ANZCOP 2015
AUSTRALIAN AND NEW ZEALAND CONFERENCE ON OPTICS AND PHOTONICS
INTERNATIONAL YEAR OF LIGHT AUSTRALIA 2015 - OFFICIAL EVENT

Conference Handbook

The Australian and New Zealand Conference on Optics and Photonics
29 November – 3 December 2015
The University of Adelaide, South Australia
www.anzcop2015.com.au

Handbook sponsored by

MACQUARIE University
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MQ PHOTONICS
RESEARCH CENTRE

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PhD and MRes opportunities in Optics and Photonics

MQ Photonics is a large and vibrant Macquarie University Research Centre with some 45 staff and over 40 research students, supported by an extensive suite of state-of-the-art laboratories and world-class facilities. The Centre has strong involvement in three ARC Centres of Excellence: CNBP, CUDOS and EQuS.

Our research is grouped around six research banners:

Photonics sources/laser applications
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Photonics for the environment
Quantum photonics – fundamental & applied

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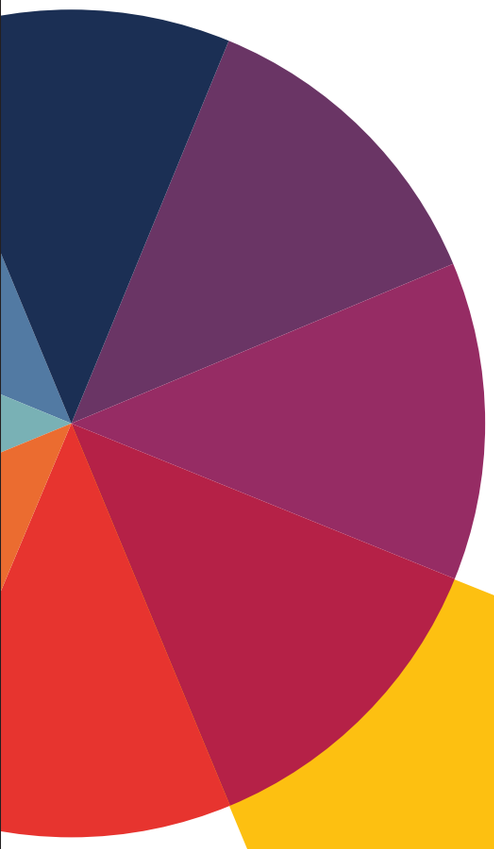
Contents



Welcome from the Conference Chair

A/Prof Peter Veitch

The Australian and New Zealand Conference on Optics and Photonics (ANZCOP) conference series integrates the Australian Conference on Optics, Lasers and Spectroscopy (ACOLS) and the 40th Australian Conference on Optical Fibre Technology (ACOFT). ANZCOP 2015 is the second such conference, and is run under the auspices of the Australian Optical Society and Engineers Australia.

Optics and photonics research continues to be a dynamic and exciting field or research internationally and within Australia. It can be used to ask and answer fundamental questions about quantum mechanics and atomic physics and to probe chemical reactions, to make new types of chemical and environmental sensors, new biological sensors and medical diagnostics and devices, better computers and communications systems, better fundamental standards and metrology, and even to measure elusive ripples in the curvature of space-time.

The local organizing committee has assembled an exciting program for ANZCOP 2015, featuring a wide range of plenary and invited talks that I am sure you will find enjoyable and inspiring. It features a plenary talk by the 2015 Frew Fellow of the Australian Academy of Sciences: Professor Ursula Keller from ETH Zurich. We also have plenary talks on the use of carbon nanotube and graphene for nonlinear optics, semiconductor nanowires for optoelectronics, and the use of optics and photonics for testing fundamental physics with cold atoms, for visible electromagnetic astronomy and in the Advanced LIGO gravitational wave interferometer, which re-started the search for gravitational waves this year - the centenary of Einstein's publication of the field equations for General Relativity.

I warmly welcome you to ANZCOP 2015. Help us celebrate the IYL. We hope you enjoy the exciting science and technology.

On Site Contacts

All Occasions Management
Telephone: +61 (8) 8125 2200
Facsimile: +61 (8) 8125 2233
12 Stirling Street, Thebarton SA 5031

Simon Duncan
Senior Coordinator – Conventions and Events
Mobile: 0424 909 444
Email: simon@aomevents.com

Danielle Skurray
Coordinator – Conventions and Events
Mobile: 0447 444 369
Email: danielle.skurray@aomevents.com

Local Organising Committee

Peter Veitch
(University of Adelaide)
General Chair

Andre Luiten
(University of Adelaide)
ACOLS Program Chair

John Arkwright
(Flinders University)
ACOFT Program Chair

David Ottaway
(University of Adelaide)

Heike Ebendorff-Heidepriem
(University of Adelaide)

About The Venue

University of Adelaide
The University of Adelaide is a public university in Adelaide, South Australia. Established in 1874, it is the third oldest university in Australia. It is consistently ranked in the top 1% of universities worldwide. It is also associated with five Nobel laureates, 104 Rhodes scholars and is a member of the Group of Eight, as well as the Sandstone Universities.

THE UNIVERSITY of ADELAIDE

Conference Program

Sunday 29th November 2015

4.00pm – 7.00pm	Conference Registration | *Eclipse Function Room, Level 4, Union House*
4.15pm - 5.00pm	Tours of the Institute of Photonics and Advanced Sensing | *Braggs Building*
5.00pm – 7.00pm	Welcome Reception | *Eclipse Function Room, Level 4, Union House* Sponsored by: Australian National Fabrication Facility (ANFF)

Monday 30th November 2015

8.00am – 9.00am	Conference Registration | *Bonython Hall*
9.00am – 9.20am	Conference Opening | *Braggs*
9.20am – 10.10am	**Professor Ursula Keller** Ionization Dynamics and Time Delays | *Braggs*
10.10am – 11.00am	**Professor Joss Bland-Hawthorn** Astrophotonics: Future of Astronomical Instrumentation | *Braggs*
11.00am – 11.30am	**Morning Tea** | *Bonython Hall*

Concurrent Sessions	FIBRE OPTIC SENSING 1 | *Horace Lamb*	ATOM OPTICS 1 | *Braggs*
11.30am – 11.45am	**Professor Bob Lieberman** Optical fiber sensors – submicron to suprakilometer	**Ken Baldwin** Precision measurement of tune-out wavelengths in metastable helium: a test of QED
11.45am – 12.00pm		**Paul Dyke** A kinematically 2D interacting Fermi gas
12.00pm – 12.15pm	**Meg Knowles** Distributed strain sensing using optical Fibres	**Jesse Everett** Stationary light in an atomic Raman memory
12.15pm – 12.30pm	**Brant Gibson** Diamond NV Magnetometers	**Peter Hannaford** Quantum simulation with ultracold atoms in a magnetic lattice
12.30pm – 12.45pm		**Roman Khakimov** Wheeler's delayed choice experiment with matter waves
12.45pm – 1.00pm	**Scott Foster** A magnetostrictive fibre laser magnetometer	**Dene Murphy** Rydberg blockaded cold ion beams
1.00pm – 2.00pm	**Lunch** | *Bonython Hall*	

Monday 30th November 2015 continued

Concurrent Sessions	FIBRE OPTIC CHEMICAL SENSING | *Horace Lamb*	QUANTUM OPTICS 1 | *Braggs*
2.00pm - 2.15pm	**Alexandre Francois** Biosensing using microspheres at the end of fibres	**Bryn Bell** Single photon level frequency conversion in a silicon nanowire
2.15pm - 2.30pm		**Xiang Zhang** Time-bin entanglement in compact and reconfigureable silicon nitride photonic circuits
2.30pm – 2.45pm	**M. Nazari** Aqueous contaminant detection via a metal organic framework thin film coating on an optical fibre end-face	**Geoff Pryde** Experimental measurement-device-independent quantum steering
2.45pm – 3.00pm	**Agnieszka Zuber** Gold rush with an optical fibre	**Joel Corney** Creating non-Gaussian entanglement in optical fibre
3.00pm – 3.15pm	**Tess Reynolds** A fibre tip whispering gallery mode biosensing platform	**Jiakun He** Integrated silicon photonic degenerate photon pair quantum splitter
3.15pm – 3.30pm	**Elizaveta Klantsataya** Surface plasmon scattering in exposed core optical fiber for enhanced resolution refractive index sensing	**Kristian Helmerson** Single photon vortex knots

3.30pm – 4.00pm **Afternoon Tea** | *Bonython Hall*

Concurrent Sessions	FIBRE LASERS | *Horace Lamb*	ATOM OPTICS 2 AND SPECTROSCOPY | *Braggs*
4.00pm – 4.15pm	**Shigeki Tokita** High power 3 μm erbium fiber lasers and their applications	**Satya Sainadh Undurti** Measuring strong-field photo-ionization and laser intensity with percent level accuracy
4.15pm – 4.30pm		**Chris Vale** Thermodynamics of a 2D Fermi gas
4.30pm – 4.45pm	**James Leger** The Physics of Coherent Fiber Laser Beam Combining	**Robert Scholten** Single-shot electron diffraction using a cold atom electron source
4.45pm - 5.00pm		**Ben Sparkes** Brightness Enhancement of a Cold Ion Source using Stimulated Raman Adiabatic Passage

Monday 30th November 2015 continued

Concurrent Sessions	FIBRE LASERS | *Horace Lamb*	ATOM OPTICS 2 AND SPECTROSCOPY | *Braggs*
5.00pm – 5.15pm	**Andrew Malouf** Modelling of a 3.5μm dual-wavelength pumped fibre laser	**Hannes Griesser** Strong nonlinearities with suspended-core fibre
5.15pm – 5.30pm	**Quentin Mocaer** High-energy sub-50 fs pulses via nonlinear compression in ypocycloid-core Kagome fiber	**Russell McLean** Topological charge transfer in stepwise-excited Rb vapour

5.30pm – 6.30pm AOS AGM Meeting | *Braggs*
6.30pm – 7.30pm Poster Sundowner | *Bonython Hall*

Tuesday 1st December 2015

8.00am – 9.00am Conference Registration | *Bonython Hall*
9.10am – 10.00am **Professor Shinji Yamashita**
Carbon Nanotube and Graphene Photonics | *Braggs*

10.00am – 10.30am **Morning Tea** | *Bonython Hall*

Concurrent Sessions	ACOFT PHOTONIC DEVICES 1 | *Horace Lamb*	NONLINEAR OPTICS | *Braggs*
10.30am – 10.45am	**Chunle Xiong** Multiplexing of Heralded Single Photons	**Adrian Ankiewicz** Multi-rogue waves and triangle numbers
10.45am – 11.00am		**Alvaro Casas Bedoya** Tunable RF filter enabled by stimulated Brillouin scattering (SBS) in silicon
11.00am – 11.15am	**Robert McLaughlin** A fibre-optic imaging probe incorporating a 3D printed lens	**Amol Choudhary** 50 dB Brillouin gain in chalcogenide waveguides
11.15am – 11.30am	**Andrea Blanco-Redondo** Observation of waveguiding by topological defects in a silicon photonic platform	**Jörg Schmiedmayer** Does an isolated quantum system relax?
11.30am – 11.45am	**Ivan Maksymov** Third harmonic generation and ultrasound detection with long dipole plasmonic antennae	
11.45am – 12.00pm	**Wen Qi Zhang** Universal optical fibre fluoresence sensing platform for wine monitoring	**Igor Litvinyuk** Timing electron localization in dissociating H_2^+

Tuesday 1st December 2015 continued

Concurrent Sessions	ACOFT PHOTONIC DEVICES 1 | *Horace Lamb*	NONLINEAR OPTICS | *Braggs*
12.00pm – 12.15pm	**Dmitrii Stepanov** All-fibre tunable waveplate for polarisation control	**Han Xu** Double-peak structure of R-dependent enhanced ionization rate of H_2^+
12.15pm – 12.30pm	**Georgios Tsiminis** Towards an optical fibre sensor for monitoring vitamin B12 in blood	**Atia tul Noor** Dissociative double ionization of acetylene in strong laser field

12.30pm – 1.30pm **Lunch** | *Bonython Hall*

Concurrent Sessions	ACOFT PHOTONIC DEVICES 2 | *Horace Lamb*	SPECTROSOPY | *Braggs*
1.30pm – 2.00pm	**Professor Alan Willner** High-capacity free-space optical communications using multiplexing of multiple orbital-angular-momentum modes	**Professor Ursula Keller** Gigahertz laser frequency combs
2.00pm – 2.15pm	**Andri Mahendra** Dynamic thermal control scheme on silicon nitride photonic integrated circuits	**James Anstie** A flexible platform for quantitative frequency-comb spectroscopy
2.15pm – 2.30pm	**Wen Qi Zhang** Characterisation of noises and losses in optical fibres in nonlinear frequency domain	
2.30pm – 2.45pm	**Darren D. Hudson** Photonic Chip Platforms for Supercontinuum Generation in the Mid-IR	**Sarah Scholten** Broadband phase-sensitive frequency-comb spectroscopy using a virtually imaged phased array
2.45pm – 3.00pm		**Jiahao Dong** Polarisation impedance matching spectroscopy – a new method for cavity enhanced gas sensing
3.00pm – 3.15pm	**Kashif Amir** Noise effect on the nonlinear Fourier transform	**Roland Fleddermann** Compact 40 kHz delay line with cascading multi-level phase plate for low coherence interferometry
3.15pm – 3.30pm	**Alexei Tikhomirov** CO_2 Laser Fibre taper profiling for splice-free fibre laser arrays	**Yajie Guan** Double pass cavity enhanced absorption measurement with scattering minimisation

3.30pm – 4.00pm **Afternoon Tea** | *Bonython Hall*

Tuesday 1st December 2015 continued

Concurrent Sessions	ACOFT PHOTONIC DEVICES | *Horace Lamb*	INSTRUMENTATION | *Braggs*
4.00pm – 4.15pm	**Simon Gross** Laser-written 3D integrated photonics	**Lyle Roberts** Increasing the laser power of space debris laser ranging systems using an optical phased array
4.15pm – 4.30pm		**Samuel Francis** Development of an alignment insensitive displacement interferometer
4.30pm – 4.45pm	**Nicolas Riesen** Three-dimensional C+L band and EDFA pump band integrated tapered mode couplers	**King Ung Hii** Multiple-pass lateral shearing interferometer
4.45pm – 5.00pm	**Douglas Little** Interfacing spider silks with ultrafast-laser written integrated optics	**Ashby Hilton** Bidirectional microwave and optical signal dissemination
5.00pm – 5.15pm	**Carly Whittaker** Fabrication of polymer optical fibres for radiation sensing	**Philip Light** Laser frequency noise measurement using a passive coherent discriminator
5.15pm – 5.30pm	**Robert J Williams** Highly-Efficient Frequency Conversion of High-Power Fiber Lasers in Diamond	**John Canning** Smartphone spectrometers

5.30pm – 6.30pm **Poster Sundowner** | *Bonython Hall*

Wednesday 2nd December 2015

8.00am – 9.00am Conference Registration | Bonython Hall

9.10am – 10.00am **Dr Aidan Brooks**
Advanced LIGO: from Concept to Operation and Beyond | *Braggs*

10.00am – 10.30am **Morning Tea** | *Bonython Hall*

Concurrent Sessions	FBG SENSING | *Horace Lamb*	OPTIC SENSING 1 | *Braggs*
10.30am – 10.45am	**Raman Kashyap** Shape sensing with optical fibres: the present and the future	**Shasidran Raj** Space Debris Tracking using Continuous Wave Lasers
10.45am – 11.00am		**Murray Hamilton** A polarimetric back-scatter sonde for determining cloud phase

Wednesday 2nd December 2015 continued

Concurrent Sessions	FBG SENSING | *Horace Lamb*	OPTIC SENSING 1 | *Braggs*
11.00am – 11.15am	**He Shi** Transient pressure measurement in pipelines using optical fibre sensor	**Dan Shaddock** LISA Pathfinder and beyond: laser interferometry in space
11.15am – 11.30am	**Albert Ruiz Vargas** The use of fibre optic sensing technology with intraluminal impedance catheter for functional gastrointestinal motility disorders	
11.30am – 11.45am	**Claire Davis** Monitoring the Structural Health of Defence Platforms with Optical Fibres	**Tom Chambers** Development of a digital holographic imager for the study of cloud microphysics
11.45am – 12.00pm		**Ori Henderson-Sapir** CO_2 sensing for mining applications using Er:ZBLAN, 2.8 μm fibre laser
12.00pm – 12.15pm	**Gary Allwood** Optical fibre Bragg grating sensor based reed switch for physical intrusion detection	**Sean Manning** Development and Implementation of a Robust Angle of Arrival Turbulence Measurement System
12.15pm – 12.30pm	**Bretislav Mikel** Preparation and measurement of FBG based length, temperature and vibration sensors	**Silvie Ngo** Digitally Enhanced Homodyne Interferometry fibre systems for Co-phasing Large Segmented Telescopes

12:30pm – 1.30pm **Lunch** | *Bonython Hall*

Concurrent Sessions	ACOFT BIOPHOTONICS | *Horace Lamb*	LASERS | *Braggs*
1.30pm – 1.45pm	**Erik Schartner** Cancer margin detection using a pH sensitive optical fibre sensor	**Professor Ursula Keller** High-power modelocked thin disk lasers
1.45pm – 2.00pm		**Miftar Ganija** A cryogenic Ho:YAG laser
2.00pm – 2.15pm	**Josiah Firth** Development of a novel optical electrode for biopotential recording	**Lachlan Harris** Short-pulse 1645nm Er:YAG lasers

Wednesday 2nd December 2015 continued

Concurrent Sessions	ACOFT BIOPHOTONICS | *Horace Lamb*	LASERS | *Braggs*
2.15pm – 2.30pm	**Martin Ploscher** Current challenges in imaging modalities using multimode fibre	**Amol Choudhary** A low-threshold Brillouin laser in a chalcogenide waveguide
2.30pm – 2.45pm		**David Lancaster** Watt-level holmium guided-wave chip laser for mode-locking and single frequency application
2.45pm – 3.00pm	**John Arkwright** Clinical results from fibre Bragg grating based in-vivo diagnostic catheters	**Jae Daniel** Widely tunable thulium fibre sources for medical, industrial and scientific applications
3.00pm – 3.15pm	**Robert McLaughlin** A microscope-in-a-needle: OCT and fluorescence needle probes	**Lars Hildebrandt** Single-mode interband cascade lasers for spectroscopic applications
3.15pm – 3.30pm		**Neil Broderick** First demonstration of complete spectral control of optical pulses at 1 micron

3.30pm Afternoon Tea | *Bonython Hall*

Concurrent Sessions	MATERIALS & PLASMONICS | *Horace Lamb*	QUANTUM OPTICS 2 | *Braggs*
4.00pm – 4.15pm	**Jasper Cadusch** A plasmonic photodiode for direct polarisation state readout	**Marcus Doherty** Diamond quantum microscopy
4.15pm – 4.30pm	**Katie Chong** Wavefront control with metadevices based on all-dielectric Huygens metasurfaces	
4.30pm – 4.45pm	**Ann Roberts** Superchiral optical near-fields	**Sergei Slussarenko** High heralding efficiency single photon source for quantum information science applications
4.45pm – 5.00pm	**Stuart Earl** Efficient coupling between optical nano-antennas & nanoscale quantum dot aggregates	**Alexander Wood** Measurement of geometric phase with rotating nitrogen-vacancy centers
5.00pm – 5.15pm	**Peipei Jia** Freestanding metal nanohole membrane fabricated by template tranfer with a soluable adhesive	**Min Jet Yap** A vacuum compatible glass based squeezed light source

Wednesday 2nd December 2015 continued

Concurrent Sessions	MATERIALS & PLASMONICS | *Horace Lamb*	QUANTUM OPTICS 2 | *Braggs*
5.15pm – 5.30pm	**Hua Lu** Selective absorption of light in monolayer graphene by excitation of graphene plasmons	**Mirko Lobino** Scalable trapped-ion single-photon source with monolithically integrated optics
5.30pm – 5.45pm	**Ann Roberts** Metasurface optical transfer functions	**Sascha Hoinka** Low-momentum Bragg spectroscopy of a strongly interacting Fermi gas
5.45pm – 6.00pm	**Jonathon Hall** Multilayer resonator sensitivity analysis	**Xiang Zhang** Active temporal multiplexing of indistinguishable heralded single photons from silicon

4.00pm – 6.00pm ACOFT post-deadline session | *Benham Lecture Theatre*
7.00pm Conference Dinner | *Adelaide Oval*

Thursday 3rd December 2015

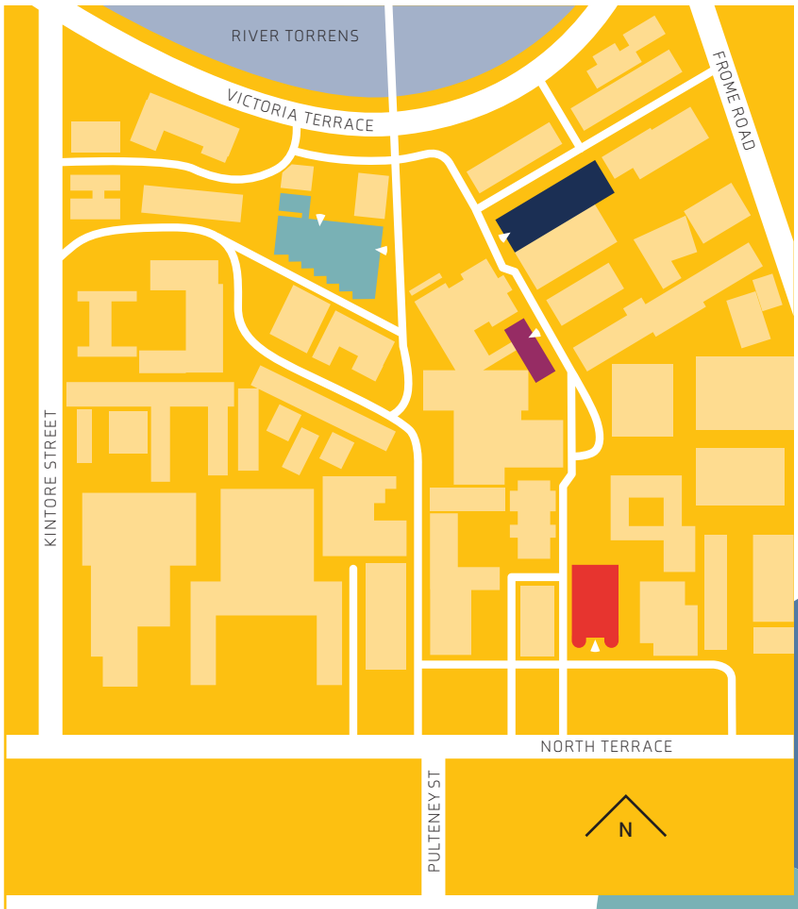
8.00am Conference Registration
9.00am **Professor Chennupati Jagadish**
Semiconductor Nanowires for Optoelectronics and Energy Applications | *Braggs*

9.50am **Morning Tea** | *Braggs*

10.20am **Professor Ed Hinds**
Testing Fundamental Physics with Cold Atoms | *Braggs*
11.10am Closing Ceremony
11.30am Conference Close

Disclaimer The information presented is correct at the time, in the event of unforeseen circumstances, the Organising Committee reserves the right to delete or alter items in the conference program.

Venue Map



Bonython Hall
Exhibition, Poster
Presentations, Catering and
Registration / Information Desk

The Braggs Lecture Theatre
Main Plenary Hall &
Concurrent Sessions

Horace Lamb Lecture Theatre
Concurrent Presentation Hall

Eclipse Function Room
Level 4, Union House
Welcome Reception

Please Note: *Main entrance to Adelaide University is via North Terrace, located at the bottom of the above map.*

General Information

Car Parking
There are various secure parking lots available along North Terrace. The closest ones to The University of Adelaide are:

- *Wilson Parking*
  215-255 North Terrace, Adelaide
- *Wilson Parking*
  15 Frome Street, Adelaide

Local Transport

Trains and Buses
Please visit www.adelaidemetro.com.au or call 1300 311 108 for further information and timetables.

Taxis
The main taxi companies in Adelaide are:

- *13CABS*
  Telephone: 13 22 27
- *Adelaide Independent Taxis*
  Telephone: 13 22 11

Temperature
For the months of November and December, Adelaide's mean maximum temperature is 27 degrees and the mean minimum is 15 degrees.

Name Badges
All delegates, sponsors, exhibitors will be issued with a name badge at registration. Admittance to all sessions and social functions included in the registration fee will require presentation of your badge.

Registration Desk
All delegates must register to attend the conference. The registration and information desk will be located in Braggs Foyer and Bonython Hall of The University of Adelaide and will be open during the following hours:

- Sunday 29 November
  | *Eclipse Function Room, Level 4, Union House*
  4.00pm – 7.00pm
- Monday 30 November | *Bonython Hall*
  8.00am – 5.30pm
- Tuesday 1 December | *Bonython Hall*
  8.00am – 5.30pm
- Wednesday 2 December
  | *Bonython Hall*
  8.00am – 5.00pm
- Thursday 3 December | *Braggs Foyer*
  8.00am – 11.30am

Sponsors

The ANZCOP organising Committee would like to thank the following sponsors of the 2015 Conference

Australian Government
Department of Defence
Defence Science and Technology Group

Conference Satchel Sponsor

The **Defence Science and Technology (DST) Group** is a national leader in safeguarding Australia by delivering valued scientific advice and innovative technology solutions for Defence and national security. Part of the Department of Defence, DST Group is Australia's second largest public-funded science and technology organisation.

www.dsto.defence.gov.au

IPAS
Institute for Photonics and Advanced Sensing

Conference Lanyard Sponsor

IPAS is one of five world-leading research institutes at the University of Adelaide. The mission of IPAS is to use the power of light to make the world a healthier, wealthier, safer and smarter place. We are doing this by building unique sensors which harness the powerful properties of light to learn about the environment: this might be inside the human body where we are building tools to diagnosis disease, inside an aircraft where we can search for hidden corrosion, inside a nuclear reactor where we want to measure radiation, or mapping methane leaks for environmental monitoring.

www.ipas.edu.au

AIP

Pen and Satchel Insert Sponsor

APL Photonics is an authoritative, peer-reviewed, open access, rapid publication serving the entire international photonics community. The journal publishes high-quality original contributions to the science of light and the technology that generates, controls, and detects photons. APL Photonics welcomes research that presents novel understanding and significant advances, leads to the development of key enabling technologies, and serves as a catalyst for multidisciplinary breakthroughs in the field.

www.aip.org

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Handbook Sponsor

The **MQ Photonics Research Centre** is a vibrant group of some 70 researchers working within an extensive suite of state of the art laboratories and facilities at Macquarie University. Our research is grouped around six research banners: Photonics sources/laser applications; natural and engineered optical materials; photonics for life and health sciences; photonics for the environment; astrophotonics; and quantum photonics. We offer a diverse range of research projects for PhD and Masters candidates together with scholarships for suitably qualified applicants.

research.science.mq.edu.au/mqphotonics/

ANFF

Welcome Reception Sponsor

Established under the National Collaborative Research Infrastructure Strategy, the **Australian National Fabrication Facility** (ANFF) links 8 university-based nodes to provide researchers and industry with access to state-of-the-art fabrication facilities. The capability provided by ANFF enables users to process hard materials (metals, composites and ceramics) and soft materials (polymers and polymer-biological moieties) and transform these into structures that have application in sensors, medical devices, nanophotonics and nanoelectronics.

www.anff.org.au

Exhibition Floor Plan & Listing

Please visit the ANZCOP Exhibitors Located in Bonython Hall during the conference.

Booth	Company
01	Lastek
02	Nanoplus GmbH
03	Warsash Scientific
04	NewSpec Pty. Ltd.
05	IPAS & The Centre for Nanoscale BioPhotonics
06	Liquid Instruments
07	Coherent Scientific
08	Keysight Technologies

Exhibitor Profiles

01 – Lastek

Lastek is the leading distributor in Australia and New Zealand for many of the world's most advanced laser and photonics companies. Our sales and service personnel, including several PhD graduates, are the most experienced in the industry. We support customers in leading edge applications in diverse fields. These range from fundamental research in physics, chemistry, engineering and biology, to industrial applications of photonics technology, to advanced microscopy and imaging systems, and spectroscopy.

www.lastek.com.au

02 – Nanoplus GmbH

Nanoplus provides DFB and FP lasers at any customer specific wavelength in the entire range from 760-14000 nm. Laser Diodes are available from 760-3000 nm, Interband Cascade Lasers from 3000-6000 nm and Quantum Cascade Lasers from 6000-14000 nm. The lasers' excellent performance is due to their very high spectral purity, narrow linewidth and excellent reliability. These superior key features make them the perfect light source for extremely precise sensing applications in industry and research.

www.nanoplus.com

03 – Warsash Scientific

Warsash Scientific is a leading supplier of scientific instruments and components serving Australian and New Zealand research, defence and industry since 1976. We specialise in Nanopositioning, Spectroscopy, Photonics, MEMS, Vibration Analysis, Thermal Monitoring and Thin Film technologies. Over 35 years Warsash Scientific has built a network of suppliers, all leaders in their fields, providing unique technologies across a broad spectrum of photonics-related applications.

www.warsash.com.au

04 – NewSpec Pty. Ltd

NewSpec specialises in the sales and service of high-end scientific equipment to the scientific research, aerospace & defence, microelectronics and life science markets throughout Australia and New Zealand. NewSpec is the exclusive distributor for several leading international manufacturers including Newport Corporation (Spectra-Physics Lasers, New Focus & Oriel) and Hitachi High-Technologies.

www.newspec.com.au

05 – IPAS & The Centre for Nanoscale BioPhotonics

IPAS is one of five world-leading research institutes at the University of Adelaide. The mission of IPAS is to use the power of light to make the world a healthier, wealthier, safer and smarter place. We are doing this by building unique sensors which harness the powerful properties of light to learn about the environment: this might be inside the human body where we are building tools to diagnosis disease, inside an aircraft where we can search for hidden corrosion, inside a nuclear reactor where we want to measure radiation, or mapping methane leaks for environmental monitoring.

www.ipas.edu.au

The **Centre for Nanoscale BioPhotonics** (CNBP) is an Australian Research Council Centre of Excellence, focused on driving the development of new light based sensing tools that can measure at the nanoscale level - providing powerful new ways of understanding cellular processes within the living body. A $40m initiative, this prestigious research centre is a collaborative program, with key nodes at the University of Adelaide, Macquarie University and RMIT University, with other industry and academic partners located around the world. Funded for seven years from 2014, the Centre of approximately 100 staff and students brings together expertise in physics, material science, chemistry, biochemistry, neuroscience, embryology, cardiology and medicine.

www.CNBP.org.au

06 – Liquid Instruments

Liquid Instruments – Test and measurement, reimagined
Liquid Instruments makes a new breed of test and measurement device that couples high-speed analog inputs and outputs to fast reconfigurable digital signal processing. Liquid Instruments' first product – Moku:Lab – is an all-in-one measurement device that can measure, record and generate signals from DC to 200 MHz, replacing multiple instruments at a fraction of the cost.

www.liquidinstruments.com

07 – Coherent Scientific

Coherent Scientific specialises in the supply and support of scientific lasers, spectroscopy systems, optical microscopes and equipment for nanoscale surface characterisation. We are the local distributor for market leaders such as Bruker, Coherent Inc, Nikon, Princeton Instruments, Quantel, Fianium and Aerotech. We have supported our customers for over 25 years with a highly experienced sales and service personnel located throughout Australia and New Zealand.

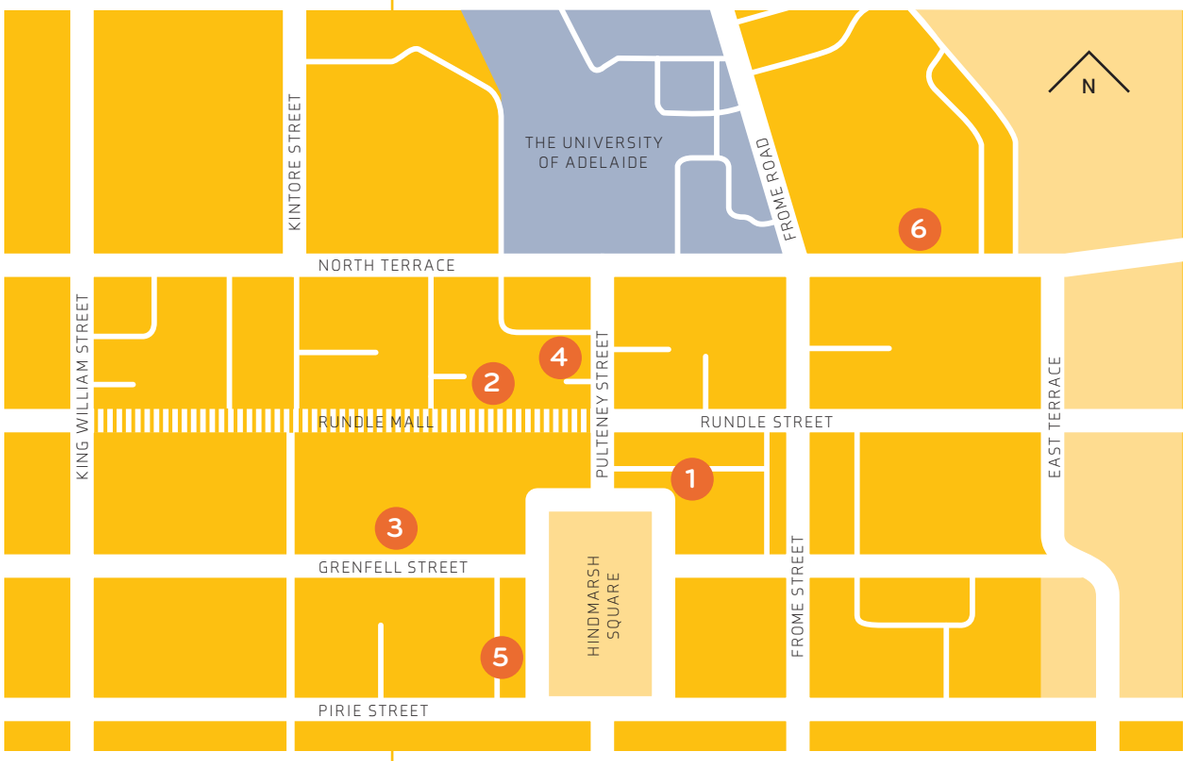
www.coherent.com.au

08 – Keysight Technologies

Helping you unlock measurement insights. For more than 75 years we have been helping you unlock measurement insights, first as the electronic measurement businesses of Hewlett-Packard and Agilent Technologies, and now, as Keysight Technologies. Our unique combination of hardware, software and people will help enable your next moment of insight, whether you're working on mobile devices such two ways radio, antenna test or interference analysis, optical and digital, cloud computing, semiconductors, renewable energy, or the latest glimmer in your imagination. Keysight is here to help you see what others can't – and then make it reality.

www.keysight.com

Accomodation and Map of Adelaide



1 **Crowne Plaza**
8 minute walk to venue
16 Hindmarsh Square
Adelaide, SA 5000
300m from University of Adelaide

2 **Hotel Richmond**
7 minute walk to venue
128 Rundle Mall
Adelaide, SA 5000
290m from University of Adelaide

3 **IBIS Hotel**
9 minute walk to venue
122 Grenfell Street
Adelaide, SA 5000
450m from University of Adelaide

4 **Mansions of Pultney**
5 minute walk to venue
21 Pultney Street
Adelaide, SA 5000
85m from University of Adelaide

5 **Mantra on Hindmarsh Square**
10 minute walk to venue
55-67 Hindmarsh Square
Adelaide, SA 5000
450m from University of Adelaide

6 **Royal Adelaide Hospital Residential Wing**
6 minute walk to venue
North Terrace
Adelaide, SA 5000
350m from Conference Venue

Conference Plenary Speakers

Dr Aidan Brooks

LIGO Laboratory, Caltech

Aidan Brooks did a Ph.D. in Physics in high precision wavefront sensing at the University of Adelaide, graduating in 2007. He accepted an offer to do post-doctoral research with LIGO Laboratory at Caltech, implementing high power upgrades to the Enhanced LIGO detector. In 2009, he accepted a junior research scientist position, researching auxiliary length control mechanisms for Advanced LIGO and subsequently assumed the role of Cognizant Scientist in Charge of Thermal Compensation in 2011. Caltech made him a permanent staff member in 2013. He is currently researching ways to implement universal active wavefront control in Advanced LIGO, designing cryogenic third-generation gravitational wave detectors and measuring thermal noise in the dielectric mirror coatings. In his spare time, he likes to cycle across Europe and make science videos explaining solar magneto-hydrodynamics to his 5-year old nephew.

Advanced LIGO: from concept to operation and beyond

The Advanced LIGO interferometric gravitational wave detectors are now operational and, at the time of this presentation, will be deep into their first observing run. The years of design, construction and commissioning of these state-of-the-art instruments were rife with challenges and replete with examples of technical acumen from the hundreds of scientists and engineers working on the project. This talk will review the motivation and history of the Advanced LIGO Project from this perspective and look to what the future holds for these observatories.

Professor Chennupati Jagadish

Research School of Physics and Engineering, Australian National University

Professor Jagadish is an Australian Laureate Fellow, Distinguished Professor and Head of Semiconductor Optoelectronics and Nanotechnology Group in the Research School of Physics and Engineering, Australian National University. He is also serving as Vice-President and Secretary Physical Science of the Australian Academy of Science. Prof. Jagadish is an Editor/Associate editor of 6 Journals, 3 book series and serves on editorial boards of 17 other journals. He has published more than 810 research papers (540 journal papers), holds 5 US patents, co-authored a book, co-edited 5 books and edited 12 conference proceedings and 15 special issues of Journals. He won the 2000 IEEE Millennium Medal and received Distinguished Lecturer awards from IEEE NTC, IEEE LEOS and IEEE EDS. He is a Fellow of the Australian Academy of Science, Australian Academy of

Technological Sciences and Engineering, IEEE, APS, MRS, OSA, AVS, ECS, SPIE, AAAS, IoP (UK), IET (UK), IoN (UK) and the AIP. He received Peter Baume Award from the ANU in 2006, the Quantum Device Award from ISCS in 2010, IEEE Photonics Society Distinguished Service Award in 2010, IEEE Nanotechnology Council Distinguished Service Award in 2011 and Electronics and Photonics Division Award of the Electrochemical Society in 2012, 2013 Walter Boas Medal, 2015 IEEE Pioneer Award in Nanotechnology and 2015 IEEE Photonics Society Engineering Achievement Award.

Semiconductor Nanowires for Optoelectronics and Energy Applications

Semiconductors have played an important role in the development of information and communications technology, solar cells, solid state lighting. Nanowires are considered as building blocks for the next generation electronics and optoelectronics. In this talk, I will introduce the importance of nanowires and their potential applications and discuss about how these nanowires can be synthesized and how the shape, size and composition of the nanowires influence their structural and optical properties. I will present results on axial and radial heterostructures and how one can engineer the optical properties to obtain high performance optoelectronic devices such as lasers, THz detectors, solar cells. Future prospects of the semiconductor nanowires will be discussed.

Professor Ed Hinds

Imperial College, London

Ed Hinds is a Royal Society Research Professor (since 2006) and a Chair in Physics (2002) at Imperial College London. He received his B.A. (1971) and D.Phil. (1974), both in Physics, from Oxford University. Before joining Imperial, Ed worked at Columbia (1975-1976), Yale (1976-1995) and University of Sussex (1995-2002). He is the Founder and Director of the Centre for Cold Matter at Imperial College. Awards include Royal Society Leverhulme Trust Senior Research Fellow (1998), Alexander von Humboldt Research Prize (1998), EPSRC Senior Research Fellow (1999), Fellow of the Royal Society, Royal Society Research Professor (2006), IoP Thomson Medal and Prize (2008), Royal Society Rumford Medal (2008), IoP Faraday Medal and Prize (2013). Ed's aim is to study fundamental problems in physics and to develop new methods for producing and manipulating cold atoms and molecules, leading to new technology. His work can be described under three headings: (i) Quantum manipulation of atoms and photons on atom chips; (ii) Production and applications of cold molecules; (iii) Tests of fundamental physical laws, especially measurement of the electron's electric dipole moment (i.e. its shape).

Testing Fundamental Physics with Cold Atoms

Cold and ultracold molecules provide a sensitive way to search for new physics, e.g. variation of fundamental constants, dark energy, or new elementary particles. I will describe some of these ideas, with particular emphasis on the search for a permanent electric dipole moment of the electron, which already provides a strong constraint on possible supersymmetric theories of particle physics. Laser cooling, already very successful in cooling atoms, can now be applied to molecules. I will discuss the recent advances in that area and the extraordinary sensitivity that this new approach can bring to tests of fundamental physics.

Professor Joss Bland-Hawthorn

ARC Laureate Fellow; SIfA Director, University of Sydney

Joss Bland-Hawthorn is an ARC Laureate Fellow Professor of Physics and Director of the Sydney Institute for Astronomy (SIFA). He was born in England before moving overseas in 1985. After receiving his PhD from the Royal Greenwich Observatory and the University of Sussex, he took a 3-year postdoc in astrophysics at the Institute for Astronomy, University of Hawaii. In 1988-1993, he was a tenured professor at the Space Physics & Astronomy Department, Rice University, Texas. In 1993, he joined the Australian Astronomical Observatory, Sydney. In 2000, he was appointed Head of Instrument Science, a new division that was created to reflect the increasing need for complex novel solutions to astronomical instrumentation. In 2007, Joss was awarded the prestigious Federation Fellowship with a tenured professorship in the Sydney Institute for Astronomy (SIFA), School of Physics, University of Sydney. In 2009, he co-founded the Institute of Photonics and Optical Science (IPOS). In 2010, he was Leverhulme Professor at Oxford and held a Visiting Senior Fellowship at Merton College, Oxford. In 2011, he was the Brittingham Scholar at the University of Wisconsin, USA. He has won numerous awards including the Jackson Gwilt medal from the Royal Astronomical Society (2012) and the W.H. Steel medal from the Australian Optical Society (2015). In 2012, he was elected Fellow of the Australian Academy of Science and the Optical Society of America. In 2014, Joss was awarded the prestigious Australian Laureate Fellowship. He serves on several boards including Section H (IAU) and the Annual Reviews of Astronomy and Astrophysics (USA). He has delivered numerous lecture series (e.g. Saas Fee, Bologna, Wisconsin) and is a regular speaker on the conference circuit, in addition to delivering occasional addresses at schools, clubs and industry. He was the Canon Lecturer at Canon Inc, Shinegawa, Tokyo (2012), the Plenary Speaker at the Supreme Court Judges conference (2013), and the Allison Levick Lecturer (2014). He is a regular guest at the University of Oxford, the University of Bologna and the University of Marseille.

Astrophotonics: the Future of Astronomical Instrumentation

Over the past 15 years, astrophotonics - the interface between photonics and astronomical/space instrumentation - has led to important advances in adaptive optics, laser communications,

interferometry, vortex coronography, precision spectroscopy through fibre etalons, filtering through photonic lanterns and multi-core fibre gratings, and so on. There is an important role here for nanophotonics if nano-patterning can be achieved over large surfaces (~100mm OD). These advances will be exploited by a new generation of astronomical instruments, as we describe. The case for photonics becomes even more compelling in an era of extremely large telescopes (25-42m aperture) now under construction.

Professor Shinji Yamashita

Research Center for Advanced Science and Technology, University of Tokyo

Shinji Yamashita was born in Osaka, Japan, on August 14, 1965. He received the B.E., the M.E. and Dr. Eng. degrees in Electronic Engineering from the University of Tokyo, Tokyo, Japan in 1988, 1990, and 1993, respectively. He was appointed as a Research Associate in 1991, a Lecturer in 1994, an Associate Professor in 1998, and a Professor in 2009, at the University of Tokyo. At present, He is a Professor at the Research Center for Advanced Science and Technology (RCAST), the University of Tokyo. From 1996 to 1998, he stayed at Optoelectronics Research Center (ORC), University of Southampton, UK, as a visiting research fellow. He has been engaged in research of coherent optical fiber communications, optical fiber amplifiers, fiber nonlinearities and fiber lasers. His current interest is in fiber lasers and nonlinear devices for optical fiber communications and sensors. He has published and presented over 250 refereed papers in the field. He is a member of the Institute of Electrical and Electronics Engineers (IEEE), Optical Society of America (OSA), the Institute of Electronics, Information, and Communication Engineers of Japan (IEICE), and the Japan Society of Applied Physics (JSAP).

Carbon Nanotube and Graphene Photonics

We review the optical properties of carbon nanotubes (CNTs) and graphene, and describe how those properties have been used for the implementation of various nonlinear fiber optic applications. Early studies on the optical properties of CNTs revealed that these materials exhibit high third order susceptibility and a broadband saturable absorption with a sub-picosecond response time. Recent discovery of similar nonlinear optical properties in graphene attracts much attention in this field. Such ultrafast, highly nonlinear optical response means that they can be employed for noise suppression and for the mode-locking of fiber lasers, and in addition, their high third order nonlinearity holds great promise for the implementation of various other nonlinear fiber optic devices such as wavelength converters based on four wave mixing. In this lecture, we will discuss the various methods that have been considered thus far for the integration of CNTs and graphene in optical systems and highlight the advantages and limitations of using the saturable absorption of CNTs and graphene for the passive mode-locking of fiber lasers, and the current status of CNT and graphene saturable absorbers in the state of art fiber laser technologies.

Professor Ursula Keller

Department of Physics, ETH Zurich
2015 Frew Fellow of the Australian Academy of Science

Ursula Keller a tenured professor of physics at ETH Zurich since 1993 (www.ulp.ethz.ch), and currently also a director of the Swiss multi-institute NCCR MUST program in ultrafast science since 2010 (www.nccr-must.ch). Born in Switzerland 1959, she received a „Diplom" at ETH Zurich in 1984, a Ph.D. at Stanford University USA in 1989, was a Member of Technical Staff at Bell Labs USA 1989 to 1993, a visiting professor at the Lund Institute of Technologies (2001) and at UC Berkeley (2006). She has been a co-founder and board member for Time-Bandwidth Products (acquired by JDSU in 2014) and for GigaTera (acquired by Time-Bandwidth in 2003).
Her research interests are exploring and pushing the frontiers in ultrafast science and technology. Awards include the OSA Charles H. Townes Award (2015), LIA Arthur L. Schawlow Award (2013), ERC advanced grant (2012), EPS Senior Prize (2011), OSA Fraunhofer/Burley Prize (2008), Leibinger Innovation Prize (2004), and Zeiss Research Award (1998). OSA, SPIE, IEEE and EPS Fellow, member of the Royal Swedish Academy of Sciences, Academy Leopoldina and Swiss Academy of Techical Sciences. She supervised and graduated more than 60 Ph.D. students. According to Web of Science (23. Feb. 2015) > 15'000 citations and an h-index of 66.

Attosecond Ionization Dynamics and Time Delays

The basic motivation is to understand and ultimately control how matter functions at the electronic, atomic and molecular level. Initially our focus is on the question how quanta of energy and charge are transported on an atomic spatial and attosecond time scale. In principle, time dependent-processes in quantum mechanics are described by the time-dependent Schrödinger Equation (TDSE). The challenge is that the TDSE in most cases cannot be solved without approximations and that time is not an operator and therefore not a direct observable. Semi-classical models, on the other hand, seem to explain suprisingly well many current attosecond measurements. Attosecond measurements have advanced rapidly with reproducable and high-quality data, allowing for very fundamental tests for our current understanding and models in time-dependent quantum mechanics. This talk will review the recent progress in attosecond ionization dynamics and time delays in photoemission and tunnel ionization. Following the peak of an electron wavepacket (i.e. the group delay) for determining time delays can be tricky and often misleading. We will discuss why in the multi-photon or tunnel ionization regime the group delay (or the related Wigner delay) gives the wrong explanation for the measured delay, whereas in the single-photon ionization regime we can show experimentally that the Wigner time delay can explain the general trend correctly although it does not capture all the observed features.

Conference Invited Speakers

Professor Alan Willner

President-Elect, OSA

Alan Willner (Ph.D., 1988, Columbia) worked at AT&T Bell Labs and Bellcore, and he is currently the Steven and Kathryn Sample Chair in Engineering at the Univ. of Southern California. He has received the International Fellow of U.K. Royal Academy of Engineering; Presidential Faculty Fellows Award from the White House; IEEE Sumner Award; Guggenheim, Packard, and Fulbright Foundation Fellowships; OSA Forman Engineering Excellence Award; IEEE Photonics Society Engineering Achievement Award; SPIE President's Award; IEEE Globecom Best Paper Award; Eddy Best Contributed Technical Paper Award from Pennwell; and Fellow of National Academy of Inventors. He is Fellow of AAAS, IEEE, OSA, and SPIE. Prof. Willner has been Co-Chair of the U.S. National Academies Study on Optics and Photonics; President-Elect of OSA; President of IEEE Photonics Society; Editor-in-Chief of Optics Letters of Journal of Lightwave Technology; and General Co-Chair of CLEO. Prof. Willner has > 1100 publications, primarily in optical communications and signal processing.

High-Capacity Free-Space Optical Communications Using Multiplexing of Multiple Orbital-Angular-Momentum Modes

*The ability to multiplex multiple, spatially overlapping data-carrying modes over the same physical medium represents the potential for increasing system capacity and spectral efficiency. Generating different amounts of orbital-angular-momentum (OAM) on different optical beams has emerged as a technique for such mode multiplexing. A beam can carry OAM if its phase front "twists" in a helical fashion as it propagates, and the amount of OAM corresponds to the number of 2*pi phase shifts that occur in the azimuthal direction. Each OAM beam is orthogonal and can be efficiently multiplexed and demultiplexed with little inherent crosstalk, and OAM is compatible with other forms of multiplexing (e.g., polarization multiplexing and WDM). This presentation will explore the achievements of and challenges to OAM-based free-space optical communication systems, including transmission, turbulence compensation, link design, and switching.*

Alexandre Francois

Dr Alexandre François received a B.Sc. degree in Material Sciences Engineering from the Institute of Science and Techniques of Grenoble, France, in 2001, a M.Sc. degree in Physics and Materials Sciences from the University Claude Bernard, France, in 2002 and a Ph.D. degree in Electrical Engineering, specialized in solid state Physics, optoelectronics

and micro/nano fabrication technologies, from the University of Sherbrooke, Canada, in 2006. From 2007 to 2008, Dr François worked as a Research Fellow at Fujirebio Inc., Japan, a pharmaceutical company specialized in medical diagnostic, on optical biosensing technologies. Dr François joined the University of Adelaide, in November 2008 as research fellow under the guidance of Prof Tanya Monro, with the mandate to develop Tanya Monro's group activity in biological sensing before joining the University of South Australia as part of Tanya Monro's Laureate fellowship team. He remains associated with the University of Adelaide and the Institute for Photonics and Advanced Sensing, and the ARC Centre of Excellence in NanoscaleBiophotonics (CNBP) as an associate investigator. His research work mainly focuses on label free sensing technologies with a specific emphasis on Plasmonics, Whispering Gallery Modes, fibre optics for sensing, surface functionalization and immunoassay design.

Combining whispering gallery mode lasers and microstructured optical fibres for in-vivo biosensing applications

Here we review our recent progress in optimising fluorescent based optical microresonators and present an approach involving combining of these resonators with suspended core microstructured optical fibres.

Professor Bob Lieberman

President-Elect, SPIE

Robert A. Lieberman, Ph.D., received his Ph.D. in solid-state physics and biophysics at the University of Michigan in 1981 and joined AT&T Bell Laboratories working first on semiconductor and magnetic device development, and then in the Research Area on fiber optic biological, chemical, and physical sensors. Dr. Lieberman joined Physical Optics Corporation (POC) in 1991, becoming Vice President of Research and Development in 1996. In 1998 he founded Intelligent Optical Systems (IOS) where he served as President until 2014. During that time, he participated in several spin off companies, including Optinetrics, Maven Technologies, LEDI LLC, and Optical Security Sensing. He has been the principal investigator on projects for a broad spectrum of government agencies, holds 34 U.S. patents, and has chaired dozens of conferences on sensing and sensor technology. Dr. Lieberman currently serves as the 2015 President-Elect of SPIE, President of Lumoptix LLC, and CTO of Taff Optical.

Optical Fiber Sensors – Submicron to Suprakilometer

The advancement of optical waveguide technology has been driven by interplay between the development of techniques for sensing and for communications. This interplay has resulted in sensors capable of measuring physical and chemical properties at length scales comparable to entire railroad tunnels, comparable to cellular organelles, and a panoply of point sensors, distributed sensors, and sensor arrays for every length scale in between. As new waveguide-related technologies emerge, exciting new opportunities are arising to extend this range even further.

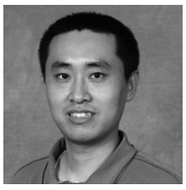
Brant Gibson

A/Prof. Gibson was awarded his PhD from La Trobe University in 2004. From 2004-05, he was a Research Fellow in the School of Physics at the University of Melbourne developing Ultra High Throughput Optical Probes for sub-diffraction limited microscopy. From 2005-09, A/Prof. Gibson was a Photonics Development Engineer at Quantum Communications Victoria (QCV) where he and colleagues designed and developed Australia's first commercial quantum security product (QCV SPS 1.01). From 2009-11, A/Prof. Gibson was a Senior Research Fellow in Physics at The University of Melbourne and in 2011 he was awarded an ARC Future Fellowship on Hybrid Diamond Materials for Next Generation Sensing, Biodiagnostic and Quantum Devices. In July 2013, he commenced the position of Senior Lecturer at RMIT University in the School of Applied Sciences. A/Prof. Gibson is the RMIT Node Leader and a Science Theme Leader of the Australian Research Council Centre of Excellence for Nanoscale BioPhotonics.

Hybrid nanodiamond-doped photonic sensors

Fluorescent nanodiamonds (NDs) have a range of unique properties which make them highly desirable for solid system quantum applications. Their fluorescence is produced via optical excitation of atomic defects, such as the negatively charged nitrogen vacancy centre (NV), within the diamond crystal lattice. Possessing long-wavelength emission, high brightness, no photobleaching, no photoblinking, single photon emission at room temperature, nanometer size, biocompatibility, and an exceptional resistance to chemical degradation make NDs almost the ideal fluorescent nanoprobe. Furthermore, the NV defect has a spin-triplet ground state, within which its electronic spin can be polarised and read out optically at room temperature. I will discuss these exciting properties in detail and also give examples of ND integration with photonic materials for hybrid ND-photonic sensing applications. The approach for combining NV quantum emitters [1,2] with photonic structures has been developed by embedding NDs into tellurite (TZN) glass, which is then drawn into fiber. This approach allows improved efficiency of the NV emitter to be coupled to a bound mode in the fiber [3] and significantly enhances device robustness. Tellurite glass was selected as the host material as it is liquid at relatively low temperatures (600-700 °C), which minimizes ND oxidation while enabling the NDs to be mixed into the glass melt [4]. Tellurite glasses transmit light in the NV center excitation and emission wavelength range (500-800 nm), and have a high refractive index (n=2.0), which enhances the capture of the NV emission in the fiber core. In this work, the origin of loss in ND-doped tellurite glass was explored [5]. Based on this understanding, the loss of ND-doped tellurite fibers was reduced by more than an order of magnitude down

to 10 dB/m across the 600-800 nm wavelength range while preserving functional NDs in the glass [6]. Using these optimised fabrication conditions, propagation of quantum information is being explored through ND-doped fibers as a backbone for remote hybrid diamond-photonic applications.



Chunle Xiong

Dr Chunle Xiong received his PhD in Physics from University of Bath, UK in 2008, for his work on optical nonlinearities in photonic crystal fibres. After his PhD, he joined the Centre for Ultrahigh bandwidth Devices for Optical Systems (CUDOS) at the University of Sydney as a postdoctoral fellow and started working on nonlinear photonics based on photonic chip platforms, in particular on-chip single-photon sources for integrated quantum technologies. In 2011, Chunle was promoted to a research fellow and appointed as the project leader of a CUDOS flagship project - quantum integrated photonics. In late 2011, Chunle was funded a fellowship by the Australian Research Council under the Discovery Early Career Researcher Award (DECRA) scheme. The fellowship allowed him to work on a three-year project, "quantum entanglement using slow-light-enhanced nonlinearity" from 2012 to 2015. Chunle's current research interest is the generation of on-demand single photons and entangled photons, as well as the processing of these photons on photonic chip platforms for secure communication.

Multiplexing of Heralded Single Photons

We present our recent progress on increasing the probability of heralded single photon generation in spontaneous four-wave mixing processes through spatial, temporal and wavelength multiplexing. The multiplexed photons are highly indistinguishable, useful for quantum applications.

Claire Davis

Dr Claire Davis is a Senior Research Scientist in the Aerospace Division of the Australian Defence Science and Technology group. She received her B.Sc. in Applied Sciences from Trinity College Dublin in 1992, M.Sc. in Optoelectronics from the Queens University Belfast in 1993 and a PhD in fibre optic sensing from Swinburne University in 2000. She provides technical leadership for the fibre optic sensing program within the Airframe Diagnostics area with a focus on the development and evaluation of fibre optic sensors and systems for application to the structural health monitoring of Defence platforms. She has been actively involved in the area of optical fibre sensing for the past 15 years and has authored over 50 technical publications in this area.

Monitoring the Structural Health of Defence Platforms with Optical Fibres

Optical fibre sensors present opportunities for health monitoring of Defence platforms primarily due to their size, robustness, capacity for distributed sensing and immunity to electromagnetic interference. This paper reports on selected research in this area by the Australian Defence Science and Technology (DST) Group.

Daniel Shaddock

Daniel Shaddock obtained his PhD from the ANU for research into interferometry for gravitational wave detection. He joined the Jet Propulsion Laboratory in 2002 to work on the Laser Interferometer Space Antenna, a space based gravitational wave detector. On returning to Australia 10 years later he led Australia's involvement in the GRACE Follow-on project, an upcoming satellite mission to map the Earth's water using sensitive measurements of gravity and is now a Professor at the ANU and the CEO of Liquid Instruments, a start-up company spun out of the ANU's Research School of Physics and Engineering.

LISA Pathfinder and beyond: laser interferometry in space

LISA PathFinder is a European Space Agency mission to demonstrate key technologies for space-based gravitational wave detectors such as eLISA. After more than a decade of development, LISA Pathfinder will be launched in December 2015 from Europe's spaceport in French Guiana. This talk will give an overview of the eLISA concept, a walkthrough of LISA Pathfinder technology and future plans for testing space-based interferometry on the GRACE Follow-on mission.

Darren D. Hudson

Darren Hudson received his PhD in 2009 from the University of Colorado (USA) in the area of atomic, molecular and optical physics. In 2010, he joined the ARC Centre of Excellence CUDOS at the University of Sydney as a postdoctoral researcher in mid-Infrared optics. In 2013, he was awarded an early career research grant by the Australian Research Council to

conduct research in the area of mid-IR, ultrafast fiber laser development. Since then his group at the University of Sydney has demonstrated the first single-frequency mid-Infrared fiber laser and the first mid-Infrared ultrashort pulse fiber laser. His current research involves developing high performance mid-IR ultrashort fiber lasers and creating broadband mid-IR sources through on-chip supercontinuum.

Photonic Chip Platforms for Supercontinuum Generation in the Mid-IR
We present key results of silicon-on-sapphire and chalcogenide planar waveguides aimed at producing multi-octave spanning supercontinuum on a chip in the mid-Infrared wavelength range.

Erik Schartner

Erik completed his PhD under the supervision of Prof Heike Ebendorff-Heidepriem, Dr Shahraam Afshar and Prof Tanya Monro on a collaborative project with The Defence Science and Technology Organisation on a project entitled "Hydrogen peroxide sensing with microstructured optical fibres: fuel, wine and babies." Since the completion of his PhD Erik has worked on a linkage project with Cook Medical, on the development of novel optical fibre probes for measurements of pH and temperature in the local medium surrounding embryos. He is currently working as a Research Fellow in the Centre for Nanoscale Biophotonics, looking at the deployment of novel optical fibre sensors in bioapplications.

Cancer Margin Detection Using a pH Sensitive Optical Fibre Sensor
We demonstrate detection of cancerous tissue in excised human tissue samples, using a polymer coated fibre optic probe sensitive to the pH of the tissue.

James Anstie

James Anstie was awarded his PhD at the University of Western Australia for work on ultra-stable cryogenic oscillators. He has worked with Rio Tinto to develop ultrasensitive airborne gravity sensors and now works within IPAS exploring new techniques for precision optical spectroscopy as part of Andre Luiten's Precision Measurement Group at the University of Adelaide. He is the recipient of a South Australian government Catalyst Research Grant, as well as several Australian Research Council grants aimed at investigating new spectroscopic techniques.

A Flexible Platform for Quantitative Frequency-Comb Spectroscopy
We are developing a flexible platform for high-performance frequency-comb spectroscopy. We outline its current capabilitiesand discuss progress towards realising a practical device forindustrial monitoring, trace gas detection and medical breathanalysis

James Leger

Prof. James Leger currently holds both the Cymer Professorship of Electrical Engineering and the Mr. and Mrs. George W. Taylor Distinguished Professorship in the College of Science and Engineering at the University of Minnesota. His research group studies a wide variety of optical techniques, including mode control of semiconductor and solid-state lasers, incoherent and coherent laser beam addition, laser metrology, solar energy optics, and the design of exotic imaging systems. He is a Fellow of the Optical Society of America, Fellow of the Institute of Electrical and Electronic Engineers (IEEE), and Fellow of the International Society of Optical Engineers (SPIE).

The Physics of Coherent Fiber Laser Beam Combining
We explore the self-phasing behaviour observed between fibers in a coherent laser array. By isolating the contribution from the Kramers-Kronig effect, we show that this mechanism can compensate for random phase errors in the array.

Jörg Schmiedmayer

Has a chair of Experimental Physics at the Technical University in Vienna (TU-Wien) and is one of the founders of the Vienna Center for Quantum Science and Technology. He studied physics and astronomy in Vienna. After a master thesis in High Energy Physics at CERN he received his Ph.D. in nuclear physics from the TU-Wien. He then turned to quantum science and spent several years as a researcher at the Rowland Institute of Science, at Harvard University and at MIT before joining the Univ. Innsbruck to develop a concept of the "AtomChip". After receiving tenure in Innsbruck, he took first a chair in experimental physics at the Universität Heidelberg and then later came back to the TU-Wien. His current research concentrates on fundamental questions of quantum physics like how our classical world emerges from microscopic quantum dynamics and on how the quantum world can be made robust enough to build technologies and applications.

In 2006, Schmiedmayer was awarded the Wittgenstein prize from the Austrian Federal Ministry of Science and Research and in 2013, an ERC Advanced grant from the European Research Council. For more details seehttp://atomchip.org/

Does an isolated quantum system relax?

Interfering two isolated one-dimensional quantum gases we study how the coherence created between the two many body systems by the splitting process slowly degrades by coupling to the many internal degrees of freedom available [1]. Two distinct regimes are clearly visible: for short length scales the system is characterized by spin diffusion, for long length scales by spin decay [2]. For a sudden quench the system approaches a pre-thermalized state [3], which is characterized by thermal like correlation functions in the observed interference fringes with an effective temperature over five times lower than the kinetic temperature of the initial system. A detailed study of the time evolution of the correlation functions reveals that these thermal-like properties emerge locally in their final form and propagate through the system in a light-cone-like evolution [4]. Furthermore we demonstrate, that the pre-thermalized state is described by a generalized Gibbs ensemble [5]. This is verified through a detailed study of the full non-translation invariant phase correlation functions up to 10th order. Finally we show two distinct ways for subsequent evolution away from the pre-thermalized state. One proceeds by further de-phasing, the other by higher order phonon scattering processes. In both cases the final state is indistinguishable from a thermally relaxed state. We conjecture that our experiments points to a universal way through which relaxation in isolated many body quantum systems proceeds if the low energy dynamics is dominated by long lived excitations (quasi particles).

Marcus Doherty

Dr Doherty was conferred his PhD by the University of Melbourne in 2012. For his PhD thesis, Dr Doherty was awarded the Chancellor's Prize for Excellence in the PhD thesis by the University of Melbourne. In 2012, he commenced his postdoctoral fellowship at the Australian National University. In 2013, he began lecturing at the Australian National University and undertook a visiting fellowship to the Network for Functional Nanotechnologies, Baden-Württemberg, Germany. In 2014 and 2015, Dr Doherty made several research tours across Europe and the USA that were supported by competitive travel grants. For his postdoctoral research, Dr Doherty has been awarded the 2015 Phillip Law Award by the Royal Society of Victoria and the 2015 Geoff Opat Early Career Researcher Prize by the Australian Optical Society. Dr Doherty is continuing his postdoctoral fellowship at the Australian National University. His research is focussed on the innovation of optical solid-state quantum technologies, with projects ranging from discovering optical defects in solids, developing quantum microscopy techniques and addressing problems in solid-state quantum computing.

Diamond quantum microscopy

Optical defects in diamond are forging new frontiers in high-resolution high-sensitivity quantum microscopy with applications ranging from nano-magnetometry to –piezometry. Here, techniques for universal sensitivity enhancement, advanced nano-electrometry and novel force microscopy are reported.

Martin Ploscher

Martin Ploschner received his PhD from the University of St Andrews, Scotland in 2012 for his studies exploring novel optical manipulation techniques utilising plasmon resonances. From 2012 to 2015, Martin has worked as a Research Fellow at the University of St Andrews/University of Dundee (UK) under the supervision of Dr Tomas Cizmar. Here, he developed ultrafast beam-shaping holographic techniques for microendoscopy utilising multimode fibre. This technology enabled on-the-fly beam-shaping in multimode fibres for both imaging and manipulation purposes. He is now based at Macquarie University, Sydney, where he works as a research fellow at the local node of the ARC Centre for Nanoscale Biophotonics. His current research activities range from ultrafast beam-shaping in complex media, non-invasive light-sheet microscopy, to compressive sensing imaging and to novel structured illumination imaging modalities.

Raman Kashyap

Dr Raman Kashyap is a full Professor, jointly appointed in the Departments of Engineering Physics and Electronics Engineering at Polytechnique Montreal, and currently holds a Canada Research Chair in Future Photonics Systems. Dr. Kashyap previously worked at BT Research Laboratories in the UK for 25 years, researching optical fibres, optical devices and applications in photonics. He is the author of a book on Fiber Bragg gratings and has filed more than 40 patents, published over 500 papers in journals and conferences and presented over 100 invited seminars. Dr. Kashyap is an elected Fellow of the Optical Society of America, the SPIE, the Engineering Institute of Canada, the Canadian Academy of Engineering, the Institute of Physics, and the Academy of Sciences of the Royal Society of Canada.

Shape sensing with optical fibres: the present and the Future

Surgical instruments such as catheters or biopsy needles requiring

accurate tracking can benefit from the use of optical fibres due to their flexiblity, small cross-section and the ability for incorporation into existing equipment, without increasing the footprint. Shape sensing, which is the reconstruction of shape of the instrument head as it is being utilised invivo is required for real time monitoring and for the safety of the patient, allowing one to reach the targeted cells or blood vessels with greater accuracy. Fibre Bragg gratings (FBGs) written into optical fibres may be used for sensing strain, and by the use of 3 fibres with carefully positioned FBGs, it is possible to determine the shape of such a surgical tool as it flexes and is manipulated within a patient. Also possible is shape sensing with optical frequency domain reflectometry (OFDR) without FBGs, which has recently been demonstrated to be a highly effective scheme for truly distributed shape reconstruction of the entire needle, instead of point located sensing as in the case of the FBGs. This presentation will review the current schemes as well as the latest developments for future applications.

Robert McLaughlin

After completing his PhD at the University of Western Australia, Dr McLaughlin was employed for three years at the University of Oxford as a postdoctoral researcher. He then left academia for industry, working in a spin-off company from the University of Oxford, and eventually being appointed as Product Manager at Siemens Medical Solutions. He was responsible for the development of three commercial medical products. He returned to Australia in 2007 and took a position as Associate Professor at the University of Western Australia (UWA). He has published 2 book chapters, 59 scientific journal papers and 7 patents, and been awarded over $3.5M in research funding. He has over 1500 citations in Google Scholar. In 2011, he received the National Breast Cancer Foundation Patron's Award for 'Innovation and Vision in Research, and was awarded a fellowship from Cancer Council WA. In 2014, he won the SPIE Start-up Challenge business pitch competition as part of Photonics West, and led the team named as WA Innovator of the Year. He was also a recipient of the UWA Vice-Chancellor's Mid-career Research Award and lead the team awarded the UWA Vice-Chancellor's Award for Impact and Innovation. His work has focused on the development of optical needle probes, with a particular focus on their use in cancer.

A microscope-in-a-needle: OCT and fluorescence needle probes

Optical imaging technologies, such as optical coherence tomography (OCT), have the potential to provide exquisitely high-resolution images of tissue. However, their limited image penetration depth places most diseases beyond their reach. Our lab has focused on the development of OCT needle probes, highly miniaturized imaging probes that are encased within a hypodermic needle, and that may be inserted deep into tissue. In this talk, I will describe our development of OCT needle probes, showing specific case-studies in breast cancer and lung imaging. Our smallest 3D scanning probes have an outer diameter of only 310 microns, and are encased within a 30-gauge needle. We have developed dynamic needle probes, capable of acquiring 3D volumetric datasets in a few seconds. We have also integrated our probes into biopsy needles to guide tissue sampling and to warn of nearby blood vessels. Recent work has looked at the development of flexible needles for endobronchial imaging. In addition, we have developed the first dual-modality needle probes, capable of simultaneously acquiring OCT and fluorescence images, and showed them to be sufficiently sensitive to detect signal from fluorescently-labelled anti-bodies targeted for specific cells types.

Shigeki Tokita

Institute of Laser Engineering, Osaka University

Shigeki Tokita is an associate professor of the Institute of Laser Engineering (ILE), Osaka University. After receiving his Dr. Eng. from the Osaka University in 2006, he was an assistant professor at the Institute for Chemical Research, Kyoto University in 2006–2013. His research interests are in high-power fiber lasers and laser-plasma interactions. He conducts research in efficient high-average-power Yb-doped lasers, Er-doped mid-infrared fiber lasers, control of energetic electron beam produced by ultrahigh-intensity laser pulses and strong terahertz wave generation by laser-plasma interactions. He is also a director of the project to upgrade the LFEX petawatt laser system.

High Power 3 μm Erbium Fiber Lasers and Their Applications.

Recent breakthroughs in fluoride-fiber laser technologies enabled high power mid-infrared output of a few tens of watts with long lifetime operation of more than 1000 hours. We will review the recent advances in high power 3 μm Er fiber lasers. The high power 3 μm fiber lasers are significantly useful for laser processing of transparent materials. We also will introduce new glass processing techniques (cutting, chamfering, and welding) using a 3 μm fiber laser.

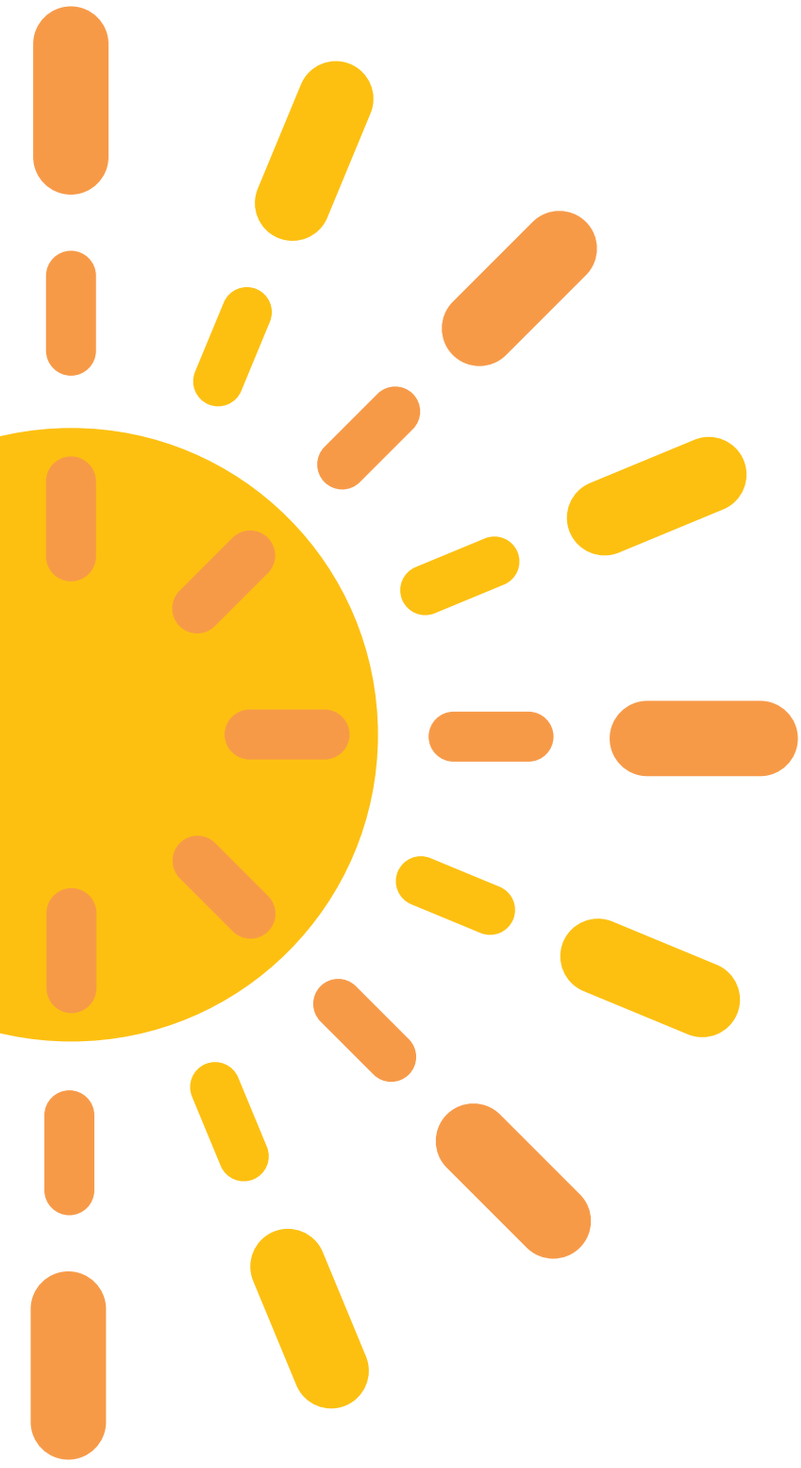
Simon Gross

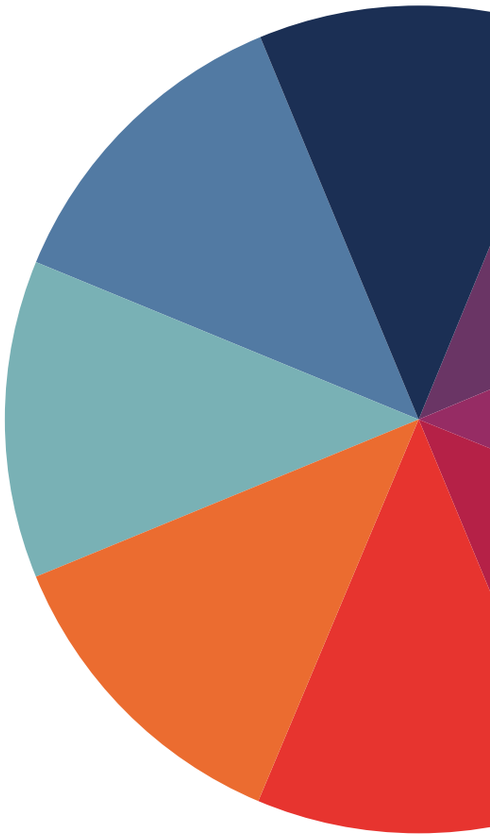
Simon Gross received his M.Sc. degree in Microelectronics from the Vienna University of Technology, Austria and PhD degree in Physics from Macquarie University, Australia in 2009 and 2013, respectively. He is a Macquarie University Research Fellow at the MQ Photonics Research Centre and Centre for Ultrahigh Bandwidth Devices for Optical Systems (CUDOS) at

Macquarie University. His research interest are the application of ultrafast lasers to optical materials processing in particular laser direct-writing of photonic waveguide devices for telecommunication, sensing and astronomical applications. Hi is a member of the Australian Optical Society and The Optical Society and SPIE.

Laser-written 3D integrated photonics

Femtosecond laser direct-writing is an enabling technology for the fabrication of 3D integrated photonic circuits. Recentprogress on 3D integrated photonics for astronomy, opticalcommunication and beam shaping of high power diode lasers isreviewed.





Abstracts – Oral

Adrian Ankiewicz

MULTI-ROGUE WAVES AND TRIANGLE NUMBERS

Adrian Ankiewicz and Nail Akhmediev

The number of components in any complicated rogue wave is a triangle number. We propose using a 2d integral to identify this number. This work can be applied widely to determine the rogue wave order in nonlinear patterns arising in optical fibres, water waves, plasmas and other phenomena.

Optical Sciences Group, Research School of Physics and Engineering, The Australian National University

Agnieszka Zuber

GOLD RUSH WITH AN OPTICAL FIBRE

Agnieszka Zuber, Malcolm Purdey, Erik Schartner, Caroline Forbes, Benjamin van der Hoek, David Giles, Andrew Abell, Tanya Monro and Heike Ebendorff-Heidepriem

We report a portable method for fluorescence-based detection of gold with detection limit as low as 74ppb. Using an optical fibre results in higher sensitivity for larger nanoparticles than cuvette measurements.

University of South Australia, Adelaide; Deep Exploration Technologies Cooperative Research Centre, School of Physical Sciences, The University of Adelaide; Univeristy of Adelaide, Institute for Photonics and Advanced Sensing; ARC Centre of Excellence for Nanoscale BioPhotonics, The University of Adelaide

Albert Ruiz Vargas

THE USE OF FIBRE OPTIC SENSING TECHNOLOGY WITH INTRALUMINAL IMPEDANCE CATHETER FOR FUNCTIONAL GASTROINTESTINAL MOTILITY DISORDERS

A Ruiz-Vargas, M Costa, L Wiklendt, PG Dinning and JW Arkwright

We present a composite impedance fibre optic manometry catheter for monitoring functional gastrointestinal disorders (FGID). The catheter uses a dual lumen silicone extrusion to separate each technology and has been validated in ex-vivo animal models.

Human Physiology, Flinders University; Gastroenterology and Surgery, Flinders Medical Centre; School of Computer Science, Engineering and Mathematics, Flinders University

Alexander Wood

MEASUREMENT OF GEOMETRIC PHASE WITH ROTATING NITROGEN-VACANCY CENTRES

A. A. Wood, Y. Fein, L. C. L. Hollenberg, R. E. Scholten and A. M . Martin

We report on progress towards experimental measurement of quantum geometric phase in mechanically rotated ensembles of nitrogen-vacancy centres in diamond. Extensions to the experiment include precision sensing of rotation and measuring geometric phase from single NV-centres.

Centre for Quantum Computation and Communications Technology, University of Melbourne; University of Melbourne

Alexei Tikhomirov

CO2 LASER FIBRE TAPER PROFILING FOR SPLICE-FREEFIBRE LASER ARRAYS

Alexei Tikhomirov, Scott Foster

We propose and investigate the use of a CO2 laser for the fabrication of couplers in a double-core (DC) fibre for splice-free fibre laser arrays. We demonstrate couplers with improved bandwidth (50 nm) and fabrication of dual taper couplers in DC fibres with a possibility of relative phase adjustment in the cores of the fibre by elongating the fibre section between the tapers.

DST Group

Alvaro Casas Bedoya

TUNABLE RF FILTER ENABLED BY STIMULATED BRILLOUIN SCATTERING (SBS) IN SILICON

Alvaro Casas-Bedoya, Blair Morrison, Mattia Pagani, David Marpaung and Benjamin J. Eggleton

We report the first functional signal processing device based on stimulated Brillouin scattering in a silicon nanowire, a high performance tunable RF photonic notch filter with 48dB suppression, using only 0.98dB of on-chip SBS gain.

University of Sydney

Amol Choudhary

A LOW-THRESHOLD BRILLOUIN LASER IN A CHALCOGENIDE WAVEGUIDE

A.Choudhary, B.Morrison, D. Marpaung, K. Vu, B. Luther-Davies, S. Madden and B.J Eggleton

In this paper, we demonstrate optimized fabrication of a chalcogenide rib waveguide to realize a Brillouin laser with a low threshold power of 83 mW at a wavelength of 1550.05 nm.

Laser Physics Centre, Australian National University; CUDOS, School of Physics, University of Sydney

Amol Choudhary

50DB BRILLOUIN GAIN IN CHALCOGENIDE WAVEGUIDES

B. Morrison, K. Vu, A. Choudhary, B. Luther-Davies, S. J. Madden, D. Marpaung, and B. J. Eggleton

We report on the demonstration of more than 50dB of Stimulated Brillouin Scattering gain in a compact chalcogenide waveguide. We anticipate this breakthrough will lead to new functionalities for microwave photonics and Brillouin Lasers.

Laser Physics Centre, Australian National University; CUDOS, School of Physics, University of Sydney

Andrea Blanco-Redondo

OBSERVATION OF WAVEGUIDING BY TOPOLOGICAL DEFECTS IN A SILICON PHOTONIC PLATFORM

A. Blanco-Redondo, I. Andonegui, M.J. Collins, G. Harari, Y. Lumer, M.C. Rechtsman, B.J. Eggleton, M. Segev

We experimentally demonstrate, in a silicon photonic platform, the existence of topologically protected defect states by interfacing two dimer chains with different topological invariants.

University of Sydney; University of the Basque Country; Technion Institute of Technology; Penn State University

Andrew Malouf

MODELLING OF A 3.5M DUAL-WAVELENGTH PUMPED FIBRE LASER

A. Malouf, O. Henderson-Sapir and D. J. Ottaway

We present a numerical model of a dual-wavelength pumped Er3+ doped ZBLAN fluoride glass fibre laser that generates laser light at 3.5μm. The numerical model demonstrates good agreement with experimental results.

University of Adelaide

Andri Mahendra

DYNAMIC THERMAL CONTROL OF SILICON NITRIDE PHOTONIC INTEGRATED CIRCUITS

A. Mahendra, C. Xiong, X. Zhang, B. J. Eggleton, P. H. W. Leong

Multiple heaters in photonic integrated circuits must be controlled accurately to achieve reliable performance of the thermooptic system. In this paper, we show wavelength stabilization using a system with unique design for silicon nitride circuits.

Centre of Ultrahigh bandwidth Devices for Optical Systems(CUDOS), Institute of Photonics and Optical Science (IPOS), School of Physics, The University of Sydney; Computer Engineering Lab, School of Electrical and Information Engineering, The University of Sydney

Ann Roberts

METASURFACE OPTICAL RANSFER FUNCTIONS

A. Roberts, K. Singh and T.J. Davis

Here we present the investigation of the optical transfer functions of metasurfaces supporting subradiant plasmonic modes. Such an approach has significant implications for new forms of optical imaging and optical information processing.

The University of Melbourne

Ashby Hilton

BIDIRECTIONAL MICROWAVE AND OPTICAL SIGNAL DISSEMINATION

P. S. Light, A. P. Hilton, R. T. White, C. Perrella, J. D. Anstie, J. G. Hartnett, G. Santarelli, and A. N. Luiten

We present a technique to transfer the stability of a microwave frequency reference to an optical frequency comb in a different location, allowing for both stabilized optical and microwave measurements at both locations.

University of Adelaide

Atia Tul Noor

DISSOCIATIVE DOUBLE IONIZATION OF ACETYLEN IN STRONG LASER FIELD

Atia-tul-noor, Han Xu, Xiaoshan Wang, Robert Sang and Igor Litvinyuk

We studied the molecular dynamics in strong laser field by investigating the dissociative double ionization of acetylene using single short laser pulse and pump probe approach along with COLTRIMS technique.

Griffith University

Ben Sparkes

BRIGHTNESS ENHANCEMENT OF A COLD ION SOURCE USING STIMULATED RAMAN ADIABATIC PASSAGE

B. M. Sparkes , R. J. Taylor, D. Murphy, R. W. Speirs, A. J. McCulloch, and R. E. Scholten

We demonstrate enhanced excitation efficiency in a cold atom ion source using stimulated Raman adiabatic passage, enabling increased brightness in next-generation atomic beam ion sources for sub-nanometer resolution imaging and fabrication of nano-devices.

University of Melbourne

Bretislav Mikel

PREPARATION AND MEASUREMENT OF FBG BASED LENGTH, TEMPERATURE AND VIBRATION SENSORS

B. Mikel, R. Helan, M. Holik, J. Hrabina, M. Jelinek and O. Cip

We present fiber Bragg gratings based sensors for measurement length and temperature and tilted fiber Bragg gratings based vibration sensors. We prepared sensors and system to monitoring of the nuclear power plant containment shape deformation.

Institute of Scientific Instruments of the CAS, v. v. i.; NETWORK GROUP

Bryn Bell

SINGLE PHOTON LEVEL FREQUENCY CONVERSION IN A SILICON NANOWIRE

B.A. Bell , C. Xiong, A. Casas-Bedoya, B.J. Eggleton

Frequency conversion of single photon level light is demonstrated using optical Bragg scattering in a silicon waveguide for the first time. We measure a conversion efficiency of 32%, and interference between two disparate input frequencies.

University of Sydney

Carly Whittaker

FABRICATION OF POLYMER OPTICAL FIBRES FOR RADIATION SENSING

C. A. Whittaker, H. Ebendorff-Heidepriem, N.A. Spooner, D. Ottaway

We report on the use of billet ram extrusion as a method for fabrication of microstructured polymer optical fibres for radiation sensing applications. Extrusion and fibre drawing conditions are investigated to determine their impact on optical performance.

DST Group; ARC Research Hub for Australian Copper-Uranium; ARC Centre of Excellence for Nanoscale BioPhotonics; Institute for Photonics and Advanced Sensing (IPAS) and the School of Physical Sciences, The University of Adelaide

Chris Vale

THERMODYNAMICS OF A 2D FERMI GAS

K. Fenech, P. Dyke, T. Peppler, M. G. Lingham, S. Hoinka, H. Hu and C. J. Vale

We measure the thermodynamic equation of state for a 2D Fermi gas with attractive interactions. This displays a nonmonotonic behaviour characteristic of lower-dimensional systems.

Swinburne University of Technology

David Lancaster

WATT-LEVEL HOLMIUM GUIDED-WAVE CHIP LASER FOR MODE-LOCKING AND SINGLE FREQUENCY APPLICATION

D.G. Lancaster, V.J. Stevens, V. Michaud-Belleau, S. Gross, T.M. Monro

We report the highest-power glass guided-wave chip laser and achieve over 1 W of output power in monolithic operation near 2070 nm (69% slope efficiency). Tunability from 2010 nm to 2100 nm, and a beam quality of M2=1.09 are demonstrated.

IPAS, University of Adelaide; University of South Australia; MQ Photonics Research Centre, Macquarie University; Centre d'optique, photonique et laser (COPL), Université Laval

Dene Murphy

RYDBERG BLOCKADED COLD ION BEAMS

D. Murphy, A.J. McCulloch, R.E. Scholten and B.M. Sparkes

Cold ion bunches offer a unique platform for the study of intra-beam Coulomb effects pertinent to ultrafast electron diffraction studies. We use Rydberg blockade to correlate the ions, improving the bunch brightness, coherence and focusability.

School of Physics, The University of Melbourne

Dmitrii Stepanov

ALL-FIBRE TUNABLE WAVEPLATE FOR POLARISATION CONTROL

D.Yu. Stepanov

An all-fibre reflective tunable waveplate is demonstrated comprising Bragg gratings written in a photosensitive polarisation maintaining fibre. Polarisation control of a laser spanning three loops on a Poincaré sphere is demonstrated by tuning the laser wavelength.

DST Group

Douglas Little

INTERFACING SPIDER SILKS WITH ULTRAFAST-LASER WRITTEN INTEGRATED OPTICS

D. J. Little, A. Arriola, M. J. Withford and D. M. Kane

Evanescent coupling of light into spider silks is demonstrated using an optical chip fabricated using the ultrafast-laser direct-write technique.

MQ Photonics Research Centre, Department of Physics and Astronomy, Macquarie University; Centre for Ultra-high Bandwidth Devices for Optical Systems, Department of Physics and Astronomy, Macquarie University

Elizaveta Klantsataya

SURFACE PLASMON SCATTERING IN EXPOSED CORE OPTICAL FIBER FOR ENHANCED RESOLUTION REFRACTIVE INDEX SENSING

E. Klantsataya, A. François, H. Ebendorff-Heidepriem, P. Hoffmann, and T.M. Monro

We report on a development of a small core optical fibre Surface Plasmon Resonance (SPR) sensor with reduced linewidth.Narrower SPR curves make smaller spectral shifts resolvable thereby improving sensor resolution and detection limit.

University of South Australia; The University of Adelaide, Institute for Photonics and Advanced Sensing; ARC Centre of Excellence for Nanoscale BioPhotonics

Gary Allwood

OPTICAL FIBRE BRAGG GRATING SENSOR BASED REED SWITCH FOR PHYSICAL INTRUSION DETECTION

G. Allwood, G. Wild, S. Hinckley

This paper describes a fibre Bragg grating based reed switch for physical intrusion detection applications. The optical fibre reed switch can be used to detect a security breach in windows and doors.

Edith Cowan University

Geoff Pryde

EXPERIMENTAL MEASUREMENT-DEVICE-INDEPENDENT QUANTUM STEERING

Sacha Kocsis, Michael J.W. Hall, Adam J. Bennet, Dylan J. Saunders, Geoff J. Pryde

Quantum steering is a form of nonlocality that is quite robust to noise and optical loss. We experimentally show how to overcome a previous drawback of steering – the need to trust one party's measurement device.

University of Oxford; Max-Planck-Institut für Gravitationsphysik; Griffith University

Georgios Tsiminis

TOWARDS AN OPTICAL FIBRE SENSOR FOR MONITORING VITAMIN B12 IN BLOOD

G. Tsiminis, J. L. Brooks, T. M. Monro, M. R. Hutchinson

This work discusses progress in creating an optical fibre sensor based on Raman spectroscopy to measure levels of vitamin B12 in human blood, a modifiable risk factor for dementia and Alzheimer's disease.

Institute for Photonics and Advanced Sensing and School of Physical Sciences, The University of Adelaide; School of Medicine, The University of Adelaide; University of South Australia; ARC Centre of Excellence in Nanoscale Biophotonics, The University of Adelaide

Han Xu

DOUBLE-PEAK STRUCTURE OF R-DEPENDENT ENHANCED IONIZATION RATE OF H2+

Han Xu, Feng He, Dave Kielpinski, Robert Sang, Igor Litvinyuk

Our pump-probe experiment using extremely short few-cycle pulses and ab initio simulation verifies the double-peak structured internuclear-distance-dependent enhanced ionization rate of Hydrogen molecule ion, which is predicted by fix-nuclei model decades ago.

Griffith University

Hannes Griesser

STRONG NONLINEARITIES WITH SUSPENDED-CORE FIBRES

H.P. Griesser, C. Perrella, A.N. Luiten, R. Kostecki and P.S. Light

Suspended-core microstructured optical fibers have demonstrated strong interaction between guided modes and surrounding matter, with modelling and initial result suggesting it may provide a robust platform for the photon-photon interactions required for quantum logic.

University of Adelaide

He Shi

TRANSIENT PRESSURE MEASUREMENT IN PIPELINES USING OPTICAL FIBRE SENSOR

H. Shi, J. Gong, J. W. Arkwright, A. W. Papageorgiou, M. F. Lambert, A. R. Simpson, A. C. Zecchin

This paper reports a preliminary experimental study on transient pressure measurement in pipelines using an optical fibre sensor. The measurement of the optical sensor is consistent with that from a conventional pressure transducer.

The University of Adelaide; Flinders Univeristy

Hua Lu

SELECTIVE ABSORPTION OF LIGHT IN MONOLAYER GRAPHENE BY EXCITATION OF GRAPHENE PLASMONS

Hua Lu and Min Gu

The light absorption of monolayer graphene is investigated in the graphene-dielectric grating structure. We find that graphene absorption is significantly enhanced and possess selectivity in the mid-infrared region due to the excitation of graphene plasmons.

Swinburne University of Technology

Igor Litvinyuk

TIMING ELECTRON LOCALIZATION IN DISSOCIATING H2+

H. Xu, X. Wang, A. Atia-Tul-Noor, D. Kielpinski, R. T. Sang, and I. V. Litvinyuk

We measure the timing of electron localisation in dissociating H2+ by using a CEP (carrier envelop phase)-stabilized few-cycle pump-probe scheme. Electron localization occurs after 15 fs following the initial ionization of neutral H2.

Griffith University; Lanzhou University

Ivan Maksymov

THIRD HARMONIC GENERATION AND ULTRASOUND DETECTION WITH LONG DIPOLE PLASMONIC ANTENNAE

I.S. Maksymov and A.D. Greentree

Efficient nonlinear optical generation at the nanoscale and all-optical detection of ultrasound are two unrelated outstanding technological problems. We suggest and theoretically demonstrate that both problems can be solved by using long dipole plasmonic nanoantennae.

ARC Centre for Nanoscale BioPhotonics, RMIT University

Jae M.O. Daniel

WIDELY TUNABLE THULIUM FIBRE SOURCES FOR MEDICAL, INDUSTRIAL AND SCIENTIFIC APPLICATIONS

Jae M. O. Daniel

Within the published literature, wavelength coverage of thulium fibre laser sources has been demonstrated from 1650 nm – 2200 nm in a silica host. Results of these fibre laser tuning experiments are collated to highlight the remarkable flexibility as well as highlighting the broad range of applications for such sources.

Defence Science and Technology Group; Aether Photonics

Jasper Cadusch

A PLASMONIC PHOTODIODE FOR DIRECT POLARIZATION STATE READOUT

J. J. Cadusch, E. Panchenko, T.D.James and A. Roberts

We present a unique metal-semiconductor-metal (MSM) photodiode design capable of converting the polarisation state of an incident beam into an electric signal, using passive or active optical antennas.

The University of Melbourne

Jesse Everett

STATIONARY LIGHT IN AN ATOMIC RAMAN MEMORY

J.L. Everett, G.T. Campbell, Y-W. Cho

We present a novel solution for stationary light. The solution is based on the time-reversal symmetry of 3-level atoms. We provide experimental evidence including absorption imaging of the stationary atomic coherence.

Centre for Quantum Computation and Communication Technology, ANU

Jiahao Dong

POLARISATION IMPEDANCE MATCHING SPECTROSCOPY – A NEW METHOD FOR CAVITY ENHANCED GAS SENSING

Jiahao Dong, Timothy T-Y. Lam, Roland Fleddermann, Yajie Guan, Chathura P. Bandutunga, David E. McClelland, Malcolm B. Gray, and Jong H. Chow

We present a new architecture for gas absorption measurements, which utilises the non-degenerate polarisation resonances of an optical cavity. A CO2 absorption line was measured and initial noise equivalent absorption of 2.2×10-9 Hz-1/2 was achieved.

Research School of Physics and Engineering, Australian National University; National Measurement Institute

Jiakun He

INTEGRATED SILICON PHOTONIC DEGENERATE PHOTON PAIR QUANTUM SPLITTER

Jiakun He, Byn A. Bell, Alvaro Casas-Bedoya, Yanbing Zhang, Alex S. Clark, Chunle Xiong and Benjamin J. Eggleton

We generate and deterministically split degenerate photon pairs with an on-chip silicon Sagnac loop coupled with a mirror for the first time. A Hong-Ou-Mandel dip with 94% visibility verifies the deterministic splitting.

CUDOS, School of Physics, University of Sydney

Joel Corney

CREATING NON-GAUSSIAN ENTANGLEMENT IN OPTICAL FIBRE

J. F. Corney, M. J. Tacey and M. K. Olsen

W use cumulants to characterise the departure of the statistics of Kerr-squeezed pulses from Gaussian behaviour, and correlate this with measures of entanglement for CV systems. Using stochastic methods, we simulate the quantum dynamics of non-Gaussian state production in optical fibre to determine the feasibility of detecting the non-Gaussian correlations experimentally.

The University of Queensland

John Arkwright

CLINICAL RESULTS FROM FIBRE BRAGG GRATING BASED INVIVO DIAGNOSTIC CATHETERS

P. G. Dinning, L. Wiklendt, J.W. Arkwright

Since 2008 we have been using fibre optic manometry catheters for monitoring pressure and contact force inside the human body. We present results and clinical interpretations of the data obtained from these studies.

Flinders Medical Centre

John Canning

SMARTPHONE SPECTROMETERS

J. Canning, M. A. Hossain, K. Cook, A. Jamalipour

Smartphone based spectrometers, the platform lab-in-a-phone technology, is reviewed.

The University of Sydney

Jonathon Hall

MULTILAYER RESONATOR SENSITIVITY ANALYSIS

J.M.M. Hall, S. Afshar, V., T. Reynolds, M.R. Henderson, A. François, N. Riesen and T.M. Monro

We present a new model for multilayer microresonators, which is generalised to include dipoles or dipole distributions in any layer. Simulating the whispering gallery mode spectra of a layered microresonator, refractive index sensitivity is analysed.

University of Adelaide

Josiah Firth

DEVELOPMENT OF A NOVEL OPTICAL ELECTRODE FOR BIOPOTENTIAL RECORDING

J.H. Firth, L. Silvestri, N. H. Lovell and F. Ladouceur

We present a prototype novel optical electrode that utilises Deformed Helix Ferroelectric Liquid Crystal (DHFLC) to transduce small biological voltage signals passively and linearly into the optical domain. Using the device, action potentials could potentially be visualized and measured using standard confocal microscopy.

UNSW Electrical Engineering and Telecommunications

Kashif Amir

NOISE EFFECT ON THE NONLINEAR FOURIER TRANSFORM

Kashif Amir, Wen Qi Zhang, Qun Zhang, Terence H. Chan, and Shahraam Afshar V

We compare the results of band-limited and white noise models of discrete eigenvalues of Nonlinear Fourier Transform and show that they agree, when the bandwidth of noise is larger than that of the signal.

Institute for Photonics and Advanced Sensing, University of Adelaide; Institute for Telecommunications Research, University of South Australia; Laser Physics and Photonic Devices Laboratories, School of Engineering, University of South Australia

Katie Chong

WAVEFRONT CONTROL WITH METADEVICES BASED ON ALL-DIELECTRIC HUYGENS' METASURFACES

Katie E. Chong, Isabelle Staude, Lei Wang, Anthony James, Jason Dominguez, Sheng Liu, Salvatore Campione, Ganapathi S. Subramania, Ting S. Luk, Manuel Decker, Dragomir N. Neshev, Igal Brener and Yuri S. Kivshar

We demonstrate efficient optical wavefront control at near-infrared frequencies by using two silicon metadevices based on Huygens' metasurfaces, namely a beamshaper and a hologram. Such metadevices show realistic potential for low-loss real-world applications.

Institute of Applied Physics, Abbe Center of Photonics, Friedrich-Schiller-Universität; Nonlinear Physics Centre, Research School of Physics and Engineering, Australian National University; Center for Integrated Nanotechnologies, Sandia National Laboratories

Ken Baldwin

PRECISION MEASUREMENT OF TUNE-OUT WAVELENGTHS IN METASTABLE HELIUM: A TEST OF QED

K. G. H. Baldwin, B. M. Henson, R. I. Khakimov, R. G. Dall, Li-Yan Tang, and A. G. Truscott

We present the first measurement for helium atoms of the tune-out wavelength at which the atomic polarizability vanishes. Using a novel atom laser based potential sensor we are able to measure polarizability with record sensitivity and provide independent verification of QED predictions in helium.

Wuhan Institute of Physics and Mathematics, Chinese Academy of Sciences; Australian National University

King Ung Hii

MULTIPLE-PASS LATERAL SHEARING INTERFEROMETER

K.U. Hii

A new multiple-pass configuration for lateral shearing interferometer is proposed for applications that require sensitive collimation detection. A laser beam with divergence angle as small as 1.1 x 10-3 degrees can be detected by this system.

Swinburne University of Technology Sarawak

Kristian Helmerson

SINGLE PHOTON VORTEX KNOTS

Kristian Helmerson and Sebastien Tempone-Wiltshire

In analogy to Feynman's double slit experiment, we demonstrate the formation of a complex 3D optical field – an optical vortex knot – one photon at a time.

Monash University

Lachlan Harris

SHORT-PULSE 1645NM ER:YAG LASERS

L.M. Harris, D.J. Ottaway and P.J. Veitch

We report an Er:YAG laser that produces 9 mJ pulses with 4.5 ns duration. The resulting 2 MW peak power is to our knowledge the highest achieved from the 1.6 μm transition in Er:YAG.

Adelaide University

Lars Hildebrandt

SINGLE-MODE INTERBAND CASCADE LASERS FOR SPECTROSCOPIC APPLICATIONS

L. Hildebrandt, J. Scheuermann, M. von Edlinger, R. Weih, L. Nähle, M. Fischer, J. Koeth, M. Kamp, S. Höfling

Distributed Feedback interband cascade laser devices targeting the Mid-IR absorption features of important gas species are presented. Application examples for industrial process control and environmental monitoring with sensitivity in the low ppb range are described.

Nanoplus Nanosystems and Technologies GmbH

Meg Knowles

DISTRIBUTED STRAIN SENSING USING OPTICAL FIBRES

M. Knowles, C. Davis, N. Rajic, J. Choi and G. Swanton

This paper reports on an experimental evaluation of a commercially available distributed fibre optic strain measurement system based on Rayleigh scattering. Measurements are compared to conventional electrical strain gauges and full field stress mapping techniques.

Defence Science and Technology Group

Miftar Ganija

A CRYOGENIC HO:YAG LASER

M. Ganija, N. Simakov, A. Hemming, J. Haub, J. Munch and P.J. Veitch

We report on the development of a continuous wave, Tm-doped fiber-laser pumped, cryogenically-cooled Ho:YAG laser. It exhibits the lowest threshold intensity ever observed in a Ho:YAG laser and produces an almost-diffraction-limited output.

The University of Adelaide; Defence Science Technology Group

Min Jet Yap

A VACUUM COMPATIBLE GLASS BASED SQUEEZED LIGHT SOURCE

Min Jet Yap, Terry G. McRae, Andrew R. Wade, Georgia L. Mansell, Sheon S.Y. Chua, Bram J. J. Slagmolen, Robert L. Ward, Daniel A. Shaddock and David E. McClelland

We present results of a prototype quasi-monolithic, glass based, vacuum compatible squeezed light source in the audio band frequency range. The squeezer aims to address issues limiting squeezed vacuum injection into interferometric gravitational wave detectors.

Université Pierre et Marie Curie; The Australian National University

Mirko Lobino

SCALABLE TRAPPED-ION SINGLE-PHOTON SOURCES WITH MONOLITHICALLY INTEGRATED OPTICS

M. Lobino, M. Ghadimi, V. Blums, B.G. Norton, P. Fisher, H. Hayden, J.M. Amini, C. Volin, D. Kielpinski, and E. W. Streed

We demonstrate the first fully integrated and scalable diffractive mirrors for efficient ion light collection. We also generated single photons using an Yb+ ion and collected them using these mirrors to do a quantum communication protocol.

HP Labs; Griffith University; Georgia Tech Research Institute

Murray Hamilton

A POLARIMETRIC BACK-SCATTER SONDE FOR DETERMINING CLOUD PHASE

Murray Hamilton, Huichao Luo, Thomas Chambers

A polarimetric backscatter sonde (polarsonde) is described that determines the thermodynamic phase of cloud particles. The significance of this to climate is discussed, and modeling and experimental results presented.

University of Adelaide

Murray Hamilton

DEVELOPMENT OF A DIGITAL HOLOGRAPHIC IMAGER FOR THE STUDY OF CLOUD MICROPHYSICS

Thomas Chambers, Murray Hamilton, Iain Reid

A low cost, light weight, digital holographic imaging system suitable for airborne measurements of three dimensional cloud microphysical parameters is presented.

University of Adelaide

Neil Broderick

FIRST DEMONSTRATION OF COMPLETE SPECTRAL CONTROL OF OPTICAL PULSES AT 1 MICRON

N. G. R. Broderick, J. Kho, M. C. Simpson, R. Provo, J.D. Harvey and Tom Killen and Qing Li

We report on the first demonstration of spectral and temporal shaping at 1 micron using a specially developed Waveshaper. Pulse compression, double pulse and parabolic pulse formation are demonstrated along with improved behaviour in a CPA system.

University of Auckland

Nicolas Riesen

ON THE FUNDAMENTAL LIMITS OF FAR-FIELD DETECTION OF THE WGMS OF ACTIVE MICROSPHERES

N. Riesen, A. François, T. Reynolds, M. R. Henderson and T. M. Monro

We explore the Q-factor limits for far-field sampling of the whispering gallery modes of active microspherical resonators. It is shown that non-resolvable 'mode-splitting' arising from slight asphericity accounts for the typically low Q-factors realized.

University of South Australia

Nicolas Riesen

THREE-DIMENSIONAL C+L BAND AND EDFA PUMP BAND INTEGRATED TAPERED MODE COUPLERS

N. Riesen, S. Gross, J. D. Love, and M. J. Withford

Three-dimensional C+L band mode couplers written into photonic chips using femtosecond lasers are reported. These integrated tapered couplers allow for mode multiplexing over broad bandwidths, with low loss and excellent mode extinction ratios.

IPAS, School of Physical Sciences, The University of Adelaide

Ori Henderson-Sapir

CO2 SENSING FOR MINING APPLICATIONS USING ER:ZBLAN, 2.8 μm FIBRE LASER

O. Henderson-Sapir, D. J. Ottaway and J. Anstie

We report on an Er:ZBLAN fibre laser operating at 2.8 μm for continuous in-situ sensing of CO_2 gas during mining operations using the heap-leaching method.

University of Adelaide

Paul Dyke

A KINEMATICALLY 2D INTERACTING FERMI GAS

P. Dyke, K. Fenech, T. Peppler, M. Lingham, S. Hoinka, P. Hannaford, C. J. Vale

We establish the criteria for an interacting 2D Fermi gas to be kinematically 2D and investigate the behaviour of a 2D Fermi gas near a p-wave Feshbach resonance.

Swinburne University of Technology

Peipei Jia

FREESTANDING METAL NANOHOLE MEMBRANE FABRICATED BY TEMPLATE TRANFER WITH A SOLUABLE ADHESIVE

P. Jia, Jun Yang and H. Ebendorff-Heidepriem

Large-area freestanding metal nanomembranes with nanohole arrays are implemented with high quality and uniformity. The transmission of the freestanding membrane show higher efficiency compared to that with same features on a substrate.

Western University; University of Adelaide

Peter Hannaford

QUANTUM SIMULATION WITH ULTRACOLD ATOMS IN A MAGNETIC LATTICE

P. Surendran, Y. Wang, T. Tran, I. Herrera, S. Whitlock, R. McLean, A. Sidorov and P. Hannaford

We report the application of ultracold atoms stored in a magnetic lattice to simulate condensed matter phenomena including lattice spin models based on long-range interactingRydberg atoms in a large spacing magnetic lattice.

Swinburne University of Technology; University of Heidelberg

Philip Light

LASER FREQUENCY NOISE MEASUREMENT USINGPASSIVE COHERENT DISCRIMINATOR

V. Michaud-Belleau, P. S. Light, R. T. White, H. Bergeron, N. Bourbeau Hébert, J.-D. Deschênes, A.N. Luiten and J. Genest

We present an entirely passive short-delay fibre interferometer which uses a 90° optical hybrid to perform in-phase and quadrature detection, in order to determine the frequency noise spectrum of a stable laser.

Université Laval; University of Adelaide

Quentin Mocaer

HIGH-ENERGY SUB-50 FS PULSES VIA NONLINEAR COMPRESSION INHYPOCYCLOID-CORE KAGOME FIBER

Eric Mottay, Florent Guichard, Guillaume Machinet, Yoann Zaoute, Clemens Hoenninger, and Quentin Mocaer*

We report on fiber delivery of ultrafast lasers. We demonstrate propagation of 500 fs, 1 mJ pulses over a distance of 10 m. We also report 100W average power transmission, and sub-50 fs pulse compression.

Amplitude Systemes

Robert Scholten

SINGLE-SHOT ELECTRON DIFFRACTION USING A COLD ATOM ELECTRON SOURCE

R. W. Speirs, C. T. Putkunz, A. J. McCulloch, K. A. Nugent, B. M. Sparkes and R. E. Scholten

We demonstrate single-shot nanosecond electron diffraction from monocrystalline gold using cold electron bunches generated from a cold atom electron source.

LaTrobe University; The University of Melbourne

Robert J Williams

HIGHLY-EFFICIENT FREQUENCY CONVERSION OF HIGH-POWER FIBER LASERS IN DIAMOND

Robert J. Williams, Johannes Nold, Maximilian Strecker, Ondrej Kitzler, Aaron McKay, Thomas Schreiber and Richard P. Mildren

Diamond is used to convert 630 W output from a Yb fiber laser with >60% conversion efficiency and diffraction-limited output. Stimulated Brillouin scattering is observed in diamond for the first time.

MQ Photonics Research Centre, Department of Physics and Astronomy, Macquarie University & Fraunhofer Institute for Applied Optics and Precision Engineering

Roland Fledderman

COMPACT 40 KHZ DELAY LINE WITH CASCADING MULTI-LEVEL PHASE PLATE FOR LOW COHERENCE INTERFEROMETRY

R. Fleddermann, W. M. Lee, G. Campbell, P. K. Lam, J. H. Chow, D. E. McClelland

We present a novel, compact delay line demonstrating time domain OCT A-line scan rates of up to 40 kHz (theoretical maximum 1.4 MHz) with scan depths of 400 μm (theoretical maximum of 14 mm).

Department of Quantum Science, Australian National University; Research School of Engineering, College of Engineering and Computer Science, Australian National University; Centre for Gravitational Physics, Australian National University

Roman I. Khakimov

WHEELER'S DELAYED CHOICE EXPERIMENT WITH MATTER WAVES

R.I. Khakimov, A.G. Manning, R.G. Dall and A.G. Truscott

Using a single ultracold metastable helium atom in an interferometer we, for the first time, create an atomic analogue of Wheeler's proposal: demonstrate how delayed choice of measurement determines which one of wave/particle behaviours is observed.

Research School of Physics and Engineering, Australian National University

Russell McLean

TOPOLOGICAL CHARGE TRANSFER IN STEPWISE-EXCITED RB VAPOUR

A.M. Akulshin, I. Novikova, E. E. Mikhailov, S.A. Suslov and R.J. McLean

We demonstrate the usefulness of observing topological charge transfer from laser light to new optical fields generated inatomic media for identifying the processes responsible for their generation.

Swinburne University of Technology; University of Heidelberg; College of William and Mary

Satya Sainadh Undurti

MEASURING STRONG-FIELD PHOTO-IONIZATION AND LASER INTENSITY WITH PERCENT LEVEL ACCURACY

Satya Sainadh U, W.C. Wallace, O. Ghafur, J.E. Calvert, C. Khurmi, D.E. Laban, M.G. Pullen, A.N. Grum-Grzhimailo, D. Wells, H.M.Quiney, X.M. Tong, I.V. Litvinyuk, R.T. Sang, K. Bartschat and D. Kielpinski.

We present measurements of strong-field ionisation yield for Krypton (Kr) with percent- level accuracy, calibrated using atomic Hydrogen (H). From these, we derive a laser peak intensity calibration standard reproducible in any lab with 800 nm laser usable in the 1014 W/ cm2 range.

Griffith University

Samuel Francis

DEVELOPMENT OF AN ALIGNMENT INSENSITIVE DISPLACEMENT INTERFEROMETER

S.P. Francis, R.L. Ward, D.E. McClelland and D.A. Shaddock

A multi-sensor optical fibre interferometer able to measure relative motion between two satellites without requiring precise placement or alignment. This measurement architecture could simplify measurements on future gravity observation space missions such as GRACE.

The Australian National University

Sarah Scholten

BROADBAND PHASE-SENSITIVE FREQUENCY-COMB SPECTROSCOPY USING A VIRTUALLY IMAGED PHASED ARRAY

S. K. Scholten, N. Bourbeau Hébert, R. T. White, J. Genest, J. D. Anstie and A. N. Luiten

We demonstrate a simple interferometric technique for direct measurement of the phase (and amplitude) response of a molecular sample, using a near-path-matched Michelson interferometer and frequency-comb spectrometer based on a virtually imaged phased array.

University of Adelaide; Institute for Photonics and Advanced Sensing (IPAS); Universite Laval

Sascha Hoinka

LOW-MOMENTUM BRAGG SPECTROSCOPY OF A STRONGLY INTERACTING FERMI GAS

S. Hoinka, P. Dyke, M. Lingham, K. Fenech, P. Hannaford and C.J. Vale

Bragg spectroscopy in the low-momentum regime is applied to a homogeneous Fermi gas to study collective and pair-breaking excitations throughout the BCS-BEC crossover including the evolution of the sound velocity and pairing gap.

Swinburne University of Technology

Scott Foster

A MAGNETOSTRICTIVE FIBRE LASER MAGNETOMETER

S. Foster, J. Harrison, D. Bulla

We propose a new class of fibre optic magnetometer based on coupling a magnetostrictive material to a single frequency Bragg grating fibre laser. In a proof-of-principle demonstration with a Terfenol-D transducer coupled to a DFB fibre laser we achieved a linear responsivity of 1.5 Hz/nT and a non-linear coupling of 4.5×10-5 Hz/nT2. This corresponds to a sensitivity of 17nT/√Hz at 230Hz. We report initial results of vapour deposition of a 1.2 micron Terfenol-D coating directly onto the cladding of a DFB fibre laser.

Defence Science and Technology Group

Sean Manning

DEVELOPMENT AND IMPLEMENTATION OF A ROBUST ANGLE OF ARRIVAL TURBULENCE MEASUREMENT SYSTEM

S. Manning , B.A. Clare, K.J. Grant and K.A. Mudge

We present details of an Angle of Arrival turbulence measurement system. Particular attention will be given to the data processing algorithms that were necessary for robust operation under a wide range of operating conditions.

Defence Science and Technology Group

Sergei Slussarenko

HIGH HERALDING EFFICIENCY SINGLE PHOTON SOURCE FOR QUANTUM INFORMATION SCIENCE APPLICATIONS

S. Slussarenko, M. M. Weston, S. Wollmann, H. M. Chrzanowski and G. J. Pryde

We present a high-heralding efficiency source of high purity single photon pairs, based on engineered parametric downconversion process. Our source is compatible with established telecommunication infrastructure and is suitable for multiphoton quantum information experiments.

Centre for Quantum Dynamics, Griffith University

Shasidran Raj

SPACE DEBRIS TRACKING USING CONTINUOUS WAVE LASERS

S. Raj, R. Ward, R. Fleddermann, L. Roberts, S. P. Francis, D.E. McClelland, C. Smith and D.A. Shaddock

Using continuous wave lasers modulated with pseudo-random noise for accurate tracking of space debris to predict and avoid collisions with orbiting spacecraft.

Australian National University; EOS Space Systems Pty Ltd

Silvie Ngo

DIGITALLY ENHANCED HOMODYNE INTERFEROMETRY FIBRE SYSTEMS FOR CO-PHASING LARGE SEGMENTED TELESCOPES

S. Ngo, R. Fleddermann, F. Rigaut, M. B. Gray, and D. A. Shaddock

We present the noise performance of a digitally enhanced homodyne interferometry (DEHoI) system. We discuss its applications to laser frequency stabilisation and piston sensing for large segmented telescopes.

Stephen Collins

AQUEOUS CONTAMINANT DETECTION VIA A METAL ORGANIC FRAMEWORK THIN FILM COATING ON AN OPTICAL FIBRE END-FACE

M. Nazari, M. R. Hill, M. C. Duke, F. Sidiroglou, S. F. Collins

Metal Organic Framework (MOF) coatings on optical fibre endfaces were used for the detection of trace amounts of contaminants in water. This Fabry-Perot interferometer arrangement provided a suitable response for the detection of rhodamine-B.

Victoria University; CSIRO Materials Science and Engineering

Stuart Earl

EFFICIENT COUPLING BETWEEN OPTICAL NANO-ANTENNAS & NANOSCALE QUANTUM DOT AGGREGATES

Stuart K Earl, Marvin Berger, Thorsten Schumacher, Daniel E Gomez, Timothy D James, Markus Lippitz and Ann Roberts

We have fabricated structures comprising single optical antennas in close proximity to lithographically patterned aggregates of quantum dots. We report on the emission spectra and lifetime of the coupled system.

School of Physics, The University of Melbourne; University of Bayreuth; CSIRO Manufacturing Flagship; Melbourne Centre for Nanofabrication (MCN)

Tess Reynolds

A FIBRE TIP WHISPERING GALLERY MODE BIOSENSING PLATFORM

T. Reynolds, A. François, N. Riesen, J. M. M. Hall, S. V. Afshar, S. J. Nicholls, and T. M. Monro

The biosensing platform presented here combines microstructured optical fibres (MOF) with the refractive index transduction mechanism based on whispering gallery modes (WGM) within dye-doped polystyrene microspheres, providing an opportunity to conduct real-time label-free in-vivo sensing.

University of South Australia; The Institute for Photonics and Advanced Sensing (IPAS), and ARC Centre of Excellence for Nanoscale BioPhotonics (CNBP), University of Adelaide; South Australia Health & Medical Research Institute (SAHMRI)

Wen Qi Zhang

UNIVERSAL OPTICAL FIBRE FLUORESENCE SENSING PLATFORM FOR WINE MONITORING

Wen Qi Zhang, Wan Aizuddin Wan Razali, Varun Sreenivasan, Tanya M. Monro and Dennis Taylor

We present the design of a fluorescence–based fibre sensor platform using sol-gel, nanorubies and novel optical designs to provide a reliable and easy to use platform for intensity measurement based sensors.

School of Agriculture, Food and Wine, The University of Adelaide; Institute for Photonics & Advanced Sensing and School of Physical Sciences, the University of Adelaide; Department of Physics and Astronomy, Macquarie University; University of South Australia

Wen Qi Zhang

CHARACTERISATION OF NOISE AND LOSS IN OPTICAL FIBRES IN NONLINEAR FREQUENCY DOMAIN

Terence H. Chan, Kashif Amir, Wen Qi Zhang, Qun Zhang, and Shahraam Afshar V

We derive an analytical model to characterise how noise and signal attenuation cause perturbation in the discrete eigenvalues of Nonlinear Fourier Transform. Our analytical model is verified by simulation results.

University of South Australia, Australia; Institute for Photonics & Advanced Sensing and School of Physical Sciences, the University of Adelaide

Xiang Zhang

ACTIVE TEMPORAL MULTIPLEXING OF INDISTINGUISHABLE HERALDED SINGLE PHOTONS FROM SILICON

X. Zhang, Z. Liu, M. J. Collins, A. Mahendra, D.-Y. Choi, C. J. Chae, P. H. W. Leong, B. J. Eggleton, and C. Xiong

Using active temporal multiplexing we have demonstrated 100% enhancement to the heralded single photon output probability from silicon. A Hong-Ou-Mandel quantum interference with 91% visibility indicates that the multiplexed photons are highly indistinguishable.

Guangdong University of Technology; University of Sydney; Gwangju Institute of Science and Technology; Australian National University

Xiang Zhang

TIME-BIN ENTANGLEMENT IN COMPACT AND RECONFIGUREABLE SILICON NITRIDE PHOTONIC CIRCUITS

X. Zhang, A. Mahendra, J. He, D.-Y. Choi, C. J. Chae, D. Marpaung, P. H. W. Leong, B. J. Eggleton and C. Xiong

We demonstrate the integration of pump time-bin preparation, wavelength demultiplexing, and entanglement analysis on a monolithic silicon nitride photonic chip for time-bin entanglement generation. A two-photon interference fringe with 88.4% visibility was achieved.

Gwangju Institute of Science and Technology; University of Melbourne; Australian National University; University of Sydney

Yajie Guan

DOUBLE PASS CAVITY ENHANCED ABSORPTION MEASUREMENT WITH SCATTERING MINIMISATION

Ya J. Guan, Chathura P. Bandutung, Jiahao Dong, Roland Fleddermann, Timothy T-Y Lam, Malcolm B. Gray and Jong H. Chow

We propose a double pass architecture for cavity enhanced absorption spectroscopy. We also show a passive equilateral triangle cavity design and an active dithering method which minimized its scattering effects by a factor of 500.

Research School of Physics and Engineering, Australian National University; National Measurement Institute

Poster Abstracts

Aaron McKay

BEAM COMBINING USING DIAMOND RAMAN AMPLIFIERS

A. McKay, D.W. Coutts, D.J. Spence and R.P. Mildren

We report a strategy for combining the power of multiple non- collinear 1064-nm beams into a single 1240-nm Stokes beam based on stimulated Raman scattering in diamond with more than 70% power conversion at kilowatt peak powers.

Macquarie University

Andrew McCulloch

ULTRACOLD ELECTRON AND ION BEAMS FROM A LASERCOOLED NEUTRAL ATOM BEAM

A. McCulloch, R. P. M. Tielen, B. M. Sparkes, K. A. Nugent and R. E. Scholten

We present a source of electrons and ions produced by photoionisation of cold atoms. The low temperatures achieved using laser cooling result in charged particle beams with small transverse velocity distributions, resulting in high brightnesses.

LaTrobe University & University of Melbourne

Arafat Hossain

SMARTPHONE LASER BEAM PROFILER

A. Hossain, J. Canning, K. Cook and A. Jamalipour

A simple, low cost, portable smartphone-based laser beam profiler is reported and used to characterize two industrial UV laser sources.

The University of Sydney

Arafat Hossain

SMARTPHONE SPECTROMETER WITH FIBER ENDOSCOPE PROBE

A. Hossain, J. Canning, K. Cook and A. Jamalipour

A hand-held smartphone spectrometer using an endoscopic fiber bundle to collect signal is demonstrated.

The University of Sydney

Blake Entwisle

INCREASED SYNAPTIC ACTIVITY INDUCED BY INFRARED LASER RADIATION IN VITRO

B. Entwisle, S. McMullan, P. Bokiniec, S. Gross ,R. Chung and M. J. Withford

This study examined the synaptic response of cells undergoing infrared laser nerve stimulation (ILS). The first known report of increased synaptic activity of cells exposed to ILS was observed. Neuronal depolaristion was also noted.

Macquarie University

Bradley Clare

LASER SIGNALING SYSTEM FOR THE RAN

B. Clare, S. Manning, K. J. Grant and K. A. Mudge

A pulsed laser communication system to replace the Royal Australian Navy's visual signaling system is described and demonstrated.

Defence Science and Technology Group

Bradley Clare

DEVELOPMENT OF A 4-PIXEL MODULATING RETROREFLECTOR

B. Clare, D. Bulla, K. J. Grant and K. A. Mudge

Bandwidth increase of a modulating retroreflector via pixellation is detailed. The bandwidth increase is necessary to exploit forward error correction for digital video transmission.

Defence Science and Technology Group

Chathura Bandutunga

INTEGRATING OPTICAL SENSORS IN ACOUSTIC SYSTEMS

C. Bandutunga, Roland Fleddermann, Malcolm B. Gray, John D. Close and Jong H. Chow

An all-optical acoustic strain readout technique is presented for use in an in-air microphone. Integrated with a 38 micron polymer diaphragm, we achieve a pressure sensitivity of 74uPa/ √Hz.

Australian National University & National Measurement Institute

David McManus

TORSION PENDULUM LOW-FREQUENCY GRAVITATIONAL-FORCE SENSOR

D. McManus, Min Jet Yap, Robert L. Ward, Bram J.J. Slagmolen, Daniel A. Shaddock and David E. McClelland

We present a low-frequency gravitational-force sensor which will be sensitive to local and distant gravitational gradients. The current prototype is on track be installed into a vacuum to mitigate local environmental disturbances.

Australian National University

Dijana Bogunovic

TUNABLE VOLUME HOLOGRAPHIC GRATINGS IN CHROMOPHORE DOPED POLYMERS

D. Bogunovic, S.G. Raymond and C.Simpson

Volume holographic gratings (VHG) were photobleached in thin chromophore doped polymer films. They were examined as free space gratings and also as Bragg gratings in lasermicromachined waveguides in polymer films.

The University of Auckland & Callaghan Innovation

El-Abed Haidar

THEORETICAL STUDY OF TUNING FOUR-WAVE MIXING PHASE MATCHING BY STIMULATED BRILLOUIN SCATTERING

El-Abed Haidar, C. Martijn de Sterke and Benjamin J. Eggleton

This paper theoretically and numerically investigates the feasibility of enhancing four wave mixing bandwidth by tuning the phase matching condition via stimulated Brillouin scattering. We find the greatest benefit for normal dispersion.

CUDOS

Erik Streed

CHARGED NANODIAMONDS IN A PAUL TRAP

Nanodiamonds were ionized and loaded into a linear Paul trap. Fluorescence from NV colour centres was observed.

Griffith University

George Chen

ANGLE-RESOLVED CHARACTERIZATION OF OPTICAL FIBER PREPARATION TECHNIQUES

G. Chen, David G. Lancaster and Tanya Monro

Angle-resolved characterization of waveguides can provide detailed information about the relative attenuation of different ray groups. For the first time, this highly sensitive technique is exploited to investigate the effectiveness of different coating stripping and fiber cleaning techniques.

University of South Australia

Hadiya Jasbeer

EFFECT OF BIREFRINGENCE ON THE PERFORMANCE OF CW EXTERNAL-CAVITY DIAMOND RAMAN LASEr

H. Jasbeer, Robert J. Williams, Ondrej Kitzler, Aaron McKay, Jipeng Lin and Richard P. Mildren

Stress induced birefringence in laser grade diamond was characterized using Mueller polarimetry. Significant amount of circular retardance of up to 28o was measured in addition to linear birefringence. The effect of birefringence on the performance of CW diamond Raman lasers was investigated.

Macquarie University

Haitao Luan

FEMTOSECOND LASER PROCESSING FOR HIGH EFFICIENCY LARGE SCALE THIN-FILM A-SI SOLAR CELLS

Haitao Luan and Min Gu

A femtosecond laser is used for processing a-Si solar cells to improve the efficiency with the narrower and cleaner grooves compared with those with the widely used nanosecond laser in industry.

Swinburne University of Technology

Huichao Luo

SCATTERING PHASE FUNCTION MEASUREMENT OF ICE CRYSTALS

Huichao Luo, Murray Hamilton and Andrew MacKinnon

Cloud ice crystals ifluee the Earth's radiatio udget ad liate y satterig ad absorbing both solar radiation and thermal emission. There are instruments which measure scattering from cloud ice crystals (Lidar, polarsonde etc.), but correct interpretation needs knowledge of the scattering properties of a single ice crystal, and the size, shape, orientation of the ice crystals being observed. Because of inadequate theoretical models, laboratory measurement of ice crystal scattering properties is important.

University of Adelaide

Jan Hrabina

IODINE CELLS WITH CERTAIN SATURATION PRESSURES

J. Hrabina, M. Sarbort, O.Acef, F. Du-Burck, M. Zucco, M. Hola, B. Mikel, O. Cip and J. Lazar

We present the design, spectral properties and media purity levels of absorption cells filled at certain saturation pressure of iodine. An approach relying on linewidth measurement of the hyperfine transitions is proposed as a novel technique for iodine cells absorption media purity evaluation.

Czech Academy of Science, Laboratoire de Physique des Lasers, Istituto Nazionale di Ricerca Metrologica & Sytèmes de Rêférence Temps Espace

John Canning

RECOVERY OF RARE EARTH DOPED GAIN COEFFICIENTS WITH HIGH TEMPERATURE ANNEALING

J. Canning, W. Liu, K. Cook, A. Zareanborji, Y. Luo and G-D. Peng

High temperature annealing partially recovers the degraded excited state lifetime of Er 3+ and gain coefficient of an Er 3+ /Yb 3+ co-doped phosphosilicate optical fibre with hydrogen loading. It fully reocvers the deterioration observed with hypersensitisation.

The University of New South Wales & The University of Sydney

Jonathan Hall

MICROBUBBLE RESONATOR SIMULATION USING FDTD

J. Hall, S. Afshar, V. ,M.R. Henderson, A. François, N. Riesen, T. Reynolds and T.M. Monro

The whispering gallery mode spectrum of a microbubble resonator is simulated using FDTD. The spectrum is then matched to experimental results for given shell thicknesses. This represents a robust computational tool for testing microbubble designs.

University of Adelaide

Joshua Toomey

SCIENCE DATABASE FROM NONLINEAR LASER SYSTEMS: A BIG-DATA OPEN-ACCESS RESEARCH RESOURCE

C. McMahon and D. M. Kane

We introduce an open access online database containing datasets from various nonlinear laser systems. This is a valuable new resource for researchers in complex laser dynamics, nonlinear science, data science and machine learning.

Macquarie University

Kalpana Singh

SUBRADIANT MODES IN A PERIODIC ARRAY OF SILVER NANOROD TRIMERS AND TETRAMERS

K. Singh, P. Achmari, T. James, T. Davis and A. Roberts

Phase sensitive subradiant and azimuthal modes of a periodic array of silver nanorod trimer and tetramer metasurfaces are excited by linearly polarized light. The influence on the far field scattered light is investigated.

University of Melbourne

Kerry Mudge

EXPERIMENTAL CHARACTERISATION OF AN FPGA OPTICAL MODEM WITH ATMOSPHERIC FADING

K. Mudge, K.J. Grant, B. A. Clare, C. L. Biggs, W. G. Cowley and S. Manning

The performance of a free-space laser communications modem employing forward error correction is evaluated experimentally using an atmospheric optical fading laboratory simulator. Fading parameters used are based on experimental characterisation of the optical channel.

The University of South Australia & Defence Science and Technology Group

Kevin Cook

OPTICAL FIBRE FABRICATED FROM A 3D-PRINTED PREFORM

K. Cook, J. Canning, , S. Leon-Saval, Z. Reid, Md. Arafat Hossain , J.E. Comatti, Y. Luo and G.D. Peng

The first optical fibre to be made from a 3D-printed preform is reviewed. A transparent filament consisting of a propriety polystyrene mixture containing styrene-butadiene-copolymer and polystyrene is used to print the air-structured preform.

The University of New South Wales & The University of Sydney

Leonardo Chavez-Guerrero

AGAVE PULP NANOCELLULOSE FILM DECORATED WITH GOLD NANOSTRUCTURES FOR IMPROVED SERS SENSING

L. Chavez-Guerrero, Paloma Jimenez-Vara, S. Sepulveda-Guzman and C. Rodriguez-Liñan

Surface-enhanced Raman scattering (SERS) has been widely applied in biomedical field, as biosensors and medical diagnostics, because of its ability to provide detailed molecular information through the enhancement of Raman scattering signals. Several research groups have demonstrated that Au nanostructures, such as nanoparticles, nanorods and nanostars enhance magnitude and spectrum profile of SERS. However, due to the low affinity of organic molecules to Au nanoparticle surface and the short distance range of SERS effect several substrates have been developed to trap and retain molecules for enhanced SERS. In this work we present the preparation of nanocellulose from Agave pulp and the films preparation by spin coating. The resulting films were characterized by SEM and UV-vis spectroscopy. In addition, nanocellulose films were modified by Au nanostructures such as nanorods and nanostars by spin off the colloidal dispersion on the substrate. The nanocellulose supported gold nanostructured films exhibited tunable optical properties. Rhodamine b, and tetracycline were selected to study the Raman response when interacting with the nanocellulose film decorated with A. The nanocellulose based films show great potential as active SERS materials for SERS-based applications.

Universidad Autonoma de Nuevo Leon

Maria Samokhina

DO SOME SPIDER SILKS SUPPRESS LIGHT SCATTER AT SHORTER WAVELENGTHS?

M. Samokhina, D Little and D.M. Kane

It was previously found that the scattering efficiency from orb-weaver-spider silk decreases at shorter visible wavelengths. In our experiments no evidence of such differential scattering was found for radial silks.

Macquarie University

Michael Lawrence Castanares

IMPROVING HOLOGRAPHIC MULTI-SITE FLUORESCENCE EXCITATION VIA TEMPORAL GATING

M.L. Castanares, J. Drury, H-A. Bachor and V.R. Daria

We report significant enhancement of multi-site two-photon fluorescence excitation from multiple foci produced via phaseonly holographic projection whilst maintaining a low photonflux on the sample.

Australian National University

Miftar Ganija

AN INVESTIGATION OF DIODE PUMPED, CRYOGENICALLY COOLED ER:YAG LASERS

M. Ganija, S. Hollitt, J. Munch and P.J. Veitch

Cryogenically cooling of quasi-3-level gain media can offer a dramatic improvement in lasing but the spectral width of the pump absorption lines can be reduce significantly. We report spectroscopic and lasing measurements of cryogenically-cooled Er:YAG.

The University of Adelaide

Mumta Hena Mustary

PHASE SHIFTS IN HHG OF ISOTOPES USING THE GOUY PHASE INTERFEROMETER TECHNIQUE

M. H. Mustary, D. E. Laban, J. B. O. Wood, I. V. Litvinyuk and R. T. Sang

We investigate the dynamics of molecules when they are ionized in a strong field by an ultrashort laser pulse. Our technique explores phase shifts in high harmonic generation between hydrogen (H_2) and deuterium (D_2).

Griffith University

Nicolas Riesen

ON THE FUNDAMENTAL LIMITS OF FAR-FIELD DETECTION OF THE WGMS OF ACTIVE MICROSPHERES

N. Riesen, A. François, T. Reynold, M. R. Henderson and T. M. Monro

We explore the Q-factor limits for far-field sampling of the whispering gallery modes of active microspherical resonators. It is shown that non-resolvable 'mode-splitting' arising from slight asphericity accounts for the typically low Q-factors realized.

University of South Australia & The University of Adelaide

Nilusha N. Perera

MODELING EFFECTIVE OPTICAL CONSTANTS OF NANOSTRUCTURED SILVER FILMS

M.N.M.N. Perera, D. Schmidt, W.E.K. Gibbs and P.R. Stoddart

Nanostrutured thin films have attracted attention particularly in applications of sensor technologies and photovoltaics. Generalized ellipsometry was used to derive the effective optical constants of silver nano-void structures fabricated by physical vapour deposition.

Swinburne University of Technology & National University of Singapore

Rachel Guo

A STUDY OF ACRIDINE ORANGE TO DETECT BACTERIA IN SOLUTION USING FLUORESCENCE SPECTROSCOPY

R. Guo, C. McGoverin, S. Choi, C. Tuffnell, S. Swift and F. Vanholsbeeck

Microbiological monitoring of food products using standard plate counting is time-consuming. We are developing a substantially quicker bacteria count method using fluorescence spectroscopy. Here we explore the suitability of a relatively cheaper fluorescent nucleic acid-binding dye, acridine orange.

University of Auckland & Veritide Limited

Rejvi Kaysir

CHARACTERIZATION OF OPTICAL GAIN IN PERYLENE RED-DOPED PMMA

MD Rejvi Kaysir, Simon Fleming, Rowan W. MacQueen, Timothy W. Schmidt, and Alexander Argyros

The optical gain in Perylene Red-doped PMMA is characterized using the stimulated gain coefficient, for co-propagating and transverse pumping configurations. The stimulated gain coefficient is used, which allows gain to be characterized independently of pump configuration.

School of Physics, The University of Sydney & School of Chemistry, The University of New South Wales

Roman I. Khakimov

SINGLE-ATOM SOURCE IN THE PICOKELVIN REGIME

R.I. Khakimov, A.G. Manning, R.G. Dall and A.G. Truscott

We demonstrate a source comprised of a single ultracold metastable helium atom, which enables novel free-space quantum atom optics experiments to be performed on single massive particles with large de Broglie wavelengths [1]

Australian National University

Sally Doolette

CLASSIFICATION OF ORGANIC MATERIALS WITH LASER INDUCED BREAKDOWN SPECTROSCOPY

S.L. Doolette, J. Quinton and B.L. Rogers

Laser Induced Breakdown Spectroscopy (LIBS) of types of plastic samples with the use of the Chemometric techniques Principal Component Analysis and Cluster Analysis.

Centre for Expertise in Energetic Materiala, Flinders University & Defence Science and Technology Organisation

Sean Manning

A DYNAMIC MULTICOLOURED QUICK RESPONSE CODE FOR SCIENCE OUTREACH

S. Manning, K.J. Grant, B.A. Clare and K.A. Mudge

We have developed an information encoding and display system for use during the International Year of Light and ongoing outreach activities. The system transmits and receives encoded URLs in an aesthetically appealing format.

Defence Science and Technology Group

Shahraam Afshar

OPTIMISATION OF RARE-EARTH MATERIALS FOR LASER COOLING

Gianraffaele Moffa, William Rogers, Shahraam Afshar, Heike Ebendorff-Heidepriem, Reza Ghomaschi Zonghan Xie

We investigate the parameters affecting cooling efficiency and produce a very high optical quality ZBLAN glass doped with 4mol% Yb3+. We determine the cooling region and verify the direct relationship between dopant concentration and absorption.

Simon Curtis

A CLIMATOLOGY OF CLOUDS OVER ADELAIDE

S. A. Curtis

One year of results from a ground based polarimetric cloud Lidar in Adelaide is collected and compared with satellite based polarimetric cloud Lidar measurements.

University of Adelaide

Sreenesh Shashidharan

DUAL-CORE POF AND ITS APPLICATION IN PRESSURE SENSING

S.Shashidharan,S.Ghatrehsamani, and G. E. Town

We describe a novel dual-core polymer optical fiber (POF) made of PMMA with an axial air-hole for pressure sensing. Numerical calculations show a sensitivity up to 4 nm/MPa in the wavelength range of 600-900nm

Macquarie University

Srijith Kanakambaran

LOCATING PARTIAL DISCHARGES IN POWER TRANSFORMERS USING FIBER BRAGG GRATINGS

Srijith K, R. Sarathi, B.Srinivasan

We present a fiber Bragg grating based scheme for identifying the location of partial discharges in power transformers. Hilbert transform and wavelet techniques are employed to precisely locate the acoustic signals in a controlled test bed.

Indian Institute of Technology Madras

Stephen Collins

INTRINSIC DETERMINATION OF PH USING A BARYCENTRE ALGORITHM TO CHARACTERISE FLUORESCENCE FROM AN OPTICAL FIBRE SENSOR

Bhadra Thotath, T. Hien Nguyen, Weiwei Zhang, Gregory W. Baxter, Tong Sun, Stephen F. Collins, Kenneth T.V. Grattan

An algorithm to determine the barycentre of the signal received from a fluorescence-based fibre optic sensor probe has been implemented for the intrinsic characterisation of the fluorescence spectra of a pH sensor using coumarin dyes.

Nanchang Hangkong University, Victoria University & City University London

Vini Gautam

OPTIMISING TWO-PHOTON IMAGING OF LIVING NEURONS IN BRAIN TISSUE

Vini Gautam, Jack Drury, Julian Choy, Christian Stricker, Hans Bachor, Vincent Daria

We optimize two-photon imaging of living neurons in brain tissue by temporally gating an incident laser. This technique results in enhanced fluorescence signal from the sample, at the same time preserves the cell viability.

The Australian National University

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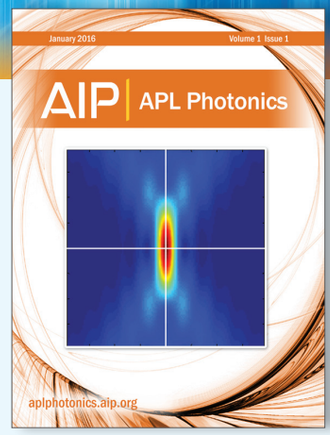

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