



Centre for  
**Nanoscale  
BioPhotonics**  
ARC CENTRE OF EXCELLENCE

2016 | ANNUAL  
REPORT

Light to Measure

# Contents

## Welcome to the ARC Centre of Excellence for Nanoscale BioPhotonics (CNBP) 2016 Annual Report.

### 1 CNBP ORGANISATIONAL STRUCTURE

|                                  |    |
|----------------------------------|----|
| Director's Report                | 4  |
| About Us                         | 6  |
| Structure and Governance         | 7  |
| CNBP Values                      | 8  |
| Executive Management Committee   | 9  |
| Advisory Board                   | 11 |
| International Science Committee  | 12 |
| Education and Outreach Committee | 13 |
| Centre Personnel                 | 14 |

### 2 CNBP RESEARCH

|   |    |
|---|----|
| Case Studies  | 21 |
| – Bleaching Assisted Multi-Channel<br>Microscopy (BAMM)     | 22 |
| – Revolutionary IVF Discoveries                             | 23 |
| – Regeneous Cell Therapies                                  | 24 |
| – Cancer Margin with pH                                     | 25 |
| – Optical Fibre Probe for Brain<br>Temperature Measurements | 26 |
| Science Leadership Team<br>Highlights and Goals             | 27 |
| – Prof. Andrew Greentree                                    | 28 |
| – A/Prof. Brant Gibson                                      | 29 |
| – Prof. Ewa Goldys  | 30 |
| – A/Prof. Jeremy Thompson                                   | 31 |
| – Prof. Nicolle Packer                                      | 32 |
| – Prof. Robert McLaughlin                                   | 33 |
| – Prof. Andrew Abell  | 34 |
| – Prof. Jim Piper   | 35 |
| – Prof. Mark Hutchinson                                     | 36 |
| – Prof. Stephen Nicholls                                    | 37 |
| – Prof. Heike Ebendorff-Heidepriem<br>& Prof. Tanya Monro   | 38 |

### 3 ACTIVITY AND ACHIEVEMENTS

|  |    |
|--|----|
| CNBP Internal Collaborations             | 40 |
| CNBP External Collaborations             | 42 |
| Outreach, Education and<br>Communication | 44 |
| Awards                                   | 49 |

### 4 KPIs AND FINANCIAL STATEMENTS

|                           |    |
|---------------------------|----|
| 2016 KPIs at a Glance     | 50 |
| CNBP KPIs                 | 51 |
| Financials                | 56 |
| Global Collaborations     | 57 |
| Partner Organisations     | 58 |
| Other Partners and Grants | 61 |
| Legacy Partners           | 62 |

### 5 APPENDICES

|                                      |    |
|--------------------------------------|----|
| Appendix 1: Conference Participation | 64 |
| Appendix 2: Centre Publications      | 70 |
| Appendix 3: Community Events         | 77 |
| Appendix 4: Media Engagement         | 82 |

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**Centre for  
Nanoscale  
BioPhotonics**  
ARC CENTRE OF EXCELLENCE



**Australian Government**

**Australian Research Council**



**MACQUARIE**  
University  
SYDNEY • AUSTRALIA



**RMIT**  
UNIVERSITY

# CNBP Organisational Structure





# Director's Report

**Welcome to the 2016 annual report of the Australian Research Council Centre of Excellence for Nanoscale BioPhotonics (CNBP), a highlights package of our exciting scientific journey. In now our third year of operation, the CNBP has produced some amazing scientific and organisational outcomes and continued to deliver more ground breaking firsts for our Centre.**

Within the science program of the CNBP we are asking questions at the nanoscale. For it is at the nanoscale that we can begin to guide light to interact with biology. It is at the nanoscale where we can create light where we need it. It is at the nanoscale that we can observe life begin, watch the triggers of pain be activated, and heart disease evolve. I am very excited about the work conducted in our Centre in 2016 and what we have in store for the coming years.

This year has seen very exciting additions to the membership of the CNBP. Prof. Robert McLaughlin and his research team of three postdocs joined the University of Adelaide node of the CNBP. As the inaugural Chair of BioPhotonics and the recipient of a 2016 South Australian Government Premier's Research, and Industry Fund Fellowship, Rob has seamlessly integrated his translational and entrepreneurial activities into the CNBP research program. 2016 also saw Dr. Michael Baratta from the University of Colorado awarded the inaugural American Australian Association CNBP Fellowship to conduct work within the CNBP network. His research with the CNBP during 2016 has explored the deployment of novel protein biosensors in translational behavioural models of neuropsychiatric illness.



The momentum of industry engagement and translation that has been part of the CNBP from day 1 has been carried across the whole Centre this year with Prof. Ewa Goldys and Dr. Martin Gosnell being awarded the "Innovative Use of Technology" award at the 2016 Australian Museum Eureka Prizes. Other successes include Dr. Erik Schartner's team being awarded Medical Device Partnering Program funding to translate an early biosensor with cancer margin detection capabilities into a clinically deployable prototype device. Together with commercial partners Regeneus Pty Ltd, CNBP investigators were also awarded an ARC Linkage grant to translate CNBP technologies; and both Schartner's and McLaughlin's teams were successful in receiving Commercialisation Acceleration Scheme funding to aid commercialisation of their Intellectual Property.

This year of translational success was topped off with the South Australian Government announcing the \$2.4M funding of the South Australian Rapid Commercialisation Initiative (SARCI), triggered by the collaborative industry work the CNBP established during the year. These successes will see CNBP technologies being developed and deployed into food innovation areas over the next 4 years. Our research program continues to be externally motivated with even closer ties with our current and future commercial partners to create disruptive technologies. We are seeing the translation of CNBP technologies and CNBP generated knowledge servicing multiple markets, from outback farms in animal production, through to the rural doctor treating their patients.



Our vision is to create economic and social value for all our communities and multiple industry sectors. Our high impact science publications from the past year will only be a part of our outcomes from this research, with industry translation and commercialisation intentionally evolving and facilitated within the CNBP.

The CNBP hosted several events in 2016 including scientific workshops, a Partner launch at our International Partner IPHT in Jena Germany, together with UHN industry networking events at Laval University in Toronto, Canada, and the inaugural meeting of SPIE BioPhotonics Australasia, which also included a focused industry and Government networking event. These activities saw engagement with over 400 stakeholders, including representatives of the State Government, industry, members of the University communities and the general public. These collective activities exemplify our key pillars of Academic Excellence, Commercial Impact, Quality Communication and a Nurturing Environment. Since the beginning of CNBP, these principles have grown from an organisational initiative into meaningful actions. This can be seen in our amazing science programs and has been exemplified in the way that we have conducted this science through open communication channels with industry and government.

The third CNBP scientific retreat at Victor Harbor was a resounding success with close to 100 Centre students, Associate and Partner Investigators in attendance for the three-day event. Critically, our family friendly policy was borne out with the inclusion of multiple working parents and their children in the program through intentional scheduling and planning of our program. As is the CNBP way, we did things differently in the research presentations, with a combination of rapid fire 1 minute project updates, 3 minute thesis presentations from our Centre graduate students, and in-depth science presentations from teams of our researchers undertaken without slides. Once again the retreat highlighted and strengthened the vibrant culture and environment of nurturing and mentoring of our scientists across all levels.

CNBP scientists are out in the community and in the media, educating and exciting others about our science. Our Centre continues to be one in which our scientists can openly share and test new, raw and cutting edge hypotheses, where our scientists are mentored and equipped with the skills to be the next generation of science leaders. This means we have an environment where we are encouraged to practice and to take the big risks that sometimes fail, so that when the once in a lifetime opportunities come around we are already fashioned with the necessary skills to succeed.

CNBP scientists are out in the community and in the media, educating and exciting others about our science.

I would like to congratulate all of the Centre's personnel for a highly successful and productive year. Thanks to our wonderful CNBP leadership team for all their hard work in 2016. These are exciting times! ■

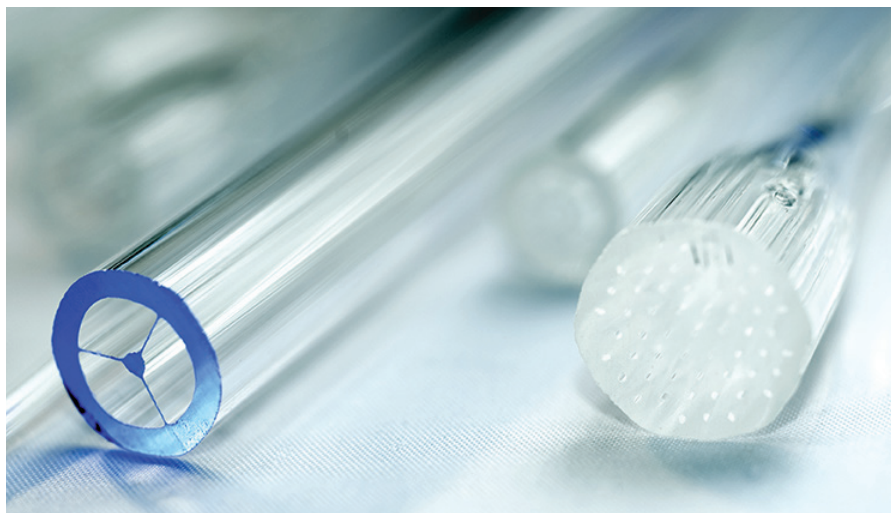


**Prof. Mark Hutchinson**  
Director, CNBP

# About Us



# Structure and Governance



## **The CNBP links into the broader Australian community through a selected network consisting of Partners and Associate Investigators (AIs).**

The reach and capacity of the Centre will be enhanced by active links with Partner Organisations, providing Centre researchers with rich opportunities to work within leading international groups in areas that complement and extend the core capabilities in the Centre, both within Australia (CSIRO, SAHMRI) and overseas (Leibniz Institute of Photonic Technology, Peking University, Huazhong University of Science and Technology, University Health Network Toronto, Southampton University and City University London).

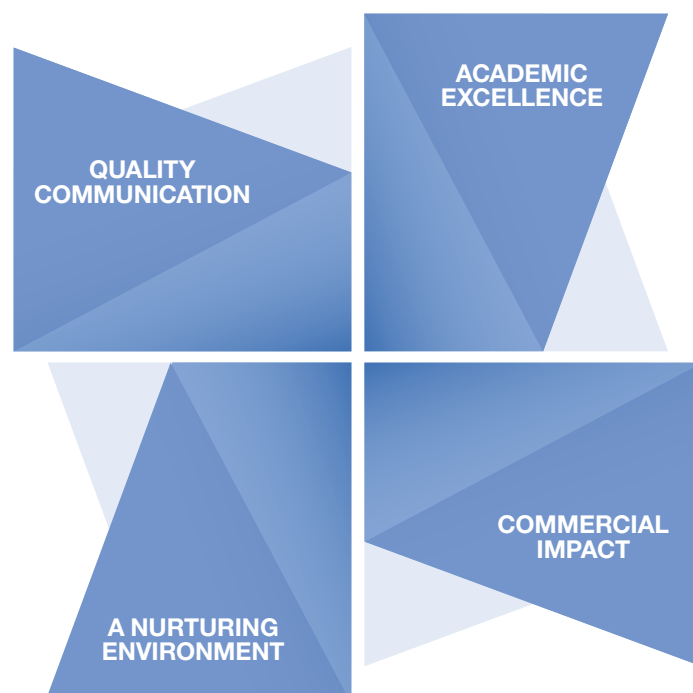
Our corporate partners (Olympus Australia, Heraeus and Bioplatforms Australia) will help drive commercial outcomes from CNBP research.

Through the Centres, connected Associate Investigators and CNBP's researchers have opportunities to link into other institutions including University of Adelaide, Macquarie University, RMIT University, University of Melbourne, Monash University, University of Technology Sydney, University of New South Wales, University of Western Australia, SAHMRI, Australian National University, Swinburne University of Technology, The University of Queensland, UC Davis and University of Nottingham.

A strong governance structure enables us to marshal the enthusiasm and commitment of this team to the vision of the CNBP to pursue ambitious science goals. ■



# CNBP Values



## CNBP Broad Objectives

- Lead international research in nanoscale biophotonics—creating tools for understanding complex biological systems.
- Empower and integrate fields of leading researchers across physics, chemistry and biology.
- Pioneer approaches to transdisciplinary research training and nurturing entrepreneurship in emerging scientists.
- Inspire children through to young adults to aspire to careers in science as a pathway to making a difference.
- Engage with leading international centres and researchers to strengthen outcomes and raise the profile of Australian Research.
- Seed industries by creating disruptive technology platforms and partnering with industry.

## CNBP Scientific Aims

- Reach the limits of light-based measurement within complex and dynamic biological environments.
- Exploit physics and multiple scales—nanoscale to macro—using photons to bridge from nanomaterial to devices.
- Create smart, tailored interfaces between these nanoscale systems and the biochemical environment.
- Develop new ways to control molecular function in solution and on surfaces.
- Establish new forms of assay measurement that can operate within living organisms.
- Use these assays to study key problems associated with embryological development, and brain and blood vessel function.
- Understand the molecular mechanisms, processes and functionalities in these biological systems.

## CNBP Values

The four CNBP pillars underpin all aspects of our work.

- Academic excellence
- Commercial impact
- Quality communication
- A nurturing environment

# Executive Management Committee

The Executive Management Committee (EMC) oversees all aspects of the Centre's activities. In addition, Senior Scientists work together as the Science Leadership Team (SLT) to oversee and steer the CNBP's scientific focus.

In 2016 the EMC met monthly, with meetings alternating between face-to-face and video conference. Meetings were attended in person across all nodes rotating during the year, with science workshops scheduled around these meetings bringing together the wider CNBP community at each of the nodes. ■

**Prof. Mark Hutchinson**  
Centre Director, CNBP  
Origin of Sensation  
Leader  
THE UNIVERSITY  
OF ADELAIDE



**Prof. Ewa Goldys**  
Joint Deputy Director  
Measure Co-Leader  
MACQUARIE  
UNIVERSITY



**Emeritus Prof.  
Jim Piper AM**  
MQ Node Leader  
MACQUARIE  
UNIVERSITY



**A/Prof.  
Brant Gibson**  
Joint Deputy Director  
Illuminate Leader  
RMIT Node Leader  
RMIT UNIVERSITY



**Prof. Andrew Greentree**  
Chief Investigator  
Measure Co-Leader  
RMIT UNIVERSITY



**A/Prof. Jeremy Thompson**  
Chief Investigator  
Spark of Life Leader  
THE UNIVERSITY  
OF ADELAIDE



**Prof. Andrew Abell**  
UA Node Leader  
Chief Investigator  
Recognise Leader  
THE UNIVERSITY  
OF ADELAIDE



**Prof. Tanya Monro**  
Chief Investigator  
UNIVERSITY  
OF ADELAIDE  
UNIVERSITY OF  
SOUTH AUSTRALIA



## Executive Management Committee (continued)



Photo: Dr. Philipp Reineck

**Prof. Stephen Nicholls**

Chief Investigator  
Inside Blood Vessels  
Leader  
SAHMRI



**Prof. Nicolle Packer**

Chief Investigator  
Discover Leader  
MACQUARIE  
UNIVERSITY



**Prof. Heike Ebendorff-Heidepriem (Observer)**

CNBP Senior  
Investigator  
THE UNIVERSITY  
OF ADELAIDE



**Dr. Ivan Maksymov**

ECR Representative  
RMIT UNIVERSITY



**Prof. Robert McLaughlin (Observer)**

CNBP Senior  
Investigator  
THE UNIVERSITY  
OF ADELAIDE



**Mrs. Vicky Staikopoulos**

Co-Student  
Representative  
THE UNIVERSITY  
OF ADELAIDE



**Mr. Christopher Ashwood**

Co-Student  
Representative  
MACQUARIE  
UNIVERSITY



**Mrs. Melodee Trebilcock (Secretary)**

Centre Manager, CNBP  
THE UNIVERSITY  
OF ADELAIDE



**Mr. Tony Crawshaw (Observer)**

Communications  
and Outreach  
Coordinator, CNBP  
MACQUARIE  
UNIVERSITY



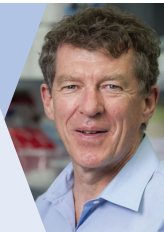


# Advisory Board

The Advisory Board works to strengthen CNBP linkages with academic, industry and government, identifying strategic engagement opportunities. The Board met three times during 2016, with the final meeting being face-to-face and acknowledging outgoing Chair, Prof. Ian Frazer and welcoming new Chair, Ms. Catriona Jackson.

**Prof. Ian Frazer (Chair)**

Director, Translational  
Research Institute  
UNIVERSITY OF  
QUEENSLAND



**Ms. Catriona Jackson**

Deputy CEO  
UNIVERSITIES  
AUSTRALIA



**Prof. Mark Hutchinson**

Centre Director, CNBP  
THE UNIVERSITY  
OF ADELAIDE



**A/Prof. Paul Willis**

Director, RiAus  
AUSTRALIA'S  
SCIENCE CHANNEL



**Prof. Peter Nelson**

PVCR  
MACQUARIE  
UNIVERSITY



**Prof. Goran Roos**

Private Consultant  
COMMERCIALISATION



**Mr. Mick Reid**

Private Consultant  
INDUSTRY &  
BUSINESS



**Prof. Michael Brooks**

DVCR  
THE UNIVERSITY  
OF ADELAIDE



**Prof. Calum Drummond**

DVCR  
RMIT UNIVERSITY



**Prof. Hugh Possingham**

Director ARC  
Centre of Excellence  
for Environmental  
Decisions (CEED)  
UNIVERSITY OF  
QUEENSLAND



**Mrs. Melodee Trebilcock (Secretary)**

Centre Manager, CNBP  
THE UNIVERSITY  
OF ADELAIDE



# International Science Committee

**Prof. Dennis Matthews (Chair)**

Director  
Centre of  
BioPhotonics  
Science &  
Technology  
UC DAVIS



**Prof. Mark Hutchinson**

Centre Director, CNBP  
THE UNIVERSITY  
OF ADELAIDE



**Prof. Katarina Svanberg**

Professor  
LUND UNIVERSITY



**Prof. Paul French**

Professor  
IMPERIAL COLLEGE  
LONDON



**Prof. Bob Grubbs**

Professor and  
Nobel Laureate  
CALTECH



**Prof. Yafeng Guan**

Professor  
CHINESE ACADEMY  
OF SCIENCES



**Prof. Francesco Pavone**

Professor  
EUROPEAN  
LABORATORY  
FOR NONLINEAR  
SPECTROSCOPY



**Prof. Kishan Dholakia**

Professor  
UNIVERSITY  
OF ST ANDREWS, UK



**Dr. Martin Matzuk**

Director  
CENTER FOR  
BAYLOR COLLEGE  
OF MEDICINE  
HOUSTON, TEXAS



**A/Prof. Kelly Nash**

Professor  
UNIVERSITY  
OF TEXAS  
SAN ANTONIO



The CNBP International Science Committee (ISC) advises on the strategic directions of the scientific endeavours of the Centre, and supports the delivery of other Centre outcomes.

In 2016 three ISC meetings were scheduled, two via video conferencing and one at CNBP's Annual Retreat in Adelaide, whereby the Committee met individually with each Chief Investigator of the Centre contributing to the ISC 2016 report for the Centre. ISC members also attended the inaugural SPIE BioPhotonics Australasia Conference prior to departing for the Annual Retreat. The ISC under the direction of Chair, Professor Dennis Matthews continued to provide significant input and suggestions into the progression of the Centre to date during 2016 and contributed to the future planning of the scientific translation of the Centre.

CNBP welcomed three new members during 2016 – Associate Professor Kelly Nash, University of Texas, San Antonio, Professor Kishan Dholakia, University of St Andrews, United Kingdom and Dr. Martin Matzuk, Director of the Center for Drug Discovery, Baylor College of Medicine, Houston, Texas. ■

**Mrs. Melodee Trebilcock (Secretary)**

Centre Manager, CNBP  
THE UNIVERSITY  
OF ADELAIDE



# Education and Outreach Committee

The Education and Outreach Committee, chaired by A/Prof. Paul Willis, guides CNBP researchers towards effective approaches to communicating the wonders of science to the broader community. During 2016 the committee met three times via video conference.

CNBP is committed to showcasing its research and scientific achievements to the wider community, the general public, school students and other interested audiences. Our desire is to grow the awareness of CNBP and its specific activities, to promote increased understanding of the transdisciplinary field of nanoscale biophotonics and to enthuse and encourage the community to engage with scientific thinking and to be excited by the wonders of science. In doing so we hope to contribute to a well-informed and science-literate public. We also look to motivate students in their current STEM related study, inspiring them to become the scientists and researchers of the future. During 2016, CNBP has successfully embraced a wide range of communications strategies and activities to support this engagement focus. ■

**A/Prof. Paul Willis (Chair)**

Director, RiAus  
AUSTRALIA'S  
SCIENCE CHANNEL



**Prof. Mark Hutchinson**

Centre Director, CNBP  
THE UNIVERSITY  
OF ADELAIDE



**Mr. Mike Seyfang**

Private Consultant  
IT & Social Media



**Mr. Nick Besley**

Senior Manager  
Engagement  
RMIT UNIVERSITY



**Dr. Rachel Dunlop**

Medical Researcher  
and Sceptic



**A/Prof. Rod Lamberts**

Associate Director  
CPAS  
ANU



**Mr. Tony Crawshaw**

Communications  
and Outreach  
Coordinator, CNBP  
MACQUARIE  
UNIVERSITY



**Mrs. Melodee Trebilcock (Secretary)**

Centre Manager, CNBP  
THE UNIVERSITY  
OF ADELAIDE





# Centre Personnel

## CENTRE PERSONNEL

### Centre Executive/Science Leadership Team

|                                  |   |
|----------------------------------|---|
| Prof. Mark Hutchinson            | Centre Director, The University of Adelaide                               |
| Prof. Ewa Goldys                 | Centre Deputy Director (joint), Macquarie University                      |
| A/Prof. Brant Gibson             | Centre Deputy Director (joint), Node Director RMIT University             |
| Prof. Andrew Abell               | Chief Investigator, Node Director, The University of Adelaide,            |
| Prof. Heike Ebendorff-Heidepriem | CNBP Investigator, The University of Adelaide                             |
| Prof. Andrew Greentree           | Chief Investigator, RMIT University                                       |
| Prof. Robert McLaughlin          | CNBP Investigator, The University of Adelaide                             |
| Prof. Tanya Monro                | Chief Investigator, University of Adelaide, University of South Australia |
| Prof. Stephen Nicholls           | Chief Investigator, SAHMRI  |
| Prof. Nicolle Packer             | Chief Investigator, Macquarie University                                  |
| Prof. Jim Piper                  | Chief Investigator, Node Director Macquarie University                    |
| A/Prof. Jeremy Thompson          | Chief Investigator, The University of Adelaide                            |

### Professional Staff

|                         |  |
|-------------------------|--|
| Mrs. Melodee Trebilcock | Centre Manager, The University of Adelaide   |
| Mr. Tony Crawshaw       | Communications & Outreach Manager, Macquarie University                                  |
| Dr. Kathy Nicholson     | Chief Operating Officer, The University of Adelaide (maternity leave until October 2016) |
| Ms. Leonie McKay        | Administrator and EA to Node Director, Macquarie University                              |
| Ms. Brooke Bacon        | Administrator and EA to Node Director, RMIT University                                   |
| Mrs. Bronwyn Gibson     | Administrator and EA to Centre Director, The University of Adelaide                      |
| Mrs. Karen English      | Administrator, The University of Adelaide  |

### CNBP Researchers

|                              |                                 |
|------------------------------|---------------------------------|
| Dr. Ayad Anwer               | Macquarie University            |
| Dr. Akash Bachhuka           | The University of Adelaide      |
| Dr. Beatriz Blanco-Rodriguez | ECR, The University of Adelaide |
| Dr. Hannah Brown             | University of Adelaide          |
| Dr. Andrew Care              | ECR, Macquarie University       |
| Dr. Nicole Cordina           | ECR, Macquarie University       |
| Dr. Denitza Denkova          | ECR, Macquarie University       |
| Dr. Greg Dmochowski          | UHN Toronto                     |
| Dr. Daniel Drumm             | ECR, RMIT University            |
| Dr. Arun Everest-Dass        | Macquarie University            |
| Dr. Sabrina Heng             | The University of Adelaide      |
| Mr. Rodney Kirk              | The University of Adelaide      |
| Mr. Roman Kostecki           | The University of Adelaide      |
| Dr. Peipei Jia               | ECR, The University of Adelaide |
| Dr. Lianmei Jiang            | ECR, Macquarie University       |
| Dr. Desmond Lau              | RMIT University                 |
| Dr. Tom Lawson               | Macquarie University            |

## CENTRE PERSONNEL

### CNBP Researchers (continued)

|                        |  |
|------------------------|--|
| Dr. Jiawin Li          | ECR, The University of Adelaide          |
| Dr. Guozhen Liu        | Macquarie University                     |
| Dr. Yong Liu           | Macquarie University                     |
| Dr. Ivan Maksymov      | RMIT University                          |
| Dr. Melanie McDowall   | The University of Adelaide               |
| Dr. Abidali Mohamedali | Macquarie University                     |
| Dr. Sanam Mustafa      | The University of Adelaide               |
| Dr. Annemarie Nadort   | ECR, Macquarie University                |
| Dr. Antony Orth        | ECR, RMIT University                     |
| Dr. Lindsay Parker     | ECR, Macquarie University                |
| Dr. Victoria Peddie    | ECR, The University of Adelaide          |
| Dr. Martin Ploschner   | ECR, Macquarie University                |
| Mr. Benjamin Pullen    | The University of Adelaide & SAHMRI      |
| Dr. Malcolm Purdey     | ECR, The University of Adelaide & SAHMRI |
| Mr. Bryden Quirk       | The University of Adelaide               |
| Dr. Phipp Reineck      | ECR, RMIT University                     |
| Dr. Erik Schartner     | The University of Adelaide               |
| Dr. Nisha Schwarz      | ECR, The University of Adelaide & SAHMRI |
| Dr. Jacob Thomas       | ECR, The University of Adelaide          |
| Dr. Georgios Tsiminis  | The University of Adelaide               |
| Dr. Fan Wang           | Macquarie University                     |
| Dr. Jingxian Yu        | The University of Adelaide               |
| Dr. Michelle Zhang     | ECR, The University of Adelaide          |

### Associate Investigators/Affiliates

|                            |   |
|----------------------------|---|
| A/Prof. Igor Aharanovich   | Associate Investigator, University of Technology Sydney |
| Dr. Louise Brown           | Associate Investigator, Macquarie University            |
| A/Prof. Jennifer Cornish   | Associate Investigator, Macquarie University            |
| Dr. Wei Deng               | ECR, Associate Investigator, Macquarie University       |
| Dr. MyNgan Duong           | Associate Investigator, SAHMRI                          |
| Dr. Alexandre Francois     | Associate Investigator, The University of Adelaide      |
| Dr. Alfonso Garcia-Bennett | Associate Investigator, Macquarie University            |
| Prof. David Gardner        | Associate Investigator, University of Melbourne         |
| Dr. Jonathan George        | Associate Investigator, The University of Adelaide      |
| Prof. Irene Hudson         | Associate Investigator, University of Newcastle         |
| Dr. David Inglis           | Associate Investigator, Macquarie University            |
| Dr. Woie Ming (Steve) Lee  | Associate Investigator, Australian National University  |
| Dr. Guozhen Liu            | Associate Investigator, Macquarie University            |

## Centre Personnel (continued)

### CENTRE PERSONNEL

#### Associate Investigators/Affiliates (continued)

|                            |   |
|----------------------------|---|
| Dr. Yiqing Liu             | Associate Investigator, Macquarie University                |
| Prof. Bruce Hammock        | Associate Investigator, UC Davis                            |
| Prof. Stephen Hill         | Associate Investigator, University of Nottingham            |
| Dr. Peter Hoffman          | Associate Investigator, The University of Adelaide          |
| Dr. John Horsley           | ECR, Affiliate, The University of Adelaide                  |
| Prof. Dayong Jin           | Associate Investigator, University of Technology Sydney     |
| Dr. Borja Lopez-Perez      | Associate Investigator, The University of Adelaide          |
| A/Prof. Kevin Pflieger     | Associate Investigator, University of Western Australia     |
| Prof. Sally McArthur       | Associate Investigator, Swinbourne University of Technology |
| Prof. Dougal McCulloch     | Associate Investigator, RMIT University                     |
| Prof. Paul Mulvaney        | Associate Investigator, University of Melbourne             |
| Dr. Mark Prescott          | Associate Investigator, Monash University                   |
| Dr. Peter Psaltis          | Associate Investigator, SAHMRI                              |
| Dr. Yinlan Ruan            | Associate Investigator, The University of Adelaide          |
| Dr. Abel Santos            | Associate Investigator, The University of Adelaide          |
| Dr. Bingyang Shi           | Associate Investigator, Macquarie University                |
| Dr. Varun Sreenivasan      | ECR, Associate Investigator, Macquarie University           |
| Dr. Nima Sayyadi           | Associate Investigator, Macquarie University                |
| Dr. Anwar Sunna            | Associate Investigator, Macquarie University                |
| Dr. Shahraam Afshar Vahid  | Associate Investigator, University of South Australia       |
| Dr. Achini Vidanapathirana | Associate Investigator, SAHMRI                              |
| A/Prof. Tiffany Walsh      | Associate Investigator, Deakin University                   |
| Dr. Stephen Warren-Smith   | ECR, Associate Investigator, The University of Adelaide     |
| Dr. Steven Wiederman       | Associate Investigator, The University of Adelaide          |
| Prof. Marc Wilkins         | Associate Investigator, University of NSW                   |
| Dr. Helen (Xiaxue) Xu      | ECR, Associate Investigator, Macquarie University           |
| Dr. Run Zhang              | Associate Investigator, The University of Queensland        |
| Dr. Tim (Jiangbo) Zhao     | ECR, Associate Investigator, The University of Adelaide     |
| A/Prof. Andre Zvyagin      | Associate Investigator, Macquarie University                |

#### Students – PhD

|                          |   |
|--------------------------|---|
| Mr. Shathili Abdulrahman | PhD Student, Macquarie University       |
| Mr. Azim Arman           | PhD Student, The University of Adelaide |
| Mr. Christopher Ashwood  | PhD Student, Macquarie University       |
| Mr. Matthew Briggs       | PhD Student, The University of Adelaide |
| Mr. Marco Capelli        | PhD Student, RMIT University            |
| Mr. Patrick Capon        | PhD Student, The University of Adelaide |
| Mr. Wenjie Chen          | PhD Student, Macquarie University       |



## CENTRE PERSONNEL

### Students – PhD (continued)

|                         |   |
|-------------------------|---|
| Ms. Sandya Clement      | PhD Student, Macquarie University       |
| Ms. Minakshi Das        | PhD Student, Macquarie University       |
| Mr. Fei Deng            | PhD Student, Macquarie University       |
| Mr. Kasun Dissanayake   | PhD Student, City University London     |
| Mr. Shilun Feng         | PhD Student, CSIRO, Melbourne           |
| Mr. Libing Fu           | PhD Student, Macquarie University       |
| Mrs. Fang Gao           | PhD Student, Macquarie University       |
| Ms. Anna Guller         | PhD Student, Macquarie University       |
| Mr. Abbas Habibalahi    | PhD Student, Macquarie University       |
| Mr. Jonathan Hall       | PhD Student, The University of Adelaide |
| Ms. Mengke Han          | PhD Student, The University of Adelaide |
| Mr. Meng He             | PhD Student, Macquarie University       |
| Mr. Ashleigh Heffernan  | PhD Student, RMIT University            |
| Ms. Aimee Horsfall      | PhD Student, The University of Adelaide |
| Ms. Sameera Iqbal       | PhD Student, Macquarie University       |
| Mr. Kashif Islam        | PhD Student, Macquarie University       |
| Mr. Jonathan Jacobsen   | PhD Student, The University of Adelaide |
| Ms. Maria Javaid        | PhD Student, RMIT University            |
| Ms. Hong Ji             | PhD Student, University of Adelaide     |
| Ms. Zahra Khabir        | PhD Student, Macquarie University       |
| Ms. Aniket Kulkarni     | PhD Student, The University of Adelaide |
| Mr. Rahul Kumar         | PhD Student, City University London     |
| Ms. (Olivia) Luen Liang | PhD Student, Macquarie University       |
| Ms. Megan Lim           | PhD Student, The University of Adelaide |
| Ms. Jiajun Liu          | PhD Student, The University of Adelaide |
| Mr. Deming Liu          | PhD Student, Macquarie University       |
| Mr. Yujia Liu           | PhD Student, Macquarie University       |
| Mr. Saabah Mahbul       | PhD Student, Macquarie University       |
| Ms. Hanna McLennan      | PhD Student, The University of Adelaide |
| Ms. Nuriyah Mohammed    | PhD Student, RMIT University            |
| Mr. Stefan Musolino     | PhD Student, The University of Adelaide |
| Ms. Layla Pires         | PhD Student, UHN Toronto                |
| Mr. Aziz Rehman         | PhD Student, Macquarie University       |
| Ms. Tess Reynolds       | PhD Student, University of Adelaide     |
| Ms. Vlada Rozova        | PhD Student, Macquarie University       |
| Mr. Yu (Rain) Shi       | PhD Student, Macquarie University       |
| Mrs. Vicky Staikopoulos | PhD Student, The University of Adelaide |
| Mr. Daniel Stubing      | PhD Student, University of Adelaide     |

## Centre Personnel (continued)

| CENTRE PERSONNEL             |  |
|------------------------------|--|
| Students – PhD (continued)   |  |
| Ms. Georgina Sylvia          | PhD Student, The University of Adelaide  |
| Ms. Yan (Victoria) Wang      | PhD Student, Macquarie University  |
| Mr. (Fei) Felix Wang         | PhD Student, Macquarie University  |
| Mr. Wan-Azizuddin WanRazali  | PhD Student, Macquarie University  |
| Mr. Piotr Wargocki           | PhD Student, Macquarie University  |
| Mr. Yunle Wei                | PhD Student, The University of Adelaide  |
| Mr. Kaixin Zhang             | PhD Student, Macquarie University  |
| Mr. Xianlin Zheng            | PhD Student, Macquarie University  |
| Mrs. Nafisa Zohora           | PhD Student, RMIT University   |
| Students – Masters/Honours   |  |
| Ms. Elizabeth Camilleri      | Masters, Macquarie University  |
| Mr. Manoj Kale               | Masters, Macquarie University  |
| Mr. Stepehn Kirby            | Honours, The University of Adelaide  |
| Ms. Lauren Murray            | Honours, The University of Adelaide  |
| Ms. Kathryn Palasis          | Honours, The University of Adelaide  |
| Mr. Xuanzhao Pan             | Masters, The University of Adelaide  |
| Ms. Rashmi Pillai            | Masters, Macquarie University  |
| Mr. Avishkar Saini           | Masters, The University of Adelaide  |
| Mr. Eshan De Soysa           | Honours, RMIT University   |
| Mr. Daniel Stavrevski        | Masters, RMIT University   |
| Ms. Emma Wilson              | Honours, RMIT University   |
| Mr. Josef Worboys            | Honours, RMIT University   |
| Mr. Michael Woy              | Masters, The University of Adelaide  |
| Mr. Yuan Qi Yeoh             | Honours, The University of Adelaide  |
| Ms. Cheow (Tiffany) Yuen Tan | Honours, The University of Adelaide  |
| Visiting Fellows             |  |
| Dr. Michael Baratta          | to Macquarie University and The University of Adelaide AAA Fellowship recipient from The University of Colorado                            |
| Prof. Brett Bouma            | to The University of Adelaide in Plenary Speaker capacity for SPIE BioPhotonics Australasia 2016 from Harvard Cancer Centre, Massachusetts |
| Dr. Andrew Brown             | to Macquarie University and The University of Adelaide from SPIE, California   |
| Prof. Leon Chosez            | to The University of Adelaide from Institute European de Chimie et Biologie  |
| Prof. Yves DeKonnick         | to The University of Adelaide in Plenary Speaker capacity for SPIE BioPhotonics Australasia 2016 from Quebec Mental Health Institute       |
| Prof. Kishan Dholakia        | to The University of Adelaide from University of St Andrews in ISC capacity and presented a seminar  |
| Jochen Feldman               | to RMIT University from LMU, Munich  |

## CENTRE PERSONNEL

### Visiting Fellows (continued)

|                                      |  |
|--------------------------------------|--|
| Dr. Peter Grace                      | to The University of Adelaide from The University of Colorado, Boulder   |
| Prof. Catherine Grosdemange-Billiard | to The University of Adelaide from University of Strasberg   |
| Prof. Chongfeng Guo                  | to Macquarie University visiting under CSC Fellowship scheme   |
| Mr. Edan Habel                       | Summer Scholar from ANU  |
| Prof. Rainer Heintzman               | to The University of Adelaide in Plenary Speaker capacity for SPIE BioPhotonics Australasia 2016 from Leibniz Institute of Photonic Technology (IPHT) Jena |
| Dr. Depeng Kong                      | to The University of Adelaide from Chinese Academy of Science  |
| Mr. Christian Leiterer               | to Macquarie University DAAD Fellow Jan2014-Jan2016  |
| Prof. Richard Levenson               | to The University of Adelaide in Plenary Speaker capacity for SPIE BioPhotonics Australasia 2016 from UC Davis Medical Centre                              |
| Prof. Dennis Matthews                | to The University of Adelaide in ISC capacity  |
| Prof. Graeme Milligan                | to The University of Adelaide from University of Glasgow   |
| Takeshi Ohshima                      | to RMIT University from National Institutes for Quantum and Radiological Science and Technology (QST)  |
| Dr. Christopher Paige                | to The University of Adelaide from University Health Network (UHN) Toronto   |
| Dorit Pud                            | to The University of Adelaide from University of Haifa, Israel   |
| Dr. Nelida Rodriguez                 | to The University of Adelaide  |
| Prof. Schiewer                       | to The University of Adelaide from the University of Freiburg  |
| Prof. Katarina Svanberg              | to The University of Adelaide in ISC capacity  |
| Xiaohui Wang                         | to Macquarie University under the Australian China Young Exchange Program (YESP)   |
| Prof. Chris Xu                       | to The University of Adelaide in Plenary Speaker capacity for SPIE BioPhotonics Australasia 2016 from Cornell University, New York City                    |
| Prof. Akhihiro Yamanaka              | to The University of Adelaide from Nagoya University, Japan  |

### Partner Investigators

|                            |   |
|----------------------------|---|
| A/Prof. Gilberto Brambilla | University of Southampton                                   |
| Prof. Qingming Luo         | Huazhong University of Science and Technology (HUST), China |
| Prof. Steven Maier         | The University of Colorado, Boulder                         |
| Prof. Stephen Nicholls     | SAHMRI  |
| Prof. Juergen Popp         | Institute of Photonic Technology (IPHT), Jena               |
| A/Prof. Yujie Sun          | Peking University, China                                    |
| Prof. Sun Tong             | City University London                                      |
| Prof. Brian Wilson         | University Health Network (UHN) Toronto                     |
| A/Prof. Peng Xi            | Peking University, China                                    |
| Dr. Yonggang Zhu           | CSIRO   |





# CNBP Research

## Case Studies

## Case Studies

### Bleaching Assisted Multi-Channel Microscopy (BAMM): Going beyond colour in fluorescence microscopy

#### CASE STUDY

#### Bleaching Assisted Multi-Channel Microscopy (BAMM)

DR. ANTONY ORTH

**Fluorescence microscopy is one of the most widely used techniques in biology. Light emitting molecules called fluorophores highlight structures and proteins in the cell, resulting in information-rich images. Each target within a cell (say, a specific protein or the nucleus) is tagged by a certain fluorophore with a unique colour. Colour filters in the microscope can then select emission from any one of the types of fluorophores while blocking light originating from all others.**

This approach is versatile, but there is a major limitation. The visible spectrum, where most fluorophores operate, can get crowded. The visible colour spectrum spans the range from 400nm to 700nm and only about 200nm of this range is available for fluorescence emission due to optical engineering considerations. Fluorescence emission near the excitation wavelength is blocked in order to introduce the excitation light to the sample. On the other hand, a typical fluorophore emits over a 50nm range of that spectrum. For colour filtering to work properly, the fluorescent emission from different species should not overlap – in other words they should have distinct-enough colours.



However, if you're dividing up 200nm of the visible spectrum into 50nm segments, the colours of fluorescent emitters blend together when you attempt to squeeze in more than four different colours.

In order to highlight more targets for more highly multiplexed experiments, we need to use another property to differentiate between fluorescent species.

At the CNBP, we have developed a technique called “bleaching-assisted multichannel microscopy” (BAMM) to increase multiplexing in fluorescence microscopy. Instead of using colour to differentiate between fluorophores, we exploit a universal phenomenon called photo-bleaching – the apparent dimming of a fluorophore or pigment under repeated exposure to light. Because each type of fluorophore photo-bleaches at a different rate, we can differentiate between fluorophores without using any colour information.

the CNBP has turned what has historically been considered a detrimental effect into a useful phenomenon.

When paired with colour information, this added dimension of contrast enables scientists to use 2-3x more types of fluorescent molecules in a single sample. Moreover, BAMM also relaxes some experimental design constraints. Some targets are best tagged with certain fluorophores, but what if the two ideal fluorophores for two different targets have the same colour? Previously they were incompatible, but with BAMM, they can be used simultaneously.

Simplicity is perhaps BAMM's biggest asset, making it attractive from an industry perspective. Current approaches to increased multiplexing involve significantly expensive hardware. In contrast, BAMM actually simplifies microscope design by obviating the need for colour filters in some cases. In leveraging photo-bleaching for increased multiplexing, the CNBP has turned what has historically been considered a detrimental effect into a useful phenomenon. ■



# Case Studies

## Revolutionary IVF Discoveries

CASE STUDY

### Revolutionary IVF Discoveries

A/PROF. JEREMY THOMPSON

**Most of us appreciate that every animal, including ourselves, start life as the fusion product between a sperm and egg, producing an embryo.**

Although this sounds trite, the process by which an early embryo forms continues to fascinate us and many other scientists around the world. Much of this fascination is directed towards just how unique and very different these two cell types are. Whereas one cell is a mobile packet of condensed DNA (the sperm), the other is the largest cell in the body (the egg, or more formally referred to as the oocyte). And whereas males can produce an almost endless number of sperm, there is a finite number of oocytes produced and this fact alone is the cause of age-related infertility.

Nevertheless, the uniqueness of the sperm and the oocyte, and the complexity of how they come together in the reproductive tract of any animal, is only part of the story. Pregnancy establishment requires an orchestrated series of hormonal events that entail the communication between brain, gonads and in females especially, the reproductive tract. Furthermore, it is not only the endocrine hormones, such as progesterone, that are important, but increasingly we recognize that reproduction involves the immune system as well. These signals culminate to provide the environment that sperm, oocytes and embryos operate within.



A/Prof. Jeremy Thompson

**Our photonic probes approach is enabling us to access the lumen of the (female) reproductive tract in a way not achievable before.**

Studying these events present difficult challenges that are being tackled by the CNBP. Our major challenge is that we don't understand just how dynamic life is for a sperm or egg in the reproductive tract. For example, we don't have a way of assessing the environment established inside the female reproductive tract without invasively isolating it.

All of our knowledge regarding the biochemistry of sperm-oocyte fertilisation and early embryo development has been gained using *in vitro* assessments – we have no way of viewing early development in a continuous way *in situ*. Our photonic probes approach is enabling us to access the lumen of the (female) reproductive tract in a way not achievable before.

In conjunction with our CNBP chemists, we are exploring the measurement of cations such as  $H^+$  (pH),  $Zn^{2+}$ , and  $Ca^{2+}$ , plus  $H_2O_2$ . Both  $Zn^{2+}$ , and  $Ca^{2+}$  are involved in the fertilisation process – but never visualised *in situ*. Combinations of hyperspectral autofluorescence functionality or Raman spectroscopy and Optical Coherence Tomography are planned to accompany our photonic probes approach. ■

# Case Studies

## Regeneus Cell Therapies

CASE STUDY

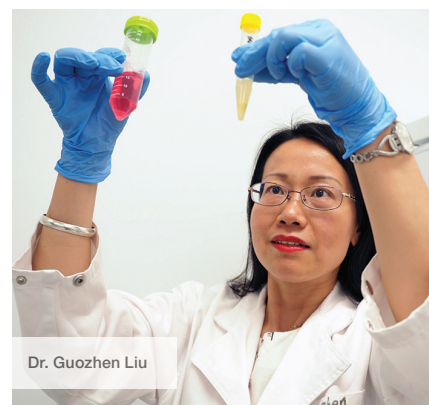
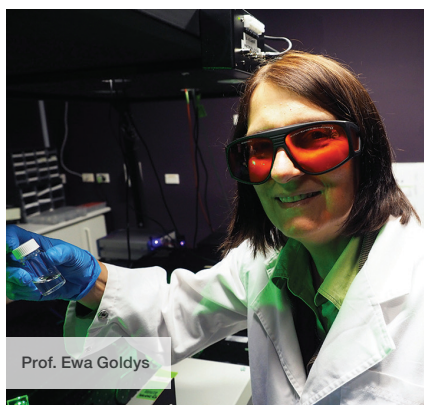
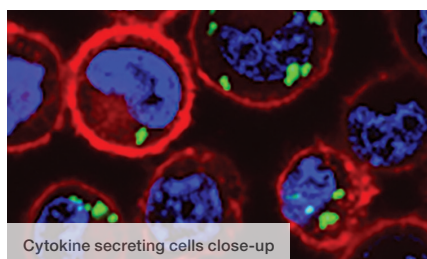
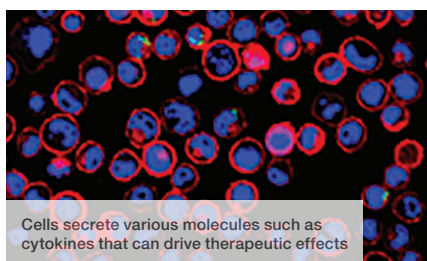
### Next Generation Cell Therapies

PROF. EWA GOLDYS  
DR. GUOZHEN LIU

On her first day at work a young CNBP researcher, Dr. Guozhen Liu sat in a meeting next to her supervisor Professor Ewa Goldys (Deputy Director, CNBP) and Australian entrepreneur and luminary, Dr. Graham Vesey.

Vesey's role is the Executive Director and Chief Scientific Officer of Regeneus Pty Ltd, a regenerative medicine company specializing in innovative cell-based therapies, targeting unmet medical needs in human and animal healthcare.

Little did Dr. Liu know that this was a turning point in her life, and that she, would be working closely with Regeneus in the coming years ahead - this based on her breakthrough cell labeling research, focused on the identification and selection of cells based on molecular secretions.

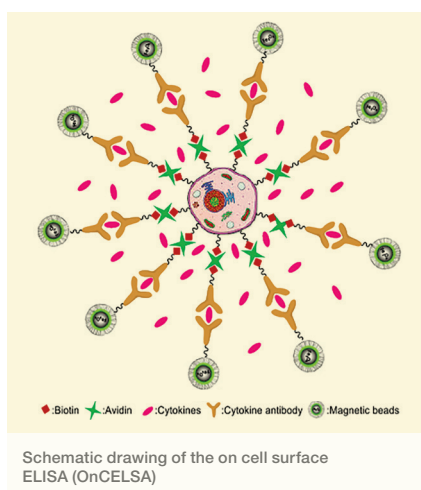


Fast forward two years and Dr. Liu's research inspired by this very first meeting, has given rise to a patented OnCELISA technology for selecting cell populations with specific biochemical characteristics and optimised therapeutic properties. The OnCELISA patent has been licenced to Regeneus Pty Ltd, who develop novel high added-value therapeutic products for the veterinary market, such as the Greencross (ASX:GXL) network of clinics.

These are set to be marketed directly by Regeneus, and in conjunction with a global marketing partner, a major veterinary pharmaceutical company Merial/Zoetis, and distributed through the global Henry Schein distribution network.

Joint work with Regeneus has been supported by a research contract at the end of which Dr. Liu and partners secured an ARC Linkage award. The Linkage research offers the tantalising prospect of developing a specific treatment for pain with outstanding effectiveness, both for animals, and, potentially for human health in the future as well. The approach of using secretions of tightly selected and recipient-matched cells is unique in the world and it will give Regeneus a critical edge to compete as part of the global economy.

Dr. Guozhen Liu and other CNBP scientists are part of the wave of early career researchers who will form a cradle of future innovative industries which will take Australia well into the 21st century. The products developed in this project will create a huge downstream market opportunity, which, for osteoarthritis amounts to 2,000,000 patients and for neuropathic pain, an additional 1,000,000 patients per year. It is no wonder that Dr. Liu looks confidently into the future, even more so, that she has now secured a highly coveted ARC Future Fellowship and major industry partners can't wait to hear about her latest work and results. ■





## Case Studies

### Cancer Margin Detection with Optical Fibres

CASE STUDY

#### Cancer Margin Detection with Optical Fibres

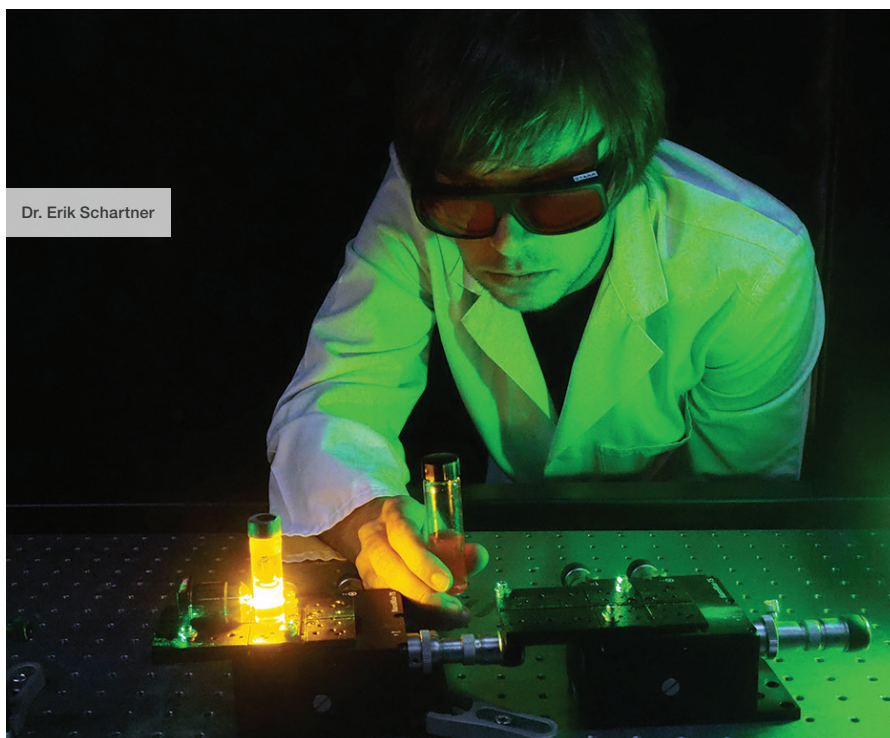
DR. ERIK SCHATNER

**CNBP researchers, in collaboration with researchers at the Royal Adelaide Hospital have developed a sensor which can potentially aid surgeons in differentiating between healthy and cancerous tissue during surgery.**

This is a key need in applications such as surgery for breast cancer, where current methods are limited in their effectiveness. In 15-20% of cases the patient requires follow-up surgery to remove tumour tissue that was missed in the initial surgery. This is naturally extremely traumatic to the patient, as well as adding a significant unnecessary burden to the healthcare system.

As such there's a strong need for a low-cost, rapid and sensitive method that can be used intraoperatively by the surgeon in the theatre.

The probe works by measuring at the pH of the surface of the tissue, which results have shown correlates well with whether or not the tissue is healthy or tumorous. The tip of an optical fibre is coated with a pH sensitive indicator, and the signal read out uses a low-cost light emitting diode and portable spectrometer.



Dr. Erik Schartner

A strong focus on this project was practical applications, with surgeons involved in the development of the project from the outset to ensure that the final outcomes involved a device that would be useful for real-world applications.

This work was the basis for a successful 2017 Adelaide University Commercial Accelerator Scheme (CAS) application and a 2016 Medical Devices Partnering Program application that will allow for further development of the probe towards commercial applications. Currently the focus of this activity is on collecting additional clinical relevant data, with an emphasis towards being able to engage with commercial partners in the near future. ■

CNBP researchers have developed a sensor which can potentially aid surgeons in differentiating between healthy and cancerous tissue during surgery.

# Case Studies

## Optical Probe for Brain Temperature Measurements

CASE STUDY

### Optical Probe for Brain Temperature Measurements

MR. STEFAN MUSOLINO

**The brain is the most temperature sensitive organ in the body and animal studies have shown that even small deviations in brain temperature are capable of producing profound effects such as behavioural change and neuronal cell death.**

These changes in temperature can occur as a result of disease, brain injury and/or drug use and can result in further damage to the brain. In order to measure and understand these temperature changes and how they are influenced by various biochemical pathways in the brain, a probe capable of pinpoint temperature measurement in small brain regions is required. Currently, the spatial precision of conventional temperature measurement techniques is approximately 125 micrometres, which is relatively large compared to smaller regions of the brain making temperature measurement with high spatial precision impossible.

To remedy this, a transdisciplinary team at the CNBP has developed an optical fibre-based point temperature sensor capable of pinpoint brain temperature measurement in freely-moving animals. The sensor tip has been minimised to only a few microns to provide for precisely localised temperature monitoring within the temperature control centres of the brain where the conventional technology would struggle.



Mr. Stefan Musolino

Due to the small size of the fibre tip it has the possibility to be combined with existing sensors and implanted with identical methods without inducing additional stress or damage. This could allow for multimodal monitoring of brain activity post-brain injury. Furthermore, the experimental configuration of the sensor has been adapted to a completely portable setup, allowing for deployment to spaces outside of conventional optics laboratories due to the exclusion of bulk optics used in the experimental materials.

A fully developed probe could find potential application in human brain temperature monitoring after traumatic brain injury, stroke, or subarachnoid haemorrhage when the brain is extremely sensitive and vulnerable to small deviations in temperature. This could play a useful role in the monitoring of patients with severe head trauma in order to prevent secondary injury to the brain. The probe also has the potential to be utilized for tracking hypothermia in infants with neonatal encephalopathy to aid in neuroprotective therapy efforts during the first 72 hours after delivery.

This work was presented at the Florey Postgraduate conference in Adelaide Sep 2016, the SPIE Biophotonics Australasia conference in Adelaide Oct 2016, and the ASCEPT-MPGPCR joint scientific meeting in Melbourne Nov 2016. ■

CNBP has developed an optical fibre-based point temperature sensor capable of pinpoint brain temperature measurement in freely-moving animals.



A microscopic image showing numerous cells, likely bacteria or yeast, with bright green fluorescent rings or structures visible within or on their surfaces. The background is a soft, out-of-focus green.

# CNBP Research

Science Leadership Team (SLT)  
Highlights and Goals

# Science Leadership Team Highlights and Goals

## Prof. Andrew Greentree and Team

SLT

### SLT Highlights and Goals

PROF. ANDREW GREENTREE

#### Highlights from 2016

The RMIT measure/theory team made significant progress in a number of programs across the Centre.

The team has strength in various modeling techniques and continues to apply fundamental theory to programs as diverse as nanoparticle modeling and new measurement techniques. The team is working on new approaches to quantum nanoscopy, Bayesian microscopy, *ab initio* modeling of structures, plasmonic devices, photoacoustics, and photonic modeling.

Specific developments include:

- A new approach to generating and detecting ultrasound using plasmonic nanoantennae or Ivan Maksymov's designs use structures smaller than the wavelength of both the light and sound being detected and promise to enable ultrasonic detection inside smaller blood vessels than possible with existing technology
- An enhanced search algorithm for finding a particle on a line in the presence of errors, or 'smart scanning' or Daniel Drumm's mathematical analysis of this classic problem demonstrated a new and enhanced solution. Far from a mathematical curiosity, Dr. Drumm's novel solution to this problem points the way to faster microscope scans.



Prof. Andrew Greentree

#### Goals and Plans for 2017

In addition to developing new results we will translate our existing concepts into practical architectures for experimental development.

This will include:

- Detailed plans for array sensing on-fibre
- Applications and schemes for acoustically generated optical frequency combs
- Show the resource optimisation of arrays of single photon detectors
- Protocols for the demonstration of smart scanning. ■

The team is working on new approaches to quantum nanoscopy, Bayesian microscopy, *ab initio* modeling of structures, plasmonic devices, photoacoustics, and photonic modeling.



# Science Leadership Team Highlights and Goals

## A/Prof. Brant Gibson and Team

SLT

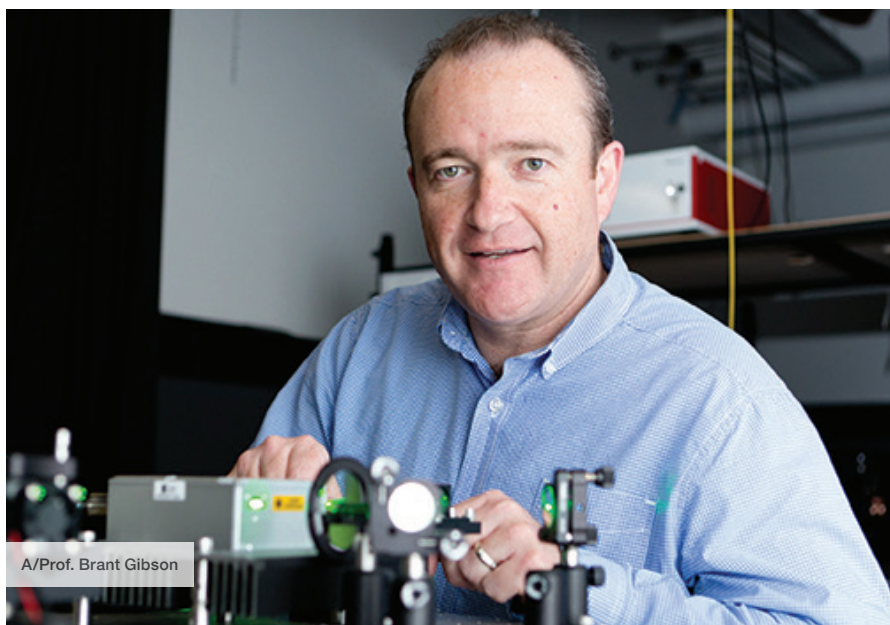
### SLT Highlights and Goals

A/PROF. BRANT GIBSON

#### Highlights from 2016

The Illuminate team continued to explore advanced optical materials to enable efficient delivery and collection of light to and from cells and molecules locally. Our Centre-wide research efforts have comprised novel microscopy techniques, bio-compatible fluorescent nanoparticles, next-generation optical fibres, and nanoparticle-enriched hybrid materials.

- A newly patented imaging modality, Bleaching Assisted Multichannel Microscopy (BAMM), has been developed which takes advantage of differences in photobleaching rates, typically seen as a problem, to distinguish between fluorescent species.
- The first extruded hollow core optical fibre has been fabricated with a single ring of cladding holes. Preform pressurization was used to tailor the size of the internal holes for optimized biophotonic Raman-based sensing applications. This fibre is currently being tested in a wide range of biologically-relevant compounds.
- A Centre-wide collaboration has for the first time quantitatively compared the brightness and photostability of emerging red and near-infrared bioimaging fluorescent nanomaterials. Many novel fluorescent nanomaterials exhibit



A/Prof. Brant Gibson

radically different optical properties compared to organic fluorophores, which are still the most extensively used class of fluorophores in biology today. This study benchmarked and assessed the practical impact of the differences in optical properties of organic dyes, semiconductor quantum dots, fluorescent beads, carbon dots, gold nanoclusters, nanodiamonds, and nanorubies.

#### Goals and Plans for 2017

1. Realise bright and photostable fluorescence from nanoparticles less than 10 nanometres in size for blood-brain barrier crossing applications.
2. Create hybrid multifunctional nanomaterials which can be both photostable and capable of biologically-relevant chemical sensing.
3. Advance protocols for controlled, repeatable and scalable production of chemically-synthesised nanoparticles.

4. Fabricate nanostructured devices which are capable of stimulating real-time dynamics of complex neuronal ensembles.
5. Quantify the operation of emerging nanomaterials in spectral regions where absorption and scattering from biological samples is either at a minimum or a maximum.
6. Develop novel imaging modalities to study the underlying mechanisms behind atherosclerotic plaque ruptures resulting from severe cardiovascular disease. ■

# Science Leadership Team Highlights and Goals

## Prof. Ewa Goldys and Team

SLT

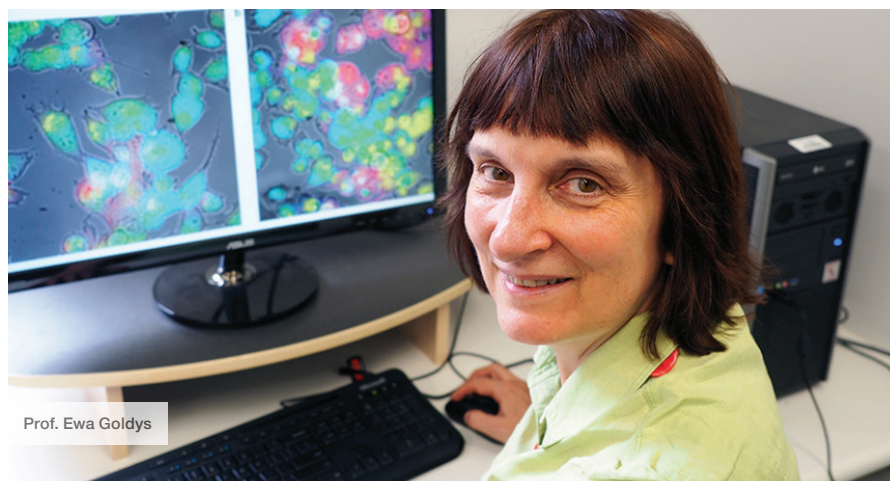
### SLT Highlights and Goals

PROF. EWA GOLDYS

#### Highlights from 2016

The Measure team at Macquarie University continued 2016 working extensively with colleagues across the Centre and beyond and achieving significant breakthroughs in technical methodological approaches and exploration of the basic science of noninvasive optical diagnostics and cytokine sensing.

- Two publications led by CNBP PhD graduates, Sandya Clement, and Deming Liu reached the top 5% of all time publications ranked by Altmetrics.
- Our PhD students and early-career scientists led review publications in prestigious journals *Nanoscale* (Dr. Annemarie Nadort) and *Biosensors and Bioelectronics* (Dr. Guozhen Liu); both involved Centre-wide CNBP partners.
- Three patents have been lodged. (2 provisional, 1 PCT)
- Prof. Ewa Goldys and Dr. Martin Gosnell from Quantitative Pty Ltd have been recognised with a 2016 Australian Museum ANSTO Eureka Prize for Innovative Use of Technology. The awarded technology is a core component of the CNBP technology portfolio and it was captured in two refereed publications in 2016.
- Using this awarded approach, in a Centre wide collaboration led by Prof. Mark Hutchinson we have quantified the world first label free predictive signature of exaggerated pain.



Prof. Ewa Goldys

- The Measure team has been extraordinarily successful in leveraging funding, with seven major external awards secured in 2016: (1) ARC Future Fellowship (Dr. Liu) to develop new methods to probe brain immune activity; (2) a 4 years NHMRC Early Career Fellowship (Dr. Nadort) for joint clinical translational research on fluorescence-guided glioma surgery with Dr. Davidson from Macquarie University Hospital; (3) a 3 years ARC DECRA Fellowship (Dr. Ploschner) to develop the world smallest microscope; and (4) a 3 years DECRA Fellowship to (Dr. Lu) to advance time-gated microscopy. Two ARC Discovery awards in 2016 include one led by Prof. Goldys and Prof. Gronthos from our Partner Institution SAHMRI on rejuvenating stem cells, and a second one led by Al Zvyagin with Prof. Goldys and Dr. Lu to advance single nanoparticle imaging technology. An ARC Linkage grant was awarded in early 2016 to our Centre-wide team (Prof. Goldys, Dr. Liu, Prof. Hutchinson) on the back of our licensed OnCELISA technology. The award is to explore differences between male and female pain in veterinary animals and to develop cellular therapies.

#### Goals and Plans for 2017

1. Validate the world's first label-free signature of exaggerated pain states paving the way for an objective pain biomarker – with Origins of Sensation.
2. Contribute to the goal of the Origins of Sensation team to visualise glial reactivity and immune signaling in pain.
3. Deploy novel biosensors *in vitro* and *in vivo* to quantify key signaling molecules, with the Origins of Sensation.
4. Advance the hyperspectral technology through the development of GUI and transitioning of the technology to CNBP Adelaide. Commercialise aspects of this technology. Progress a number of projects in this area.
5. Advance cytokine detection technologies working towards real time sensing and associated devices. Establish major commercial partnerships and advance academic partnership with UColorado.
6. Work with UToronto partners to develop a deep tissue interventional nanotechnology and with SAHMRI partners on cell senescence. ■

# Science Leadership Team Highlights and Goals

## A/Prof. Jeremy Thompson and Team

SLT

### SLT Highlights and Goals

A/PROF. JEREMY THOMPSON

#### Highlights from 2016

The Spark of Life Theme had several notable science and commercialisation developments through 2016, continuing our goal of measuring the events of fertilization and early development *in situ* and in real-time.

- A notable advance has been the collaboration between our PhD students Hanna McLennan and Avi Saini and other CNBP researchers in developing the first photonic sensing probe to measure the activity of eggs and embryos. Initially this work is focused on pH determination, but will expand to measure other important ions and reactive oxygen species.
- In collaboration with University of Adelaide's Robinson Research Institute we are working with Dr. Tony Orth from the RMIT node in the development of a sperm motility analyser using a mobile phone platform; the 'MiBoyz' project. This project was one of two selected for an entrepreneurial development, 'ON Prime' through the CSIRO, and heralds a new direction for the Robinson Research Institute into developing "At home fertility tests".
- A second project also selected for 'ON Prime' includes Dr. Melanie McDowall in assessing the whispering gallery resonance



properties of eggs and early embryos, as a novel sensing modality. This work won two awards at the Australian eChallenge award night for Best Medical Innovation and Research Commercialisation.

- In conjunction with Prof. Robert McLaughlin's team, we have successfully imaged freshly collected bovine IVF samples using Optical Coherence Tomography (OCT).
- PhD student Megan Lim spent 1 month working with RMIT CNBP colleagues developing immune-transmission electron microscopy with gold nanoparticles to investigate further our discovery that the cumulus-oocyte complexes contains haemoglobin.

#### Goals and Plans for 2017

1. Spin-out IVF Vet Solutions, our livestock IVF support business unit and further develop commercial opportunities emerging in both the human and veterinary artificial reproductive technologies space, such as the MiBoyz project and OCT.
2. Determining the source and function of oocyte haemoglobin, with further collaboration with the RMIT CNBP colleagues.
3. Be the first to place a photonic-sensing fibre within the reproductive tract of a living animal to sense several ions and molecules.
4. Establish the hyperspectral microscopy capacity in our laboratories, to transfer the Macquarie University capability to Adelaide and to be used by all 3 biological challenges. ■



# Science Leadership Team Highlights and Goals

## Prof. Nicolle Packer and Team

SLT

### SLT Highlights and Goals

PROF. NICOLLE PACKER

#### Highlights from 2016

As the platforms for visualisation of biomolecules in cells have developed in the Discovery team we have, in 2016, increased our collaborative projects with the CNBP team across multiple nodes, by applying a variety of bioconjugated nanoprobes to detect different specific molecular targets in the three biological challenges of pain, reproduction and cardiovascular biology.

- The use of time gated chemistry and long lifetime upconversion nanoparticles (UCNPs) and nanodiamonds, together with new multifunctionality of the Olympus microscopes has allowed the autofluorescence of fixed cells and tissues to be no longer visible, thus allowing us to see targeted molecules clearly.
- Using different modes of bioconjugation of specific antibodies and mRNA to the nanolabels we have been able to fluorescently see different expression in pain and drug treatment as well as using nanoparticles to deliver targeted photodynamic therapy.
- Proteomics technology has allowed us to discover that different nanoparticles, when exposed to serum, become covered with different protein coats depending on the type of nanoparticle and their functionalisation, a fact that brings us one step closer to enabling the use of nanoparticles in live biological applications.



Prof. Nicolle Packer

Photo: Chris Stacey, Macquarie University.

- We have made the amazing discovery that we can discriminate different tissue types in fixed sections of organs using laser mass spectrometric ionisation of the sugars attached to proteins, thus promising a high accuracy replacement of the current subjective analysis of pathology specimens.
- Two CNBP AIs from MQ are in the process of commercialising their research into unique, tiny nanodiamond production. Spurred on by success in the CSIRO-run 'On Prime' start-up accelerator, the possibilities of the company LuciGem look very promising.
- Completion of new biomolecular laboratory and opening by Chief Scientist, Mary O'Kane has enabled the location of all ECRs and PhDs in new and well provisioned laboratories including facilities for culturing and imaging live cells and tissues.
- A NanoBlock database that collects knowledge on the properties of nanoparticles has broadened to include protocols, building blocks and applications as an invaluable resource for CNBP researchers.

#### Goals and Plans for 2017

1. Move the developed imaging platforms from their successful application in fixed cells to their use in live cell molecular imaging and tracking by both cell surface binding and internalisation of nanolabels.
2. Develop the laser mass spectrometric tissue imaging platform to allow simultaneous analysis of different biomolecules (peptides, glycans, lipids) in the same place at the same time.
3. Characterise the positive and negative cellular responses to exposure to protein corona coated nanoparticles and bare nanoparticles to measure the biological effects of nanoparticle applications.
4. Explore the use of naturally assembling protein nanocages by genetic incorporation of photoactivatable switches that enable their light-controlled disassembly and cargo delivery.
5. Exploit the underexplored discovery of glycans attached to proteins, lipids and in extracellular matrix as novel and accessible targets for biophotonic imaging and cargo delivery. ■



# Science Leadership Team Highlights and Goals

## Prof. Robert McLaughlin and Team

SLT

### SLT Highlights and Goals

PROF. ROBERT  
MCLAUGHLIN

#### Highlights from 2016

2016 saw the creation of CNBP's Biomedical Imaging team, with the recruitment of Prof. Robert McLaughlin and his researchers.

Internationally, his team have led the development of 'imaging needles', highly miniaturised fibre-optic imaging probes encased in a hypodermic needle. This technology is enabling optics to become a tool in an entirely new set of diseases, previously beyond the reach of other imaging technologies.

2016 saw the Centre undertake a world-first human clinical trial of these imaging needles in neurosurgery, in collaboration with Sir Charles Gairdner Hospital in Western Australia. Integrated into a standard brain biopsy needle, the imaging needles are able to detect 'at-risk' blood vessels that would otherwise be damaged during a brain biopsy. The team tested the imaging needles with 12 patients undergoing surgery. These new tool will enable safer brain biopsies.



Prof. Robert McLaughlin (far right) and his team, Mr. Rodney Kirk, Dr. Jiawen Li and Mr. Bryden Quirk

#### Goals and Plans for 2017

1. Integrate the CNBP's imaging needle technology for use in chronic pain treatment, as part of the Origin of Sensation biological challenge.
2. Develop specific miniaturised imaging technologies tailored for Developmental Biology as part of the Spark of Life challenge.
3. Create new knowledge to accurately quantify fluorescence in solid tissues, leading to a new generation of fluorescence imaging probes for use deep inside the body. ■

This technology is enabling optics to become a tool in an entirely new set of diseases, previously beyond the reach of other imaging technologies.

# Science Leadership Team Highlights and Goals

## Prof. Andrew Abell and Team

SLT

### SLT Highlights and Goals

PROF. ANDREW ABELL

#### Highlights from 2016

- Preparation and investigation of new sensors for the  $\mu$ -opioid receptor, NO, eNOS, a range of metal ions, GSH, ROS, and other analytes.
- Development of photoswitchable inhibitors of GRK2 inhibitors (to allow reversible regulation of GRK2, and hence GPCR), trypsin and other proteases.
- Improved biocompatibility of sensing platforms by encapsulation into liposomes.
- Detection of a lithium ion flux through aquaporin channels using a new and specific spiropyran-based lithium ion sensor.
- A new pH sensor.
- Developed 'SpiroParticles', nanoparticles that undergoes reversible volume changes when exposed to  $\text{Zn}^{2+}$  to then release encapsulated drug.
- A new hybrid nanomaterial developed consisting of an organic fluorescent probe bound to a nanodiamond, that overcomes limitations of photobleaching, allowing concurrent and extended cell-based bio-imaging and ratiometric detection of hydrogen peroxide.
- Development of a photoswitchable antibiotic, hypoxia activated chemotherapeutics, and new fundamental approach to detecting secondary structure, protein-protein interactions, and protein-DNA interactions.



#### Goals and Plans for 2017

Work will continue on all the above projects. A number of papers will be submitted in 2017, as representative examples:

1. Reversible calcium sensor for use in live cells and microstructured optical fiber, in collaboration with Mr. Roman Kostecki (Recognize).
2. The use of nanoenvironment to control ion binding, in collaboration with Mr. Roman Kostecki.
3. A ratiometric sensor for calcium based on upconversion nanoparticle and spiropyran, in collaboration with AI Dr. Tim (Jiangbo) Zhao (Recognize).
4. A biocompatible and reversible glutathione sensor.
5. Liposome-based sensor for calcium, zinc and glutathione, in collaboration with Dr. Mel McDowall (Spark of Life).
6. Biocompatible, reversible and selective sensor for magnesium, which is part of Ms. Georgina Sylvia's PhD work and in collaboration with Ms. Jiajun Liu (Origins of Sensation).
7. Photoswitchable GRK2 inhibitors and  $\mu$ -opioid receptor agonists, in collaboration with Prof. Mark Hutchinson's group (Origins of Sensation).
8. New fluorescent sensors for hydrogen peroxide for stress detection in developing embryos, in collaboration with Ms. Hanna McLennan, Dr. Mel McDowall (Spark of Life) and Dr. Daniel Drumm (Illuminate, RMIT).
9. Multicolour HNO sensors with improved brightness and cell trappability, in collaboration with Dr. Philipp Reineck (Illuminate, RMIT), Mrs. Vicky Staikpolous (Origin of Sensation), and Mr. Benjamin Pullen (Inside Blood Vessels).
10. New Au-based biocompatible sensing platform, in collaboration with AI Dr. Abel Santos (Engineering).
11. Spiroparticle and its use in the photoregulation of caspase 3 activity *in vivo*. We aim to publish all four manuscripts in journals that are in the top 10% of the respective field. ■

# Science Leadership Team Highlights and Goals

## Prof. Jim Piper<sub>AM</sub> and Team

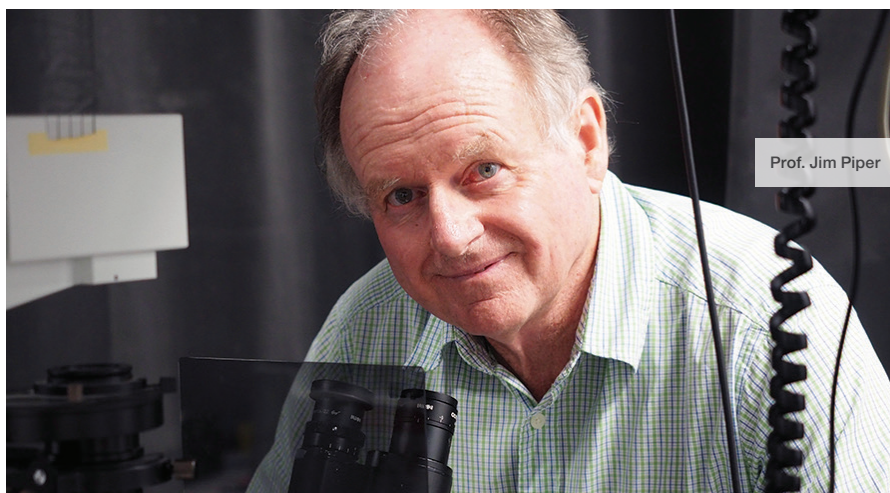
SLT

### SLT Highlights and Goals

PROF. JIM PIPER<sub>AM</sub>

#### Highlights from 2016

- Development of 3rd generation Time-Gated Luminescence (TGL) microscopes for advanced detection of long-lifetime luminescent bioprobes and capability demonstration to CNBP Partner, Olympus Australia (with AI Yiqing Lu).
- Demonstration of single target-cell detection in highly autofluorescent background (urine sample) using advanced long-lifetime molecular bioprobe and TGL detection techniques including high-speed screening of large samples (with Prof. Nicolle Packer group).
- Development of advanced single upconversion-nanocrystal (ucnc) optical characterisation techniques, together with improved (automated) ucnc growth procedures, show that details of growth conditions have significant effects on key nanocrystal properties, including luminescence lifetime and brightness (with AI Xiaoxue Xu).
- Critical improvements in ucnc growth and sample preparation, together with computational models for excitation of Tm<sup>3+</sup> dopant and new spectroscopic measurements have enabled conditions for high-contrast suppression of visible upconversion luminescence using a low-power probe laser. This together with experiments performed by Partner Investigators at Peking University,



has resulted in key demonstrations of optical super-resolution imaging of the nanocrystals (paper accepted by Nature) (with Als Prof. Dayong Jin, Dr. Yiqing Lu, Prof. Peng Xi).

- New multifunctional microscopy platform integrating Atomic Force and advanced (time-gated) Confocal Microscopy has shown capability for imaging single strands of DNA bound to ucnc bioprobes (with Packer group and AI Dr. Alfonso Garcia-Bennett).

#### Goals and Plans for 2017

1. Comprehensive investigation of ucnc growth parameters and related optical properties will be undertaken aimed at identifying optimum growth parameters for maximum brightness at luminescence lifetimes and nanocrystal sizes across a broad range (project co-funded by MOS Technologies/AusIndustry).
2. Detailed studies of optical super-resolution based on upconversion nanocrystals including optimisation of ucnc properties and sample preparation, leading to key demonstrations of super-resolution

including resolved hybrid nanocrystal structures and super-resolution imaging of ucnc bound to target sites in biological samples.

3. Extension of multifunctional nanoscopy platform including AFM, super-resolution optical imaging and Tip-Enhanced Raman Spectral imaging and application to study of biological systems.
4. Detection of target single cell and cellular components in human body fluid samples (urine, blood) using TGL techniques including rapid screening based on 2-D scanning technologies and continuous-flow sample processing employing novel microfluidic technologies.
5. Demonstration of novel functionalisation and conjugation procedures for a range of key nanoparticles (ucnc, nanodiamond, polymer nanoparticles) for robust and highly selective biolabelling of target biomolecules and biological structures, and application to key challenges in neuroscience. ■



# Science Leadership Team Highlights and Goals

## Prof. Mark Hutchinson and Team

SLT

### SLT Highlights and Goals

PROF. MARK HUTCHINSON

#### Highlights from 2016

The Origins of Sensation team continued 2016 working extensively with our colleagues across the Centre allowing us to make significant breakthroughs in technical methodological approaches and exploration of the basic science at the neuroimmune interface.

- Through ongoing collaborative efforts with the fibre sensing team we were able to successfully deploy the world's best temporally and specially resolved brain nuclei temperature monitor in behaving ambulatory rodents. The successful publication of this work by one of our graduate students Stefan Musolino resulted in significant international attention placing it in the top 0.1% of all time publications ranked by Altmetric.
- Through a Centre wide collaboration we have quantified the world first label free predictive signature of exaggerated pain. Importantly, this amazing development is underpinned by the unique CNBP capabilities in imaging, sensing, nano-materials, image analysis, protein quantification unified with translational and relevant models of exaggerated pain states.



- The Origins team early and mid-career scientists led a Centre wide review publication that covered the future of sensing and imaging for the neuroimmunology field, published in the peak journal Brain Behavior and Immunity. This publication represents a landmark piece that opens the world of biophotonics for the field.
- 3. Use bright and long-lived nanoparticles to detect rare cellular events and protein expression within spinal glial cells that have not been visualised previously owing to their scarcity.
- 4. Quantify specific protein release *in vivo* during the development and presentation of exaggerated pain states using approaches that provide superior spatial and temporal resolution.

#### Goals and Plans for 2017

1. Validate the world's first label free signature of exaggerated pain states paving the way for an objective pain biomarker.
2. Visualise glial reactivity and immune signalling during exaggerated pain states allowing the future visualisation of the neuro immune interface in real time.
5. Deploy novel biosensors *in vitro* and *in vivo* that allow quantification of short lived reactive chemical species, allowing the exploration of critical reactive signalling events. ■



# Science Leadership Team Highlights and Goals

## Prof. Stephen Nicholls and Team

SLT

### SLT Highlights and Goals

PROF.  
STEPHEN NICHOLLS

#### Highlights from 2016

The Inside Blood Vessels team had a successful 2016 in which they expanded their collaborations across the Centre that have enabled a number of important breakthrough attempts to develop novel approaches to sensing blood vessels in the setting of health and a range of disease settings. The major work during the year by our members includes:

- We have continued our collaborations with Prof. Ewa Goldys' team to expand our work in the use of hyper spectral imaging of endothelial cells. We have identified novel signals that appear to become more prominent with age and are beginning to perform functional work to determine how these changes can be used as a reliable marker of vascular age and risk.
- We have worked closely with the chemistry groups to evaluate ruthenium sensors as an approach to detecting and quantifying levels of nitric oxide. This has resulted in a manuscript which is currently in preparation between our groups.
- We have collaborated with Prof. Nicolle Packer's group to perform novel mass spectrometry studies of rabbit aorta in response to feeding with either high fat or cholesterol diets. We have identified distinct sialoglycoprotein signals, which are currently undergoing further evaluation.
- We have developed our collaboration with chemistry further by embedding one of their postdocs within our lab with collaborative efforts in the use of nano diamonds in the evaluation of vascular cell activity.
- We have commenced novel studies to develop approaches to collect endothelial cells directly from catheter based technologies, which would be an important step in the assessment of factors on blood vessel function and disease.



#### Goals and Plans for 2017

1. Extend the hyper spectral imaging platform to evaluate the impact of medical therapies on the vessel wall. This has the potential to be an important tool in the early evaluation and screening of novel therapies.
2. Our mass spectrometry signals will be further studied to determine how they can be used to monitor for changes in response to variability in vessel function and health.
3. We have commenced an important collaboration with Prof. Rob McLaughlin's group to produce more effective hybrid approaches to combined imaging of the vessels with optical coherence tomography and molecular imaging. This will be important in our efforts to study factors implicated in both plaque rupture and erosion. ■

# Science Leadership Team Highlights and Goals

## Prof. Heike Ebendorff-Heidepriem and Prof. Tanya Monro and Team

SLT

### SLT Highlights and Goals

PROF. HEIKE EBENDORFF-HEIDEPRIEM  
PROF. TANYA MONRO

### Highlights from 2016

The Fibre Sensing Team at the University of Adelaide, led by Prof. Ebendorff-Heidepriem, continued 2016 working together with colleagues across the Centre and those led by Prof. Monro as part of her Australian Laureate Fellowship program to advance capabilities and science breakthroughs in a wide range of areas including nanofabrication, surface functionalization and new fibre sensor concepts.

- Through ongoing collaboration with the Royal Adelaide Hospital breast cancer unit we successfully deployed an optical fibre probe for cancer margin detection. The successful publication of this work received media coverage on Channel 9 news, ABC news and The Advertiser among others.
- Through collaboration with the Recognize and Spark of Life team we have developed the first functionalized microstructured fibre based biosensors for the reversible nanoliter-scale measurement of biologically relevant metal ions such as zinc and calcium. This new sensing platform was successfully deployed to measure biochemical cell processes such as those caused by bacterial infection in mice models.
- The Fibre Sensing Team achieved significant breakthroughs in creating new nano/micro-structured materials and fibres for the next generation of



Prof. Heike Ebendorff-Heidepriem



Prof. Tanya Monro

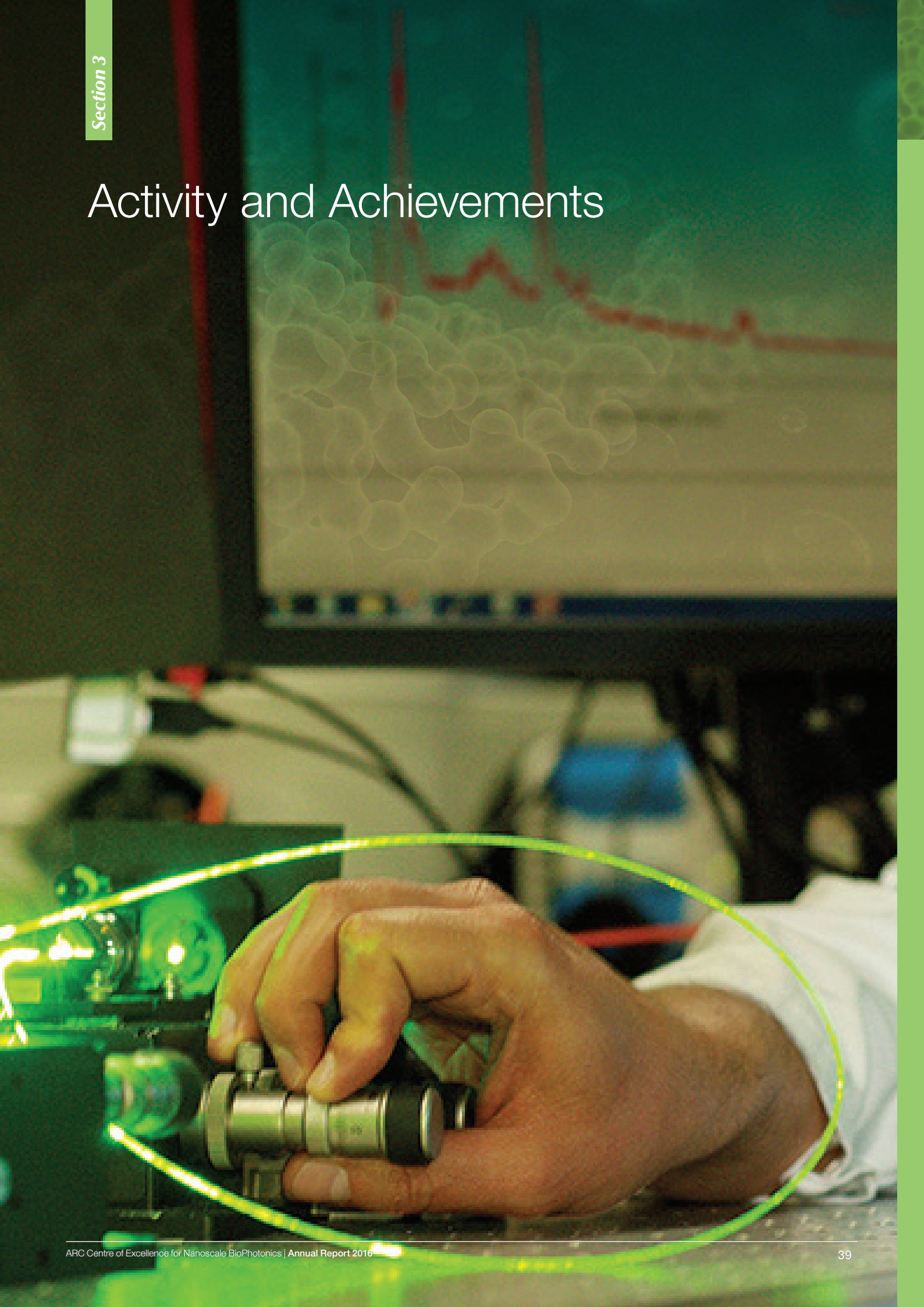
fibre-based biosensors. For example, the publication of our upconversion nanocrystal doped glass and fibre, which provide a new paradigm for photonic materials, was featured as one of most shared and talked articles in the past 12 months, with an 188 Altmetrics Score. Our gold nanomembrane concept was extended to quasiperiodic nanohole arrays with high potential for plasmonic sensing. We further pushed the limit in microstructured fibre fabrication to low-loss small-core exposed core fibre and new type of hollow core fibre, both of which allow enhanced sensitivity for biochemicals.

- Strong collaborations established between the University of Adelaide Fibre Sensing activities and the newly established UniSA Laser Physics and Photonics Devices Laboratory (LPPD) that have enabled the development of capabilities for grating inscription in novel fibres and sensing devices and also paves the way for the use of femtosecond processing techniques for adding functionality to devices for application in the CNBP biological challenge areas.

### Goals and plans for 2017

1. Develop a method to detect multiple biochemical markers on one functionalised microstructured fibre based sensing platform.
2. Develop plasma polymer functionalized exposed core fibres with high stability and reproducible sensing performance in different solvents.
3. Use functionalised microstructured fibres to quantify pain and fertilization related biochemical processes by real-time, long-term, in-vivo measurement of changes in biomarker concentrations in cerebrospinal fluid and oocyte.
4. Validate the effectiveness of gold nanomembrane for resolution improvement in electron microscopy.
5. Deploy custom-built multispectral plate reader system to bio labs to increase sampling rates and reproducibility for the investigation of the autofluorescence of cells and cell media.
6. Opportunity to exploit new compact visible laser sources recently developed by the LPPD in the development of portable sensing devices. ■

# Activity and Achievements





# CNBP Internal Collaborations

AT A GLANCE

**CNBP Members:**  
Over 200  
**ECRs:** 24  
**Workshops:** 5  
**CNBP Students:** 45  
**Professional Development Activities:** 15  
**Attendees at Professional Development Activities:** 360



## CNBP Science Workshops

### Spark of Life Workshop University of Melbourne 17 February 2016

Partnering with Prof. David Gardner (CNBP AI) at the University of Melbourne, this workshop provided a venue to increase existing collaborations while discussing the current and future clinical assisted reproduction applications of CNBP technologies. Around 20 of CNBP's colleagues attended this workshop with representatives across all three nodes.

### Sensing Workshop University of Adelaide 15 April 2016

Twenty five CNBP colleagues joined Industry representatives from Trajan Scientific and Medical, for a Sensing workshop at the University of Adelaide. Centre Postdocs presentations included discussions about sensors for biological substrate recognition in living systems; fluorescence based sensors; and a comparison of photo-switchable versus traditional non-reversible sensors.

### Conjugation and Application Workshop, Macquarie University 16 June 2016

Incorporating presentations from Centre Postdocs, panel discussions and open floor discussions, this workshop included over 50 CNBP researchers from across the Centre. Topics included: troubleshooting materials; bioconjugation and applying technologies *in vitro*, *ex vivo* and *in vivo*. A successful outcome was the development of an internal document detailing CNBP nanoparticles and their biomedical applications for use across the Centre.

### Transdisciplinary Science RMIT University Workshop 18 August 2016

With a focus on transdisciplinary inter-nodal projects, 35 CNBP researchers gathered to discuss the current status of existing projects with a focus on progressing the Centre's research readiness for translational outcomes through the use of the Technology Readiness Level (TRL assessment scale).

## CNBP Annual Retreat

### Victor Harbour, SA 19 – 22 October 2016

Almost 100 CNBP researchers, students, AIs, Partners and ISC members attended the 3rd Annual CNBP Retreat. The 3-day intensive conference built on previous successes, continuing to grow internal relationships and collaborations. The program required all Centre attendees to present a poster, with postdocs and students also participating in a 1 minute data blitz or a 3 minute thesis presentation. As with previous years, members of the International Science Committee (ISC) met individually with senior Researchers to provide a comprehensive audit of Centre research activities.

2016 saw just under 100 CNBP colleagues attend the Annual Retreat at McCracken Country Club in Victor Harbor.

## Professional Development Workshops

### Commercialisation and Grant Writing, Macquarie University 17 June 2016

ECRs and students attended a professional development workshop with Invited guest speaker, Dr. Mal Eutick (CEO, Phebra Australia) discussing his background and experience in commercialisation, working in medical device companies. The second half of the program involved discussions on grant writing led by Centre Postdocs who have had recent Fellowships wins.

### Research Integrity Macquarie University 18 June 2016

Facilitated by Dr. Ben Pitcher, Research Integrity Officer, Macquarie University, this workshop was presented to the Centre's Executive Management Committee. Topics included research integrity and management of conflicts of interest. Content from the workshop was distributed to all Centre personnel.

### Outstanding Research Outcomes through Team Excellence CNBP Annual Retreat 19 October 2016

Facilitated by Ms Tracy Maxted, from The Missing Link, Centre colleagues were provided with tools for Self-management and awareness assisting attendees to gain the most of the CNBP Annual retreat through productive collaborative conversations.

## CNBP Networks

### ECR and Graduate Network

CNBP continues to support a growing ECR and Graduate network. Connecting via Slack, these communities are active in providing peer to peer support. A Centre wide social activity was hosted in June 2016 in Sydney in conjunction with CNBP workshops.

### Mastermind Network

CNBP's Mastermind Network has continued to grow in 2016 with around 50 Centre colleagues working with individual mentors. Mentors have backgrounds in science, industry, government and communications. Individuals work directly with their mentor to discuss and develop a range of personal and professional goals.

### Women and Families in Science

The CNBP "Mum's group" was established in 2015 as an informal video conference network to support pregnant researchers and/or mothers returning to work while caring for young children. During 2016 Mums group meetings provided personnel on maternity leave with an opportunity to maintain contact with Centre colleagues while discussing back to work strategies.

Implementation of the Centres family-friendly policy including a travel fund for children to accompany primary carers to Centre workshops and activities was embraced at both the Annual Retreat and the inaugural SPIE BioPhotonics Australasia Conference. Nanny services were provided at both activities.

## CNBP Information and Technology Systems

### SLACK – Internal Communications

CNBP continues to grow its internal communication and connections using the SLACK application. This enables busy scientists to collect CNBP information sharing in one place without the distractions of other work. This enables busy scientists to access and share CNBP information in one place without other distractions.

### ASANA – Internal Project Management

CNBP researchers are actively using ASANA to keep their research projects on track and to meet all deadlines in relation to project deliverables and publication planning. This allows CNBPs transdisciplinary projects to be monitored by all interested parties across nodes.

### GotoMeetings - Global connections for internal and external stakeholders

Quality communication extends to the types of tools we use as a team to meet online. As such, the Centre widely uses GotoMeetings for internal and external video- and tele-conference meetings, enabling us to be globally connected with a user-friendly and reliable application. ■

# CNBP External Collaborations

AT A GLANCE

**Partner Launches:** 2  
**New Patents:** 5  
**Companies / Spinouts:** 3  
**Formal Collaborations:** 3  
**End-User Presentations:** 10  
**Politician Visits to Nodes:** 4

## 2016 Partner Launches

CNBP continued our tradition of hosting an official launch activity with each Partner Organisation by hosting official plaque ceremonies at the University Health Network (UHN), Toronto, Canada and the Leibniz Institute of Photonic Technology (IPHT) in Jena, Germany. Other launch activities included science workshops and laboratory tours with both Partners.

### SPIE BioPhotonics Australasia Adelaide, 16-19 October 2016

As partners and co-organiser of the inaugural SPIE BioPhotonics Australasia Conference in Adelaide, CNBP had the opportunity to engage with International thought leaders in BioPhotonics. Over four days the latest in light-based technologies and techniques were explored, with the objective of improving understanding of biology, and increasing knowledge of how living systems work at a cellular and molecular level. Over 200 world leading researchers, clinicians, policymakers, suppliers and other industry professionals were in attendance at the event.

The CNBP leadership of the event led to inclusion of industry exhibitors presenting the latest in advanced microscopy and imaging equipment;



an industry networking evening; and the participation of 100 South Australian students who were exposed to real life biophotonics applications at an half day outreach session.

## Commercialisation and End-Users

CNBP is committed to providing deployable solutions through translation of our world leading research. Through Innovation and Collaboration, CNBP scientists generate new understanding and knowledge. By making our research program externally motivated by the needs of the end users we are creating a wealth of intellectual property. With current and future commercial partners, CNBP will develop light-based measurement tools that will provide industry with deployable and practical solutions.

By educating potential end-users, CNBP researchers are also looking to increase their knowledge and appetite to implement new CNBP technologies.

2016 engagements have included:

- An interactive workshop with Phebra Australia;
- SPIE BioPhotonics Australasia Exhibitors such as Trajan Scientific and Medical, Zeiss Microscopy, Lastek and DST Group;
- The delivery of a Keynote address at the Australian Veterinary Association (AVA) Annual Conference;
- Seminars and boardroom discussions to organisations and businesses within the food and banking industry.

**Prof. McLaughlin and his team have developed a new high-tech medical device to make brain surgery safer.**



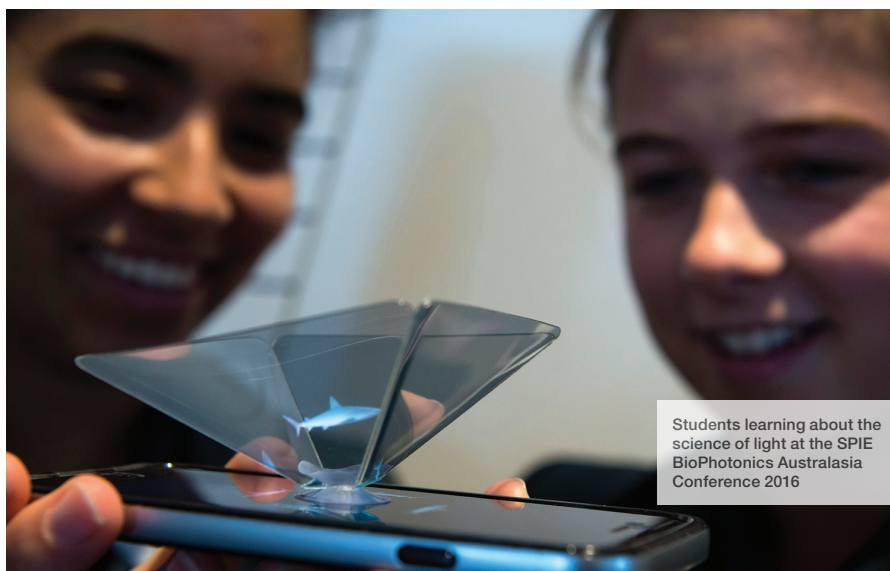
## Commercialisation of Centre Outcomes

CNBP is conducting fundamental research to underpin the development of new industries and transform the way established industries operate. This will lead to an increase in high-value jobs and greater diversity and resilience to the Australian economy. Our researchers are reframing the fundamental science required to facilitate translational outcomes.

CNBP is building translational thinking and strategy into all stages of project development, with the goal of creating an outcomes based culture, and one that celebrates and nurtures innovation.

2016 successes include:

- Facilitation of Availer's successful securement of the South Australian Commercialisation Fund (\$2.4M) to facilitate new research-based companies. Availer will work closely with CNBP researchers to support the spin out of intellectual property into new companies, providing a pathway for CNBP's research to move rapidly into the market place;
- CNBP patented the OnCELISA technology for selecting cell populations with specific biochemical characteristics and optimised therapeutic properties;
- A successful collaboration and licence agreement with Regeneus Pty Ltd commenced marketing the use of this patent into global markets for distribution which will continue into 2017 and beyond;



Students learning about the science of light at the SPIE BioPhotonics Australasia Conference 2016

- Prof. Robert McLaughlin and team have developed a new high-tech medical device to make brain surgery safer. A successful human clinical pilot trial is now complete;
- Specific commercialisation and extension funding was secured to allow CNBP technology to be deployed further into medical devices for use in clinical trials.

## Engaging with Government

### Science Meets Parliament 2016

Centre representatives attend SMP in 2016. Dr. Hannah Brown and Dr. Alfonso Garcia- Bennett had the opportunity to discuss their science and enthusiasm for innovative and ground-breaking CNBP research with Prime Minister Turnbull personally. Furthermore Dr. Mel McDowall and Dr. Hannah Brown were featured in the "Behind the Scenes at SMP" documentary produced by RiAus TV. ■

Dr. Hannah Brown and Dr. Alfonso Garcia-Bennett had the opportunity to discuss their science and enthusiasm for innovative and ground-breaking CNBP research with Prime Minister Turnbull personally.

# Outreach, Education and Communication

## AT A GLANCE

**CNBP Web Site:**  
13,453 sessions; 8,364 users; 34,588 page views.  
**CNBP News Blog:** 213 posts  
**CNBP Media Releases:** 12  
**CNBP Media Hits:** 74  
**CNBP Facebook Posts:** 99  
**CNBP Twitter Posts:** 781 (tweets and retweets)  
**CNBP Twitter Followers:** 371  
**CNBP Videos Produced:** 5

## Overview

CNBP is committed to showcasing its research and scientific achievements to the general public and wider community, school students and other interested stakeholders and audiences. Our desire is to grow the awareness of CNBP and its specific activities, to promote increased understanding of the transdisciplinary field of nanoscale biophotonics and to enthuse and encourage the community to engage with scientific thinking and to be excited by the wonders of science. In doing so we hope to contribute to a well-informed and science-literate public. During 2016, CNBP has successfully embraced a wide range of communications strategies and activities to support this engagement focus.

## CNBP Social Media, Website and Video

CNBP has taken advantage of the immediate, global, interactive and connected nature of social media to build up communities of interested audiences to aid promotion of CNBP, its research and activity, and to help build the organisation's reputation and impact.

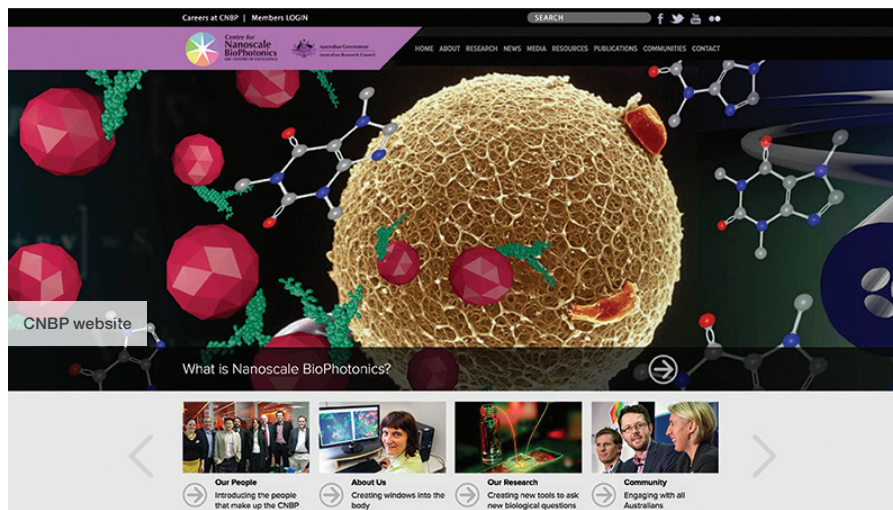
Twitter audience growth via @CNBPscience has been particularly impressive over 2016 with followers growing from 203 to 371 (an 82% increase). This was the direct result of a strategic effort to grow the channel by increasing number of posts and retweets, and by added engagement with followers. With CNBP followers located in 96 locations around the world and with a potential network reach of 656,654 the channel has effective global reach in communicating Centre achievements and outcomes.

Likewise, CNBP's Facebook channel has also seen impressive engagement, being used to promote a wide range of CNBP activity, including research

outcomes, awards, articles, events, and relevant photo and video content. As one example, a post promoting a newly developed CNBP fibre-optic sensor reached 3,702 people and had 284 likes, comments and shares.

During 2016, use of video for Centre marketing and promotion was also embraced with a 'CNBP nanoparticle innovation' video produced that illustrated the interconnectedness of Centre activity across all three University nodes. Also produced were videos supporting CNBP's successful Eureka Award entry (the use of innovative technology to see subtle colour differentiations of cells and tissue at a molecular level) as well as a range of videos showcasing CNBP's role in co-hosting the SPIE BioPhotonics Australasia conference.

Additionally, the CNBP news blog which regularly communicates key CNBP related activity via the organisational web site saw significant effort during the year, with 213 news items drafted and posted online. CNBP web site traffic overall was also pleasing with 13,453 sessions, 8,364 users and 34,588 page views recorded, well in excess of KPI targets.



Twitter audience growth via @CNBPscience has been particularly impressive over 2016 with followers growing from 203 to 371.

## CNBP Traditional Media

CNBP was delighted to see its work and research achievements showcased in traditional media during 2016.

Highlights included:

- New sensor to aid IVF – CNBP researcher Dr. Malcolm Purdey was interviewed by ABC Radio and featured in print and online articles for his work on developing a new fibre optic sensor that can measure concurrently, hydrogen peroxide and pH concentrations in solution.
- Counting cancer-busting oxygen molecules – CNBP Deputy Director Prof. Ewa Goldys gained coverage related to her work on the successful quantification of singlet oxygen produced during photodynamic therapy for cancer. This included coverage on MSN News as a 'Science story of the week'.
- Brain probe to examine drug dangers – CNBP researcher Stefan Musolino saw his work on the development of a new optical fibre-based probe capable of measuring localised brain temperature gain widespread online media exposure. Coverage included R&D Magazine and Science Daily.
- New technique takes guesswork out of IVF embryo selection – CNBP researcher Dr. Hannah Brown and her use of highly advanced digital imaging techniques to show differences in the viability of embryos featured in The Australian newspaper.
- CNBP science on TV – CNBP researcher Dr. Malcolm Purdey appeared in the science TV program 'Scope', discussing light

based sensing and explaining how innovative CNBP technologies are opening up exciting new windows into the body.

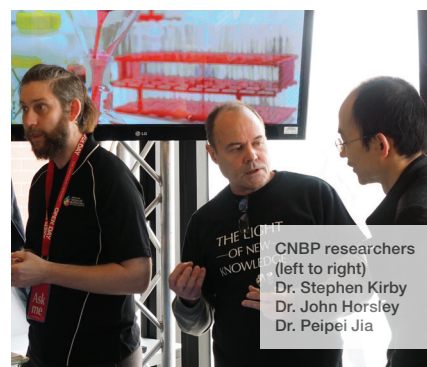
- Aiming to aid breast cancer surgery – CNBP researcher Dr. Erik Schartner appeared in broadcast, print and online media for his translational work in developing an optical fibre probe that distinguishes breast cancer tissue from normal tissue. Coverage was achieved in the Advertiser and Medical Xpress and on ABC News and Radio National.

## CNBP in the Community

### CNBP in schools

As a part of the SPIE Biophotonics Australasia conference (19 October, 2016), CNBP organised a half day outreach session for approximately 100 South Australian students. The session, aiming to inspire the next generation of scientists, saw Year 10/11 students from Concordia College, Seaview High School and Seymour College all attend the conference and enjoy talks, poster sessions, light inspired science demonstrations and discussion time with leading researchers.

Feedback from the teachers and students, and CNBP researchers involved was hugely positive. "This excursion opened me up to new opportunities and I can potentially see myself having a career in science," said one student. "The many different ways that light can be used in researching was interesting and the various experiments conducted were definitely a new experience. It was an inspiring event that changed my view on science," said another!



### University open days

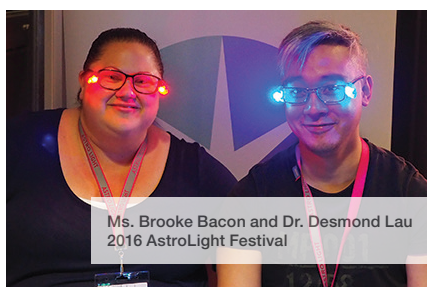
CNBP researchers were active participants' during National Science Week and contributed to Open Days across all three CNBP University nodes – staffing booths, engaging with prospective students and the general public, and undertaking a host of interactive demonstrations, experiments, talks and laboratory tours. At RMIT University alone, over 500 members of the public passed through CNBP laboratories and work spaces with the team on hand to explain the science behind lasers, nanoparticles, fibre optics and more.



## Outreach, Education and Communication (continued)



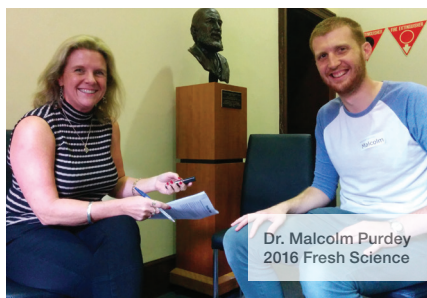
Researcher Ms. Emma Wilson  
2016 AstroLight Festival



Ms. Brooke Bacon and Dr. Desmond Lau  
2016 AstroLight Festival



Mrs. Vicky Staikopoulos and  
Burton Primary School students



Dr. Malcolm Purdey  
2016 Fresh Science

### AstroLight Festival

Researchers from the RMIT University node of the CNBP were out in force to support the 2016 AstroLight Festival at Scienceworks, Melbourne, undertaking a wide variety of talks, displays, hands-on activities and demonstrations that entertained and educated over 2,000 excited members of the public. From talks encompassing laser combat in the movies (and how lasers work in real life), to the natural 'glow-sticks' found in the living environment, to astronomy at the nanoscale, the CNBP-RMIT team had a fantastic time taking their passion for lasers, optics, fluorescence, and all things 'light-based' and molecular out to the wider community.

### Compass Collaboration

CNBP researchers, together with Adelaide Compass at the University of Adelaide, teamed up to host an extremely successful outreach session as a part of National Science Week, 2016. Adelaide Compass aims to build school students' self-confidence and familiarity with the university environment by engaging participants in fun learning activities that link back to the school curriculum. Together, CNBP and Adelaide Compass produced the 'Hit The Lights' outreach program which saw Year 5 students from Burton Primary School visit CNBP offices and laboratories, and participate in interactive workshops, demonstrations and discussions, all related to light, optics and biophotonic based science.

### Researchers Get Fresh

CNBP researchers Dr. Malcolm Purdey and Dr. Martin Ploschner participated in this year's 'Fresh Science' program which comprised media and communication training for early career researchers.

The program aims to create new 'spokespeople for science' by helping researchers articulate their activity in meaningful ways to non-scientific audiences. The program included community events where both researchers were able to put their learnings into practice, presenting and discussing their work to members of the public. Malcolm Purdey spoke about 'Sensors for healthier hearts and babies' while Martin Ploschner discussed 'Sculpturing light at the tip of a needle.' Both highly recommended the training that they received! ■

The team had a fantastic time taking their passion for lasers, optics, fluorescence, and all things 'light-based' and molecular out to the wider community.

# Awards

## CNBP Highlighted Awards and Honours for 2016

External recognition for CNBP personnel in 2016 demonstrates the versatility and strengths of our talented team. Awards have been granted from our scientific peers and the wider community, with some of the highlights as follows:

### Dr. Antony Orth

Hitachi Hi Tech Best Paper Award at SPIE Photonics West Conference  
“High Speed Biomedical Imaging and Spectroscopy: Towards Big Data Instrumentation and Management”

### Prof. Andrew Abell

Elected as Australian Fulbright Ambassador

### Prof. Andrew Abell + team

Selected to attend the OneStart Europe Semi-Finals at University of London

### Dr. Sabrina Heng

Barbara Kidman Fellowship

### Dr. Sabrina Heng

BIOLASER Laureate Project  
Presentation: Honourable Mention

### Dr. Xiaozhou (Michelle) Zhang

Institute for Photonics and Advanced Sensing (IPAS) Best Papers' Competition 2016

### Dr. Xiaozhou (Michelle) Zhang

Elected as an Australian Representative on the International Congress of Animal Reproduction (ICAR) Standing Committee

### Mr. Jonathan Hall

BIOLASER Laureate Project  
Presentation: Honourable Mention

### Dr. Malcolm Purdey

Institute for Photonics and Advanced Sensing (IPAS) Best Papers' Competition

### Dr. Mel McDowell

Institute for Photonics and Advanced Sensing (IPAS) Best Papers' Competition

### Ms. Tess Reynolds

Institute for Photonics and Advanced Sensing (IPAS) Best Papers' Competition

### Dr. Mel McDowell

Commenced MBA and received University of Adelaide scholarship for tuition

### Ms. Emma Wilson

Awarded with an award for her “Outstanding Achievements in Biotechnology” at RMIT

### Dr. Philipp Reineck

Elected as a member of Standards Australia

### Dr. Michael Barratta

Successful recipient of the CNBP-American Australian Association (AAA) Fellowship for 2016

### A/Prof. Jeremy Thompson

Elected to present President's Lecture and the Founders Lecture at the Annual Scientific Meeting of the Endocrine Society of Australia and the Society for Reproductive Biology (SRB) 2016

### Dr. Jiawen Li

Best poster award at the 8th International Conference on Information Optics and Photonics (CIOP 2016) in Shanghai

### Dr. Hannah Brown

Awarded the Australia/New Zealand best regional abstract award at the Society for the Study of Reproduction Conference in San Diego

### Dr. Jiawen Li

Wins a School of Medicine Research Travel Award from The University of Adelaide



Prof. Ewa Goldys and Dr. Martin Gosnell (Quantitative Pty Ltd) were recognised with a 2016 Australian Museum ANSTO Eureka Prize for Innovative Use of Technology.

### Prof. Ewa Goldys

Winner of Australian Museum ANSTO Eureka Prize for Innovative Use of Technology that enables colour to be used as a uniquely powerful diagnostic tool in medicine

### Mr. Christopher Ashwood

Selected as finalist for HUPO abstract competition

### Mr. Christopher Ashwood

Won PhD award for his poster at the Human Proteome Organization World Congress, 18-22 September 2016

## Awards (continued)

External recognition for CNBP personnel in 2016 demonstrates the versatility and strengths of our talented team.

**Mr. Yuan Qi Yeoh**

Awarded First Class Honours at Macquarie University

**Prof. Mark Hutchinson**

Awarded prestigious James McWha Award for Excellence

**Dr. Abel Santos**

Awarded University of Adelaide Beacon Fellowship

**A/Prof. Jeremy Thompson**

CSIRO ON Prime Commercialisation Accelerator Program recipient

**Dr. Mel McDowell**

CSIRO ON Prime Commercialisation Accelerator Program recipient

**Mr. Jonathan Hall**

CSIRO ON Prime Commercialisation Accelerator Program recipient

**Mr. Saabah Mahbub**

Winner "Best poster prize - Research by Degrees Showcase", an event held by the Department of Physics and Astronomy at Macquarie University

**Dr. Sanam Mustafa**

Barbara Kidman Fellowship

**Dr. Erik Schartner**

CAS Grant winner from The University of Adelaide Commercialisation Accelerator program

**Prof. Robert McLaughlin**

CAS Grant winner from The University of Adelaide Commercialisation Accelerator program

**Dr. Mel McDowell**

Won 1st prize in the University of Adelaide eChallenge competition (\$10K)

**Mr. Jonathan Hall**

Won 1st prize in the University of Adelaide eChallenge competition (\$10K)

**Prof. Dayong Jin**

2017 John Booker Medal by the Australian Academy of Science

**Prof. Igor Aharonovich**

2017 Pawsey Medal by the Aust Academy of Science

**Prof. Andrew Greentree**

Elected Member of the Expert Committee Review for the Canada Foundation for Innovation (Neuroscience)

**Prof. Andrew Abell**

Elected to University Council, The University of Adelaide

**Dr. Guozhen Liu**

Awarded ARC Future Fellowship

**Prof. Andrew Greentree**

Awarded ARC Future Fellowship

**Prof. Heike Ebendorff-Heidepriem**

Discovery Project Awarded

**Prof. Ewa Goldys**

Discovery Project Awarded

**Prof. Dougal McCulloch**

Discovery Project Awarded

**Dr. Louise Brown**

Discovery Project Awarded

**Dr. David Inglis**

Discovery Project Awarded

**Dr. Andrei Zvyagin**

Discovery Project Awarded

**Prof. Ewa Goldys**

Discovery Project Awarded

**Dr. Yiqing Lu**

Discovery Project Awarded

**Dr. Martin Ploschner**

Discovery Early Career Researcher Award

**Dr. Yiqing Lu**

Discovery Early Career Researcher Award

**Ms. Sandya Clement**

Recipient of Excellence in Sessional Teaching at Macquarie University

**Prof. Mark Hutchinson**

Invited Committee Member on Australia-India Strategic Research Fund (AISRF)

**Prof. Mark Hutchinson**

National Infrastructure Roadmapping Exercise Committee Member

**Prof. Mark Hutchinson**

Invited Committee Member/Male Champion of Change on the Advanced Physics, Chemistry, Mathematics and Materials Capability Expert Team for the 2016 National Research Infrastructure Roadmap

**Prof. Andrew Abell**

Winner of OneStart Europe Semi-Finals, attendance at Bootcamp at Queen Mary University of London

**Prof. Jim Piper**

Elected President of Science & Technology Australia 2016/17

**Mr. Stefan Musolino**

Recognised as The University of Adelaide's Student Ambassador for visiting Freiburg student

**Dr. Guozhen Liu**

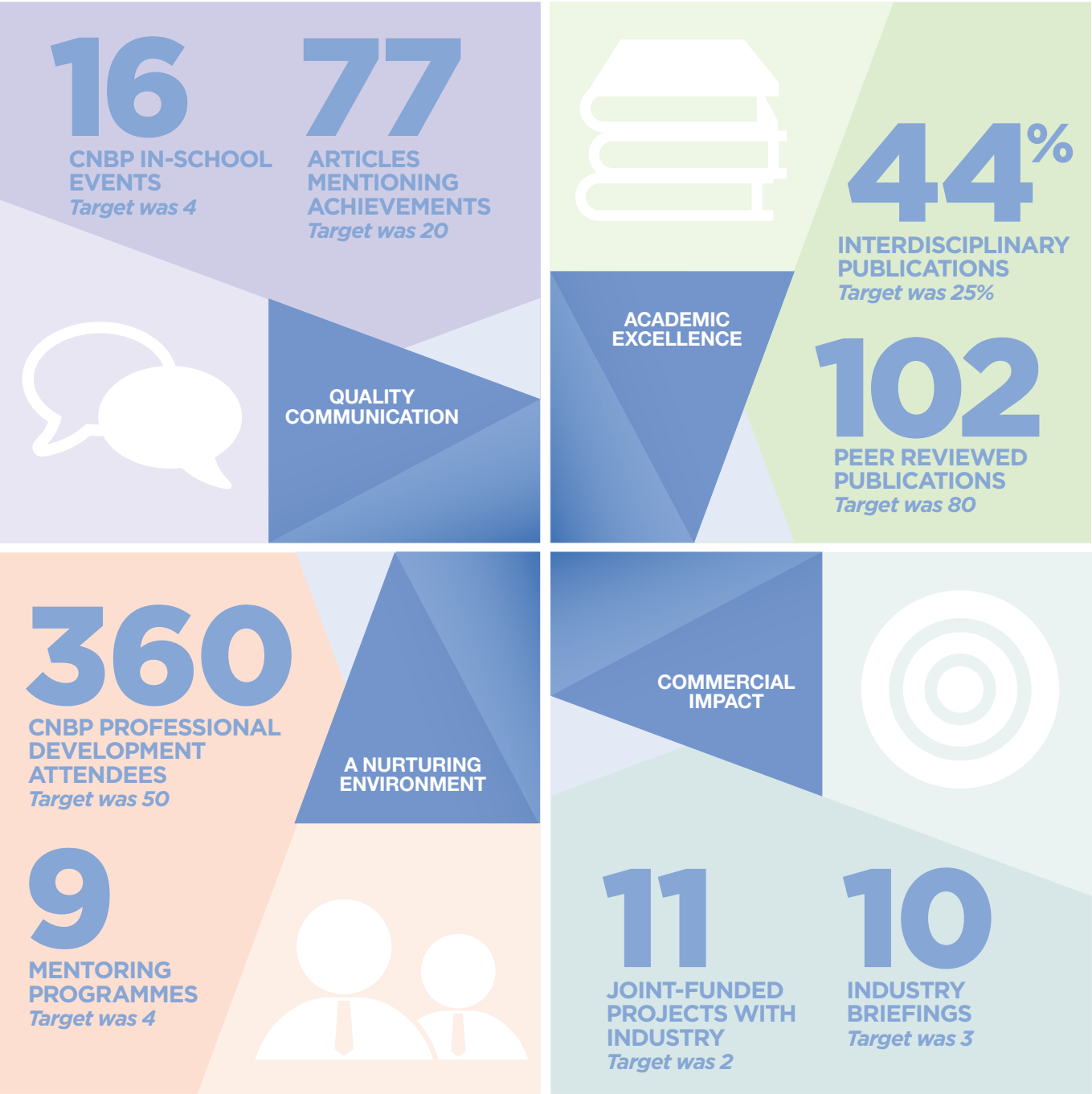
Shortlisted Georgina Sweet Award for Women in Biomedical Science 2016

Congratulations to all personnel who received awards for their dedication. ■



# KPIs and Financial Statements

# 2016 KPIs at a Glance



# CNBP KPIs

| PERFORMANCE MEASURE  | TARGET 2014 | OUTCOME 2014 | TARGET 2015 | OUTCOME 2015 | TARGET 2016 | OUTCOME 2016 |
|--|-------------|--------------|-------------|--------------|-------------|--------------|
| <b>1. Research findings</b>  |             |              |             |              |             |              |
| <b>Number of research outputs</b>  |             |              |             |              |             |              |
| Peer reviewed journal publications   | 30          | 20           | 40          | 60           | 80          | 102          |
| Other publications (conf pub, poster, community news; )                                      | 20          | 48           | 40          | 53           | 80          | 138          |
| Provisional patent application   | 1           | 3            | 1           | 3            | 2           | 5            |
| <b>Quality of research outputs</b>   |             |              |             |              |             |              |
| % of journal publications in top 10% of peer reviewed journals                               | 80%         | 60%          | 80%         | 36%          | 80%         | 46%          |
| % of journal publications in > 3.5 impact factor journals                                    | 30%         | 55%          | 40%         | 53%          | 50%         | 63%          |
| Research awards (student prizes, researcher awards, etc)                                     | 0           | 9            | 2           | 38           | 4           | 37           |
| <b>Number of invited talks/papers/keynote lectures given at major international meetings</b> |             |              |             |              |             |              |
| Invited talks/papers at major international meetings including int. conf. in Australia       | 12          | 25           | 15          | 39           | 20          | 89           |
| <b>Number and nature of commentaries about the Centre's achievements</b>                     |             |              |             |              |             |              |
| Articles mentioning achievements   | 5           | 24           | 10          | 62           | 20          | 77           |
| Media releases about achievements  | 5           | 2            | 10          | 8            | 10          | 12           |
| Citation Data  |             |              |             |              |             | 12           |
| Citation data for print publications (average for 2014 papers)                               | NA          | NA           | N/A         | N/A          | 4           | 31           |
| Citation data for online articles  | NA          | N/A          | N/A         | N/A          | NA          | N/A          |



## CNBP KPIs (continued)

| PERFORMANCE MEASURE   | TARGET<br>2014 | OUTCOME<br>2014 | TARGET<br>2015 | OUTCOME<br>2015 | TARGET<br>2016 | OUTCOME<br>2016 |
|---|----------------|-----------------|----------------|-----------------|----------------|-----------------|
| <b>2. Research training and professional education</b>  |                |                 |                |                 |                |                 |
| <b>Number of professional training courses for staff and postgraduate students attended</b>   |                |                 |                |                 |                |                 |
| Professional training courses for staff and postgraduate students   | 1              | 5               | 2              | 6               | 2              | 15              |
| <b>Number of Centre attendees at all professional training/development courses offered by the Centre</b>  |                |                 |                |                 |                |                 |
| Attendees at professional training/development Centre courses   | 10             | 45              | 50             | 250             | 50             | 360             |
| <b>Number of new postgraduate students working on core Centre research and supervised by Centre staff</b>   |                |                 |                |                 |                |                 |
| PhD student commencements   | 6              | 6               | 12             | 20              | 12             | 13              |
| New Honours/Masters students  | 0              | 1               | 6              | 13              | 10             | 10              |
| <b>Number of new postdoctoral researchers recruited to the Centre working on core Centre research</b>   |                |                 |                |                 |                |                 |
| Postdoctoral researchers recruited to Centre (defined as researchers that were recruited and commenced in the calendar year)  | 6              | 17              | 10             | 14              | 8              | 12              |
| <b>Number of postgraduate completions and completion times, by students working on core Centre research and supervised by Centre staff</b>                            |                |                 |                |                 |                |                 |
| Research student completions  | 0              | 0               | 0              | 0               | 0              | 0               |
| Average Research Completion Time  | 0              | 0               | 0              | 0               | 0              | 0               |
| Early Career Researchers: within five years of completing PhD working on core Centre research   | 10             | 14              | 10             | 22              | 10             | 24              |
| Number of students mentored (including work experience, summer scholars, MSc course work (project) Masters by Research and PhD - including visiting and cosupervised) | 10             | 25              | 20             | 16              | 30             | 45              |
| <b>Number of mentoring programs offered by the Centre</b>   |                |                 |                |                 |                |                 |
| Mentoring programs (defined as programs or group activities for school/undergraduate/graduate researchers)  | 2              | 3               | 4              | 5               | 4              | 9               |
| External stakeholder workshops  | 1              | 1               | 2              | 10              | 2              | 5               |

| PERFORMANCE MEASURE  | TARGET 2014 | OUTCOME 2014 | TARGET 2015 | OUTCOME 2015 | TARGET 2016 | OUTCOME 2016 |
|--|-------------|--------------|-------------|--------------|-------------|--------------|
| <b>3. International, national and regional links and networks</b>                  |             |              |             |              |             |              |
| <b>Number of international visitors and visiting fellows</b>                       |             |              |             |              |             |              |
| Total international visitors to Centre nodes                                       | 25          | 25           | 25          | 26           | 25          | 29           |
| Extended visits (>1 week):   | 5           | 7            | 10          | 16           | 10          | 15           |
| <b>Number of national and international workshops held/organised by the Centre</b> |             |              |             |              |             |              |
| National and international workshops (including Annual Centre Workshop)            | 2           | 3            | 2           | 9            | 2           | 6            |
| <b>Number of visits to overseas laboratories and facilities</b>                    |             |              |             |              |             |              |
| Visits to overseas labs and facilities   | 10          | 12           | 20          | 44           | 30          | 45           |
| Includes extended visits (>1 week)   | 4           | 4            | 8           | 9            | 8           | 18           |
| <b>Examples of relevant interdisciplinary research supported by the Centre</b>     |             |              |             |              |             |              |
| % publications reporting interdisciplinary research                                | 35%         | 45%          | 35%         | 44%          | 35%         | 44%          |

| PERFORMANCE MEASURE   | TARGET 2014 | OUTCOME 2014 | TARGET 2015 | OUTCOME 2015 | TARGET 2016 | OUTCOME 2016 |
|---|-------------|--------------|-------------|--------------|-------------|--------------|
| <b>4. End-User Links</b>  |             |              |             |              |             |              |
| <b>Number of government, industry and business community briefings</b>                |             |              |             |              |             |              |
| Industry briefings  | 2           | 8            | 3           | 42           | 3           | 10           |
| <b>Number and nature of public awareness/outreach programs</b>                        |             |              |             |              |             |              |
| CNBP in school events   | 0           | 1            | 2           | 36           | 4           | 16           |
| Open days / lab tours   | 2           | 3            | 2           | 14           | 2           | 9            |
| <b>Currency of information on the Centre's website</b>                                |             |              |             |              |             |              |
| Updated monthly as required   | Yes         | Yes          | Yes         | Yes          | Yes         | Yes          |
| <b>Number of website hits</b>   |             |              |             |              |             |              |
| Website hits ('000s) - (defined as page views)  | 10          | 28           | 20          | 46           | 20          | 35           |
| <b>Number of talks given by Centre staff open to the public</b>                       |             |              |             |              |             |              |
| Public talks given by Centre staff  | 6           | 30           | 15          | 82           | 15          | 28           |
| <b>Other research income secured by Centre staff Other research income (\$'000s).</b> |             |              |             |              |             |              |
| Total   | 400         | 2150         | 800         | 3806         | 1000        | 8100         |
| ARC   | 200         | 670          | 300         | 500          | 400         | 4800         |
| Other Aus. Competitive  | 100         | 750          | 200         | 2740         | 200         | 2400         |
| Industry  | 50          | 110          | 100         | 450          | 200         | 863          |
| Other (including International)   | 50          | 620          | 200         | 115          | 200         | 350          |
| <b>Number of new organisations collaborating with, or involved in, the Centre</b>     |             |              |             |              |             |              |
| New organisations involved with the Centre  | 0           | 0            | 1           | 6            | 1           | 3            |

## CNBP KPIs (continued)

| PERFORMANCE MEASURE   | TARGET<br>2014 | OUTCOME<br>2014 | TARGET<br>2015 | OUTCOME<br>2015 | TARGET<br>2016 | OUTCOME<br>2016 |
|---|----------------|-----------------|----------------|-----------------|----------------|-----------------|
| <b>5. Organisational Support</b>  |                |                 |                |                 |                |                 |
| <b>Annual cash contributions from Administering and Collaborating Organisations (\$'000)</b>    |                |                 |                |                 |                |                 |
| University of Adelaide  | 567            | 567             | 567            | 617             | 567            | 591             |
| Macquarie University  | 825            | 990             | 833            | 990             | 843            | 973             |
| RMIT University   | 224            | 224             | 224            | 235             | 224            | 219             |
| <b>Annual in-kind contributions from Administering and Collaborating Organisations (\$'000)</b> |                |                 |                |                 |                |                 |
| University of Adelaide  | 755            | 370             | 755            | 905             | 803            | 1,012           |
| Macquarie University  | 568            | 511             | 568            | 1315            | 568            | 1,120           |
| RMIT University   | 170            | 78              | 172            | 2,932           | 228            | 475             |
| <b>Annual cash contributions from Partner Organisations (\$'000)</b>                            |                |                 |                |                 |                |                 |
| Peking Uni  | 18             | 45              | 18             | 18              | 76             | 70              |
| Huazhong Uni  | 14             | 0               | 14             | 14              | 14             | 25              |
| Southampton Uni   | 23             | 6               | 23             | 74              | 23             | 0               |
| City Uni London   | 63             | 0               | 63.5           | 63              | 63.5           | 103             |
| Toronto Uni   | 15             | 0               | 15             | 15              | 15             | 15              |
| IPHT Jena   | 172            | 0               | 172            | 172             | 172            | 171             |
| SAHMRI  | 50             | 50              | 50             | 50              | 50             | 50              |
| Bioplatforms  | 100            | 0               | 100            | 100             | 100            | 100             |
| Olympus   | 40             | 40              | 40             | 40              | 40             | 40              |
| <b>Annual in-kind contributions from Partner Organisations (\$'000)</b>                         |                |                 |                |                 |                |                 |
| Peking Uni  | 20             | 12              | 20             | 20              | 20             | 30              |
| Huazhong Uni  | 10             | 14              | 10             | 10              | 10             | 16              |
| Southampton Uni   | 45             | 19              | 45             | 5               | 45             | 0               |
| Toronto Uni   | 15             | 11              | 15             | 15              | 15             | 15              |
| IPHT Jena   | 14             | 6               | 14             | 14              | 14             | 35              |
| Uni Colorado  | 0              | 0               | 0              | 0               | 20             | 20              |
| SAHMRI  | 50             | 87              | 50             | 133             | 50             | 50              |
| CSIRO   | 52             | 22              | 52             | 52              | 55             | 55              |
| Olympus   | 160            | 43              | 160            | 160             | 160            | 160             |
| Heraeus   | 10             | 10              | 10             | 10              | 10             | 4               |



| PERFORMANCE MEASURE   | TARGET<br>2014 | OUTCOME<br>2014 | TARGET<br>2015 | OUTCOME<br>2015 | TARGET<br>2016 | OUTCOME<br>2016 |
|---|----------------|-----------------|----------------|-----------------|----------------|-----------------|
| <b>Centre-specific Performance Indicators for the ARC Centre of Excellence for Nanoscale BioPhotonics</b> |                |                 |                |                 |                |                 |
| <b>6. Research training and professional education</b>  |                |                 |                |                 |                |                 |
| Student internships with industry   | 0              | 0               | 2              | 0               | 2              | 2               |
| Support Fellowship applications to attract researchers (defined as successful fellowships)                | 0              | 2               | 3              | 4               | 6              | 21              |

| PERFORMANCE MEASURE   | TARGET<br>2014 | OUTCOME<br>2014 | TARGET<br>2015 | OUTCOME<br>2015 | TARGET<br>2016 | OUTCOME<br>2016 |
|---|----------------|-----------------|----------------|-----------------|----------------|-----------------|
| <b>7. End-User Links</b>  |                |                 |                |                 |                |                 |
| Technologies in pathway to translation: Technology Transfer     | 0              | 1               | 0              | 4               | 1              | 3               |
| Joint funded projects with industry (e.g. ARC Linkage Projects) | 0              | 1               | 2              | 3               | 2              | 11              |

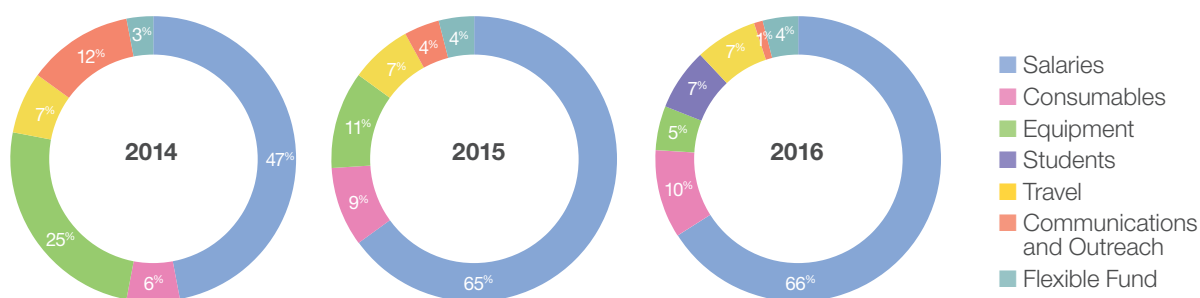
| PERFORMANCE MEASURE  | TARGET<br>2014 | OUTCOME<br>2014 | TARGET<br>2015 | OUTCOME<br>2015 | TARGET<br>2016 | OUTCOME<br>2016 |
|--|----------------|-----------------|----------------|-----------------|----------------|-----------------|
| <b>8. International, national and regional links and networks</b>  |                |                 |                |                 |                |                 |
| Secure international funded projects with international collaborators (eg NSF, DARPA, Wellcome, international fellowships, China (MOST)) | 0              | 0               | 2              | 8               | 4              | 15              |

# Financials

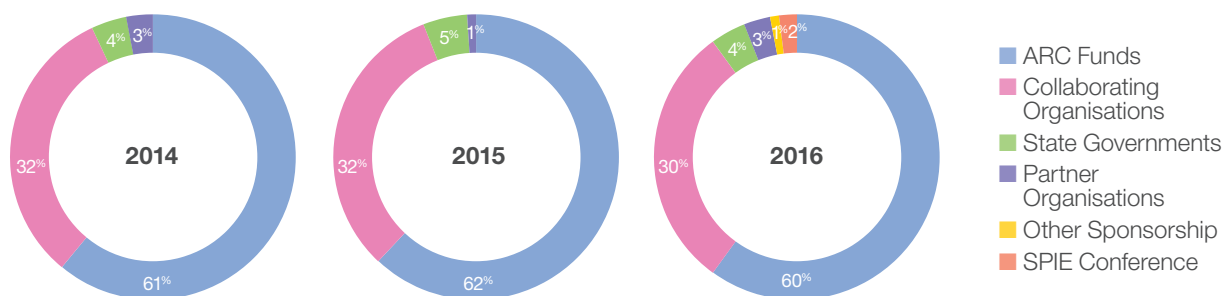
| EXPENDITURE                 | 2014 ACTUALS           | 2015 ACTUALS           | 2016 ACTUALS           | 2017 PROJECTIONS       |
|-----------------------------|------------------------|------------------------|------------------------|------------------------|
| Salaries                    | \$ 784,194.00          | \$ 3,789,520.80        | \$ 4,213,275.91        | \$ 4,267,629.98        |
| Consumables                 | \$ 107,403.00          | \$ 525,033.87          | \$ 620,525.41          | \$ 578,750.00          |
| Equipment                   | \$ 414,627.00          | \$ 646,602.86          | \$ 296,792.62          | \$ 200,000.00          |
| Students                    | \$ 0                   | \$ 21,326.26           | \$ 420,765.06          | \$ 119,833.22          |
| Travel                      | \$ 125,710.00          | \$ 393,599.01          | \$ 428,288.72          | \$ 373,920.00          |
| Communications and Outreach | \$ 193,176.00          | \$ 222,483.58          | \$ 87,218.73           | \$ 103,500.00          |
| Flexible Fund               | \$ 51,411.00           | \$ 204,558.30          | \$ 280,004.14          | \$ 380,192.50          |
| <b>Total</b>                | <b>\$ 1,676,521.00</b> | <b>\$ 5,803,124.68</b> | <b>\$ 6,346,870.59</b> | <b>\$ 6,023,825.70</b> |

| INCOME                      | 2014 ACTUALS           | 2015 ACTUALS           | 2016 ACTUALS           |
|-----------------------------|------------------------|------------------------|------------------------|
| ARC Funds                   | \$ 3,385,011.66        | \$ 3,445,635.98        | \$ 3,504,211.68        |
| Collaborating Organisations | \$ 1,781,724.00        | \$ 1,791,815.03        | \$ 1,782,477.87        |
| State Governments           | \$ 216,666.67          | \$ 261,000.00          | \$ 266,500.00          |
| Partner Organisations       | \$ 140,000.00          | \$ 90,000.00           | \$ 190,000.00          |
| Other Sponsorship           | \$ 909.09              | \$ 0                   | \$ 4,545.45            |
| SPIE Conference             | \$ 0                   | \$ 0                   | \$ 131,906.04          |
| <b>Total</b>                | <b>\$ 5,524,311.42</b> | <b>\$ 5,588,451.01</b> | <b>\$ 5,879,641.04</b> |

## 2014 - 2016 EXPENDITURE

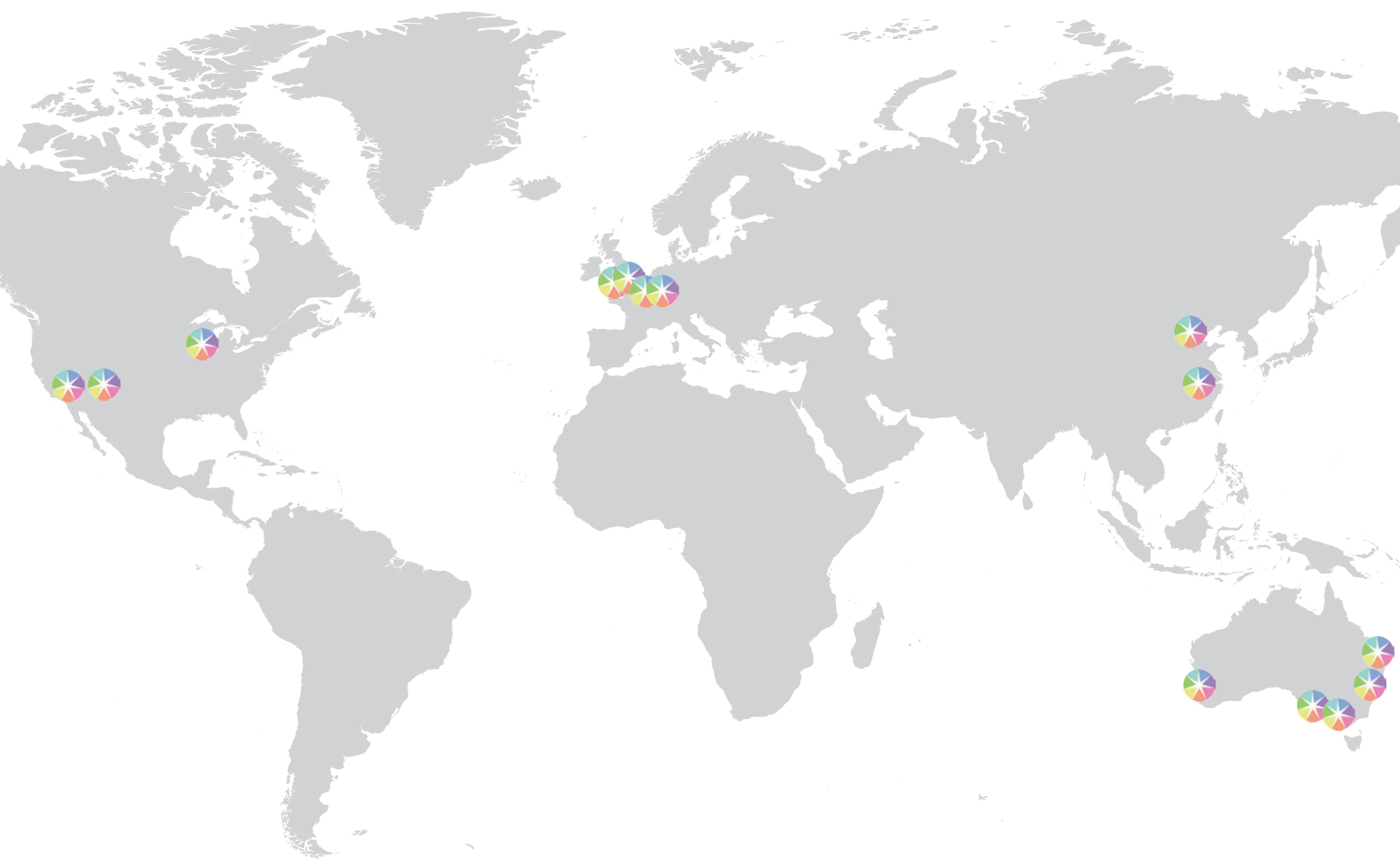


## 2014 - 2016 INCOME



# Global Collaborations

CNBP links Australia's key nanophotonics groups and builds on Global Collaborations with a focus on doing the science required to advance biology.





## Partner Organisations

CNBP has 12 official partners who contribute significant cash, in kind support and infrastructure to CNBP activities.



### SAHMRI

The SAHMRI Heart Health Program houses the Inside Blood Vessels team. In addition to their substantial in-kind contribution supporting PI Stephen Nicholls and his team, SAHMRI provides \$50k of cash support for consumables, animal costs, staff travel and CNBP communication activities.

**Partner Investigator:**  
**Prof. Stephen Nicholls**



### Leibniz Institute of Photonic Technology (IPHT), Jena

CNBP researchers travelled to IPHT in August 2016 to participate in the official Partner launch including scientific presentations, lab tours and the official presentation of the CNBP Plaque.

Dr. Stephen Warren-Smith, CNBP AI and fibre optics expert completed his postdoctoral studies at IPHT and returned to The University of Adelaide after securing a prestigious Marie S Curie fellowship.

Partner successes for 2016 include joint publications and the development of a new research project in the field of theoretical and experimental investigations for a miniaturized Fabry-Perot resonator in an optical fibre sensor.

**Partner Investigator:**  
**Prof. Juergen Popp**



### Huazhong University of Science and Technology (HUST)

During 2016 a number of CNBP – HUST projects have developed. Success stories include intra vital imaging of Chronic Constriction Injury (CCI) changes within the spinal cord and the brain; optimization of the window chamber model for longitude spinal cord imaging *in vivo* and solving issues related to breath / heartbeat induced vibrations during imaging. These optimized models, are allowing CNBP researchers in the Origin of Sensation team to monitor glial cells in a way that was previously impossible.

HUST have exceeded both their cash and in-kind contributions to CNBP in 2016, with exciting research outcomes anticipated for 2017.

**Partner Investigator:**  
**Prof. Qingming Luo**



### **Peking University, China**

Throughout the past year there has been intensive collaboration with our colleagues at PKU, in particular the group led by Prof. Peng Xi in the Dept Biomedical Engineering. The research has focussed on key demonstrations of optical super-resolution nanoscopy based on a novel concept of Stimulated Emission Depletion (STED) in thulium-doped upconversion nanocrystals.

This has been the culmination of a project initiated several years ago but given major impetus by key advances in nanocrystal growth and sample preparation at Macquarie University (Shihui Wen, Deming Liu, Chensuo Ma and Xianlin Zheng) and, of critical importance to the final acceptance of the paper, development of a theoretical computational model for the excitation-depletion process by Yiqing Lu at CNBP Macquarie University. New demonstrations of super-resolution by PhD student Xusan Yang, working under the direction of PI Prof. Xi at PKU have added key new data. CNBP Associate Investigator Prof. Dayong Jin (UTS), the originator of the concept, has also been a key participant through the year, along with a number of other contributors.

The new data and theoretical understanding arising from the collaboration in 2016 have been major factors in acceptance of the paper "Enhanced stimulated emission depletion in upconversion nanoparticles for optical nanoscopy", by the world-leading journal Nature, for publication early in 2017.

**Partner Investigators:**  
**Prof. Peng Xi and Prof. Yujie Sun**



### **University of Southampton (Soton)**

CNBP and Soton are actively seeking a Soton based PhD student to work on a joint CNBP biosensor project. Unfortunately the student recruited to commence in 2016 did not pursue the CNBP related project, resulting in new recruitment plans for 2017. CNBP look forward to pursuing this project further in 2017.

**Partner Investigator:**  
**Prof. Gilberto Brambillo**



**CITY UNIVERSITY  
LONDON**

### **City University London**

2016 saw the commencement of two PhD students at CUL, working specifically on CNBP projects. CNBP also worked with CUL to submit a joint Marie Curie Fellowship and also a joint funded application for a new FBG fabrication system at The University of Adelaide.

The Centre welcomed Partner Investigators Prof. Tong Sun and Prof. Ken Gratton's attendance at the inaugural 2016 SPIE BioPhotonics Australasia Conference. Cash and in-kind contribution from CUL were triple that of previous years.

**Partner Investigator:**  
**Prof. Tong Sun**



### **University Health Network (UHN) Toronto**

CNBP's partnership with UHN continues to go from strength to strength.

A Centre delegation visited UHN in May 2016 for a two day program of events, seminars and the official Partnership launch.

UHN supports a post-doctoral fellow, Dr. Greg Dmochowski and a PhD student, Ms. Layla Pires working on a CNBP project: the development of x-ray activated photodynamic therapy. In addition new CNBP collaborations have developed leading to a joint project exploring the use of opto-magnetic sensing of nerve function.

2016 also saw Partner Investigator Prof. Brian Wilson join the CNBPs International Science Committee as part of his retirement strategy. In 2017 CNBP will welcome the succession of a new Partner Investigator at UHN with Prof. Wilson stepping down from his PI role.

**Partner Investigator:**  
**Prof. Brian Wilson**

## Partner Organisations (continued)



### CSIRO

PhD student, Mr. Shilun Feng who commenced his PhD in 2016 is based at CSIRO and co-supervised by CNBP researchers and the local PI. Mr. Feng's project involves development of a microfluidics needle device that can detect cytokines *in situ*.

**Partner Investigator:**  
**Dr. Yonggang Zhu**



### Olympus

CNBP's partnership with Olympus continues to grow and prosper.

Olympus personnel visited all nodes, providing in kind support with the loan of instruments, application discussion for development of up-conversion technology, system servicing and training. In addition, Olympus' annual 40K cash contribution supports Centre activities.

Other highlights included:

- Olympus' exhibitor booth at SPIE BioPhotonics Australasia;
- Participation of Mr. Kim Everuss, Olympus Sales Manager in the SPIE Biophotonics Australia's industry panel;
- Support and attendance of Olympus Tokyo staff to an Austrade industry networking event held at the Australian Embassy in Tokyo;
- Olympus Tokyo staff attendance at a Health Industries South Australia industry trade expo event in Tokyo; and
- Olympus colleagues attended the 3rd annual CNBP retreat.

**Key Industry Contacts: Mr. Tommy Nagashima and Mr. Jian Shen**



### Heraeus

Heraeus continues to provide valuable support in the form of custom glass used by our researchers for fibre fabrication. CNBP was also delighted to welcome Mr. Gerhard Schoetz to Jena, Germany to take part in the 3-day IPHT Launch and workshop.

**Key Industry Contact:**  
**Mr. Gerhard Schoetz**



### The University of Colorado, Boulder

The University of Colorado commenced official activities with CNBP in 2016. Members of the CNBP visited Uni Colorado in 2016 following the Society for Neuroscience meeting, to pilot a series of joint CNBP projects and to train the Uni Colorado staff in the application of CNBP technologies.

As CNBP's 2016 AAA Fellow, Dr. Mike Baratta from Uni Colorado, visited CNBP nodes and attended the SPIE BioPhotonics Australasia Conference and the Centre's Annual Retreat.

**Partner Investigator:**  
**Prof. Steven Maier**



### BioPlatforms Australia

BioPlatforms continues to support the CNBP with an annual commitment of \$100K in 2016. CNBP members access BioPlatforms Australia facilities to generate omics data.

**Key Industry Contact:**  
**Mr. Andrew Gilbert**

## Other Partners and Grants



The CNBP was successful in securing a \$1M Government of South Australian Premiers Research Infrastructure Fund Fellowship (PRIF); resulting in the recruitment of Prof. Robert McLaughlin as the Inaugural Chair of BioPhotonics at the University of Adelaide. Prof. McLaughlin is a leader in translational BioPhotonics and brings a team of three researchers to the CNBP



The CNBP is underpinned by the state of the art fabrication facilities of the Optofab Node of the ANFF. These enable CNBP researchers to make the optical fibre sensors that have continued to progress the Centre's research in 2016.



The CNBP was awarded a 2014 (3-year) grant of \$500 NSW trade and Investment fund to support industrially relevant research at the CNBP. In 2016 this funding supported a postdoc salary at the Macquarie node.



The CNBP was awarded a 2014 (3-year) grant of \$300K from the South Australian Premiers Research Infrastructure Fund Fellowship (PRIF). In 2016 this funding supported technical and research salaries for fibre fabrication, South Australian outreach activities and interstate travel for Adelaide-based researchers.



The CNBP has been awarded 800,000 core hours of computing time, equating to \$32,000 annually to the Centre which commenced in 2015. In 2016 Prof. Andrew Greentree and Dr. Daniel Drumm utilised the NCI collaboration to enable the running of complex theoretical state of the art super computer systems.



## Legacy Partners

### SPIE.

#### The Society for Optics and Photonics (SPIE)

CNBP Partnered with SPIE to co-organise the successful inaugural SPIE BioPhotonics Australasia conference. Over 200 International delegates convened in Adelaide, Australia for 3-days in October. The conference provided an opportunity for delegates to engage on all topic BioPhotonics with a focus on biomedicine and imaging.



#### Science and Technology Australia (STA)

STA membership helps CNBP maintain strong relationships with politicians, business leaders and the wider community. Highlights of 2016 included CNBP attendance at Science meets Parliament where two CNBP postdocs had the honour of meeting Prime Minister Malcolm Turnbull to discuss science, STEM education and their CNBP research.



#### Australian Science and Media Centre (AusSMC)

CNBP's membership with Australian Science Media Centre (AusSMC) connects CNBP to the most up to date science news in media. Our membership with AusSMC in 2016 has enabled us to engage in services and expertise with presenting professional development workshops to our researchers for ongoing media training.



# Appendices

## Appendix 1: Conference Participation

| ATTENDEE                         | CONFERENCE/MEETING NAME  | ROLE                                     | MEETING TYPE  |
|----------------------------------|--|--|---------------|
| Prof. Andrew Abell               | 2016 Queenstown Molecular Biology Meeting                                    | Keynote Lecture                          | International |
| Prof. Andrew Abell               | SPIE BioPhotonics Australasia, Adelaide                                      | International Program Committee/Attendee | International |
| Prof. Andrew Abell               | AFOSR Life Sciences Program Review, Dayton, Ohio                             | Attendee/Presented                       | International |
| Prof. Andrew Abell               | Biofocus Conference, Macquarie University, Sydney                            | Invited Speaker                          | Local         |
| Mr. Ayad Anwar                   | SPIE BioPhotonics Australasia, Adelaide                                      | Oral Presentation                        | International |
| Mr. Ayad Anwar                   | Nanoscale BioPhotonics at Institute of Laser University, Baghdad, Iraq       | Invited Talk                             | International |
| Mr. Christopher Ashwood          | 21st Annual Lorne Proteomics Symposium                                       | Invited Speaker                          | National      |
| Mr. Christopher Ashwood          | Human Proteome Organization World Conference, Taipei, Taiwan                 | Invited Speaker                          | International |
| Dr. Hannah Brown                 | Scientists in Reproductive Technology (SIRT), Adelaide                       | Invited Speaker                          | National      |
| Dr. Hannah Brown                 | Society for the Study of Reproduction Conference, San Diego, USA             | Invited Speaker                          | International |
| Mr. Marco Capelli                | SPIE BioPhotonics Australasia, Adelaide                                      | Poster Presentation                      | International |
| Dr. Andrew Care                  | SPIE BioPhotonics Australasia, Adelaide                                      | Oral Presentation                        | International |
| Mr. Wenjie Chen                  | SPIE BioPhotonics Australasia, Adelaide                                      | Oral Presentation                        | International |
| Dr. Nicole Cordina               | International Nanomedicine Conference, Coogee                                | Poster Presentation                      | National      |
| Dr. Nicole Cordina               | SPIE BioPhotonics Australasia, Adelaide                                      | Attendee                                 | International |
| Dr. Arun Dass                    | Biocuration 2016, Geneva, Switzerland  | Invited Speaker                          | International |
| Dr. Arun Dass                    | SPIE BioPhotonics Australasia, Adelaide                                      | Attendee                                 | International |
| Dr. Wei Deng                     | SPIE BioPhotonics Australasia, Adelaide                                      | Oral Presentation                        | International |
| Dr. Denitza Denkova              | SPIE BioPhotonics Australasia, Adelaide                                      | Outreach                                 | International |
| Dr. Daniel Drumm                 | Australian Institute of Physics Congress, Brisbane                           | Oral Presentation                        | National      |
| Dr. Daniel Drumm                 | SPIE BioPhotonics Australasia, Adelaide                                      | Oral Presentation                        | International |
| Prof. Heike Ebendorff-Heidepriem | University of Colorado, Boulder  | Invited Speaker                          | International |
| Prof. Heike Ebendorff-Heidepriem | SPIE Photonics West, San Francisco   | Invited Speaker                          | International |
| Prof. Heike Ebendorff-Heidepriem | International Conference on Nanoscience and Nanotechnology (ICONN), Canberra | Invited Speaker                          | National      |
| Prof. Heike Ebendorff-Heidepriem | SPIE BioPhotonics Australasia, Adelaide                                      | International Program Committee/Attendee | International |
| MQ CNBP ECRS                     | Biofocus Conference, Macquarie University, Sydney                            | Attendees                                | Local         |
| Dr. Alexandre Francois           | SPIE BioPhotonics Australasia, Adelaide                                      | International Program Committee/Attendee | International |
| A/Prof. Brant Gibson             | SPIE Photonics Europe, Brussels  | Invited Speaker                          | International |
| Dr. Anna Guller                  | SPIE BioPhotonics Australasia, Adelaide                                      | Oral Presentation                        | International |

| ATTENDEE               | CONFERENCE/MEETING NAME  | ROLE   | MEETING TYPE  |
|------------------------|--|--|---------------|
| A/Prof. Brant Gibson   | Precision Sensing Australia workshop in Canberra (ANU)                                   | Attendee   | National      |
| A/Prof. Brant Gibson   | AFOSR Life Sciences Program Review, Dayton, Ohio   | Attendee/Presented   | International |
| A/Prof. Brant Gibson   | 10th International New Diamond and Nano Carbons Conference (NDNC 2016), China            | Invited Speaker  | International |
| Prof. Brant Gibson     | SPIE BioPhotonics Australasia, Adelaide  | International Program Committee/Attendee/Session Chair                     | International |
| Prof. Ewa Goldys       | SPIE Photonics West, San Francisco   | Attendee   | International |
| Prof. Ewa Goldys       | SPIE BioPhotonics Australasia, Adelaide  | Co-Chair, Organising Committee, Session Chair                              | International |
| Prof. Andrew Greentree | Biofocus Conference, Macquarie University, Sydney  | Attendee   | Local         |
| Prof. Andrew Greentree | SPIE BioPhotonics Australasia, Adelaide  | International Program Committee/Attendee/Outreach Chair, Oral Presentation | International |
| Prof. Andrew Greentree | Precision Sensing Australia workshop in Canberra (ANU)                                   | Attendee   | National      |
| Mr. Abbas Habibalahi   | SPIE BioPhotonics Australasia, Adelaide  | Attendee   | International |
| Dr. Jonathan Hall      | SPIE BioPhotonics Australasia, Adelaide  | Attendee   | International |
| Ms. Mengke Han         | SPIE BioPhotonics Australasia, Adelaide  | Attendee   | International |
| Mr. Ashleigh Heffernan | Australian Institute of Physics Congress, Brisbane                                       | Oral Presentation  | National      |
| Mr. Ashleigh Heffernan | SPIE BioPhotonics Australasia, Adelaide  | Attendee   | International |
| Dr. Sabrina Heng       | International Conference on Nanoscience and Nanotechnology (ICONN), Canberra             | Poster Presentation  | National      |
| Dr. Sabrina Heng       | Scientists in Reproductive Technology (SIRT), Adelaide                                   | Invited Speaker  | National      |
| Dr. Sabrina Heng       | 10th Florey International Postgraduate Research Conference at The University of Adelaide | Keynote Speaker  | National      |
| Dr. Sabrina Heng       | SPIE BioPhotonics Australasia, Adelaide  | Oral Presentation  | International |
| Dr. John Horsely       | SPIE BioPhotonics Australasia, Adelaide  | Oral Presentation  | International |
| Dr. John Horsley       | 6th Asia Pacific Optical Sensor Conference, Shanghai, China                              | Oral Presentation  | International |
| Dr. John Horsley       | International Conference on Biochemistry, Kuala Lumpur, Malaysia                         | Invited Speaker  | International |
| Prof. Mark Hutchinson  | AusMedtech 2016, Adelaide  | Invited Speaker  | National      |
| Prof. Mark Hutchinson  | Photonics North Conference, Quebec   | Attendee   | International |
| Prof. Mark Hutchinson  | Neuroscience Satellite Meeting, Toronto  | Attendee   | International |
| Prof. Mark Hutchinson  | Annual NIH Pain Consortium Symposium, Bethesda, MD                                       | Attendee   | International |
| Prof. Mark Hutchinson  | Pain Mechanisms & Therapeutics Conference, Taormina, Sicily                              | Invited Speaker  | International |
| Prof. Mark Hutchinson  | 23rd Annual PNIRS Scientific Meeting, Brighton, UK                                       | Board Member   | International |
| Prof. Mark Hutchinson  | Australian Veterinary Association (AVA) Annual Conference                                | Plenary Lecture  | National      |



## Appendix 1: Conference Participation (continued)

| ATTENDEE              | CONFERENCE/MEETING NAME  | ROLE  | MEETING TYPE  |
|-----------------------|--|---|---------------|
| Prof. Mark Hutchinson | 10th Annual Canadian Neuroscience Meeting, Toronto   | Invited Speaker                               | International |
| Prof. Mark Hutchinson | IASP 16th World Congress on Pain, Yokohama, Japan  | Invited Speaker                               | International |
| Prof. Mark Hutchinson | Melbourne Photonics Symposium: Biophotonics in Focus, Melbourne                                  | Invited Speaker                               | National      |
| Prof. Mark Hutchinson | SPIE BioPhotonics Australasia, Adelaide  | Co-Chair, Organising Committee, Session Chair | International |
| Prof. Mark Hutchinson | Australian Research Council Co Ex(po), Tokyo, Japan  | Invited Speaker                               | International |
| Prof. Mark Hutchinson | Health Industries South Australia Delegation, Embassy Event, Tokyo, Japan                        | Invited Speaker                               | International |
| Prof. Mark Hutchinson | Society for Neuroscience (SfN) Conference, San Diego   | Attendee                                      | International |
| Prof. Mark Hutchinson | Frontiers in Addiction Research Mini-Convention, San Diego                                       | Attendee                                      | International |
| Prof. Mark Hutchinson | ANS 2016 Conference, Hobart  | Chairperson/Invited Speaker                   | International |
| Prof. Mark Hutchinson | ASCEPT-MPGPCR Joint Scientific Meeting 2016, Sydney  | Invited Speaker                               | National      |
| Prof. Mark Hutchinson | Joint Aust Psychological Society (AuPS) and Australian Society for BioPhysics (ASB), Adelaide    | Invited Speaker                               | National      |
| Mr. Kashif Islam      | SPIE BioPhotonics Australasia, Adelaide  | Oral Presentation                             | International |
| Dr. Peipei Jia        | International Conference on Nanoscience and Nanotechnology (ICONN), Canberra                     | Invited Speaker                               | National      |
| Dr. Peipei Jia        | SPIE BioPhotonics Australasia, Adelaide  | Attendee                                      | International |
| Dr. Lianmei Jiang     | SPIE BioPhotonics Australasia, Adelaide  | Oral Presentation                             | International |
| Prof. Dayong Jin      | SPIE BioPhotonics Australasia, Adelaide  | International Program Committee/Attendee      | International |
| Prof. Dayong Jin      | SPIE BioPhotonics Australasia, Adelaide  | International Program Committee/Attendee      | International |
| Mr. Manoj Kale        | SPIE BioPhotonics Australasia, Adelaide  | Attendee                                      | International |
| Ms. Zahra Khabir      | SPIE BioPhotonics Australasia, Adelaide  | Attendee                                      | International |
| Mr. Rodney Kirk       | SPIE BioPhotonics Australasia, Adelaide  | Attendee                                      | International |
| Mr. Roman Kostecki    | Annual World Congress of Smart Materials, Singapore  | Invited Speaker                               | National      |
| Mr. Roman Kostecki    | SPIE BioPhotonics Australasia, Adelaide  | Attendee                                      | International |
| Mr. Roman Kostecki    | SPIE Smart Structures and Materials & Nondestructive Evaluation and Health Monitoring, Las Vegas | Invited Speaker                               | International |
| Mr. Roman Kostecki    | ANFF Annual Research Showcase, Melbourne   | Invited Speaker                               | National      |
| Mr. Desmond Lau       | SPIE BioPhotonics Australasia, Adelaide  | Attendee                                      | International |
| Dr. Jiawen Li         | Nanchang Hangkong University, China  | Invited Speaker                               | International |
| Dr. Jiawen Li         | Med-X Research Centre, Shanghai Jiao Tong University, China                                      | Invited Speaker                               | International |
| Dr. Jiawen Li         | 8th International Conference on Information Optics and Photonics (CIOP 2016) in Shanghai         | Invited Speaker                               | International |
| Dr. Jiawen Li         | SPIE BioPhotonics Australasia, Adelaide  | Attendee                                      | International |

| ATTENDEE                | CONFERENCE/MEETING NAME   | ROLE                                     | MEETING TYPE  |
|-------------------------|---|--|---------------|
| Dr. Guozhen Liu         | Biosensors 2016 Post Congress Symposium in Cancer Diagnostics, Miami, USA                   | Invited Speaker                          | International |
| Dr. Guozhen Lui         | SPIE BioPhotonics Australasia, Adelaide   | Oral Presentation                        | International |
| Ms. Jianjin Liu         | SPIE BioPhotonics Australasia, Adelaide   | Attendee                                 | International |
| Dr. Ivan Maksymov       | International Conference on Nanoscience and Nanotechnology (ICONN), Canberra                | Oral Presentation                        | National      |
| Dr. Ivan Maksymov       | SPIE BioPhotonics Australasia, Adelaide   | Oral Presentation                        | International |
| Mr. Saabah Mahbub       | SPIE BioPhotonics Australasia, Adelaide   | Oral Presentation                        | International |
| Dr. Mel McDowall        | International Congress of Animal Reproduction (ICAR)  | Committee Member                         | International |
| Dr. Mel McDowall        | International Congress of Animal Reproduction (ICAR), Tours, France                         | Invited Speaker                          | International |
| Prof. Robert McLaughlin | SPIE Photonics West, San Francisco  | Attendee                                 | International |
| Prof. Robert McLaughlin | AusMedtech 2016, Adelaide   | Invited Speaker                          | National      |
| Prof. Robert McLaughlin | SPIE BioPhotonics Australasia, Adelaide   | International Program Committee/Attendee | International |
| Prof. Tanya Monro       | SPIE BioPhotonics Australasia, Adelaide   | International Program Committee/Attendee | International |
| Mr. Stefan Musolino     | Freiburg-Adelaide-Nagoya Conference, Adelaide   | Attendee                                 | International |
| Mr. Stefan Musolino     | SPIE BioPhotonics Australasia, Adelaide   | Attendee                                 | International |
| Dr. Anniemarie Nadort   | SPIE BioPhotonics Australasia, Adelaide   | Oral Presentation                        | International |
| Prof. Stephen Nicholls  | SPIE BioPhotonics Australasia, Adelaide   | International Program Committee/Attendee | International |
| Prof. Stephen Nicholls  | Research Tuesdays Seminar Series, University of Adelaide                                    | Keynote Presenter                        | Local         |
| Dr. Antony Orth         | SPIE Photonics West, San Francisco  | Oral Presentation                        | International |
| Dr. Antony Orth         | SPIE BioPhotonics Australasia, Adelaide   | Oral Presentation                        | International |
| Prof. Nicolle Packer    | 21st Annual Lorne Proteomics Symposium  | Invited Speaker                          | National      |
| Prof. Nicolle Packer    | SPIE BioPhotonics Australasia, Adelaide   | International Program Committee          | International |
| Prof. Nicolle Packer    | Australian Society of Medical Research, Newcastle   | Plenary Speaker                          | National      |
| Prof. Nicolle Packer    | Warren Workshop, Sapporo Japan  | Invited Speaker                          | International |
| Prof. Nicolle Packer    | MIRAGE Glycobioinformatics, Sapporo Japan   | Attendee                                 | International |
| Prof. Nicolle Packer    | HUPO 2016, Taipei, Taiwan, Academica Sinica Seminar Day                                     | Session Chair                            | International |
| Prof. Nicolle Packer    | Australian Psychological Society (AuPS) and Australian Society for Biophysics (ASB), Uni SA | Invited Speaker                          | National      |
| Mr. Xuanzhao Pan        | COMMAD 2016, Sydney   | Poster Presentation                      | National      |
| Dr. Lindsay Parker      | 18th Meeting of the International Society for Comparative Psychology, Sydney                | Invited Speaker                          | National      |
| Dr. Lindsay Parker      | SPIE BioPhotonics Australasia, Adelaide   | Outreach Activity, Attendee              | International |
| Dr. Lindsay Parker      | RACI SA Physical and Chemistry Symposium, Adelaide  | Invited Speaker                          | National      |

## Appendix 1: Conference Participation (continued)

| ATTENDEE                 | CONFERENCE/MEETING NAME  | ROLE                                     | MEETING TYPE  |
|--------------------------|--|--|---------------|
| Dr. Victoria Peddie      | SPIE BioPhotonics Australasia, Adelaide                                      | Oral Presentation                        | International |
| Prof. Jim Piper          | SPIE BioPhotonics Australasia, Adelaide                                      | International Program Committee/Attendee | International |
| Dr. Martin Ploschner     | Biofocus Conference, Macquarie University, Sydney                            | Invited Speaker                          | National      |
| Dr. Martin Ploschner     | SPIE BioPhotonics Australasia, Adelaide                                      | Oral Presentation, Outreach Activity     | International |
| Mr. Benjamin Pullen      | SPIE BioPhotonics Australasia, Adelaide                                      | Attendee                                 | International |
| Mr. Benjamin Pullen      | ASMR 2016, Gold Coast, Qld   | Poster Presentation                      | National      |
| Dr. Malcolm Purdey       | Biosensors 2016 Post Congress Symposium in Cancer Diagnostics, Miami, USA    | Poster Presentation                      | International |
| Dr. Malcolm Purdey       | SPIE BioPhotonics Australasia, Adelaide                                      | Attendee                                 | International |
| Mr. Bryden Quirk         | SPIE BioPhotonics Australasia, Adelaide                                      | Attendee                                 | International |
| Mr. Aziz Rehman          | SPIE BioPhotonics Australasia, Adelaide                                      | Oral Presentation                        | International |
| Dr. Philipp Reineck      | International Conference on Nanoscience and Nanotechnology (ICONN), Canberra | Poster Presentation                      | National      |
| Dr. Philipp Reineck      | New Diamond Nano Carbon (NDNC) in Xian, China                                | Oral Presentation                        | International |
| Dr. Philipp Reineck      | SPIE BioPhotonics Australasia, Adelaide                                      | Oral Presentation                        | International |
| Dr. Philipp Reineck      | Australian Institute of Physics Congress, Brisbane                           | Oral Presentation                        | National      |
| Dr. Philipp Reineck      | Precision Sensing Australia workshop in Canberra (ANU)                       | Attendee                                 | National      |
| Dr. Nima Sayyadi         | SPIE BioPhotonics Australasia, Adelaide                                      | Oral Presentation                        | International |
| Dr. Erik Schartner       | Scientists in Reproductive Technology (SIRT), Adelaide                       | Invited Speaker                          | National      |
| Dr. Erik Schartner       | SPIE BioPhotonics Australasia, Adelaide                                      | Oral Presentation                        | International |
| Mr. Abdulrahman Shathili | 21st Annual Lorne Proteomics Symposium                                       | Invited Speaker                          | National      |
| Mr. Abdulrahman Shathili | SPIE BioPhotonics Australasia, Adelaide                                      | Attendee                                 | International |
| Mrs. Vicky Staikopoulos  | SPIE BioPhotonics Australasia, Adelaide                                      | Oral Presentation                        | International |
| Mrs. Vicky Staikopoulos  | ANS 2016 Conference, Hobart  | Poster Presentation                      | National      |
| Mr. Daniel Stubing       | International Conference on Nanoscience and Nanotechnology (ICONN), Canberra | Poster Presentation                      | National      |
| Dr. Anwar Sunna          | SPIE BioPhotonics Australasia, Adelaide                                      | Attendee                                 | International |
| Ms. Georgina Sylvia      | SPIE BioPhotonics Australasia, Adelaide                                      | Oral Presentation                        | International |
| Dr. Jacob Thomas         | SPIE BioPhotonics Australasia, Adelaide                                      | Attendee                                 | International |
| A/Prof. Jeremy Thompson  | 42nd International Embryo Transfer Society (IETS) Annual Conference          | Invited Speaker                          | International |
| A/Prof. Jeremy Thompson  | ESHRE, Annual Meeting, Helsinki  | Invited Speaker                          | International |
| A/Prof. Jeremy Thompson  | International Congress of Animal Reproduction (ICAR), Tours, France          | Plenary Lecture                          | International |
| A/Prof. Jeremy Thompson  | SPIE BioPhotonics Australasia, Adelaide                                      | International Program Committee/Attendee | International |
| Dr. Georgios Tsiminis    | SPIE BioPhotonics Australasia, Adelaide                                      | Oral Presentation                        | International |

| ATTENDEE               | CONFERENCE/MEETING NAME  | ROLE                | MEETING TYPE  |
|------------------------|--|---------------------|---------------|
| Dr. Fan Wang           | 9th International Conference on Nanophotonics (ICNP 2016), Taipei, Taiwan      | Invited Speaker     | International |
| Mr. Fei Wang           | SPIE BioPhotonics Australasia, Adelaide  | Attendee            | International |
| Mr. Piotr Wargocki     | SPIE BioPhotonics Australasia, Adelaide  | Attendee            | International |
| Mr. Yunle Wei          | ICONN 2016, Canberra   | Poster Presentation | National      |
| Mr. Yunle Wei          | ICOOPMA 2016, Montreal, Canada   | Oral Presentation   | International |
| Mr. Yunle Wei          | IONS KOALA 2016, Melbourne   | Poster Presentation | National      |
| Mr. Yunle Wei          | CerSJ-GOMD Joint Symposium on Glass Science and Technologies, Kyoto, Japan     | Poster Presentation | International |
| Dr. Jingxian Yu        | Gordon Research Conference on Electronic Processes in Organic Materials, Italy | Invited Speaker     | International |
| Dr. Jingxian Yu        | Ben Gurion University of the Negev   | Invited Speaker     | International |
| Dr. Jingxian Yu        | Weizmann Institute of Science  | Invited Speaker     | International |
| Dr. Jingxian Yu        | Xiamen University  | Invited Speaker     | International |
| Dr. Jingxian Yu        | SPIE BioPhotonics Australasia, Adelaide  | Oral Presentation   | International |
| Dr. Jingxian Yu        | RACI SA Physical and Chemistry Symposium, Adelaide                             | Invited Speaker     | National      |
| Mr. Kaixin Zhang       | SPIE BioPhotonics Australasia, Adelaide  | Attendee            | International |
| Mr. Xianlin Zheng      | SPIE BioPhotonics Australasia, Adelaide  | Oral Presentation   | International |
| Dr. Tim (Jiangbo) Zhao | COMMAD 2016, Sydney  | Poster Presentation | National      |
| Dr. Tim (Jiangbo) Zhao | CerSJ-GOMD Joint Symposium on Glass Science and Technologies, Kyoto, Japan     | Invited Speaker     | International |
| Dr. Tim (Jiangbo) Zhao | CerSJ-GOMD Joint Symposium on Glass Science and Technologies, Kyoto, Japan     | Poster Presentation | International |
| Dr. Tim (Jiangbo) Zhao | Australian Conference on Optical Fibre Technology 2016, Sydney                 | Invited Speaker     | National      |
| Dr. Tim (Jiangbo) Zhao | ICOOPMA 2016, Montreal, Canada   | Invited Speaker     | International |
| Dr. Tim (Jiangbo) Zhao | ICONN 2016, Canberra   | Poster Presentation | National      |
| Ms. Nafisa Zohora      | SPIE BioPhotonics Australasia, Adelaide  | Poster Presentation | International |



## Appendix 2: Centre Publications

### 2016 Centre Publications

- Acoustically-Driven Trion and Exciton Modulation in Piezoelectric Two-Dimensional MoS<sub>2</sub>; Amgad R. Rezk, Benjamin Carey, Adam F. Chrimes, **Desmond W. M. Lau, Brant C. Gibson**, Changxi Zheng, Michael S. Fuhrer, Leslie Y. Yeo, and Kourosh Kalantar-zadeh; *Nano Lett.*, 2016, 16 (2); DOI: 10.1021/acs.nanolett.5b02826.
- Three-dimensional controlled growth of monodisperse sub-50 nm heterogeneous nanocrystals; **Deming Liu**, Xiaoxue Xu, Yi Du, Xian Qin, Yuhai Zhang, Chenshuo Ma, Shihui Wen, Wei Ren, **Ewa M. Goldys, James A. Piper**, Shixue Dou, Xiaogang Liu & **Dayong Jin**; *Nature Communications* 7, Article number: 10254; DOI:10.1038/ncomms10254.
- Dopamine sensing and measurement using threshold and spectral measurements in random lasers; Wan Zakiah Wan Ismail, **Guozhen Liu, Kai Zhang, Ewa M. Goldys** and Judith M. Dawes; *Opt Express*. 016 Jan 25;24(2):A85-91. DOI: 10.1364/OE.24.000A85.
- Recent advances in cytokine detection by immunosensing; **Guozhen Liu**, Meng Qi, **Mark R. Hutchinson**, Guangfu Yang, **Ewa M. Goldys**; *Biosensors and Bioelectronics* 79 (2016) 810–821.
- Facile Peptides Functionalization of Lanthanide-Based Nanocrystals through Phosphorylation Tethering for Efficient *in Vivo* NIR-to-NIR Bioimaging; Chi Yao, Peiyuan Wang, Rui Wang, Lei Zhou, Ahmed Mohamed El-Toni, **Yiqing Lu**, Xiaomin Li, and Fan Zhang; *Anal. Chem.*, 2016, 88 (3), pp 1930–1936; DOI: 10.1021/acs.analchem.5b04385.
- X-ray induced singlet oxygen generation by nanoparticle-photosensitizer conjugates for photodynamic therapy: determination of singlet oxygen quantum yield; **Sandhya Clement, Wei Deng, Elizabeth Camilleri, Brian C. Wilson, Ewa M. Goldys**; *Scientific Reports* 6, Article number: 19954 (2016); DOI:10.1038/srep19954.
- FUT1 genetic variants impact protein glycosylation of porcine intestinal mucosa; Marianne O Hesselager, **Arun V Everest-Dass**, Morten Thaysen-Andersen, Emøke Bendixen and **Nicolle H Packer**; *Glycobiology*. 2016 Jun; 26(6):607-22. DOI: 10.1093/glycob/cww009.
- Temperature sensing up to 1300°C using suspended-core microstructured optical fibers; **Stephen C. Warren-Smith**, Linh Viet Nguyen, Catherine Lang, **Heike Ebendorff-Heidepriem**, and **Tanya M. Monro**; *Optics Express* Vol. 24, Issue 4, pp. 3714–3719 (2016); DOI: 10.1364/OE.24.003714.
- Optical Manipulation and Spectroscopy of Silicon Nanoparticles Exhibiting Dielectric Resonances; Ana Andres-Arroyo, Bakul Gupta, **Fan Wang**, J. Justin Gooding, and Peter J. Reece; *Nano Letters*, 2016, 16 (3), pp 1903–1910; DOI: 10.1021/acs.nanolett.5b05057.
- Integration of conductive reduced graphene oxide into microstructured optical fibres for optoelectronics applications; **Yinlan Ruan**, Liyun Ding, Jingjing Duan, **Heike Ebendorff-Heidepriem & Tanya M. Monro**; *Scientific Reports* 6, Article number: 21682 (2016); DOI:10.1038/srep21682.
- Extending prematuration with cAMP modulators enhances the cumulus contribution to oocyte antioxidant defence and oocyte quality via gap junctions; H.J. Li, **M.L. Sutton-McDowall**, X. Wang, S. Sugimura, **J.G. Thompson** and R.B. Gilchrist; *Hum. Reprod.* (2016) 31 (4): 810-821; DOI: 10.1093/humrep/dew020.
- One-step conjugation of glycyrrhetic acid to cationic polymers for high-performance gene delivery to cultured liver cell; Yue Cong, **Bingyang Shi, Yiqing Lu**, Shihui Wen, Roger Chung & **Dayong Jin**; *Scientific Reports* 6, Article number: 21891 (2016); DOI:10.1038/srep21891.
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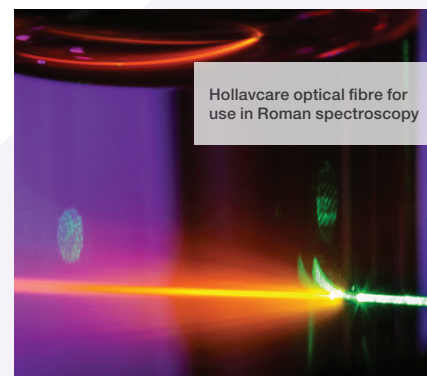


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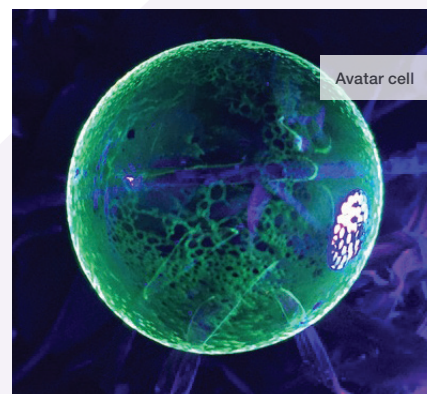


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French Canadian mesuse illuminated with LED

Photo: Dr. Hannah Brown

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Aryldiazonium salt derived mixed organic layers: From surface chemistry to their applications; Cheng Jiang, Saimon Moraes Silva, Sanjun Fan, Yanfang Wu, Muhammad Tanzirul Alam, **Guozhen Liu**, J. Justin Gooding; *Journal of Electroanalytical Chemistry*; DOI:10.1016/j.jelechem.2016.11.043.

The current state of reproductive biology research in Australia and New Zealand: core themes from the Society for Reproductive Biology Annual Meeting, 2016; L. K. Akison, P. H. Andraweera, M. J. Bertoldo, **H. M. Brown**, J. S. M. Cuffe, T. Fullston, O. Holland and J. E. Schjenken; *Reproduction, Fertility and Development*; DOI 10.1071/RD16382.

Plasmonic Fiber Optic Refractometric Sensors: From Conventional Architectures to Recent Design Trends; Elizaveta Klantsataya, **Peipei Jia, Heike Ebendorff-Heidepriem, Tanya. M. Monro** and **Alexandre Francois**; *Sensors*; 17(1), 12; DOI:10.3390/s17010012.

### 2016 Book Chapters

Solid Binding Peptides: Immobilisation Strategies for Extremophile Biocatalysis in Biotechnology; **Andrew Care**, Peter L Bergquist, **Anwar Sunna**; *Biotechnology of Extremophiles: Volume 1 of the series Grand Challenges in Biology and Biotechnology* pp 637-674.

## Appendix 3: Community Events

| CENTRE PERSONNEL       | BRIEF DESCRIPTION   | DATE     | DESCRIPTION     | DETAILS       | REACH         | AUDIENCE         |
|------------------------|---|----------|-----------------|---------------|---------------|------------------|
| Dr. Varun Sreenivasan  | ConocoPhillips Supporting Science Experience Program - Year 9 & 10 students   | January  | Event           | Presentation  | Local         | Youth/School     |
| A/Prof. Steve Weideman | A3 Business Forum   | February | Event           | Forum         | National      | Business         |
| Dr. Denitza Denkova    | Kingscliff High School Year 12 visit to Macquarie University - "Science Experience Program"   | February | Visit           | Presentations | Local         | Youth/School     |
| Dr. Lindsay Parker     | Visit to McMeen Elementary School, Denver Colorado - Year 5 students - "How research is conducted"  | February | Event           | Presentation  | International | Youth/School     |
| Dr. Lindsay Parker     | University of Colorado - Dept of Psychology & Neuroscience  | February | Invited Speaker | Presentation  | International | Science          |
| Prof. Andrew Abell     | CEDA 2016 Economic and Political Overview   | February | Event           | Forum         | National      | Business         |
| Prof. Ewa Goldys       | University of Colorado - Dept of Psychology & Neuroscience  | February | Invited Speaker | Presentation  | International | Science          |
| Prof. Mark Hutchinson  | Annual Pain Workshop, Sydney  | February | Invited Speaker | Workshop      | National      | Clinicians       |
| Prof. Tanya Monro      | WOMADelaide (the World Music Festival Adelaide) panel member - Topic: Should one trust scientists?  | February | Event           | Festival      | International | Community        |
| Prof. Tanya Monro      | Panellist, opening panel session at the 2016 Universities Australia conference on Higher Education Policy   | March    | Event           | Panellist     | National      | Science/Industry |
| Prof. Tanya Monro      | National Press Club, panel exploring issues facing women in science <a href="https://npc.org.au/speakers/women-of-science/">https://npc.org.au/speakers/women-of-science/</a> | March    | Event           | Panellist     | National      | Science/Industry |
| Dr. Hannah Brown       | Science Meets Parliament - organised by Science & Technology Australia  | March    | Event           | Forum         | National      | Science/Business |
| Dr. Melanie McDowall   | Science Meets Parliament - organised by Science & Technology Australia  | March    | Event           | Forum         | National      | Science/Business |
| Dr. Sabrina Heng       | Scientists and Mathematicians in Schools Program - Year 5/6 students  | March    | Program         | Presentation  | Local         | Youth/School     |
| Prof. Andrew Abell     | Opening of the Sia Furler Institute for Contemporary Music and Media  | March    | Event           | Opening       | National      | Community        |



## Appendix 3: Community Events (continued)

| CENTRE PERSONNEL           | BRIEF DESCRIPTION  | DATE  | DESCRIPTION     | DETAILS        | REACH         | AUDIENCE           |
|----------------------------|--|-------|-----------------|----------------|---------------|--------------------|
| Prof. Mark Hutchinson      | Science Meets Parliament - organised by Science & Technology Australia   | March | Event           | Forum          | National      | Science/ Business  |
| Prof. Mark Hutchinson      | STA Board Meeting  | March | Event           | Board Meeting  | National      | Science/ Business  |
| Prof. Nicole Packer        | Women in Life Sciences, Panel Event, Sydney  | March | Event           | Panellist      | National      | Scientists         |
| Prof. Nicole Packer        | ASMR   | April | Plenary Lecture | Lecture        | National      | Science            |
| Prof. Nicole Packer        | Synthetic Biology Australasia Society Meeting  | April | Event           | Presentation   | National      | Science            |
| Dr. Sabrina Heng           | Stemsel Photonics session - workshop for students on vacation care - Yrs 3-9                                   | April | Program         | Presentations  | Local         | Youth/ School      |
| Dr. Alfonso Garcia-Bennett | Science Meets Parliament - organised by Science & Technology Australia   | April | Event           | Forum          | National      | Science/ Business  |
| CNBP Researchers           | CNBP workshop at University of Adelaide  | April | Workshop        | Presentations  | Local         | Science            |
| Dr. Ayad Anwer             | BioPhotonics Symposium, University of Baghdad  | April | Invited Talk    | Presentation   | International | Science            |
| Dr. Ayad Anwer             | Queenstown Molecular Biology Meeting, Shanghai   | April | Invited Talk    | Presentation   | International | Science            |
| Dr. Ayad Anwer             | University of Nanchang   | April | Invited Talk    | Presentation   | International | Science            |
| Dr. Ayad Anwer             | SASTA Annual Conference, Adelaide  | April | Invited Lecture | Presentation   | National      | Science/ Community |
| Dr. Ayad Anwer             | Academy of Sciences, Beijing   | April | Invited Talk    | Presentation   | International | Science            |
| Mr. Ayad Anwer             | Endeavour Professional Development Workshop, Sydney  | April | Event           | Workshop       | National      | Business           |
| Mr. Roman Kostecki         | STEMSEL Inventors Workshop: Photonics  | April | Event           | Workshop       | National      | Science            |
| Mr. Roman Kostecki         | Stemsel Photonics session - workshop for students on vacation care - Yrs 3-9                                   | April | Program         | Presentations  | Local         | Youth/ School      |
| Prof. Mark Hutchinson      | EP3 Meeting, Glenelg   | April | Invited Speaker | Presentation   | Local         | Science/ Industry  |
| Prof. Mark Hutchinson      | Pain Adelaide, Adelaide  | April | Invited Speaker | Presentation   | Local         | Science/ Industry  |
| Prof. Tanya Monro          | Australian Academy of Science Public Lecture - Unlocking the secrets within using light - from wine to embryos | April | Event           | Public Lecture | National      | Science/ Community |
| Prof. Mark Hutchinson      | Australian Veterinary Association (AVA) Annual Conference  | May   | Invited Talk    | Presentation   | National      | Science/ Community |

| CENTRE PERSONNEL       | BRIEF DESCRIPTION  | DATE   | DESCRIPTION     | DETAILS       | REACH         | AUDIENCE          |
|------------------------|--|--------|-----------------|---------------|---------------|-------------------|
| Prof. Mark Hutchinson  | 2016 South Australian Science Excellence Awards - Judging Panel                            | May    | Event           | Judging Panel | Local         | Science/Community |
| CNBP Researchers       | CNBP Partner Launch IPHT, Jena, Germany  | May    | Partner Launch  | Launch        | International | Science           |
| Prof. Ewa Goldys       | University of Minnesota, science undergraduates  | May    | Invited Talk    | Presentation  | International | Science           |
| Prof. Stephen Nicholls | Research Tuesdays, Seminar Series, University of Adelaide                                  | May    | Invited Speaker | Seminar       | National      | Science/Community |
| Prof. Tanya Monro      | TEDx, Adelaide   | May    | Invited Talk    | Presentation  | National      | Science/Community |
|                        |  |        |                 |               |               |                   |
|                        |  |        |                 |               |               |                   |
| Dr. Denitza Denkova    | Physics in the Pub - magical light show  | June   | Event           | Presentation  | Local         | Science/Community |
| CNBP Researchers       | CNBP workshop at Macquarie University  | June   | Workshop        | Presentations | Local         | Science           |
| Dr. Malcolm Purdey     | Fresh Science - science communications training program                                    | June   | Program         | Presentation  | Local         | Science/Community |
| Dr. Martin Ploschner   | Physics in the Pub - magical light show  | June   | Event           | Presentation  | Local         | Science/Community |
| Dr. Varun Sreenivasan  | Physics in the Pub - magical light show  | June   | Event           | Presentation  | Local         | Science/Community |
| Prof. Tanya Monro      | Panellist Edu Data Summit in London - Topic: Does better data make for better universities | June   | Event           | Panellist     | International | Science/Business  |
| Prof. Mark Hutchinson  | Uni SA Future Industries Institute Annual Seminar Series - "Using Light to Measure"        | July   | Invited Talk    | Presentation  | Local         | Science           |
| Prof. Mark Hutchinson  | Lyell McEwin Hospital Grand Round  | July   | Invited Talk    | Presentation  | Local         | Clinicians        |
| Prof. Mark Hutchinson  | Opening the FAN, forum for Faculty of Health Sciences, University of Adelaide              | August | Forum           | Panellist     | Local         | Science           |
| CNBP Researchers       | CNBP workshop at RMIT University   | August | Workshop        | Presentations | Local         | Science           |
| CNBP Researchers       | CNBP Partner Launch UHN, Toronto, Canada   | August | Partner Launch  | Launch        | International | Science           |
| CNBP Researchers       | University of Adelaide Open Day  | August | Event           | Presentations | Local         | Science/Community |
| CNBP Researchers       | RMIT University Open Day   | August | Event           | Presentations | Local         | Science/Community |
| CNBP Researchers       | Macquarie University Open Day  | August | Event           | Presentations | Local         | Science/Community |

## Appendix 3: Community Events (continued)

| CENTRE PERSONNEL            | BRIEF DESCRIPTION   | DATE      | DESCRIPTION     | DETAILS        | REACH         | AUDIENCE          |
|-----------------------------|---|-----------|-----------------|----------------|---------------|-------------------|
| CNBP Researchers            | Adelaide Compass, Outreach Event with Year 5 students Bowden Primary School           | August    | Event           | Presentations  | Local         | Youth/School      |
| CNBP Researchers            | CNBP workshop at University of Melbourne  | August    | Workshop        | Presentations  | Local         | Science           |
| A/Prof. Brant Gibson        | DST Partnerships Week at DST Group, Fisherman's Bend                                  | August    | Event           | Seminars       | National      | Science/Industry  |
| Dr. Michelle Zhang          | St Ignatius College - school outreach visit "The Science of Light"                    | August    | Invited Visit   | Presentation   | Local         | Youth/School      |
| Dr. Sabrina Heng            | St Ignatius College - school outreach visit "The Science of Light"                    | August    | Invited Visit   | Presentation   | Local         | Youth/School      |
| Dr. Sanam Mustafa           | Beach Energy Women in STEM Breakfast  | August    | Invited Talk    | Presentation   | Local         | Science/Community |
| Prof. Andrew Greentree      | Inaugural Professorial Lecture  | August    | Lecture         | Public Lecture | Local         | Science/Community |
| Prof. Tanya Monro           | Panellist CEDA panel event on Women in STEM, Adelaide                                 | August    | Event           | Panellist      | National      | Science/Business  |
| Dr. Sabrina Heng            | Scientists in Schools Program - visit to Lockleys Primary School                      | September | Invited Speaker | Presentation   | Local         | Youth/School      |
| Prof. Andrew Abell and team | St Peters College student visit   | September | Invited Visit   | Presentation   | Local         | Youth/School      |
| Prof. Mark Hutchinson       | Macquarie University Lab Opening "Biomolecular Discovery Laboratory"                  | September | Invited Speaker | Presentation   | Local         | Science           |
| Prof. Mark Hutchinson       | Inaugural South Australian Cattle Producers Forum                                     | September | Invited Speaker | Presentation   | Local         | Science/Industry  |
| Prof. Mark Hutchinson       | HeSPA Spring Seminar  | September | Invited Speaker | Presentation   | Local         | Science           |
| Prof. Andrew Abel           | Attended US Consulate Reception with Ambassador John Berry                            | September | Event           | Reception      | International | Science/Industry  |
| RMIT Node                   | Astronomy & Light Festival  | September | Festival        | Festival       | Local         | Community         |
| CNBP Personnel              | CNBP co-organiser with SPIE of the inaugural SPIE BioPhotonics Australasia Conference | October   | Co-organiser    | Conference     | International | Science/Industry  |
| Dr. Andrew Care             | Nano - The new Nature Research Database Solution for Nanotechnology, Sydney           | October   | Event           | Workshop       | National      | Science           |
| Prof. Ewa Goldys            | Macquarie University - "Cell colour focused research"                                 | October   | Public Lecture  | Presentation   | Local         | Science/Community |

| CENTRE PERSONNEL      | BRIEF DESCRIPTION   | DATE     | DESCRIPTION     | DETAILS      | REACH    | AUDIENCE           |
|-----------------------|---|----------|-----------------|--------------|----------|--------------------|
| Prof. Ewa Goldys      | Charles Sturt University, School of Biomedical Sciences - "A Eureka moment for cell colour technology"          | November | Public Lecture  | Presentation | National | Science/Community  |
| A/Prof. Brant Gibson  | BioMelbourne BioBreakfast - Genomics and Personalised Medicine  | November | Event           | Seminar      | National | Science            |
| Mr. Tony Crawshaw     | LEA Regional Day Out  | November | Event           | Panelist     | National | Science/Industry   |
| Prof. Mark Hutchinson | AmCham Event - Nanotechnology   | November | Invited Speaker | Presentation | National | Science/Business   |
| Prof. Mark Hutchinson | University of Adelaide, School of Agriculture, Food and Wine's Research Day                                     | November | Public Talk     | Presentation | Local    | Science/Community  |
| Prof. Mark Hutchinson | Victor Chang Cardiac Research Institute, Barbara Ell seminar  | November | Public Talk     | Presentation | National | Science/Community  |
| Prof. Tanya Monro     | Panelist, Creative Innovation Conference 2016, Melbourne - Topic: Exponential Innovation in large organisations | November | Event           | Panelist     | National | Business/Community |



# Media Engagement

| CENTRE PERSONNEL      | DATE    | DESCRIPTION  | TYPE            | AUDIENCE             | REACH                  |
|-----------------------|---------|--|-----------------|----------------------|------------------------|
| <b>Media Coverage</b> |         |  |                 |                      |                        |
| Dr. Malcolm Purdey    | 4/1/16  | <b>Optics.org</b> - Fibre-optic sensor tipped for embryo monitoring <a href="http://optics.org/news/7/1/1">http://optics.org/news/7/1/1</a>  | Web Publication | Scientific/Community | National/International |
| Dr. Malcolm Purdey    | 5/1/16  | <b>Grafton Daily Examiner</b> - Technology paves way in IVF Process <a href="https://www.dailyexaminer.com.au/news/technology-paves-way-in-ivf-process/2889779/">https://www.dailyexaminer.com.au/news/technology-paves-way-in-ivf-process/2889779/</a>  | Web Publication | Scientific/Community | National/International |
| Dr. Malcolm Purdey    | 5/1/16  | <b>ABC News Radio</b> - CNBP researcher interviewed  | Radio           | Scientific/Community | National               |
| Dr. Malcolm Purdey    | 5/1/16  | <b>Photonics.com</b> - Fibre Optic Sensor Monitors Early Stage Embryos <a href="https://www.photonics.com/Article.aspx?AID=58139">https://www.photonics.com/Article.aspx?AID=58139</a>   | Web Publication | Scientific/Community | National/International |
| Dr. Malcolm Purdey    | 5/1/16  | <b>Phys.org</b> - New sensor to aid in invitro fertilisation <a href="https://phys.org/news/2016-01-sensor-aid-vitro-fertilization.html">https://phys.org/news/2016-01-sensor-aid-vitro-fertilization.html</a>   | Web Publication | Scientific/Community | National/International |
| Dr. Malcolm Purdey    | 6/1/16  | <b>BioOptics World</b> - Fluorescent-coated optical fibre sensor could monitor IVF noninvasively <a href="http://www.bioopticsworld.com/articles/2016/01/fluorescent-coated-optical-fibre-sensor-could-monitor-ivf-noninvasively.html">http://www.bioopticsworld.com/articles/2016/01/fluorescent-coated-optical-fibre-sensor-could-monitor-ivf-noninvasively.html</a> | Web Publication | Scientific/Community | National/International |
| Prof. Dayong Jin      | 13/1/16 | <b>Lab Online</b> - Customisable nanoparticles to improve drug delivery <a href="http://www.labonline.com.au/content/lab-equipment/news/customisable-nanoparticles-to-improve-drug-delivery-961555189">http://www.labonline.com.au/content/lab-equipment/news/customisable-nanoparticles-to-improve-drug-delivery-961555189</a>  | Web Publication | Scientific/Community | National/International |
| Prof. Ewa Goldys      | 5/2/16  | <b>Phys.org</b> - Counting cancer-busting oxygen molecules <a href="https://phys.org/news/2016-02-cancer-busting-oxygen-molecules.html">https://phys.org/news/2016-02-cancer-busting-oxygen-molecules.html</a>   | Web Publication | Scientific/Community | National/International |
| Prof. Ewa Goldys      | 5/2/16  | <b>R&amp;D Mag</b> - Counting Cancer-busting Oxygen Molecules <a href="http://www.rdmag.com/news/2016/02/counting-cancer-busting-oxygen-molecules">http://www.rdmag.com/news/2016/02/counting-cancer-busting-oxygen-molecules</a>  | Web Publication | Scientific/Community | National/International |
| Prof. Ewa Goldys      | 5/2/16  | <b>Nanowerk</b> - Counting cancer-busting oxygen molecules <a href="http://www.nanowerk.com/nanotechnology-news/newsid=42561.php">http://www.nanowerk.com/nanotechnology-news/newsid=42561.php</a>   | Web Publication | Scientific/Community | National/International |
| Prof. Ewa Goldys      | 7/2/16  | <b>Gizmag</b> - X-rays and nanoparticles combine to kill cancer deep in the body <a href="http://newatlas.com/x-rays-nanoparticles-cancer/41705/">http://newatlas.com/x-rays-nanoparticles-cancer/41705/</a>   | Web Publication |                      |                        |
| Prof. Ewa Goldys      | 7/2/16  | <b>Geek Journal</b> - X-rays and nanoparticles combine to kill cancer deep in the body <a href="http://www.geekjournal.net/articles/2016/02/x-rays-and-nanoparticles-combine-to-kill-cancer-deep-in-the-body-56696.html">http://www.geekjournal.net/articles/2016/02/x-rays-and-nanoparticles-combine-to-kill-cancer-deep-in-the-body-56696.html</a>                   | Web Publication | Scientific/Community | National/International |
| Prof. Ewa Goldys      | 8/2/16  | <b>World of Technology</b> - X-rays and nanoparticles combine to kill cancer deep in the body <a href="http://www.newsnation.in/article/114855-x-rays-nanoparticles-combo-kill-cancer-study.html">http://www.newsnation.in/article/114855-x-rays-nanoparticles-combo-kill-cancer-study.html</a>  | Web Publication | Scientific/Community | National/International |
| Prof. Ewa Goldys      | 8/2/16  | <b>Controlled Environments Mag</b> - Nanoparticles Combined with X-rays Offer Effective Cancer Treatment <a href="http://www.cemag.us/news/2016/02/nanoparticles-combined-x-rays-offer-effective-cancer-treatment">http://www.cemag.us/news/2016/02/nanoparticles-combined-x-rays-offer-effective-cancer-treatment</a>   | Web Publication | Scientific/Community | National/International |

| CENTRE PERSONNEL      | DATE    | DESCRIPTION   | TYPE            | AUDIENCE             | REACH                  |
|-----------------------|---------|---|-----------------|----------------------|------------------------|
| Prof. Ewa Goldys      | 8/2/16  | <b>News Nation</b> - X-rays and nanoparticles combo can kill cancer: Study <a href="http://www.newsnation.in/article/114855-x-rays-nanoparticles-combo-kill-cancer-study.html">http://www.newsnation.in/article/114855-x-rays-nanoparticles-combo-kill-cancer-study.html</a>  | Web Publication | Scientific/Community | National/International |
| Prof. Ewa Goldys      | 8/2/16  | <b>The Financial Express</b> (India) - X-rays and nanoparticles combo can kill cancer: Study <a href="http://www.financialexpress.com/lifestyle/science/x-rays-and-nanoparticles-combo-can-kill-cancer-study/208862/">http://www.financialexpress.com/lifestyle/science/x-rays-and-nanoparticles-combo-can-kill-cancer-study/208862/</a>  | Web Publication | Scientific/Community | National/International |
| Prof. Ewa Goldys      | 8/2/16  | <b>Free Press Journal</b> - X-rays and nanoparticles combo can kill cancer: Study <a href="http://www.freepressjournal.in/">http://www.freepressjournal.in/</a>   | Web Publication | Scientific/Community | National/International |
| Prof. Ewa Goldys      | 8/2/16  | <b>Prahaar News</b> - X-rays and nanoparticles combo can kill cancer: study <a href="http://eprahaar.in/x-rays-and-nanoparticles-combo-can-kill-cancer-study/">http://eprahaar.in/x-rays-and-nanoparticles-combo-can-kill-cancer-study/</a>   | Web Publication | Scientific/Community | National/International |
| Prof. Ewa Goldys      | 8/2/16  | <b>Business Standard</b> - X-rays and nanoparticles combo can kill cancer: study <a href="http://www.business-standard.com/article/pti-stories/x-rays-and-nanoparticles-combo-can-kill-cancer-study-116020800677_1.html">http://www.business-standard.com/article/pti-stories/x-rays-and-nanoparticles-combo-can-kill-cancer-study-116020800677_1.html</a>  | Web Publication | Scientific/Community | National/International |
| Prof. Ewa Goldys      | 8/2/16  | <b>Times of India</b> - X-rays and nanoparticles combo can kill cancer: Study <a href="http://timesofindia.indiatimes.com/home/science/X-rays-and-nanoparticles-combo-can-kill-cancer-Study/articleshow/50903210.cms">http://timesofindia.indiatimes.com/home/science/X-rays-and-nanoparticles-combo-can-kill-cancer-Study/articleshow/50903210.cms</a>   | Web Publication | Scientific/Community | National/International |
| Prof. Ewa Goldys      | 9/2/16  | <b>Deccan Chronicle</b> - Nanoparticles and X-ray combo can kill cancer: study <a href="http://www.deccanchronicle.com/lifestyle/health-and-wellbeing/090216/x-rays-and-nanoparticles-combo-can-kill-cancer-study.html">http://www.deccanchronicle.com/lifestyle/health-and-wellbeing/090216/x-rays-and-nanoparticles-combo-can-kill-cancer-study.html</a>  | Web Publication | Scientific/Community | National/International |
| Prof. Ewa Goldys      | 9/2/16  | <b>The Hans India</b> - Nanoparticles with X-rays can kill cancer cells deep within the living body <a href="http://www.thehansindia.com/posts/index/Health/2016-02-09/Nanoparticles-with-X-rays-can-kill-cancer-cells-deep-within-the-living-body/205955">http://www.thehansindia.com/posts/index/Health/2016-02-09/Nanoparticles-with-X-rays-can-kill-cancer-cells-deep-within-the-living-body/205955</a> | Web Publication | Scientific/Community | National/International |
| Prof. Ewa Goldys      | 10/2/16 | <b>The Siasat Daily</b> - X-Rays And Nanoparticles Combo Can Kill Cancer: Study <a href="http://www.siasat.com/news/x-rays-nanoparticles-combo-can-kill-cancer-study-914135/">http://www.siasat.com/news/x-rays-nanoparticles-combo-can-kill-cancer-study-914135/</a>   | Web Publication | Scientific/Community | National/International |
| Prof. Ewa Goldys      | 12/2/16 | <b>MSN News</b> (Science Stories of the Week) - Nanoparticles and X-rays can cure cancer <a href="http://www.msn.com/en-za/news/science/science-stories-of-the-week-12-february-2016/ar-BBprOxj#page=3">http://www.msn.com/en-za/news/science/science-stories-of-the-week-12-february-2016/ar-BBprOxj#page=3</a>  | Web Publication | Scientific/Community | National/International |
| Prof. Mark Hutchinson | 25/2/16 | <b>Inside South Australia</b> - Radical new research opens window on chronic pain <a href="http://insidesouthaustralia.com.au/radical-new-research-opens-window-on-chronic-pain/">http://insidesouthaustralia.com.au/radical-new-research-opens-window-on-chronic-pain/</a>   | Web Publication | Scientific/Community | National/International |
| Prof. Ewa Goldys      | 24/3/16 | <b>Erean</b> - X-Rays and nanoparticles combine to kill cancer deep in the body <a href="http://erean.eu/wordpress/x-rays-and-nanoparticles-combine-to-kill-cancer-deep-in-the-body/">http://erean.eu/wordpress/x-rays-and-nanoparticles-combine-to-kill-cancer-deep-in-the-body/</a>   | Web Publication | Scientific/Community | National/International |
| Prof. Mark Hutchinson | 29/3/16 | <b>Adelaide Radio</b> - CNBP Director Prof. Mark Hutchinson interviewed on CNBP science   | Radio           | Scientific/Community | National               |
| Dr. Michael Baratta   | 29/4/16 | <b>Photonics.com</b> - Michael Baratta Awarded CBNP Fellowship <a href="https://www.photonics.com/Article.aspx?AID=60631">https://www.photonics.com/Article.aspx?AID=60631</a>  | Web Publication | Scientific/Community | National/International |

## Media Engagement (continued)

| CENTRE PERSONNEL                         | DATE    | DESCRIPTION   | TYPE            | AUDIENCE             | REACH                  |
|--|---------|---|-----------------|----------------------|------------------------|
| Prof. Mark Hutchinson & Prof. Ewa Goldys | 17/5/16 | <b>MENA Financial Network</b> - Australian Research Council Linkage Grant to Progress Stem Cell Research into Treating Chronic Pain <a href="http://menafn.com/1094769194/Regeneus-Ltd-ASXRGs-Australian-Research-Council-Linkage-Grant-to-Progress-Stem-Cell-Research-into-Treating-Chronic-Pain">http://menafn.com/1094769194/Regeneus-Ltd-ASXRGs-Australian-Research-Council-Linkage-Grant-to-Progress-Stem-Cell-Research-into-Treating-Chronic-Pain</a> | Web Publication | Scientific/Community | National/International |
| Prof. Mark Hutchinson & Prof. Ewa Goldys | 17/5/16 | <b>Yahoo! Finance News</b> - Regeneus Ltd (ASX:RGS) Australian Research Council Linkage Grant to Progress Stem Cell Research into Treating Chronic Pain <a href="https://au.finance.yahoo.com/news/regeneus-ltd-asx-rgs-australian-223300199.html">https://au.finance.yahoo.com/news/regeneus-ltd-asx-rgs-australian-223300199.html</a>   | Web Publication | Scientific/Community | National/International |
| Prof. Mark Hutchinson & Prof. Ewa Goldys | 18/5/16 | <b>Australian Life Sciences</b> - Chronic pain treatment with stem cells <a href="http://www.labonline.com.au/content/life-scientist/article/chronic-pain-treatment-with-stem-cells-524528887">http://www.labonline.com.au/content/life-scientist/article/chronic-pain-treatment-with-stem-cells-524528887</a>  | Web Publication | Scientific/Community | National/International |
| Prof. Dayong Jin                         | 22/6/16 | <b>Optics.org</b> - Mirror improves STED resolution <a href="http://optics.org/news/7/6/34">http://optics.org/news/7/6/34</a>   | Web Publication | Scientific/Community | National/International |
| Mr. Stefan Musolino                      | 20/7/16 | <b>Phys.org</b> - New probe developed for improved high resolution measurement of brain temperature <a href="https://phys.org/news/2016-07-probe-high-resolution-brain-temperature.html">https://phys.org/news/2016-07-probe-high-resolution-brain-temperature.html</a>   | Web Publication | Scientific/Community | National/International |
| Mr. Stefan Musolino                      | 20/7/16 | <b>Science Daily</b> - New probe developed for improved high resolution measurement of brain temperature <a href="https://www.sciencedaily.com/releases/2016/07/160720132336.htm">https://www.sciencedaily.com/releases/2016/07/160720132336.htm</a>  | Web Publication | Scientific/Community | National/International |
| Dr. Philipp Reineck                      | 20/7/16 | <b>Science Meets Business</b> - Tiny gemstones advance nanoscale imaging <a href="http://sciencemeetsbusiness.com.au/gemstones-nanomaterials/">http://sciencemeetsbusiness.com.au/gemstones-nanomaterials/</a>  | Web Publication | Scientific/Community | National/International |
| Mr. Stefan Musolino                      | 20/7/16 | <b>Medical Design Technology Mag</b> - Probe Provides High Resolution Measurement of Brain Temperature <a href="https://www.mdtmag.com/news/2016/07/probe-provides-high-resolution-measurement-brain-temperature">https://www.mdtmag.com/news/2016/07/probe-provides-high-resolution-measurement-brain-temperature</a>  | Web Publication | Scientific/Community | National/International |
| Mr. Stefan Musolino                      | 20/7/16 | <b>News Medical</b> - Scientists develop new optical fibre-based probe for brain temperature measurements <a href="http://www.news-medical.net/news/20160720/Scientists-develop-new-optical-fibre-based-probe-for-brain-temperature-measurements.aspx">http://www.news-medical.net/news/20160720/Scientists-develop-new-optical-fibre-based-probe-for-brain-temperature-measurements.aspx</a>   | Web Publication | Scientific/Community | National/International |
| Mr. Stefan Musolino                      | 21/7/16 | <b>Science Blog</b> - Brain probe to examine drug dangers <a href="https://scienceblog.com/486266/brain-probe-examine-drug-dangers/">https://scienceblog.com/486266/brain-probe-examine-drug-dangers/</a>   | Web Publication | Scientific/Community | National/International |
| Mr. Stefan Musolino                      | 21/7/16 | <b>Health Canal</b> - Brain probe to examine drug dangers <a href="http://www.healthcanal.com/brain-nerves/74019-brain-probe-to-examine-drug-dangers.html">http://www.healthcanal.com/brain-nerves/74019-brain-probe-to-examine-drug-dangers.html</a>   | Web Publication | Scientific/Community | National/International |
| Mr. Stefan Musolino                      | 21/7/16 | <b>Med Gadget</b> - Tiny Probe for Measuring Temperatures Inside Brain <a href="http://www.medgadget.com/2016/07/tiny-probe-measuring-temperatures-inside-brain.html">http://www.medgadget.com/2016/07/tiny-probe-measuring-temperatures-inside-brain.html</a>  | Web Publication | Scientific/Community | National/International |

| CENTRE PERSONNEL    | DATE    | DESCRIPTION   | TYPE            | AUDIENCE             | REACH                  |
|---------------------|---------|---|-----------------|----------------------|------------------------|
| Mr. Stefan Musolino | 22/7/16 | <b>R&amp;D Magazine</b> - New Probe Developed for High-Resolution Measurement of Brain Temperature <a href="http://www.rdmag.com/news/2016/07/new-probe-developed-high-resolution-measurement-brain-temperature">http://www.rdmag.com/news/2016/07/new-probe-developed-high-resolution-measurement-brain-temperature</a>  | Web Publication | Scientific/Community | National/International |
| Mr. Stefan Musolino | 22/7/16 | <b>The Lead South Australia</b> - Brain probe to examine effects of drug use <a href="http://www.theleadsouthaustralia.com.au/industries/health/brain-probe-to-examine-effects-of-drug-use/">http://www.theleadsouthaustralia.com.au/industries/health/brain-probe-to-examine-effects-of-drug-use/</a>  | Web Publication | Scientific/Community | National/International |
| Mr. Stefan Musolino | 23/7/16 | <b>Nanotechnology Now</b> - New probe developed for improved high resolution measurement of brain temperature <a href="http://www.nanotech-now.com/news.cgi?story_id=53725">http://www.nanotech-now.com/news.cgi?story_id=53725</a>   | Web Publication | Scientific/Community | National/International |
| Mr. Stefan Musolino | 27/7/16 | <b>Optics and Photonics News</b> - A Tiny Optical Thermometer for the Brain <a href="http://www.osa-opn.org/home/newsroom/2016/july/a_tiny_optical_thermometer_for_the_brain/">http://www.osa-opn.org/home/newsroom/2016/july/a_tiny_optical_thermometer_for_the_brain/</a>   | Web Publication | Scientific/Community | National/International |
| Dr. Hannah Brown    | 10/8/16 | <b>Dr. Hannah Brown</b> , CNBP researcher interviewed by The Daily on @2ser about safe pregnancies  | Radio           | Scientific/Community | National               |
| Dr. Hannah Brown    | 25/8/16 | <b>The Australian</b> - Hi-tech discovery promises IVF relief from emotional toll <a href="https://myaccount.news.com.au/theaustralian/subscribe?pkgDef=TA_SDO_P0415A_W04&amp;directSubscribe=true&amp;b=true&amp;sourceCode=TAWEB_WRE170_a&amp;mode=premium&amp;dest=http://www.theaustralian.com.au/news/health-science/hitech-discovery-promises-ivf-relief-from-emotional-toll/news-story/dff6a6d337dea36906c65d0f36773d13?nk=30c609ab712fc9f1c0046f5c2c627b49-1487593933&amp;memtype=anonymous">https://myaccount.news.com.au/theaustralian/subscribe?pkgDef=TA_SDO_P0415A_W04&amp;directSubscribe=true&amp;b=true&amp;sourceCode=TAWEB_WRE170_a&amp;mode=premium&amp;dest=http://www.theaustralian.com.au/news/health-science/hitech-discovery-promises-ivf-relief-from-emotional-toll/news-story/dff6a6d337dea36906c65d0f36773d13?nk=30c609ab712fc9f1c0046f5c2c627b49-1487593933&amp;memtype=anonymous</a> | Print/Newspaper | Scientific/Community | National/International |
| Dr. Hannah Brown    | 25/8/16 | <b>Science Daily</b> - New technique takes guesswork out of IVF embryo selection <a href="https://www.sciencedaily.com/releases/2016/08/160825113524.htm">https://www.sciencedaily.com/releases/2016/08/160825113524.htm</a>  | Web Publication | Scientific/Community | National/International |
| Dr. Hannah Brown    | 25/8/16 | <b>Science Codex</b> - New technique takes guesswork out of IVF embryo selection <a href="http://www.sciencedocodex.com/new_technique_takes_guesswork_out_of_ivf_embryo_selection-189026">http://www.sciencedocodex.com/new_technique_takes_guesswork_out_of_ivf_embryo_selection-189026</a>  | Web Publication | Scientific/Community | National/International |
| Prof. Ewa Goldys    | 1/9/16  | <b>Australian Geographic</b> - The 2016 Eureka Prizes showcase the best in Australian science <a href="http://www.austaliangeographic.com.au/news/2016/09/2016-eureka-prizes-showcase-best-australian-science">http://www.austaliangeographic.com.au/news/2016/09/2016-eureka-prizes-showcase-best-australian-science</a>   | Web Publication | Scientific/Community | National/International |
| Prof. Ewa Goldys    | 1/9/16  | <b>Business Insider</b> - An armoured car and the first artificial memory cell are among the winners of the 2016 Eureka Prizes <a href="http://www.businessinsider.com.au/an-armoured-car-and-the-first-artificial-memory-cell-are-among-the-winners-of-the-2016-eureka-prizes-2016-9">http://www.businessinsider.com.au/an-armoured-car-and-the-first-artificial-memory-cell-are-among-the-winners-of-the-2016-eureka-prizes-2016-9</a>  | Web Publication | Scientific/Community | National/International |
| Prof. Ewa Goldys    | 1/9/16  | <b>Engineers Australia</b> - Hawkei Army Vehicle is among the 16 Eureka Prize winners <a href="https://www.engineersaustralia.org.au/portal/news/hawkei-army-vehicle-among-16-eureka-prize-winners">https://www.engineersaustralia.org.au/portal/news/hawkei-army-vehicle-among-16-eureka-prize-winners</a>   | Web Publication | Scientific/Community | National/International |



## Media Engagement (continued)

| CENTRE PERSONNEL      | DATE     | DESCRIPTION   | TYPE            | AUDIENCE                           | REACH                      |
|-----------------------|----------|---|-----------------|------------------------------------|----------------------------|
| Dr. Malcolm Purdey    | 24/9/16  | <b>Scope TV Channel Ten</b> - CNBP researcher Dr. Malcolm Purdey features in the latest episode of Scope, discussing light based sensing techniques <a href="https://tenplay.com.au/channel-eleven/scope/season-3/episode-126">https://tenplay.com.au/channel-eleven/scope/season-3/episode-126</a>   | Television      | Scientific/<br>Community/<br>Youth | National/<br>International |
| CNBP                  | 26/9/16  | <b>Photonics Online</b> - Inaugural SPIE BioPhotonics Australasia Conference to Shine Brightly <a href="https://www.photonicsonline.com/doc/inaugural-spie-biophotonics-australasia-conference-to-shine-brightly-0001">https://www.photonicsonline.com/doc/inaugural-spie-biophotonics-australasia-conference-to-shine-brightly-0001</a>                                      | Web Publication | Scientific/<br>Community           | National/<br>International |
| Dr. Georgios Tsiminis | 17/10/16 | <b>Phys.org</b> - Developing a sensor for vitamin B12 deficiency <a href="https://phys.org/news/2016-10-sensor-vitamin-b12-deficiency.html">https://phys.org/news/2016-10-sensor-vitamin-b12-deficiency.html</a>  | Web Publication | Scientific/<br>Community           | National/<br>International |
| Dr. Georgios Tsiminis | 18/10/16 | <b>The New Indian Express</b> - Sensor to detect vitamin B12 deficiency in a jiffy <a href="http://www.newindianexpress.com/lifestyle/health/2016/oct/18/sensor-to-detect-vitamin-b12-deficiency-in-a-jiffy-1529199.html">http://www.newindianexpress.com/lifestyle/health/2016/oct/18/sensor-to-detect-vitamin-b12-deficiency-in-a-jiffy-1529199.html</a>                    | Web Publication | Scientific/<br>Community           | National/<br>International |
| Dr. Georgios Tsiminis | 18/10/16 | <b>AZO Sensors</b> - Newly Developed Optical Sensor can Test Vitamin B12 Deficiency in Blood <a href="http://www.azosensors.com/news.aspx?newsID=11587">http://www.azosensors.com/news.aspx?newsID=11587</a>  | Web Publication | Scientific/<br>Community           | National/<br>International |
| Dr. Georgios Tsiminis | 19/10/16 | <b>Immedico Hospitalario</b> - Crean el primer sensor óptico para detectar la deficiencia de vitamina B12 <a href="http://www.immedicohospitalario.es/noticia/9556/crean-el-primer-sensor-optico-para-detectar-la-deficiencia-de-vitamina-b12">http://www.immedicohospitalario.es/noticia/9556/crean-el-primer-sensor-optico-para-detectar-la-deficiencia-de-vitamina-b12</a> | Web Publication | Scientific/<br>Community           | National/<br>International |
| Dr. Georgios Tsiminis | 19/10/16 | <b>Micro Finance Monitor</b> - Sensor to Detect B-12 Deficiency Developed to Help in Dementia, Alzheimer's <a href="http://www.microfinancemonitor.com/sensor-to-detect-b-12-deficiency-developed-to-help-in-dementia-alzheimers/43198">http://www.microfinancemonitor.com/sensor-to-detect-b-12-deficiency-developed-to-help-in-dementia-alzheimers/43198</a>                | Web Publication | Scientific/<br>Community           | National/<br>International |
| Dr. Erik Schartner    | 30/11/16 | <b>Medical Xpress</b> - Potential new tool to aid breast cancer surgery <a href="https://medicalxpress.com/news/2016-11-probe-aid-cancer-tissue-surgery.html">https://medicalxpress.com/news/2016-11-probe-aid-cancer-tissue-surgery.html</a>   | Web Publication | Scientific/<br>Community           | National/<br>International |
| Dr. Erik Schartner    | 30/11/16 | <b>ABC News</b> - Optical probe developed at University of Adelaide to aid breast cancer surgery <a href="http://mobile.abc.net.au/news/2016-12-01/optical-breast-cancer-probe-developed-at-university-of-adelaide/8081748?pfmredir=sm">http://mobile.abc.net.au/news/2016-12-01/optical-breast-cancer-probe-developed-at-university-of-adelaide/8081748?pfmredir=sm</a>      | Web Publication | Scientific/<br>Community           | National/<br>International |
| Dr. Erik Schartner    | 30/11/16 | <b>Science Blog</b> - A new probe may aid in complete removal of cancer tissue during surgery <a href="https://scienceblog.com/490261/new-probe-may-aid-complete-removal-cancer-tissue-surgery/">https://scienceblog.com/490261/new-probe-may-aid-complete-removal-cancer-tissue-surgery/</a>   | Web Publication | Scientific/<br>Community           | National/<br>International |
| Dr. Erik Schartner    | 30/11/16 | <b>The Lead</b> - Breast cancer probe to help surgeons identify deadly cells <a href="http://www.theleadsouthaustralia.com.au/industries/health/breast-cancer-probe-to-help-surgeons-identify-deadly-cells/">http://www.theleadsouthaustralia.com.au/industries/health/breast-cancer-probe-to-help-surgeons-identify-deadly-cells/</a>  | Web Publication | Scientific/<br>Community           | National/<br>International |
| Dr. Erik Schartner    | 30/11/16 | <b>The Engineer</b> - Optical fibre probe differentiates breast cancer tissue from normal tissue <a href="https://www.theengineer.co.uk/optical-fibre-probe-differentiates-breast-cancer-tissue-from-normal-tissue/">https://www.theengineer.co.uk/optical-fibre-probe-differentiates-breast-cancer-tissue-from-normal-tissue/</a>  | Web Publication | Scientific/<br>Community           | National/<br>International |

| CENTRE PERSONNEL    | DATE     | DESCRIPTION   | TYPE            | AUDIENCE             | REACH                  |
|---------------------|----------|---|-----------------|----------------------|------------------------|
| Dr. Erik Schartner  | 30/11/16 | <b>International Federation of Gynaecology and Obstetrics</b> - Scientists develop tool to aid breast cancer surgery <a href="http://www.figo.org/news/scientists-develop-tool-aid-breast-cancer-surgery-0015426">http://www.figo.org/news/scientists-develop-tool-aid-breast-cancer-surgery-0015426</a>  | Web Publication | Scientific/Community | National/International |
| Dr. Erik Schartner  | 30/11/16 | <b>News Medical.Net</b> - New optical fibre probe could help differentiate between healthy and cancerous tissue during surgery <a href="http://www.news-medical.net/news/20161130/New-optical-fibre-probe-could-help-differentiate-between-healthy-and-cancerous-tissue-during-surgery.aspx">http://www.news-medical.net/news/20161130/New-optical-fibre-probe-could-help-differentiate-between-healthy-and-cancerous-tissue-during-surgery.aspx</a>  | Web Publication | Scientific/Community | National/International |
| Dr. Erik Schartner  | 1/12/16  | <b>Radio Australia</b> - Optical probe developed at University of Adelaide to aid breast cancer surgery <a href="http://www.radioaustralia.net.au/international/2016-12-01/optical-probe-developed-at-university-of-adelaide-to-aid-breast-cancer-surgery/1636378">http://www.radioaustralia.net.au/international/2016-12-01/optical-probe-developed-at-university-of-adelaide-to-aid-breast-cancer-surgery/1636378</a>   | Web Publication | Scientific/Community | National/International |
| Dr. Erik Schartner  | 1/12/16  | <b>Bioscience Technology</b> - Potential New Tool to Aid Breast Cancer Surgery <a href="http://www.biosciencetechnology.com/news/2016/12/potential-new-tool-aid-breast-cancer-surgery">http://www.biosciencetechnology.com/news/2016/12/potential-new-tool-aid-breast-cancer-surgery</a>  | Web Publication | Scientific/Community | National/International |
| Dr. Erik Schartner  | 1/12/16  | <b>The Advertiser</b> - Optical fibre technology by Adelaide Uni researchers to help breast cancer surgeons <a href="http://www.adelaidenow.com.au/subscribe/news/1/index.html?sourceCode=AAWEB_WRE170_a&amp;mode=premium&amp;dest=http:%2F%2Fwww.adelaidenow.com.au%2Fnews%2Fsouth-australia%2FOptical-fibre-technology-by-adelaide-uni-researchers-to-help-breast-cancer-surgeons%2Fnews-story%2F06c5de8947ccbd2568774cf24855331f%3Fmk%3D30c609ab712fc9f1c0046f5c2c627b49-1487597034&amp;mementype=anonymous">http://www.adelaidenow.com.au/subscribe/news/1/index.html?sourceCode=AAWEB_WRE170_a&amp;mode=premium&amp;dest=http:%2F%2Fwww.adelaidenow.com.au%2Fnews%2Fsouth-australia%2FOptical-fibre-technology-by-adelaide-uni-researchers-to-help-breast-cancer-surgeons%2Fnews-story%2F06c5de8947ccbd2568774cf24855331f%3Fmk%3D30c609ab712fc9f1c0046f5c2c627b49-1487597034&amp;mementype=anonymous</a> | Web Publication | Scientific/Community | National/International |
| Dr. Erik Schartner  | 2/12/16  | <b>News Medical Life Sciences</b> - New optical fibre probe can help surgeons detect breast cancer tissue during surgery <a href="http://www.news-medical.net/news/20161202/New-optical-fibre-probe-can-help-surgeons-detect-breast-cancer-tissue-during-surgery.aspx">http://www.news-medical.net/news/20161202/New-optical-fibre-probe-can-help-surgeons-detect-breast-cancer-tissue-during-surgery.aspx</a>  | Web Publication | Scientific/Community | National/International |
| Dr. Erik Schartner  | 4/12/16  | <b>News Blaze</b> - New Breast Cancer Device Makes Surgery More Precise <a href="http://newsblaze.com/business/technology/new-breast-cancer-device-makes-surgery-more-precise_70690/">http://newsblaze.com/business/technology/new-breast-cancer-device-makes-surgery-more-precise_70690/</a>   | Web Publication | Scientific/Community | National/International |
| Dr. Philipp Reineck | 7/12/16  | <b>ABC 774 Radio</b> – CNBP researcher Philipp Reineck interviewed about CNBP science and how diamond particles and light can be used for biomedical imaging.   | Radio           | Scientific/Community | National               |
| Dr. Erik Schartner  | 30/12/16 | <b>Photonics.com</b> - Optical Fibre Probe Detects Breast Cancer <a href="https://www.photonics.com/Article.aspx?AID=61513">https://www.photonics.com/Article.aspx?AID=61513</a>  | Web Publication | Scientific/Community | National/International |

## Media Engagement (continued)

| CENTRE PERSONNEL          | DATE    | DESCRIPTION  | TYPE            | AUDIENCE             | REACH                  |
|---------------------------|---------|--|-----------------|----------------------|------------------------|
| <b>Other Publications</b> |         |  |                 |                      |                        |
| Prof. Mark Hutchinson     | 25/2/16 | <b>Inside South Australia</b> - Radical new research opens window on chronic pain <a href="http://insidesouthaustralia.com.au/radical-new-research-opens-window-on-chronic-pain/">http://insidesouthaustralia.com.au/radical-new-research-opens-window-on-chronic-pain/</a>                              | Web Publication | Scientific/Community | National/International |
| Dr. Hannah Brown          | 7/7/16  | <b>University of Adelaide Lumen Magazine</b> - World-first egg research leads to new fertility treatment <a href="https://www.adelaide.edu.au/lumen/issues/85542/news85602.html">https://www.adelaide.edu.au/lumen/issues/85542/news85602.html</a>   | Web Publication | Scientific/Community | National/International |
| Prof. Ewa Goldys          | 31/8/16 | <b>The Conversation</b> - The 2016 Eureka Prizes showcase the best in Australian science <a href="https://theconversation.com/the-2016-eureka-prizes-showcase-the-best-in-australian-science-64668">https://theconversation.com/the-2016-eureka-prizes-showcase-the-best-in-australian-science-64668</a> | Web Publication | Scientific/Community | National/International |
| Dr. Martin Gosnell        | 31/8/16 | <b>The Conversation</b> - The 2016 Eureka Prizes showcase the best in Australian science <a href="https://theconversation.com/the-2016-eureka-prizes-showcase-the-best-in-australian-science-64668">https://theconversation.com/the-2016-eureka-prizes-showcase-the-best-in-australian-science-64668</a> | Web Publication | Scientific/Community | National/International |



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