DIRECTORS MESSAGE

The last few months have been an exciting period for IPAS members. We have now settled into our new facilities in The Braggs, and are starting to get a glimpse of the impact our extraordinary new laboratory spaces will have on the quality and nature of the science we can undertake. From the atmospheric sensing laboratories on the top floor with access to the sky to the precision measurement and laser laboratories in the basement we now can support high quality research teams to focus on the research goals defined without our six research themes.

Co-location of these capabilities with facilities for glass and optical fibre fabrication, advanced manufacturing, synthetic chemistry and biochemistry means that we are uniquely positioned to pursue ambitious goals that straddle discipline boundaries.

These facilities are attracting significant numbers of international researchers for extended visits, and we already have industry partners working with us in some of the laboratories.

The 2013 IPAS Pilot Program focussed on seeding new activities at the interface of the physical and life sciences, with a particular emphasis of nurturing teams of emerging researchers spanning these fields. Glimpses of significant outcomes are already evident, from the use of fibres in the brain for a better understanding of stroke to new approaches to attaching molecules to the surfaces of photonic devices.

I am proud that the institute’s members have been engaging increasingly with industry, with many new partnerships formed, projects started, and a few start-ups established. This demonstrates the power of our collective vision - that we can create new and innovative products and industries, with the promise of high value jobs for our community. I am particularly pleased that this is occurring in concert with a strengthening of high impact research outcomes and enhanced collaborations, nationally and internationally. I firmly believe that these two elements - high impact research and disruptive outcomes for industry - go hand in hand.

None of this would be possible without the support of the fabulous IPAS core team. Piers Lincoln, for his tireless efforts in showing our top researchers how to proactively engage with industry, Sara Leggatt for her can-do, make-things-happen attitude, Liv for her effective communication and promotion of our activities, Dale for her tireless and powerful support to members in grant development and Luis’ tenacious efforts to ensure that all of the labs, systems and equipment in The Braggs are operating safely and effectively.

I hope you enjoy perusing this newsletter - it provides you with a window to some of the exciting research happening within IPAS.

Tanya Monro.
Professor Tanya Monro has been awarded the Georgina Sweet Australian Laureate Fellowship by the Australian Research Council (ARC) for $2.965m. Tanya's project entitled “Controlling light to understand and drive nanoscale processes” aims to develop a suite of light-based sensing technologies capable of quantifying the dynamic environment within a living cell.

Tanya and 16 other researchers were presented with ceremonial pins by Senator Kim Carr on Tuesday 9 July at the Laureate Ceremony at Monash University. At the event, Tanya spoke about the importance of keeping women in research and the need to break down stale stereotypes of scientists, and challenge any cultures and systems that limit women's engagement.

OTHER FUNDING SUCCESSES
IPAS members have also been successful in securing funding for the following grants:

Commonwealth's Collaborative Research Infrastructure Scheme (CRIS)
Federal Government, Commonwealth’s Collaborative Research Infrastructure Scheme (CRIS), Optofab Adelaide Node, Prof Tanya Monro – $344k

National Health and Medical Research Council (NHMRC) Project Grants
The inhibition of Biotin Protein Ligase as a new source of antibiotics, Prof Andrew Abell - $725,558

Understanding age-related protein aggregation. The mechanism of cataract and its prevention, Prof Andrew Abell - $686,972

Chemokine receptors and the control of Th17-mediated inflammation, Prof Shaun McColl - $769,192

INSTITUTE REVIEW
Over 8-9 July, IPAS underwent an external review Chaired by Professor Sir David Payne, Director of the Optoelectronics Research Centre (ORC) at The University of Southampton in the UK and a world leader in photonics.

The purpose of the review was to assess the purpose, goals and priorities of the Institute as well as the activities and achievements of the Institute with regard to grants, publications, industry and community engagement and research training and to report on recommendations for the future strategy of the Institute.

A series of interviews were conducted with key Institute stakeholders including the DVCR, Dean of Faculty of Sciences, Institute Board members, Institute management, scientific leaders, Heads of closely linked academic Schools, Early Career Researchers, PhD students and other invited stakeholders and there was a tour of the IPAS facilities. This was complemented by written submissions from external stakeholders including companies, Government departments and from internal University stakeholders.

The Review panel commented on how impressed they were by the calibre of the researchers and the research underway, the facilities and on the positive culture they experienced throughout the Institute.

We look forward to evolving IPAS’s strategies as a result of the constructive input from the review panel and think that this will set us up for sustained outcomes and impact.

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New IPAS student committee members were elected in June this year, being Ms Eleanor King, Ms Tess Reynolds, Ms Nur Bahruddin, Mr Tim Engler and Mr Roman Kostecki spanning chemistry, physics and biology. Our first event in July was a great success and brought together over 40 IPAS students to get to know each other over lunch. The IPAS student committee supports students in all aspects of their post-graduate experience.
IPAS members are regularly publishing papers in prestigious journal’s. Below is a flavour of the work undertaken by our members.

**Single nanocrystal sensitivity achieved by enhanced upconversion - Nature Nanotechnology**

We have found a way to make upconverting nano crystals 70% brighter, paving the way for improvements in applications from biosensing to security inks and with potential to remove barriers which currently limit the sensitivity of sensors.


*This work was done in collaboration with researchers from Macquarie University, Shanghai Jiao Tong University, China and Peking University, China*


**Two-color rubidium fiber frequency standard - Optics Letters**

We developed a new type of optical atomic clock where we guide light inside a gas-filled hollow-core optical fibre. The intimate contact between the gas atoms and the light allows us to exactly fix the colour of the light to correspond to a resonance in the atoms. The high performance, and compactness of this device, allows it to be used in applications such as telecommunication and navigation systems.

Authors: Perrella, C., Light, P.S., Anstie, J.D., Baynes, F.N., Benabid, F., Luiten, A.N.

*This work was done in collaboration with researchers from University of Western Australia and Universite de Limoges, France*

Optics Letters, 38 (12), 2122 - 2124 (2013)

**Chemical cross-linking and mass spectrometry for the structural analysis of protein assemblies - Australian Journal of Chemistry**

This review article highlights recent advances and applications of chemical cross-linking mass spectrometry approaches to the study of protein complexes. Continued development of these methodologies has allowed unprecedented structural information to be gained for intricate protein assemblies important for understanding biological function and human disease.

Authors: A. N. Calabrese, T. L. Pukala


**Luminescent properties of fluoride phosphate glass for radiation dosimetry - Optical Materials Express**

The luminescence properties of fluoride phosphate glass have been characterised for the purposes of radiation dosimetry. Optical fibres fabricated from these glasses may be used for environmental radiation-detection applications.

Authors: C. A. G. Kalnins, N. A. Spooner, H. Ebendorff-Heidepriem, T. M. Monro

Optical Materials Express 3 (7), 960-967 (2013)
IPAS continues to build collaborations with international and interstate researchers and teams. We have recently hosted the following speakers:

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<th>Date</th>
<th>Speaker</th>
<th>Institute</th>
<th>Talk Title</th>
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<tr>
<td>29/05/13</td>
<td>Dr Liyun Ding</td>
<td>Wuhan University of Technology, China</td>
<td>Graphene photonics for biosensing and nonlinear applications</td>
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<td>19/06/13</td>
<td>Dr Danilo Manzani</td>
<td>Institute of Chemistry, Sao Paulo State University, Brasil</td>
<td>Special glasses and optical fibres for photonic</td>
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<td>02/07/13</td>
<td>Prof Andrew White</td>
<td>University of Queensland, Queensland</td>
<td>Intriguing chemists and upsetting computer scientists using light and mirrors</td>
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<td>07/08/13</td>
<td>Prof Philip Tuckey</td>
<td>Sytèmes de Référence Temps Espace, Observatoire de Paris</td>
<td>STE-QUEST: Atomic sensors in space for fundamental physics, time and frequency metrology and other applications</td>
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<td>16/08/13</td>
<td>Dr Andrew Sutton</td>
<td>Centre for Gravitational Physics, Department of Quantum Science, Australian National University, Canberra</td>
<td>Inter-satellite interferometric laser ranging technology and terrestrial applications</td>
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<tr>
<td>20/08/13</td>
<td>Dr Mike Biercuk</td>
<td>Quantum Control Laboratory, University of Sydney, Sydney</td>
<td>Controlling Quantum Systems with Photons</td>
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<td>26/08/13</td>
<td>Mr Faraz Inam</td>
<td>Department of Physics and Astronomy, Macquarie University</td>
<td>Fundamental characterisation of nanodiamond NV centre spontaneous emission.</td>
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<td>27/08/13</td>
<td>Prof Libo Yuan</td>
<td>School of Science, Harbin Engineering University (HEU), Harbin, China</td>
<td>In-fiber integrated optic devices and its applications</td>
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<td>29/08/13</td>
<td>A/Prof Robert Scholten</td>
<td>Atom Optics, The University of Melbourne, Melbourne</td>
<td>Quantum imaging in living cells</td>
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<td>04/09/13</td>
<td>A/Prof Ju-Han Lee</td>
<td>University of Seoal, Korea</td>
<td>Nonlinear singla processing devices and pulsed lasers based on optical fiber technology</td>
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<td>09/09/13</td>
<td>Dr Ian Stewart</td>
<td>Food Safety and Innovation, South Australian Research and Development Institute (SARDI)</td>
<td>Ciguatera and Ciguatoxins – Challenges and Rewards</td>
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<td>14/10/13</td>
<td>Ms Charlotte Bond</td>
<td>PhD Student, University of Birmingham, UK</td>
<td>Gravitational wave detection: Challenges of beam and mirror distortions in advanced interferometers</td>
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<tr>
<td>17/10/13</td>
<td>Prof Dave Kielpinski</td>
<td>Griffiths University, Brisbane, Queensland</td>
<td>The shadow of a single atom</td>
</tr>
<tr>
<td>24/10/13</td>
<td>Mr Moritz Nagel</td>
<td>Humboldt-Universität zu Berlin</td>
<td>Ultra-stable cryogenic optical resonators for future technologies and tests of fundamental physics</td>
</tr>
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Klantsataya, Mr Stephen Saffi, Mr Ka Wu and A/Prof Murray Hamilton.

VISITORS TO IPAS

The OSA Student Chapter held a Scientific Photography Competition where students and staff were asked to submit a scientific photo along with a 50 word abstract. On 18 October there was an exhibition of all entries and a panel of judges chose winners in 5 categories. There was also a popular choice award. Winners included Dr Chris Perrella, Dr Matthew Henderson, Ms Liz Klantsataya, Mr Stephen Saffi, Mr Ka Wu and A/Prof Murray Hamilton.

OSA STUDENT CHAPTER

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