrogen formation through to collisions with molecular targets **Igor Bray**	Nanoscale BioPhotonics: using nanomaterials and light to understand the inner workings of the body **Brant Gibson**	Farms and Photonics: Lasers, Milk and Sperm Sorting **Cather Simpson**	Theory and experiments of novel polycontinuous liquid crystals **Stephen Hyde**	**Teaching Nexus: Evolving Physics Education in Our Schools (Workshop 3)** **Presenter:** Prof David Blair (UWA) Einsteinian Physics 1530-1700
1545-1600									
1600-1615	Kidney nephrons and podocytes - towards in vivo imaging and improved clinical management **John Bertram**	Searching for fuzzy dark matter in the Galaxy with Parkes Pulsar Timing Array **Xingjiang Zhu**	New experimental findings of non-local transport in J-TEXT and KSTAR **Yuejiang Shi**	Synthetic optical nonlinearity in dielectric and plasmonic nanosuspensions **Zhigang Chen**	Vibrationally-resolved electron-impact excitation of molecular hydrogen **Liam Scarlett**	Dynamic quantum sensing of paramagnetic species using nitrogen-vacancy centre **Melissa Mather**	A minimum optical fibre setup for REDOX measurements **Wen Qi Zhang**	Broadband circular dichroism in metallic gyroid micro-structures **Benjamin Cumming**	
1615-1630		Search for QCD Axion Dark Matter with Radio Telescopes **Peter Quinn**			Auger and conversion spectroscopy of medical radioisotope 125I **Bryan Pi Ern Tee**		Light Scattering by Double-Cylinder Spider Silk Optical Micro-fibres **Deb Kane**	Self-assembly of hexagons into infinite bicontinuous cubic polyhedra **Tomonari Dotera**	
1630-1645	A call to arms: engaging physicists in the fight against cancer **Martin Ebert**	Detector characterisation for the SABRE South dark matter experiment **Greg Lane**	Particle motion in 3D MHD equilibria versus relaxed states **David Pfefferlé**	Effect of Shape and Aggregation in Plasmonic Random Lasers **Judith Dawes**	Treating electron and positron transport through liquids from first principles **Danny Cocks**	Smart microscopy: An adaptive way of scanning **Nicolas Mauranyapin**	Tracking and manipulating the fish inner ear to understanding sound localization **Michael Taylor**	Origin of Spontaneous Mirror Symmetry Breaking in Bicontinuous Cubic and Non-cubic Phases **Goran Ungar**	
1645-1700	New Diffractive Optics for Soft X-ray Ptychography **Alaleh Aminzadeh**	Ionisation signatures of sub-GeV dark matter due to absorption and scattering of electrons **Benjamin Roberts**		Plasmene: a metasurface perfect absorber **Daniel Gomez**	Convergent close-coupling approach to proton collisions with helium **Shukhrat Alladustov**	Quantum enhanced non-linear microscopy **Catxere Casacio**	Red meat quality parameters measured using polarisation sensitive OCT **Sam Hitchman**	Bicontinuous Cubic Phases for Protein Encapsulation **Charlotte Conn**	
1700-1715	Impact of highly charged ions created by a femto-second X-ray pulse on the biological molecule structure reconstruction **Alexander Kozlov**	Searching for Transient Dark Matter Signatures with Atomic Clock Networks **Benjamin Roberts**	Results from Langmuir Probe arrays in the scrape off layer of the Wendelstein 7X Advanced Stellarator **Boyd Blackwell**	Mechanistic study of precursor conversion chemistry in Co9S8, Ni3S2, Co and Ni nanowire synthesis **John Scott**	Positron mass stopping powers in atomic and molecular hydrogen **Ravshanbek Utamuratov**	Mid-infrared molecular barcoding with dielectric metasurfaces **Dragomir Neshev**	Interferometric multiplexed fibre sensing using C-shaped fibre **Lushun Xie**		
1715-1730	Which glue to choose? A neutron-scattering study of various adhesive materials and their effect on background scattering **Kirrily Rule**	Aspects of Dark Matter Axion Clumps **Mark Hertzberg**	An attempt for the thermal transport modelling of fusion plasmas based on the statistical approach **Masayuki Yokoyama**	Ruby Payne Scott Prize Presentation **Mary Jacqueline Romero**	Engineering Pentacene Derivatives towards High-Performance Singlet-Fission **Amir Asadpoor Darvish**	Ultrafast viscosity measurement in the ballistic regime with optical tweezers **Lars Madsen**	Diffuse light-sheet microscopy for stripe-free calcium imaging of neural populations **Michael Taylor**	Repeated evolutionarily independent quasi-order to order transitions in feather barb biophotonic nanostructures **Vinodkumar Saranathan**	
1730-1745								A literal elytral rainbow: Tunable structural colors in Pachyrrhynchus weevils using single diamond biophotonic crystals **Bodo Wilts**	

1730-1800	**Break**	
1800-1845	**PLENARY SESSION 4**	*Octagon Theatre*
1800-1845	**Professor Rainer Weiss** – The beginnings of gravitational wave astronomy Introduced by Sean Salter (Woodside) **Co Chairs - David Blair and Tom Ridsdill-Smith**	
1930-2200	**CONGRESS DINNER** **- includes presentation of Harrie Massey Medal by Dame Julia Higgins IOP**	*Ground Floor Terrace, University Club*

Thursday 13 December 2018

0730-1800	**Registration open**	*Conference Foyer, University Club*
0900-1030	**PLENARY SESSION 5**	*Octagon Theatre*
0900-0945	**Prof Monika Ritsch-Marte** (Medical University of Innsbruck, Austria) – Biomedical Optics, Holography and Optical Trapping **Chair:** Halina Rubinsztein-Dunlop	
0945-1030	**Prof Garth Illingworth** (UC Santa Cruz/Lick Observatory) – Galaxies at Cosmic Dawn: Exploring the First Billion Years with the Hubble Space Telescope **Chair:** Cathryn Trott	
1030-1100	**Morning Tea**	*Ground Floor Terrace, University Club*
1100-1230	**CONCURRENT SESSION 10**	

Session:	10A - AIP Astron and Astro + Focus Next-gen Astro with new observatories	10B - AIP Nuclear & Particle Physics	10C - AIP CMM	10D - AIP ATMOP	10E - AIP QUICC	10F - AIP QUICC	10G - AOS/ACOFT	10H - AIP Biophysics & Soft Matter Physics
Topic:			Microwave,Terahertz, Optical and X-Ray spectroscopy	Exotic atomic systems and applications	Spins and qubits	Quantum information processing, ion traps	Structured light and material interactions	
Chair:	**Lister Staveley-Smith**	**Michael Paul**	**Stephen Thurgate**	**Nick Robins**	**Jiangfeng Du**	**Xinhua Peng**	**John Harvey**	**Evelyne Deplazes**
Room:	**Physics Building Clews Lecture Theatre [2.43]**	**Physics Building Ross Lecture Theatre [G.41]**	**Arts Building Room 8 [1.60]**	**Arts Building Room 9 [1.61]**	**Arts Building Fox Lecture Theatre [G.59]**	**Arts Building Austin Lecture Theatre [1.59]**	**University Club Auditorium**	**Arts Building Room 5 [G.61]**
1100-1130	Science highlights from the ASKAP radio telescope **Elaine Sadler**	Tracking the emergence of 'simple' collective nuclear excitations in nuclei. How do they arise from the underlying complex nucleonic motion? **Andrew Stuchbery**	Terahertz Frequency Phenomena in Condensed Matter and Materials Physics **Roger Lewis**	Droplet crystal ground states of a dipolar Bose gas **Blair Blakie**	Superradiance and thermalization in hybrid quantum systems **Kae Nemoto**	Differential evolution for ion-trap gate design **Barry Sanders**	Structured light for nano- and micro manipulation **Halina Rubinsztein-Dunlop**	Physics of cell adhesion: The role of the membrane in the protein recognition process **Henning Stumpf** **Ana-Suncana Smith**
1130-1145	The Phase II Murchison Widefield Array: Current Status and Future Plans **Melanie Johnston-Hollitt**	Physics of the non-Hermitian free parafermion Z(N) spin chain **Murray Batchelor**	Advanced liquid crystalline materials for laser applications characterised with high-Transmission of light (T>97.5%) and very low Reflection (R<0.7%) at VISible, Near, Short and Medium InfraRed regions **Zbigniew Raszweski**	Novel Correlations near an Orbital Feshbach Resonance **Emma Laird**	Microwave mixing by a strongly driven quantum dot **Mark Hogg**	Trapped ion fast gates scale favourably in microtrap arrays in the presence of micromotion **Joe Hope**	Towards stabilization of an optically levitated macroscopic mirror **Jinyong Ma**	Spherical tilings with ABC star polymers - a three colored Thomson problem? **Tobias Hain**
1145-1200		On the origin of asymmetric fission **Cedric Simenel**	Ultrasensitive Microwave Spectroscopy of Spin Ensembles in Multi-Mode Dielectric Crystal Resonators at 20 mK **Md Akhter Hosain**	Finite-temperature dynamics of shock waves in an ultra-cold Fermi gas **Ria Joseph**	Nuclear Electric Resonance of the 7/2 spin of a single 123Sb ion **Vincent Mourik**	Ex-vacuum phase Fresnel lenses for Trapped Ion Quantum Information Processing **Erik Streed**	Robust thermo-optic stabilisation of optical springs **Paul Altin**	Self-assembly of cubic phases in pear-shaped nanoparticle systems **Philipp Schönhöfer**

Session:	10A - AIP Astron and Astro + Focus Next-gen Astro with new observatories	10B - AIP Nuclear & Particle Physics	10C - AIP CMM	10D - AIP ATMOP	10E - AIP QUICC	10F - AIP QUICC	10G - AOS/ACOFT	10H - AIP Biophysics & Soft Matter Physics
1200-1215	The SKA-Low Aperture Array Verification System: results and plans **Randall Wayth**	Deep Neural Networks for analysis of rare B-decays at Belle and Belle II **Martin Sevior**	X-Ray Spectrometry by Microcalorimetry - Multi Detector System with real time data analysis **Stephen Thurgate**	A finite temperature model of the early universe **King Ng**	Imaging valley interference to tackle exchange variations for donors in silicon **Benoit Voisin**	High Performance Raman Memory with Spatio-temporal Reversal **Karun Paul**	Thermodynamic microscopic machine **Shu Zhang**	Equilibrium reasoning for active particles - what does it really mean? **René Wittmann**
1215-1230	JWST Status: Insights into the Challenges of Constructing the most Complex Space Telescope Ever **Garth Illingworth**	Accelerator Mass Spectrometry: the State of its Art with a 15MV Accelerator **Keith Fifield**	Interaction of Bessel-beam-structured ultrashort laser pulses with transparent media **Ludovic Rapp**	Gouy phase interferometer and its applications **Mumta Hena Mustary**	Rotation-symmetric encodings of a qubit into an oscillator **Ben Baragiola**	Single-photon non-reciprocal transport controlled by a single atom **Keyu Xia**	High-speed three-dimensional direct optical force measurement **Timo Nieminen**	Soft interactions in the Lorentz model: anomalous transport in crowded media **Charlotte Petersen**
1230-1330	**Lunch**							*Ground Floor Terrace - University Club*
1245-1315	**Decadal Plan Town Hall Meeting**							*Physics Building, Room 215*
1245-1445	**AOS Council Meeting**							*Seminar Room 1, University Club*
1330-1500	**CONCURRENT SESSION 11**							
Session:	11A - AIP Astron and Astro + Focus Next-gen Astro with new observatories	11B - AIP Nuclear & Particle Physics	11C - AIP CMM	11D - AIP ATMOP	11E - AIP QUICC	11F - AIP QUICC	11G - AOS/ACOFT	11H - AIP Complex Systems & Computational Physics
Topic:			Space Science and Defects in diamond	Quamtum measurement	Spin qubits and applications	Spin and Topological quantum computing	Nanostructures, plasmonics and metasurfaces	
Chair:	**Claudia Lagos**	**Andrew Stuchbery**	**Alastair Stacey**	**Jesper Levinsen**	**Geoff Pryde**	**Mile Gu**	**Robert McLaughlin**	**Tobias Hain**
Room:	**Physics Building Clews Lecture Theatre [2.43]**	**Physics Building Ross Lecture Theatre [G.41]**	**Arts Building Room 8 [1.60]**	**Arts Building Room 9 [1.61]**	**Arts Building Fox Lecture Theatre [G.59]**	**Arts Building Austin Lecture Theatre [1.59]**	**University Club Auditorium**	**Arts Building Room 5 [G.61]**
1330-1345	Global 21-cm signal from Cosmic Dawn and the Epoch of Reionization **Ravi Subrahmanyan**	Simple (but not too simple) descriptions of particle dark matter **Nicole Bell**	Space physics research projects at RMIT Physics **Gail Iles**	Quantum control of physically rotating qubits **Andy Martin**	Quantum Control of Spins in Solids **Jiangfeng Du**	Zero- to ultralow-field nuclear magnetic resonance and its applications **Xinhua Peng**	Plasmonic approaches to optical information processing **Ann Roberts**	Grassmann Phase Space Theory for Fermions **Bryan Dalton**
1345-1400								Brain-like collective dynamics in a neuromorphic nanowire switch network **Zdenka Kuncic**
1400-1415	Forecasting and interpreting observations of the first galaxies and the Epoch of Reionisation **Simon Mutch**	Determination of precision fusion cross sections with a superconducting solenoidal separator **Lauren Bezzina**	Magnetic circular dichroism spectroscopy of the nitrogen-vacancy centre in diamond **Michael Barson**	Correlated electron-ion pairs as a source of heralded ions **Andrew McCulloch**	Silicon-vacancy centres in nanodiamonds for engineered quantum applications **Lachlan Rogers**	Engineering longitudinal coupling in Majorana qubit systems **Thomas Smith**	III-V semiconductor resonators on insulator for nanoscale nonlinear optics **Mohsen Rahmani**	Combining Computational Physics and Evolutionary Algorithms to Create New Tailored for Purpose Granular Materials **Gary Delaney**
1415-1430	Measuring the evolution of the early Universe with radio observations of the Moon **Benjamin McKinley**	A Leptoquark Model to Address Flavour Anomalies and Generate Radiative Neutrino Mass **Innes Bigaran**	Primal surface defects of diamond: surface noise sources **Alastair Stacey**	Spinning spins: exploring rotational physics with quantum sensors **Alexander Wood**	Spin charge separation with quantum criticality **Xiwen Guan**	Topological Quantum Computation with Non-Abelian Vortex Anyons **Tapio Simula**		Machine Learning for Viscous Drag of Particles in a Fluid **Lachlan Gibson**
1430-1445	Astrophysical And Space Weather Studies of Interplanetary Scintillation with the Murchison Widefield Array **John Morgan**	Precision multiple Coulomb excitation in Cd-111 with GRETINA **Ben Coombes**	Increased density of fluorescent defects in diamond by hightemperature electron beam irradiation **Philipp Reineck**	Thermally-robust spin correlations between two atoms **Stuart Szigeti**	Discovery and engineering of optically-addressable spin-defects in diamond and hexagonal boron nitride **Marcus Doherty**	Evaluation of Threshold for Topological Codes under biased noise **Wei-Wei Zhang**	Reversible Control of the Image Contrast via Thermally Tunable Metasurfaces **Khosro Zangeneh Kamali**	Universal hidden order in amorphous cellular geometries **Gerd Schroeder-Turk**
1445-1500	A tale of TAILS: Testing the Association of Intrahour quasar variability with Local Stars **Hayley Bignall**	Belle II Silicon Vertex Detector reconstruction software **James Webb**	Spatial mapping of band bending in semiconductor devices using in-situ quantum sensors **Jean-Philippe Tetienne**	Harnessing simultaneous optical and acoustic Purcell effects **Mikolaj Schmidt**	Donor spin qubits in silicon with robust long-distance coupling **Tim Botzem**	Fault-tolerant Logical Gates in Topological Quantum Error Correcting Codes **Paul Webster**	Efficient Beam Deflection Based on Off-resonance a Dielectric Metasurface **Andrey Miroshnichenko**	Wavelength stable field-only surface integral solution of 3-D frequency and time-domain electromagnetics based on the Helmholtz equation **Qiang Sun**

1500-1530	Afternoon Tea							*Ground Floor Terrace, University Club*
1530-1700	**CONCURRENT SESSION 12**							
Session:	**12A - AIP Astron and Astro + Focus Next-gen Astro with new observatories**	**12B - Focus Session – Dark Matter Detection**	**12C - AIP CMM**	**12D - AIP ATMOP**	**12E - AIP QUICC**	**12F - AIP QUICC**	**12G - AOS/ACOFT**	**12H - AOS/ACOFT**
Topic:			Condensed Matter theory	Quantum measurement and dynamics	Discrete variable quantum optics	Hybrid and superconducting systems	Nanostructures and nanophotonics	Optical devices
Chair:	**Elaine Sadler**	**Peter Wolf**	**Meera Parish**	**Chris Vale**	**Klaus Moelmer**	**Dominic Berry**	**Shaghik Atakaramians**	**Simon Fleming**
Room:	**Physics Building Clews Lecture Theatre [2.43]**	**Physics Building Ross Lecture Theatre [G.41]**	**Arts Building Room 8 [1.60]**	**Arts Building Room 9 [1.61]**	**Arts Building Fox Lecture Theatre [G.59]**	**Arts Building Austin Lecture Theatre [1.59]**	**University Club Auditorium**	**Arts Building Room 5 [G.61]**
1530-1545	Status Report on the SKA and SKA Regional Centres **Peter Quinn**	The new Cryogenic Dark Matter Search at SNOLAB **Priscilla Cushman**	Lifetime and Dynamics of (Anti)Skyrmions **Oleg Tretiakov**	The physics of moving lab based quantum sensors to the field **Nick Robins**	Observation of conclusive one-way quantum steering **Geoff Pryde**	Quantum Networking **William Munro**	All-dielectric resonant nanophotonics **Andrey Miroshnichenko**	Mass Manufacturing Ultra-Stable Frequency Transfer Technology **Sascha Schediwy**
1545-1600			Correlated many-body states of exciton-polaritons **Meera Parish**					Heliostat sensors for solar thermal power plants **David Farrant**
1600-1615	Radio Surveys with the Murchison Widefield Array **Natasha Hurley-Walker**	Dual oscillator resonant cavity for axion detection **Catriona Thomson**	Quantum chaos and entanglement entropy **James Quach**	Collective oscillations of a strongly interacting 2D Fermi gas **Ivan Herrera Benzaquen**	Single-shot quantum advantage in simulating stochastic processes **Farzad Ghafari**	Quantum Routing of Single Optical Photons using a Superconducting Flux Qubit **Jason Twamley**	Harmonic generation in AlGaAs nanoantennas using cylindrical vector beams **Dragomir Neshev**	On-chip precision magnetometry using cavity optomechanical systems **Beibei Li**
1615-1630	Searching for the First Black Holes with the Murchison Widefield Array **Nicholas Seymour**	Atomic Probes of Axionlike Particles and Dark Matter **Yevgeny Stadnik**	Yang-Mills Theory of Electron-Phonon Interactions **Jamie Booth**	Chiral displacement and spin-orbit coupling in free-space photon emission **Daniel Higginbottom**	Solid-state single photons for quantum photonics **Azwa Zakaria**	Realizing Modular Computation in the Quantum Regime **Mile Gu**	All-Si vertical slab waveguide arrays as wavelength selective photodetectors **Jasper Cadusch**	Frequency Selective Optical Mode Imaging **Huy Tuong Cao**
1630-1645	Cold gas and star formation in galaxies **Barbara Catinella**		Casimir Torque between Uniaxial Magnetodielectric Plates **Wijnand Broer**	Testing QED With Precision Metrology of the Helium Tune-Out Wavelength **Sean Hodgman**	The Quest for Nonclassicality using Number-Resolving Single-Photon Detectors **Raphael Abrahao**	Optical Quantum Information Processing with Atom-Filled Hollow-Core Photonic Crystal Fibres **Ben Sparkes**	Addressing high multipolar resonances with high angular momentum modes of light **Xavier Vidal**	Parametric Instability Observations and Control though Optical Injection **Vladimir Bossilkov**
1645-1700	Characterising Cosmological simulations of galaxy formation and evolution **Claudia Lagos**	BREAK	Modelling electron transport properties in low-dimensional systems and high kinetic inductance films **Tommy Bartolo**	Dual Colour Magic Wavelength for Correction of Inhomogeneous Broadening in Tightly Confined Cold Atom Ensembles **Philip Light**	Enhanced single photons from electrically-controlled quantum-dot micropillars **Jihun Cha**	Quantum Sneakernet: Backbone to the quantum internet **Simon Devitt**	Nanostructured dielectric fractals on resonant metasurfaces for superior plasmonic gas-phase sensing **Mohsen Rahmani**	Phase-stabilised optical-frequency transfer for future ground-to-space laser links **Sascha Schediwy**

1715-1830 CONFERENCE AWARDS AND PLENARY SESSION 6 *Octagon Theatre*

Jodie Bradby, conference remarks and award announcements

AWARDS: People's Choice Poster Award , presented by Gino Putrino (UWA)

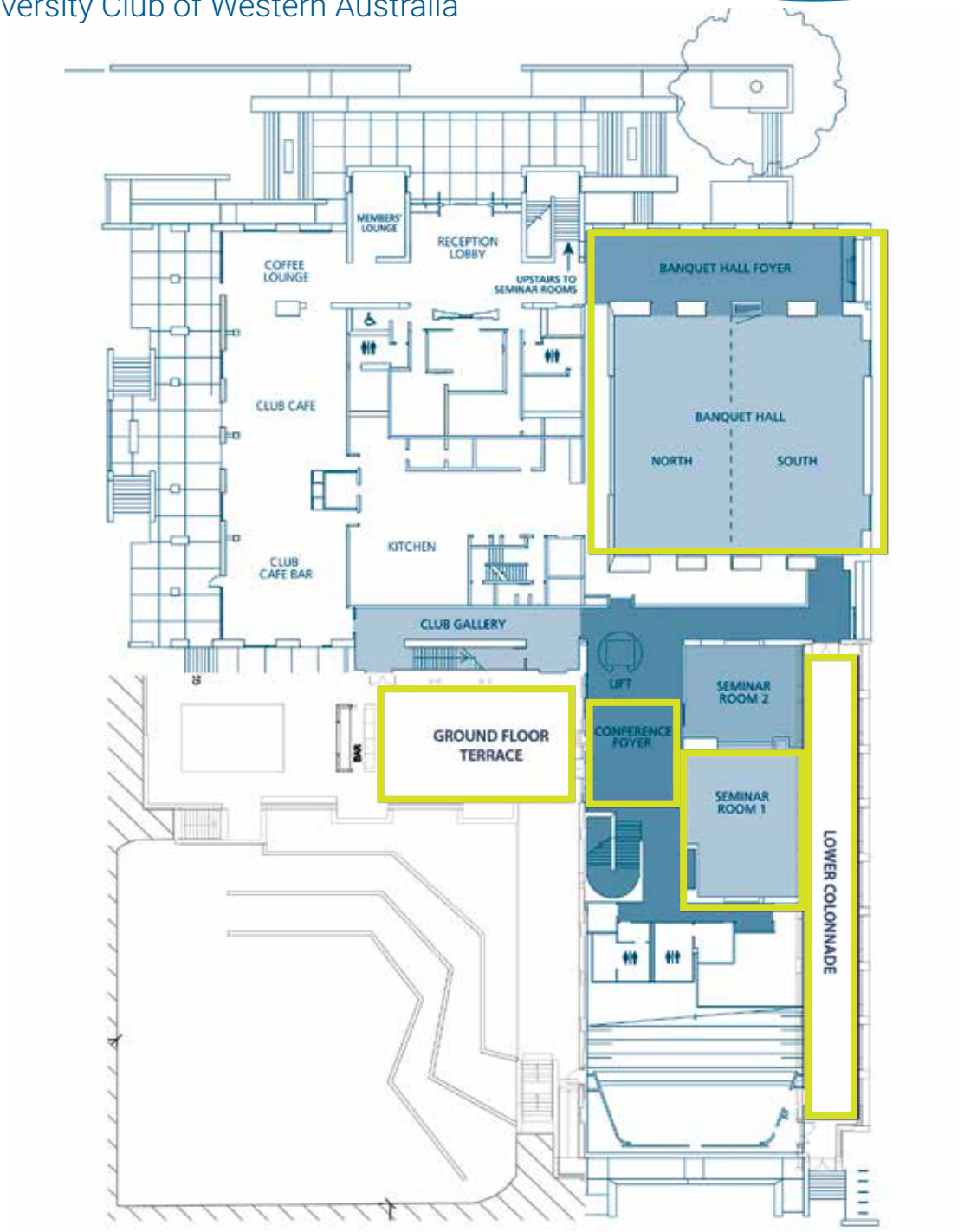
Professor Susan Scott (Australian National University) & Prof Paul Lasky (Monash University)

New discoveries by LIGO during its first and second observing runs

VENUE MAPS

Ground Level Floorplan

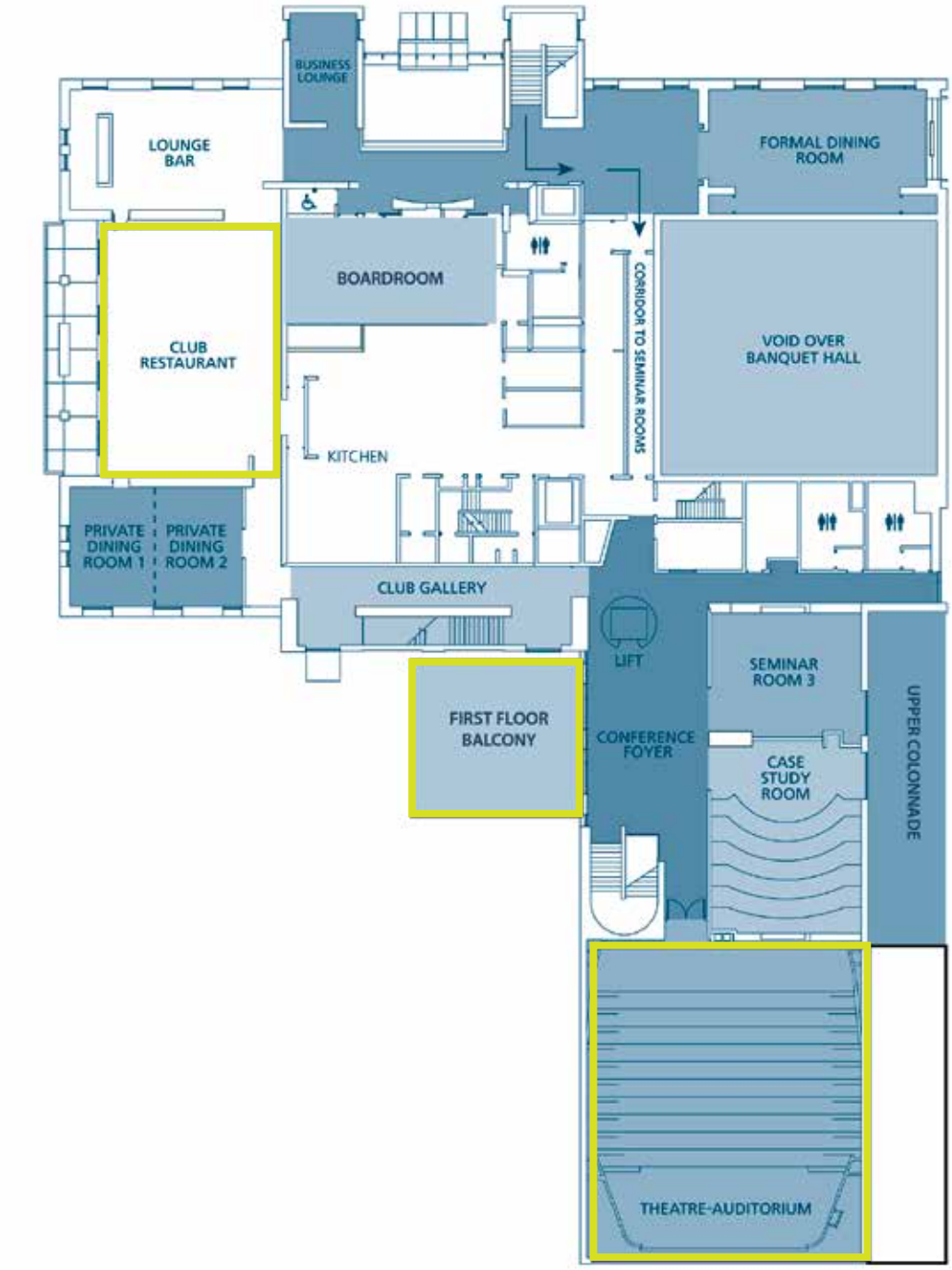
University Club of Western Australia



Conference Foyer: ..... Registration Desk
Banquet Hall: ..... Exhibition and catering
Banquet Hall/Banquet Hall Foyer/Lower Colonnade: ..... Posters
Ground Floor Terrace: ..... Welcome Reception/Dinner/Thursday catering
Seminar Room 1: ..... Diversity and Equity Group in Australian Physics Workshop

Upper Level Floorplan

University Club of Western Australia



Auditorium: .....ANFF workshop (Sunday only) and Concurrent sessions (Mon-Thurs)

Club Restaurant: .....Physics Education Group High Tea

University of Western Australia Map

University Club of Western Australia: .... ANFF workshop, exhibition, posters, catering, social functions, concurrent sessions, workshops

Arts Building: ..... Concurrent sessions

Physics Building: ..... Concurrent session

Octagon Theatre: ..... Plenary sessions and Public Lecture

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Contact: Professor Matthew Bailes, Swinburne University
W: ozgrav.org

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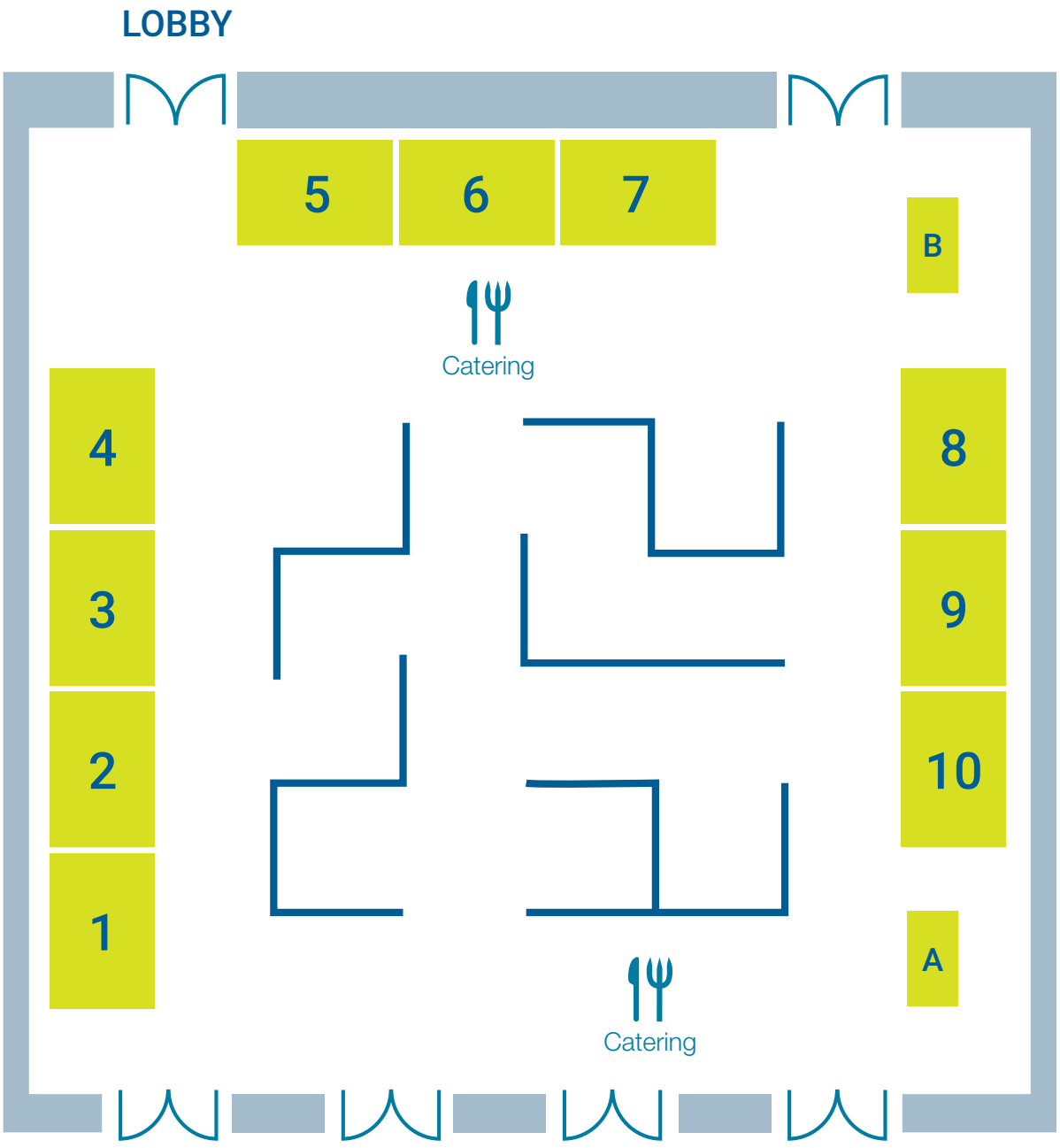

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POSTER PROGRAM

Poster Session – Monday 10 December
5.30pm – 6.30pm

NO	PRESENTER	POSTER TITLE
AIP - ASTRONOMY AND ASTROPHYSICS		
1	James Beattie Queensland University of Technology	Fractal Geometry through the Sonic Scale of the World's Largest Turbulence Simulations
2	Gurashish Singh Bhatia International Centre for Radio Astronomy Research (ICRAR)	The Central Redundant Array Mega-Tile at the Murchison Radio Astronomy Observatory
3	Charles Gravestock University of Western Australia	The Phase Synchronisation System for the Mid-Frequency Square Kilometre Array Radio Telescope
4	Paul Hancock Curtin University	Space Situational Awareness with the Murchison Widefield Array
AIP - ATOMIC & MOLECULAR PHYSICS		
5	Srivatsa Badariprasad University of Melbourne	Instability of Rotationally-Tuned Dipolar Bose-Einstein Condensates
6	Francis Bayocboc University of Queensland	Dynamics of thermalisation of two tunnel-coupled quasicondensates
8	Julian Berengut University of New South Wales	AMBiT: A program for high-precision relativistic atomic structure calculations
9	Dashavir Chetty Griffith University	Strong field excitation of Argon with few-cycle laser pulses
10	Jonathan Dean University of Melbourne	Absolute energy of the K alpha emission spectrum of Scandium
11	Zhi-Tao Deng University of Queensland	Properties of Superfluid Flow Between Reservoirs
12	Bernard Field Monash University	Variational approach for modelling Bose polarons at finite temperature
13	Daniel Flynn University of Melbourne	Muonic hydrogen and the proton radius problem
14	Dmitry Fursa Curtin University	Electron-impact dissociation of molecular hydrogen
16	Guillaume Gauthier University of Queensland	Transport Dynamics of an Atomtronic LRC Circuit
17	Amy Geddes University of New South Wales	Saturated configuration interaction calculations for five-valent Ta and Db
18	Rohan Glover Griffith University	Frustrated tunneling ionization dynamics with CEP locked pulses
19	Kwan Goddard Lee University of Queensland	Non-Symmetric Vortex equilibria in a Boes-Einstein condensate
20	Joshua Guanzon University of Queensland	Simulation of the Jarzynski equality in a finite temperature Bose gas

NO	PRESENTER	POSTER TITLE
22	John McFerran University of Western Australia	Comparison of frequency-to-voltage converters for laser frequency stabilisation and cooling of atoms
23	Matt Reeves University of Queensland	Bistability and non-equilibrium condensation in a driven-damped atomic superfluid
24	Oliver Sandberg University of Queensland	Exact Floquet analysis of time-averaged trapping potentials
25	Grace Sawyer Curtin University	Electron collisions with negative ions
26	Matthew van Eck Curtin University	Cross Sections and Spin Asymmetries for Electron Collisions with Lead Atoms
27	Raymon Watson EQUS University of Western Australia	Optical dipole trapping of ytterbium for an optical lattice clock
28	Daniel Wells University of Melbourne	A phase space perspective on high harmonic generation using Wigner quasiprobability distributions
AIP - BIOPHYSICS & SOFT MATTER PHYSICS		
29	Declan Armstrong University of Queensland	Three Dimensional Manipulation and Force Measurement of Microorganisms
30	Azin Azadi Murdoch University	3D printed mechanical meta-materials and bone scaffolds: non-linear elastic behaviour in a "severed" Diamond network.
31	Itia Favre-Bulle University of Queensland	High speed multiple particle tracking for biological applications
32	Jan Gluschke University of New South Wales	Monolithic complementary nafion-gated nanowire circuits with kHz response for bioelectronics applications
33	René Wittmann Heinrich-Heine-Universität Düsseldorf	Density functional theory for two-dimensional hard rods
AIP - COMPLEX SYSTEMS & COMPUTATIONAL PHYSICS		
34	Snezhana I. Abarzhi University of Western Australia	Effect of noise on Rayleigh-Taylor mixing with time-dependent acceleration
35	Snezhana I. Abarzhi University of Western Australia	Stability of an accelerated hydrodynamic discontinuity
36	Ryan Kidd University of Queensland	Phase space methods for nonlinear quantum dynamics in atomic BECs

NO	PRESENTER	POSTER TITLE
AIP - CONDENSED MATTER & MATERIAL		
37	Alireza Aghajamali Curtin University	Xenon Release upon Thermal Annealing of Nanodiamonds: A Molecular Dynamics Study
38	Tomi Baikie Cambridge University	Singlet Fission Luminescent Solar Concentrators
39	Nicholas Collins University of Melbourne	Towards deterministic implantation of colour centres in diamond
40	Daniel Creedon University of Melbourne	Irradiation induced modification of superconductivity in boron doped diamond
41	Martin Cyster RMIT University	Simulation of low pressure oxidation in Josephson junction fabrication
42	Guochu Deng Australian Nuclear Science & Technology Organization	The Cold-Neutron Triple-Axis Spectrometer SIKA at OPAL
43	Masaaki Doi Tohoku Gaukin University	Magneto-optical Keer Effect of D022-Mn3Ga/Cr/L10-MnGa Trilayered Circler Dots
44	Ruhao Fang University of Sydney	Strain-engineered Ultrahigh Mobility in Phosphorene for Terahertz Frequency Transistors
45	Fabio Isa CSIRO Manufacturing	Nano-diamonds on group-IV semiconductor substrates for quantum optics
46	Mark Johnson University of New South Wales	Electrical control of a single spin-7/2 123Sb donor in 28Si
47	Akib Karim RMIT University	Ab-initio photoluminescence spectrum of NV−centres in small nanodiamonds
48	Mykhailo Klymenko RMIT University	Multi-electron states of phosphorus dopants in silicon nano-structures
49	Mikhail Kostylev University of Western Australia	Effects of hydrogen on the ferromagnetic resonance of Ni80Fe20/Y/Pd multilayer films
50	Ross Leon University of New South Wales	Electrically driven spin qubits with micromagnet in Silicon-MOS quantum dots
51	Hironari Okada Tohoku Gakuin University	Martensitic phase transition under high pressure in Heusler alloy Pd2Mn1+xSn1-x
52	William Pappas ARC Centre of Excellence in Exciton Science	Spatial variation and correlation of spin and magnetoluminescence in organic light-emitting diodes
53	Alexandr Sadovnikov Saratov State University	Brillouin light scattering study of strain-controlled Yttrium Iron Garnet stripes
54	Sergey Samarin University of Western Australia	Spin-orbit interaction on surfaces by spin-polarized (e,2e) spectroscopy
55	Thomas Schefer University of Western Australia	Effect of Hydrogen on the FMR linewidth of thick Co/Pd bilayer systems
56	Toshiyuki Shima Tohoku Gakuin University	Effect of pseudo-diffusion layers on the magnetic properties for artificial Nd-Fe-B grid patterns
57	Irene Suarez-Martinez Curtin University	Graphitization studies using an Atomic Absorption Spectrometer as an ultra-high temperature oven
58	Stuart Watt University of Western Australia	Impact of hydrogen gas on the inverse Spin Hall effect in Pd-Co bi-layer films
AIP - EDUCATION FOR PHYSICS & RELATED DISCIPLINES		
59	Rahul Kumar Choudhary University of Western Australia	An analysis of high school students' attitudes and understanding of Einsteinian physics using short and long interventions
60	Anthony Greaves Swinburne University	An electromagnetic and circuit theory concept inventory of undergraduate engineering students
61	Lorna Jarrett University of Wollongong	Public understanding of key scientific concepts underlying climate change, and suggested learning and teaching strategies to overcome misconceptions
62	Magdalena Kersting University of Oslo & University of Western Australia	How History and Philosophy of Science Can Inform Teaching and Learning of General Relativity in Upper Secondary School
63	Guillermo Munoz Matutano Macquarie University	Educational Toolbox for Photon Correlation Principles and Fundamentals in Quantum Optics
64	Jules Rankin University of Sydney	The Life of a Syllabus: Almost 20 years of HSC Physics.
65	Geoff Swan Edith Cowan University	Short courses for teachers
66	Graham Wild RMIT University	A Matlab based multiple choice marking system graded students' work, email them a copy of their quiz with computer generated feedback, and provided question analytics to inform intervention and revision.
AIP - GEOPHYSICS, SOLAR, TERRESTRIAL & SPACE PHYSICS		
67	Brett Carter RMIT University	The Effect of Plasma Density Variations on the Generalised Rayleigh Taylor Instability in the Equatorial Ionosphere
AIP - GRAVITATIONAL WAVES & RELATIVITY		
68	Sebastian Murk Macquarie University	Properties of stress-energy tensor and metric close to the Schwarzschild radius
69	Michael Page University of Western Australia	Enhanced detection of high frequency gravitational waves using unstable optomechanical filters with low loss microresonators
AIP - INDUSTRIAL & APPLIED PHYSICS		
70	Ludovic Rapp Australian National University	Evaluation of surface processing efficiency with powerful ultrashort pulse lasers for large-scale industrial applications
71	Jingchao Song University of Melbourne	Large area plasmonic colour pixels via Nanoimprint Lithography
72	Matthew van Breugel Macquarie University	Affordable Nano-scale Thermometry with Diamond

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AIP - NUCLEAR & PARTICLE PHYSICS		
73	David Dossett University of Melbourne	Automating calibration at the Belle II experiment
74	Greg Lane Australian National University	E6 transition in the decay of Fe-53m
75	Brendan McCormick Australian National University	Relative measurements of g(2+) in the stable even-even Ge and Se isotopes
76	Chandrima Sengupta Australian National University	Elastic Scattering and Reaction cross section of 8Li on heavy and medium mass targets
77	Ben Swinton-Bland Australian National University	Systematic Study of Quasifission in 48Ca-Induced Reactions
78	Anton Wallner Australian National University	Limits in Accelerator Mass Spectrometry for Astrophysical and Nuclear Applications
79	Matt Westlake University Of Wollongong	Characterization and investigations in to phonon dynamics of Silver doped Lanthanum Manganite nano particles for hypothermia treatment of cancer cells.
80	Scott Williams University of Melbourne	Networked cosmic muon detectors for outreach and cosmic muon background measurement
AIP - PLASMA PHYSICS		
81	Snezhana I. Abarzhi University of Western Australia	Late-time evolution of Rayleigh-Taylor instability in a domain of a finite size
82	Snezhana I. Abarzhi University of Western Australia	Effect of noise on Rayleigh-Taylor mixing with space-dependent acceleration
83	Kavya Hemantha Rao Griffith University	Angle resolved X-ray emission spectroscopy of laser produced metal plasmas and alloys
84	Desmond Hill University of Western Australia	Effect of pressure fluctuations on Richtmyer-Meshkov coherent structures
85	Desmond Hill University of Western Australia	Dimensional crossover in Richtmyer-Meshkov unstable flows in the presence of pressure fluctuations
86	Vishnu Mangalath University of Western Australia	Coordinate-free Grad-Shafranov equation on a Riemannian manifold with Killing field
87	David Pfefferlé University of Western Australia	What may the experimental and numerical data tell us on properties of Rayleigh-Taylor interfacial mixing?
88	David Pfefferlé University of Western Australia	Non-planar elasticae as optimal curves for the magnetic axis of stellarators
AIP - QUANTUM INFORMATION, CONCEPTS & COHERENCE		
89	Estelle Asmodelle ARC Centre for Quantum Computation Communication Technology - University of Queensland	Relativistic Bohmian Trajectories
90	Leonardo Assis Morais University of Queensland	Transition edge sensor: photon-number resolving detectors
91	Travis Baker Griffith University	Beyond the Conventional Limit to the Coherence of a Laser
92	Ben Baragiola Centre for Quantum Computing & Communication Technology	Quantum trajectories for the joint state of a system and field
93	Philip Blocher Aarhus University - Department of Physics & Astronomy	Temporally non-local effects in optical detection
94	Kok-Wei Bong Griffith University	Strong unitary and overlap uncertainty relations: theory and experiment
95	Shakib Daryanoosh Macquarie University	Quantum master equations for entangled qubit environments
96	Marcus Doherty Australian National University	Optimisation of diamond quantum processors
97	Tim Evans University of Sydney	Methods in Matrix Product Operator Tomography
98	Florian Frank Institute of Quantum Optics, Ulm University	Closed-loop optimization of single spin control in room-temperature solids
99	Jemy Geordy EQUS & Macquarie University	Bayesian estimation of blinking in nano-diamond color centres
100	Kaumudibikash Goswami University of Queensland	Extracting information from depolarising channels using indefinite causal order
101	Glen Harris University of Queensland	Stable Levitation of Superfluid Helium; Optomechanics with Droplets
102	Sean Hodgman Australian National University	Bogoliubov-Cherenkov Radiation, Machine Learning and Quantum Depletion Experiments with Helium Bose-Einstein Condensates
103	Lewis Howard University of Queensland	Optimal Spatial Metrology
104	Michael Kewming University of Queensland	Ignorance of the whole does not imply ignorance of the parts: Qudit Random Access Codes in spatial modes of light
105	Ruvi Lecamwasam Australian National University	Analysis and feedback-control of a levitating mirror
106	Anthony Leung Australian National University	Storing single photons using gradient echo memory
107	Lucas Mensen RMIT University	Predicting successful error correction in a measurement-based quantum computation with continuous-variable cluster states
108	Gary Mooney University of Melbourne	Gate synthesis using higher orders of the Clifford hierarchy
109	Felix Pollock Monash University	Long-time dynamics from short-time tomography data for driven open quantum processes

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110	Nicholas Pritchard University of Western Australia	Cluster-Based Simulation of the Quantum Approximate Optimisation Algorithm
111	Sarath Raman Nair EQUS & Macquarie Unversity	Towards room-temperature lasing with NV centres in open fibre cavities
112	Sarath Raman Nair EQUS & Macquarie Unversity	On the theory of diamond Raman lasers with colour centres in the crystal
113	Rostyslav Savytskyy CQC2T, School of EE&T, University of New South Wales	Tuning the flip-flop qubit of a 31P donor in silicon
114	Jordan Scarabel Griffith University	Towards a Quantum Network with Trapped Ions and Waveguides
115	Oliver Stockdale University of Queensland	Modelling expanding vortex clusters in thin film superfluid helium
116	Ming Su University of Queensland	Asymmetric Quantum Interference Observed Using Photon-number-resolving Detectors
117	Run Yan Teh Swinburne University of Technology	Creation, storage and retrieval of an optomechanical cat
118	Sam Tonetto University of Melbourne	Sampling Boltzmann Distributions with Quantum Annealing
119	Blayney Walshe RMIT University	Fault-tolerant measurement-based quantum computing with impure continuous-variable cluster states
120	Prahlad Warszawski University of Sydney	Optomechanical quantum control of superfluid Helium vortices
121	Keyu Xia Nanjing University	Quantum memory and gates using a Lambda-type quantum emitter coupled to a chiral waveguide
123	Wei-wei Zhang The University Of Sydney	Identification quantum topological phases with neural networks deep learning
AIP - SYNCHROTRON SCIENCE, SCATTERING, MICROSCOPY, IMAGING		
124	Dehong Yu Australian Nuclear Science & Technology Organisation	PELICAN – a Multi-Purpose Time-of-Flight Cold Neutron Spectrometer
AOS/ACOFT - BIOPHOTONICS		
125	Steven Hinckley Edith Cowan University	Optical coherence tomography modelling incorporating absorption and scattering
126	Jaehwan Kwon Kyungbook University	Micro vibration measurement and surface vibration projection of latex samples using optical Doppler tomography system
127	Oeon Kwon Kyungpook National University	Real-time index regulating technique for direct wavenumber-linearization in spectral domain optical coherence tomography
128	Farah Qazi University of Melbourne	Non-invasive optical imaging of nematode eggs

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AOS/ACOFT - NONLINEAR OPTICS		
129	Michelle Wang University of Sydney	Short-range surface plasmons for stimulated Brillouin scattering
AOS/ACOFT - OPTICAL DEVICES		
130	Raymond Harrison RMIT University	Multi-photon evolution using waveguide adiabatic passage
131	Douglas Little Macquarie University	Quantum-Random Bit Generation using Raman-Laser Pulses in Diamond with Randomly-Oriented Linear Polarisations
132	Ben Sparkes University of Adelaide	High-transmission fibre ring resonator for spectral filtering of master oscillator power amplifiers
AOS/ACOFT - OPTICAL SENSING		
133	Steven Hinckley Edith Cowan University	Determining the Displacement of Flexible Membranes using Fibre Bragg Gratings
134	Lu Peng University of Adelaide	Micron-scaled resolution distributed sensing using exposed core fibre
135	Paul Sibley Australian National University	Exploring the performance of Digitally Enhanced Interferometry for Optical Phased Arrays
136	Nonthanan Sitpathom Macquarie University	Shaping of microsphere arrays by plasma treatment for optical sensing
137	Lei Xu University of New South Wales	Hybrid Metasurface Based Polarization Independent Tunable Perfect Absorber and Plasmonic Sensor
AOS/ACOFT - OPTICS, PHOTONICS & LASER PHYSICS		
138	Deeksha Beniwal University of Adelaide	Mid-IR fibre lasers for wavefront correction in advanced gravitational wave detectors.
139	Le Gao RMIT University School of Science LAIN Group	Development of optically active solid medium for high-capacity optical data storage
141	Isaac Lenton University of Queensland	OTSLM: A toolbox for production of flexible structured light
142	David McAfee University of Adelaide	An electronically controlled mode-locked thulium all-fibre laser at 1.990μm
143	Jillian Moffatt University Of Adelaide	Energy transfer upconversion parameter for 4I13/2 measured in erbium doped ZBLAN fibre
144	Kerry Mudge Defence Science Technology Group	Scintillation Mitigation Strategies for Asymmetric Free Space Laser Communications
145	Kerry Mudge Defence Science Technology Group	Analysis of Atmospheric Turbulence Effects for Laser Satellite Communications
146	Sascha Schediwy University of Western Australia	Development of an Optical Phased Array to Power Interstellar Travel

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147	Mandip Singh Indian Institute of Science Education & Research, Mohali	Three-dimensional imaging of a pattern localized in a phase space
148	Lei Xu University of New South Wales	Highly-efficient normal second-harmonic generation from doubly-resonant AlGaAs nanoantennas
AOS/ACOFT - QUANTUM OPTICS		
149	Paul Altin Australian National University	Controlling the squeezing ellipse angle at a 2 micrometer wavelength
150	W Y Sarah Lau University of Queensland	Hectometer Revivals of Quantum Interference
151	Yasmine Sfendla University of Queensland	Proposal for optomechanical single-vortex detection in 2D superfluids
COMMAD - ELECTRON DEVICES & SYSTEMS		
152	Weijun Fan Nanyang Technological University	Tensile Strain Effect on Band Structure of Ge and Ge Quantum Well
153	Jeremy Gillbanks University of Western Australia	Reference Electrode-Free pH Sensing at Temperatures above 300 K Using AlGaN/GaN Transistor-Based Chemical Sensors
154	Georgina Carson University of New South Wales	An atomically precise 4-qubit processor using donor spins in silicon
155	Shahbaz Khan University of Western Australia	Response enhancement of a magnetic-film based hydrogen gas sensor using size reduction to microchip dimensions
156	Peter Metaxas University of Western Australia	Spin torque nano-oscillators for electronic, frequency-based, magnetic biosensing
157	Michal Zawierta University of Western Australia	AFM integration with on-chip optical interferometric read-out
COMMAD - OPTOELECTRONICS/PHOTONIC DEVICES & SYSTEMS		
158	Minh Nguyen University of Technology Sydney	Nanoassembly of hexagonal boron nitride and gold nanospheres
159	Inseok Yang Australian National University	Single axial n-i-p junction InP nanowires for high performance solar cells
COMMAD - TECHNOLOGIES & THEORIES FOR MICROELECTRONICS, OPTOELECTRONICS & PHOTONICS		
160	Yaman Afandi University of Western Australia	Study of Porosity Gradient in Released Porous Silicon Microstructures
161	Gilberto Umana Mebreno Microelectronics Research Group, The University Of Western Australia	Modelling of damping characteristics in silicon-gold bilayer cantilevers

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162	Gurpreet Singh Gill University of Western Australia	Modelling and Fabrication of Anti-Stiction Features for Electrostatically Actuated Microsystems
164	Praveen Kumar Revuri University of Western Australia	Si and SiO2 thin films deposited by ICPCVD at low temperature and high deposition rate for MEMS applications
165	Tarun Sanders University of Western Australia	Investigation of a novel method for the fabrication of larger area imaging fibre bundles with greater number of pixels and reduced dead space
166	Pritam Sharma University of Western Australia	Engineering porous silicon thin films to obtain high TCR and low 1/f noise for application in thermal detectors.
167	Jorge Silva Castillo University of Western Australia	Method for optical modelling of non-uniform and non-parallel multi-thin film MEMS optical filters and mirrors
168	Hoe Tan Australian National University	Wafer-scale growth of hexagonal boron nitride on sapphire substrates using metal organic vapour phase epitaxy
269	Jianan Wang University of Western Australia	A Raman spectroscopy study on the surface structural properties of gallium nitride-based materials
FOCUS SESSION - 50 YEARS OF BICONTINUOUS CUBIC PHASES		
170	Benjamin Cumming RMIT University	Impact of cubic symmetry on the optical properties of gyroid networks
FOCUS SESSION - OPTICAL & QUANTUM BIO-SENSING		
171	Michael Barson Australian National University	Quantum sensing of Neuronal signals
172	Larnii Booth University of Queensland	Quantum limited plasmonic sensing of motor molecule dynamics
173	Pawan Kumar Abbe Center of Photonics, Friedrich-Schiller-Universität Jena	Mid-infrared sensing by induced coherence in a single nonlinear waveguide
174	Cyril Laplane Macquarie University	A new tool for optical manipulation of nano-object based on atomic forces
175	Daniel McCloskey University of Melbourne	Enhancement of Fluorescence from Dense Ensembles of Near-Surface Nitrogen-Vacancy Centres for Biological Sensing
176	Chris Perrella University of Adelaide	Rapid optical measurement of 13CO2 and 12CO2 number density
177	David Simpson University of Melbourne	Diamond based quantum sensing and imaging
178	David Simpson University of Melbourne	Nanoscale intracellular thermometry using diamond quantum probes

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