AuPS News

March 2017

Student Member Profile – Rosemary Cater The University of Sydney

Rosemary Cater is a fourth-year PhD candidate at the University of Sydney within the discipline of Pharmacology, under the supervision of Associate Professor Renae Ryan and Professor Robert Vandenberg. Rosemary won the AuPS PhD publication prize in Adelaide 2016. The prize is awarded for the best original paper published by an AuPS member during the course of their PhD studies.

What is your current position/role?

My PhD involves understanding the molecular mechanisms utilised by the human glutamate transporters to regulate synaptic concentrations of glutamate (the major excitatory neurotransmitter). What I find so interesting about glutamate transporters is that they don't just transport glutamate – they also function as chloride channels. I like to refer to this as a "split personality." Several crystal structures of an archaeal glutamate transporter at different stages of the transport cycle have been solved. These structures have taught us a considerable amount about the transport process, but have not revealed the location of the chloride channel, which suggests that this channel opens only briefly during the transport cycle.

Can you tell us about your award winning publication?

Previously, myself and others have identified several residues that may form part of this chloride channel. A recent molecular dynamics study published in *Cell* developed a model of a possible chloride permeation pathway and pointed to an arginine residue that may control selectivity for anions over cations. In my paper, "*Tuning the ion selectivity of glutamate transporter associated uncoupled conductances*," I mutated this arginine residue to a histidine in order to manipulate its charge in a physiological setting by varying the pH of its environment. This allowed me to investigate the role of the native arginine's positive charge in determining anion selectivity through the channel. Our results revealed that a single positive charge at this position is crucial for anion selectivity, and that the absence of this positive charge switches the pathway to a purely cation-selective channel. These findings have enhanced our understanding of how this single protein functions as both a transporter and a channel, and how these two personalities are integrated.

What are your career plans once you have completed your PhD?

I've recently submitted my PhD and am currently awaiting feedback from my markers. The next step forward in my research career will be a post-doctoral appointment at Columbia University in New York, where I will be researching the mechanisms by which the transporter MFSD2A transports Omega-3 fatty acids such as DHA across the blood brain barrier using both structural and functional assays. This transporter is completely unrelated to glutamate transporters and I am thoroughly looking forward to navigating this new field and broadening my experimental skill set.

What was your experience of the AuPS meeting in 2016?

The 2016 AuPS/ASB meeting provided on multiple fronts, from the free communication sessions where I heard from leaders in my field and was able to share my work with the society to the fantastic dance moves witnessed (and performed) at the conference dinner. I thoroughly enjoyed the 2016 AuPS/ASB meeting and was honoured to receive the Best Student Publication Prize.

What do you like to do in your spare time?

In addition to my interests in science, I love running, travelling within and beyond Australia's borders, spending time with my family and friends and going to the movies.

Rosemary was awarded the AuPS prize for best student publication at the 2016 Scientific Meeting in Adelaide. The prize was proudly sponsored by SDR scientific.

Cater RJ, Vandenberg RJ, Ryan RM. Tuning the ion selectivity of glutamate transporter-associated uncoupled conductances. J Gen Physiol 2016: 148:13-24.

Student Member Profile – Mitchell Lock University of South Australia

Mitchell Lock is a third year PhD candidate in the School of Pharmacy and Medical Sciences at the University of South Australia. Mitchell won the AuPS best oral presentation award in Adelaide 2016.

Can you tell us about your award winning presentation?

The adult mammalian heart has very little capacity to repair after damage because adult cardiomyocytes lack the ability to proliferate. Some miRNAs that have roles in cell cycle and regeneration change expression during heart development at the time when proliferation ceases in both rodents and sheep. We investigated the expression of miRNAs and their predicated target genes after myocardial infarction in sheep hearts before and after birth when the response to injury is different. We utilized a custom designed sheep miRNA microarray and qRT-PCR to identify differentially expressed miRNAs in the Infarct area, Border Zone and Remote Area of fetal and adult hearts. From these data we utilized k-means clustering and miRNA target prediction algorithms to determine potential target genes which were assessed for gene ontology. Target genes of clustered fetal miRNAs showed enrichment for *Insulin and Neuregulin signalling* as well as *pathways in cancer* which is indicative of increased proliferation. In contrast, target genes in the six month old sheep showed enrichment for

Endocytosis, Axon guidance and *MAPK signalling*. Taken together, miRNAs that are downregulated in the fetus following myocardial infarction may have significant roles in regulating cardiomyocyte proliferation in sheep. Low expression of these miRNAs in the fetus allows cardiac repair after damage with high expression after birth resulting in limited capacity for repair.

Why did you choose to follow a career in Physiology?

I gained inspiration from my high school Biology teacher, a subject I only picked up in the last year of my studies. This new-found interest resulted in changing my university preferences to enter the Bachelor of Medical Science at University of South Australia. In my second year of tertiary study I applied for a scholarship at Australian National University to spend the remainder of my undergraduate in Canberra to receive a co-badged degree. This scholarship was a fantastic experience for me and even resulted in meeting the Prime Minister at that time, the Honourable Julia Gillard. I returned to South Australia to complete my honours after receiving a scholarship from the University of South Australia (from which I have already published three journal articles as first author) and am currently continuing in a similar research area with my PhD, of which I am entering the third year.

What was your experience of the AuPS meeting in 2016?

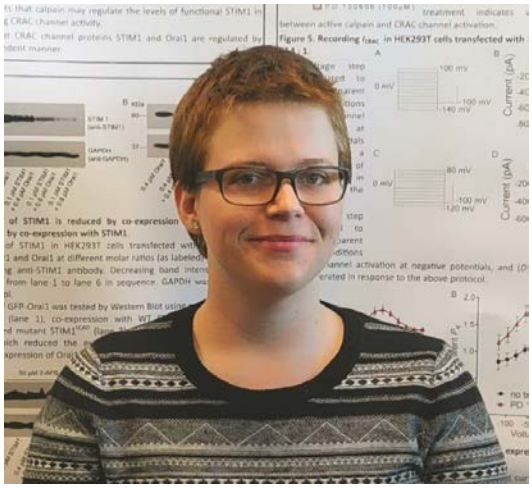
At the AuPS Meeting 2016 I was part of the local organizing committee. I highly recommend other HDR students to get involved in helping organize the meeting if it is held in their home town, as this provides an invaluable experience and always looks good on your CV. It was a privilege to present my work, and received very positive feedback from the audience, resulting in the oral presentation award.

What do you like to do in your spare time?

Outside of my university studies, I am a bit of a technology geek. I like to keep up to date with the latest devices in the consumer electronics area, which unfortunately results in the quite expensive hobby of collecting my favourite pieces of technology. I have a good memory for remembering all the specifications of a device and am often giving advice to friends and family when it comes to upgrading. I enjoy building computers from scratch and tinkering with device software, which sometimes inevitably creates more problems than what I was intending to fix.

Mitchell was awarded the AuPS prize for his oral presentation at the 2016 Scientific Meeting in Adelaide. The prize was proudly sponsored by SDR scientific.

Student Member Profile – Melissa Adams South Australian Health and Medical Research Institute



Melissa Adams is currently a research assistant at the South Australian Health and Medical Research Institute. Melissa won the AuPS best poster presentation award in Adelaide 2016.

How did you begin your career in Physiology?

After completing my BSc I went on to work for a lab with a research focus in lysosomal storage disorders. I was introduced to electrophysiology as a tool to study and characterise a neuronopathic disease model that I was working on in 2015. When that project ended I was eager to continue learning about electrophysiology and so I took on an honours project under Associate Professor Grigori

Rychkov through the University of Adelaide.

Can you tell us about your award winning publication?

The poster that I presented at the AuPS 2016 meeting, "Ca^{2+} release-activated Ca^{2+} channels are regulated by Calpain", was a summary of my thesis, for which I was awarded honours first class. Previous research has indicated that Ca^{2+} release-activated Ca^{2+} (CRAC) channels are regulated in some part by intracellular Ca^{2+}, and that the Ca^{2+}-dependent protease calpain is able to cleave STIM1, one of the proteins of the CRAC channel. My research project involved putting these two components together – studying the effects of high intracellular Ca^{2+}, effects of calpain inhibition, and both together on store operated calcium entry and CRAC channel function. Analysis of the data I collected suggests that the dependence of the cellular levels of STIM1 and Orai1 proteins on intracellular Ca^{2+} is mediated, at least in part, by calpain.

What research are you currently involved with?

I am currently working as a research assistant under Associate Professor Grigori Rychkov. A large portion of my work this year has been using calcium imaging to measure the effect of channel agonists on store operated calcium entry, which I am enjoying immensely, and I hope to move my research career in the coming years towards characterising cell models and drug candidates through electrophysiology techniques. I am pleased to say that I am also continuing to study the CRAC channel through patch-clamping, expanding on the work that Grigori presented at last year's AuPS conference.

What do you like to do in your spare time?

In my free time I like ice skating (which I'm terrible at), watching horror movies, and sewing – I'm currently working on a dress to wear to my graduation ceremony in April.

Melissa was awarded the AuPS prize for her poster presentation at the 2016 Scientific Meeting in Adelaide. The prize was proudly sponsored by SDR scientific.

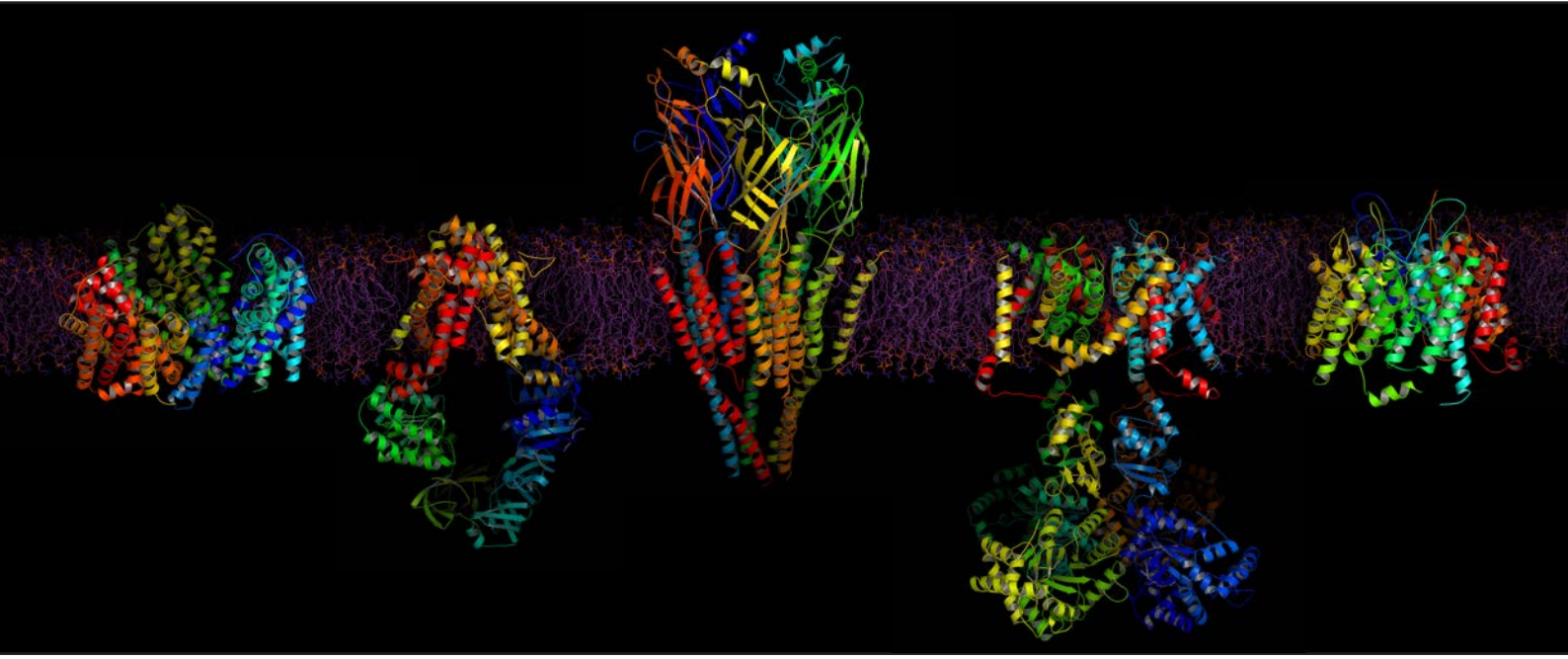
AuPS Melbourne 2017

November 19-22

Hosted by the Victorian College of Pharmacy (Monash University) in Royal Parade in Parkville.

Local Contact: Natalie Trevaskis natalie.trevaskis@monash.edu

Abstract submission is now open and closes 30 April 2017 http://iups2017.com



The Gage Conference on Ion Channels and Transporters

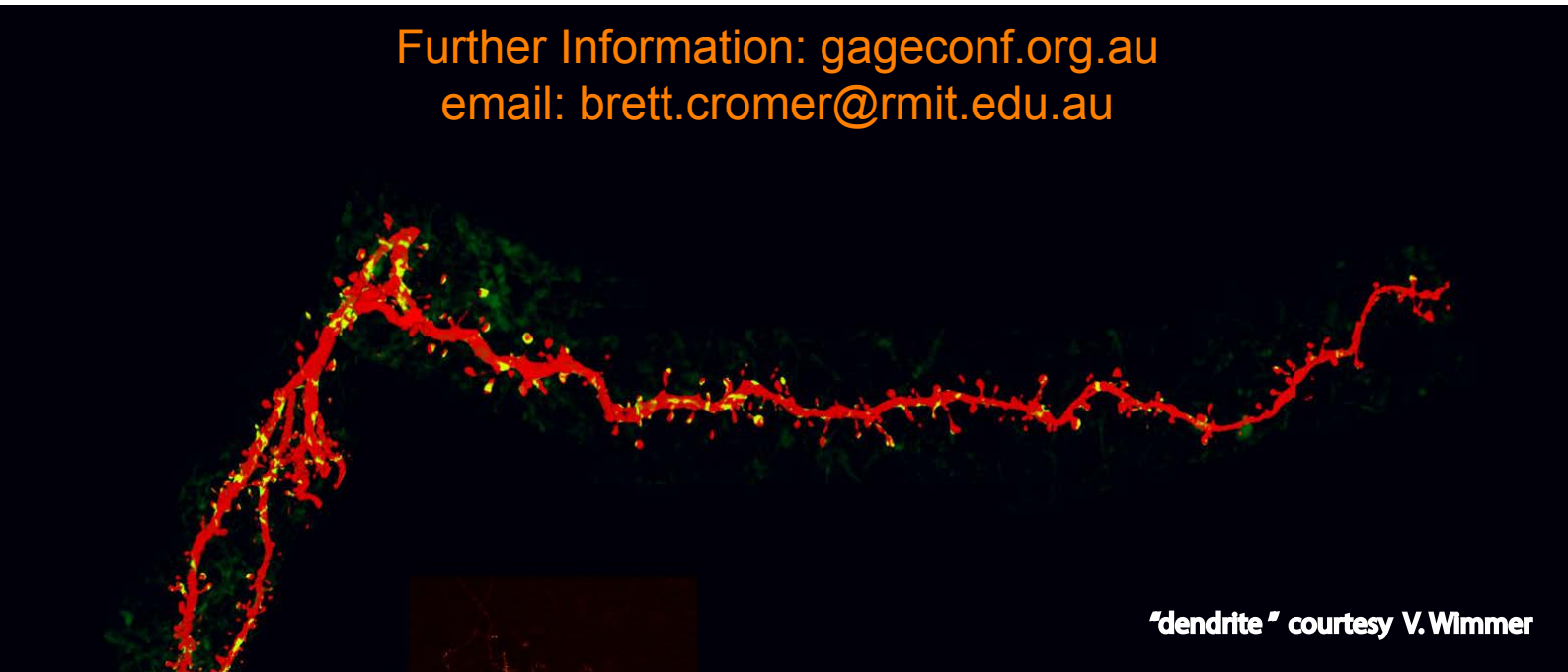
Canberra Boys Grammar School, ACT
19th - 21st April 2017

This is a biennial meeting, named in honour of Peter Gage.
It encompasses all aspects of the biology
of ion channels and transporters - including molecular mechanisms, regulation, physiology, neurophysiology, pharmacology and pathology.

We will invite registration and abstract submission in early Feb. 2017.
www.gageconf.org.au

Organising Committee
Brett Cromer, Angela Dulhunty, Stefan Broer, Andrea Yool,
Mary Collins, Denisse Leyton, Nathan Absalom, Glenn King & David Adams

Further Information: gageconf.org.au
email: brett.cromer@rmit.edu.au



http://www.the-aps.org/bioposter.aspx

http://www.the-aps.org/mm/Conferences/APS-Conferences/2017-Conferences/CV-Aging

Entries for the 2017 Australian Museum Eureka Prizes are now open!

There are 15 prizes on offer rewarding excellence in the fields of research & innovation; leadership; science engagement; and school science, including one new Eureka Prize – Excellence in Data Science.

To view the fill line-up, go to eureka-entry.australianmuseum.net.au/.

Entries close 7pm AEST Friday 5 May. Have a question? Check out the FAQs, or contact the Eureka Prizes team at eureka@austmus.gov.au or on (02) 9320 6230.

Learn more about the Australian Museum Eureka Prizes at www.australianmuseum.net.au/eureka.

Submissions are now open for 2017 entries.

For the fifth year in a row, the *Science* and SciLifeLab Prize for Young Scientists offers four recent PhDs a career-making opportunity. Could you (or your grad student) be one of them?

Recent doctoral graduates in the life sciences may submit a 1000-word essay based on their thesis work. Four winners, in different categories, will be selected for this international award.

Application deadline: July 15, 2017

The winners will:

- Be published by *Science*
- Receive up to 30,000 USD in prize money
- Be honored in Stockholm, Sweden during Nobel week

Categories:
Cell and Molecular Biology | Ecology and Environment
Genomics and Proteomics | Translational Medicine

APPLY NOW

EMBL Australia

Applications for the 2017 EMBL Australia PhD Course are now open.

Be one of 60 outstanding first and second year PhD students from around Australia to attend the 4th EMBL Australia PhD Course in Melbourne. The two-week residential course will be held at Monash University's Clayton campus between July 9 and 21.

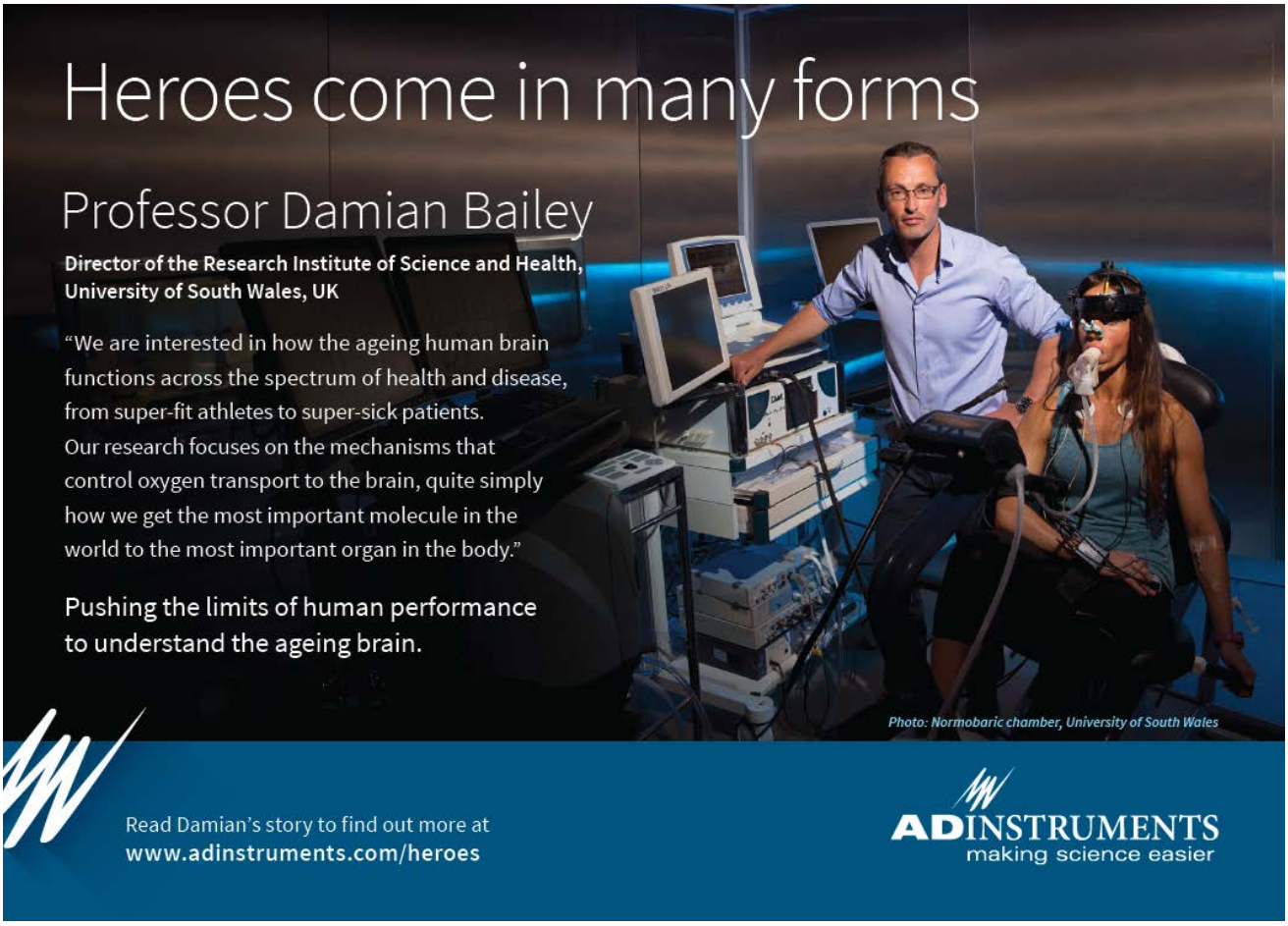
Modelled on the compulsory pre-doc training program of the prestigious European Molecular Biology Laboratory (EMBL), the course covers a wide range of topics – from epigenetics and bioinformatics to translational and clinical sciences – exposing students to the latest ideas in molecular biology.

Sessions held by international guest speakers and researchers from around Australia will provide students with an overview of the full range of life science research and infrastructure available in Australia, as well as useful tools and ideas for their projects and a network of scientific contacts across the country.

There are no course fees and once students are in Melbourne, EMBL Australia will provide accommodation and most meals.

Apply online here. The application deadline is April 30.

Please direct any queries to: student.admin@emblaustralia.org.



ADInstruments design and build high-performance data acquisition systems, trusted for a wide range of life science research and teaching applications. PowerLab hardware has provided reliable and sensitive data acquisition for an entire generation of scientists and educators, and combines with LabChart analysis software and a huge range of signal transducers to offer a flexible solution for almost all types of acquisition and analysis. Typical applications include human and animal physiology, pharmacology, neurophysiology, biology, zoology, biochemistry, and biomedical engineering.

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This issue of AuPS News was compiled by Chris Shaw and with many thanks to the generous contributors.

The next issue of AuPS News will be distributed to members in June 2017.
All contributions for AuPS News should be sent to: newsletter@aups.org.au before the end of May.