Welcome from the Congress Chairs

On behalf of the organising committee, we are delighted to welcome you to the 19th Congress of the Australian Institute of Physics (AIP) and the 35th Australian Conference on Optical Fibre Technology (ACOFT). Whilst ACOFT has been staged in Melbourne many times, this marks the third time the AIP Congress has been held in Melbourne, the last being in 1992 and the first in 1980.

The 2010 AIP Congress also incorporates the annual meeting of the Australian Optical Society as well as meetings of many of the AIP's technical groups. With over 700 delegates, the AIP/ACOFT 2010 Congress will be the most diverse scientific meeting in the Australian physics calendar. It provides a forum for discussions within specialist physics topic areas and opportunities for physicists from academia, government, industry and the commercial sector to keep up to date in areas outside their core interests. The 2010 Congress represents only the second time that it has been co-located with ACOFT which attracts optical fibre researchers investigating issues ranging from fundamental challenges in fibre design and fabrication to applications including telecommunications, biomedicine and imaging. First held in 1977, as a workshop on guided wave photonics, ACOFT is the second oldest conference series in the world in this topic area and of ongoing significance in the "information age".

In 2010 we also celebrate the 50th anniversary of the laser with our opening plenary lectures highlighting developments in ultrafast and optical fibre lasers and special Laserfest sessions exploring the past and future of this extraordinary invention. Other special sessions include the Women in Physics forum and a short course on nanofabrication. We look forward to meeting you in the relaxed environment of the welcome reception on Sunday evening, catered poster sessions on Monday and Wednesday evenings and the Congress Dinner on Tuesday night at the Plaza Ballroom on Collins Street. The Congress venue, Melbourne's new Convention and Exhibition Centre, is located a short stroll along the Yarra River from Melbourne's CBD. We hope that you will find an opportunity to explore Melbourne, its architecture, laneways, galleries, excellent shopping and world-class restaurants.

A large conference such as this relies on the inspired efforts of a dedicated team and we thank our program committee chairs, Elisabetta Barberio and Peter Hannaford (AIP) and David Moss (ACOFT), as well as all members of the organising committee and the AIP and ACOFT programme committees, the AIP stream convenors and the abstract and paper reviewers as well as our ever-attentive conference managers Kymberlee Senior and Janette Sofronidis. We also would like to extend a special thanks to Gaby Bright, Stuart Wyithe and Peter Johnston who made significant contributions to the early organisation of the conference.

We would also like to take the opportunity to express our deep appreciation for the generous support of our sponsors and exhibitors that has made this Congress possible. Please take time to visit the exhibition, meet our exhibitors and explore the diverse range of products and services on display.

Away from the busy lives we lead at our universities, research institutions and businesses we hope that this conference will provide you with a relaxed, but stimulating, meeting place to reflect on your research, get together with old and new friends, establish collaborations and see the future of physics in our students and early-career scientists. We hope you enjoy your participation in the 2010

Australian Institute of Physics Congress and the Australian Conference on Optical Fibre Technology: Living Physics.

Associate Professor Andrew Peele
La Trobe University AIP 2010 Co-Chair

Associate Professor Ann Roberts
The University of Melbourne AIP 2010 Co-Chair

Associate Professor Stephen Collins
Victoria University ACOFT 2010 Chair

Welcome from the President - Australian Institute of Physics

Welcome to the 19th Australian Institute of Physics Congress, incorporating the 35th Australian Conference on Optics and Fibre Technology (ACOFT). As with previous congresses, many societies or common interest groups have combined to hold their specialist meetings during the period of the Congress. As the biggest gatherings of Australian physicists, our congresses provide opportunities for networking across the discipline and allow all delegates to hear talks by distinguished speakers on a wide range of physics topics. Of particular note this year will be recognition of the 50th anniversary of the first operation of a laser, a reminder of how physics continues to shape modern technology and provide tools that facilitate advances in other fields of science. To run a congress like this requires dedicated effort by many people. I thank all those who have contributed, in particular co-chairs of the Congress organising committee, Andrew Peele and Ann Roberts, and Stephen Collins, chair of ACOFT.

I wish all delegates an enjoyable and rewarding Congress.

Brian James, President - Australian Institute of Physics

Abstract Reviewers

ACOFT
David Moss
Peter Farrell
Stuart Jackson
Steve Madden
Arnan Mitchell
Dominic Murphy

Acoustics, Music and Ultrasonics

Roger Rasool

Astronomy and Astrophysics

Warrick Couch

Atomic & Molecular Physics

Andy Martin

Biophysics / Biomedical Physics

Harry Quiney

Complex Systems, Computational & Mathematical Physics

Andrew Melatos

Condensed Matter, Materials and Surface Physics

Gary Bryant
Chris Pakes
Salvy Russo

Education & History of Physics

Maurizio Toscano
Pam Mulhall

Meteorology, Oceanography, Environmental Physics and Climate Change

John Zillman

Nuclear and Particle Physics

Nicole Bell
Martin Sevior
Mahananda Dasgupta

Optics, Photonics and Lasers

Russell McLean
Tim Davis
Snjezana Tomljenovic-Hanic

Plasma Science

Christine Charles

Quantum Information, Concepts and Coherence Group

Andrew Greentree

Relativity and Gravitation

Leo Brewin

Renewable Energy

Paul Mulvaney

Solar, Terrestrial and Space Physics

Iver Cairns
Marcus Duldig
Trevor Harris
Vasili Lobzin
Roman Makarevich
Dave Neudegg
Iain Reid
Colin Waters

Synchrotron Science

Martin de Jonge
Karen Siu

Women in Physics

Nicoleta Dragomir

CONCURRENT SESSION 7

1100 - 1230	7A ACOFT – Microstructured Fibers and Novel Devices	7B AOS – Quantum Optics	7C Education 1	7D ACOFT – Novel Devices I	7E Biophysics / Biomedical Physics 1	7F Plasma Science 1	7G AOS – Optical Trapping	7H Relativity & Gravitation 1
	Banquet Room 202	*Meeting Room 203*	*Meeting Room 204*	*Meeting Room 207*	*Meeting Room 208*	*Meeting Room 209*	*Meeting Room 205*	*Meeting Room 206*
	Chair: Snjezana Tomljenovic-Hanic	**Chair: Ken Baldwin**	**Chair: Pam Mulhall**	**Chair: John Canning**	**Chair: Harry Quiney**	**Chair: Christine Charles**	**Chair: Robert Scholten**	**Chair: Susan Scott**
1100 - 1130	Professor Tanya Monro (Invited 30 mins) *University of Adelaide SA* **Optical Fibres: Nanostructures Enabling New Properties and Applications**	Hans Bachor (30 mins, #151) *ACQAO ACT* **Quantum Optics - quo vadis ?**	Neil Champion (30 mins, #583) *Williamstown High School VIC* **Australian Curriculum: Physics. How Did They Get It So Wrong?**	Warren McKenzie (#450) *University of New South Wales NSW* **Fabricating Novel Diamond Waveguides Using the Focused Ion Beam Hard Mask**	Samantha Lichter (#395) *University of Melbourne VIC* **Diamond Encapsulation for a Bionic Eye**	Tony Murphy (Invited 30 mins) *CSIRO Materials Science and Engineering NSW* **Waste Treatment Using Arc Plasmas**	Timo Nieminen (#547) *University of Queensland QLD* **Computational Modelling of Imaging of Vaterite Microspheres through Crossed Polarizers**	Bram Slagmolen (30 mins, #170) *Australian National University ACT* **The Australian National University Contribution to Advanced LIGO**
1115 - 1130				Scott Jones (#351) *Electrical Engineering & Telecommunications NSW* **Electroactive Self-Assembling Hydrogels for Flexible Display Technology**	Rebecca Ryan (#451) *University of Melbourne VIC* **Structure Determination**		Guillaume Maucort (#201) *University of Queensland QLD* **Measurements of Micro-Viscoelasticity Using Constant Power Optical Tweezers with Controllable Torque**	
1130 - 1145	Pourandokht Naseri (#488) *The University of Sydney NSW* **Air Core Metallic Light Guides for Scintillation Dosimetery in Radiotherapy**	Murray Olsen (#220) *University of Queensland QLD* **Analysis of a Continuous Variable Cluster State**	Philip Dooley (#677) *University of Sydney NSW* **Building a Successful Outreach Program**	Kok Hou Wong (#286) *University of New South Wales NSW* **Polymer Optical Fiber with Enhanced Surface Properties via Surface Chemistry Modifications**	Evan Curwood (#461) *University of Melbourne VIC* **Reconstructing Single Biomolecules in the Presence of Damage**	Roman Kompaneets (#544) *University of Sydney NSW AUSTRALIA* **Vibrations of a Quantum Plasma of Arbitrary Degeneracy**	Daryl Preece (#645) *University of Queensland QLD* **Optical Tweezers for Wide-Band Micro-Rheology**	Adam Mullavey (#136) *Australian National University ACT AUSTRALIA* **Arm Length Stabilisation for Advanced LIGO**
1145 - 1200	Alessandro Tuniz (#41) *University of Sydney NSW* **Design of an Optically Invisible Metamaterial Fibre**	Michael Stefszky (#318) *Australian National University ACT* **Advancements in Low Frequency Squeezing for Gravitational-Wave Detection**	Maria B Parappilly (#332) *Flinders University SA* **AstroFest- Promoting Physics Careers through Astronomy**	Zourab Brodzeli (#463) *University of New South Wales NSW* **State of Charge of Battery Indicator Based on Fibre Optic Probe**	Darren Alvares (#292) *University of New South Wales NSW* **Inkjet Printed Low Power Organic Transistors for Integrated Biomedical Sensors**	Daniel Graham (#43) *University of Sydney NSW* **Three-Dimensional Electromagnetic Strong Turbulence: Scaling Behavior, Spectra, Field Statistics, and Wave Packet Structure**	Theodor Asavei (#658) *University of Queensland QLD* **Optical Paddle-Wheel**	Sheon Chua (#200) *Australian National University ACT* **Squeezed State Injection for the Sensitivity-Improvement of Advanced Gravitational-Wave Interferometers**
1200 - 1215	Geraldine Marien (#577) *Macquarie Univsersity NSW* **Profiles of Fibre Bragg Grating Stopbands for Temporal Spectral Astronomy**	Anton Desyatnikov (#477) *Australian National University ACT* **Collapse of Elliptic Optical Beams with Orbital Angular Momentum**	Judith Pollard (#471) *University of Adelaide SA* **Is There a Gender Bias in Pre- and Post-Testing?**	Nicolas Riesen (#651) *Australian National University ACT* **Dispersion Equalisation in Few-Mode Fibres**	Ajay Tikka (#347) *Victoria University VIC* **Wireless Implant Communication using Inductive Coupling**	Roman Kompaneets (#538) *University of Sydney NSW* **Shielding of a Moving Test Charge in a Quantum Plasma**	Alexander Stilgoe (#679) *University of Queensland QLD* **Non-Conservative Behaviour of Complex Optical Force Fields**	Thanh Nguyen (#331) *Australian National University ACT* **Control of the Complex Optical Springs**
1215 - 1230	Tilanka Munasinghe (#499) *University of Adelaide SA* **Highly Nonlinear, Low Dispersion Fibres for Telecommunications Applicaitons**	Brendan Wilson (#456) *University of Melbourne VIC* **Large Dipole Systems in Ultrasmall Cavities: Extreme Cavity QED**	Neil Champion (#106) *Williamstown High School VIC* **Electric Circuits: The Design and Implementation of a Constructivist Approach to Learning**	Kunimasa Saitoh (#473) *Hokkaido University JAPAN* **Limitation on Effective Area of Large-Mode-Area Leakage Channel Fibers Under Bent Condition**	Jeffrey Davis (#726) *Swinburne University of Technology VIC* **Coherent Effects in Photosynthesis and Associated Biomolecules**	Rod Boswell (#45) *Australian National University ACT* **Focussed Inert Ion Beam systems for 3D rock tomography on the nano-scale**	Michael Taylor (#706) *University of Queensland QLD* **Sagnac Interferometer Enhanced Particle Tracking in Optical Tweezers**	Andrew Wade (#344) *Australian National University ACT* **A Benchtop Polarisation Speed Meter for Gravitational Wave Detection**
1230 - 1330	**Lunch Break** *(please note, lunch is not provided by congress)* **Casual Poster Viewing – Exhibition Hall**							
1240 - 1325		**Nobel Prize in Physics 2010** *How to win a Nobel Prize with a pencil and sticky tape* 1240 - 1325 Session Sponsor: *Melbourne Materials Institute*						

CONCURRENT SESSION 8

1330 - 1500	8A ACOFT – Silicon Photonics	8B AOS/AMP – Spectroscopy	8C Education 2	8D ACOFT – Novel Devices II	8E Biophysics / Biomedical Physics 2	8F Plasma Science 2	8G AOS – Lasers	8H Relativity & Gravitation 2
	Banquet Room 202	*Meeting Room 203*	*Meeting Room 204*	*Meeting Room 207*	*Meeting Room 208*	*Meeting Room 209*	*Meeting Room 205*	*Meeting Room 206*
	Chair: Arnan Mitchell	**Chair: Andre Luiten**	**Chair: Maurizio Toscano**	**Chair: Peter Domachuk**	**Chair: Harry Quiney**	**Chair: Rod Boswell**	**Chair: David Coutts**	**Chair: Susan Scott**
1330 - 1345	Bill Corcoran (#425) *University of Sydney NSW* **Silicon-chip-based THz Bandwidth Radio-frequency Spectrum Analyser**	Gar-Wing Truong (#523) *University of Western Australia WA* **Progress in Determining the Boltzmann Constant Using Alkali Metal Spectroscopy**	Margaret Wegener (#96) *University of Queensland QLD* **Virtual Realities for Learning Introductory Physics**	Michael Stevenson (#208) *University of Sydney NSW* **Controlled Fabrication of Tunable Delay Using Compound Phase Shifted Resonators**	Kumar Ganesan (#274) *University of Melbourne VIC* **Diamond Penetrating Electrode Array for Bionic Eye**	Sally L McArthur (Invited 30 mins) *Swinburne University of Technology VIC* **Plasma Polymers in Biotechnology: Power, Patterning and PDMS**	Helen Pask (#353) *Macquarie University NSW* **Diode-Pumped Terahertz Laser Source**	Jude Prezens (#25) *University of Melbourne VIC* **The Double Kerr Solution as a Possible Mechanism for Controlled Causality Violation**
1345 - 1400	David Moss (#693) *University of Sydney NSW* **CMOS Compatible All-Optical Waveguides**	Christopher Perrella (#186) *University of Western Australia WA* **Non-Linear Spectroscopy of Rubidium in Hollow Core Fibres For Compact Clocks and Quantum Optics**	Anton Rayner (#250) *University of Queensland QLD* **The Influence of Tablet Technology on Learning in Engineering Thermodynamics**	Stephen Collins (#659) *Victoria University VIC* **Modelling of an Alternative Pi-phase-shifted Fibre Bragg Grating Operating at Twice the Bragg Wavelength**	Heiko Timmers (#133) *University of New South Wales ACT* **Micro-Scratching and Scanning Probe Microscopy towards Understanding Wear in Knee Prostheses**		David Ottaway (#680) *University of Adelaide SA* **Microstructured Erbium Doped Tellurite Fibre Laser**	Phil Threlfall (#39) *Australian National University ACT* **The Conformal Structure of FRW Space-Times**
1400 - 1415	Trung Duc Vo (#489) *University of Sydney NSW* **Silicon Chip Based Instantaneous Dispersion Monitoring for a 640 Gbit/s DPSK Signal**	Feng Wang (#227) *Swinburne University of Technology VIC* **Electron Correlation Effects of Bound Electronic Wavefunctions to Gamma-Ray Spectra of Positron Annihilation in Atoms and Small Molecules**	Gary Tuck (#108) *University of Queensland QLD* **Radioactivity Experiments on iLab at The University of Queensland**	Mattias Åslund (#599) *University of Sydney NSW* **Comparison between a Mach-Zender and a Michelson Interferometer Employing Faraday Mirrors for the Delayed Self-Heterodyne Interferometry Technique**	Christian Steinhauer (#144) *University of Munich GERMANY* **Imaging DNA Nanostructures with Super-Resolution Fluorescence Microscopy**	Yuriy Tyshetskiy (#228) *University of Sydney NSW AUSTRALIA* **Charging of Nanoparticles in Complex Plasmas: The Role of Quantum Tunneling of Electrons**	Alexander Sabella (#366) *DSTO SA* **Efficient Diamond Raman Lasers Operating at 1240 nm and 1485 nm**	Richard Barry (#73) *Australian National University ACT* **Contact Properties of the Abstract Boundary Construction**
1415 - 1430	Fangxin Li (#691) *University of Sydney NSW* **All-Optical Time-Division Demultiplexing at 160Gb/s and 640Gb/s via FWM in a Silicon Nanowire**	Christopher Chantler (#584) *University of Melbourne VIC* **A Facility for Testing Quantum Electro-Dynamics, Plasma Physics, Laboratory Astrophysics and the Fundamental Constants of Nature – A Visible, VUV, X-Ray Synchrotron Source Allied with an Electron Beam Ion Trap**	Joe Wolfe (#606) *University of New South Wales NSW* **Multimedia Learning and Teaching: The Physclips Example**	Fotios Sidiroglou (#629) *Victoria University VIC* **Improving the Radial Dopant Distribution in Silica Optical Fibres**	Chathurika Abeyrathne (#354) *University of Melbourne VIC* **Signal Recovery from Noise in Biological Systems**	Kunwar Singh (#42) *University of Sydney NSW* **Radiation Propagation in Fluctuating Plasmas Using Kinetic Equations: Theory and Simulations**	David Lancaster (#441) *University of Adelaide SA* **Towards Realisation of a 2m Thulium Chip Laser**	Krzysztof Bolejko (#631) *Australian National University ACT* **Pre-Inflationary Homogenization of the Universe**
1430 - 1445	Thach Nguyen (#757) *RMIT University VIC* **Polarisation Dependent Scattering Loss in Thin, Shallow-Ridge Silicon-on-Insulator Waveguides with Resonant Lateral Leakage**	Lucas Smale (#592) *University of Melbourne VIC* **Towards a Characterization of Kß Spectral Profiles for Scandium, Titanium, Chromium and Manganese**	Joanna Turner (#278) *University of Southern Queensland QLD* **Remote Laboratories and Experiment Kits for Tertiary Physics Distance Education Students**	Scott Wade (#431) *Swinburne University of Technology VIC* **Bend Effects on Fibre Bragg Gratings in Standard and Low Bend Loss Optical Fibres**	Jon Swaim (#705) *University of Queensland QLD* **Ultra-Sensitive Biosensing Using Optical Microresonators**	Roman Kompaneets (#535) *University of Sydney NSW* **Kinetic Modes in Field-Driven Plasma Flows**	Matthew Petrasiunas (#712) *Griffith University QLD* **A High-Power Ultrafast Laser Source with 300 MHz Repetition Rate for Trapped-Ion Quantum Logic**	TBC
1445 - 1500	Fangxin Li (#689) *University of Sydney NSW* **Low Propagation Loss Silicon-on-Sapphire Integrated Waveguides**	TBC	David Mills (#534) *Monash University VIC* **Communication and Confidence in Student-Designed Experiments**	Keiron Boyd (#479) *University of Adelaide SA* **Elliptical CO2 Laser Beam Tapering of Pressurised Bismuth Microstructured Optical Fibe**	Dirk Lorenser (#676) *University of Western Australia WA* **Miniaturized Optical Probe using Gradient-Index Optics for In-Vivo Confocal Microscopy**	Mushtaq Ahmad (#416) *University of Sydney NSW* **Nonlinear Waves in Quantum Plasmas**	Miftar Ganija (#498) *University of Adelaide SA* **Power Scaling and Reliable Cryogenic Cooling of a High Power Solid State Laser**	TBC
1500 - 1530	**Afternoon Tea** – *Banquet Room 201* – Sponsored by *RMIT University* **Casual Poster Viewing – Exhibition Hall**							