

AuPS News – June 2023

Mid-Year Update from the National Secretary

A/Prof. Severine Lamon

I am only 5 months into my National Secretary role, and it feels like so much has happened already! In late November, I took over the role of AuPS National Secretary from Prof. Glenn Wadley at the conclusion of a successful meeting in Hobart, which many will remember as one of the best in AuPS history. Glenn had not signed up for nearly 3 years of pandemic, but nevertheless did a wonderful job at keeping our Society afloat during this time. The Hobart meeting, masterly organised by Renee Ross and her LOC team, was a brilliant tribute to our capacity to rebound as a group. Congratulations Renee.

Overall, the meeting was a perfect mix of great science, networking and fun. Highlights included AuPS lecture by Prof. Janna Morrison, a long-term member and friend of the AuPS, an outstanding 'Savant Thakur ECR Workshop' facilitated by science communicator Dr Shane Huntington OAM and a memorable gala dinner. The dinner was an opportunity to celebrate two new AuPS Honorary members, Prof. Dirk van Helden and Prof. Derek Laver, who proved to be excellent choices and keen dancers. The contribution of up-and-coming researchers Catherine Dimasi and Nykola Kent (Student Oral Presentation Prizes), Alastair Saunders and Sai Yarlagadda (Student Poster Presentation Prizes), Aldo Meizoso (PhD Publication Prize) and Noni Frankenberg (Postdoctoral Publication Prize) was recognised through the award of our various student and ECR prizes. Finally, two mid-career scientists, Associate Professor Christian Moro and Associate Professor Elizabeth Beckett, were respectively awarded the Physiology Education



Grant and the Michael Roberts Excellence in Physiology Education Award for their outstanding contribution to physiology education. I would like to congratulate them all for their achievements.

At the end 2023, a number of long-standing AuPS council members including Renee Ross, Nir Eynon, Kevin Watt, Adam Rose, Ben Perry and Andrew Moorhouse will be retiring from council. As a result, the AuPS will elect four new councillors to be announced in September (applications are due at the end of June, please refer to my recent email for more details). Renee, Nir, Kevin, Adam, Ben and Andrew have each brought novel and unique contributions to their respective position, whether old or new. Here I

am especially thinking about our two newest created positions on council, social media officer (assumed by Adam Rose), and sponsorship officer (assumed by Kevin Watt), which have become critical to the success of our activities and our annual meeting in particular. Becoming a council member is a great opportunity for EMCRs and others. It allows you to understand the ins and outs of the functioning of the Society and is a tremendous occasion to create a solid network of fellow physiologists. I was first co-opted onto the AuPS council in 2015, where I acted as Membership Officer. I was a postdoctoral research fellow and within the youngest council members at the time. Eight years later, I feel like an AuPS dinosaur, eternally grateful to now be surrounded by so many brilliant younger minds on council. Most importantly, I know, or know of, most of our members – as colleagues, friends, collaborators or future collaborators. As a result, I am never short of advice, mentors or simply people I know I can ask anything. The AuPS does a great job at keeping the small Australian physiology community together, so please consider getting involved.

An important part of the role of the AuPS council is to promote physiological science and scientists in Australia and more broadly. I am especially fond of our student and ECR initiatives, including our Research Training Award for student members, which we hope to next offer at Bond University in early 2024. Meanwhile, keep an eye open for upcoming calls for the AuPS PhD Grant Scheme and the Physiology Education Grant Scheme, but also our annual prizes the Michael Roberts Teaching Award, the AK McIntyre Award and the Postdoctoral and PhD publication prizes. The outcomes of these awards will be announced at our next Annual Scientific Meeting in Melbourne (Australian Catholic University) on the 26th-29th of November. For us Victorians, who attended the Melbourne Hub as our second-best option in 2021, you will remember Nolan Hoffman's expert organisation. While we may not have been in Gold Coast, we were so well looked after that we almost forgot we missed out. I am

pleased to announce that Nolan, in collaboration with Nir Eynon and John Hawley, are working hard to prepare another memorable Melbourne meeting for us at the end of this year. This year's meeting will feature a co-badged day with the Australian & New Zealand Society for Sarcopenia & Frailty Research (ANZSSFR) and will be organised amidst a muscle and exercise physiology heavy week in Melbourne, with the Victorian Muscle Network symposium and the Exercise, Muscle and Metabolism symposium flanking both ends of the meeting. Council member Brad Launikonis was selected to present the AuPS Invited Lecture, a prestigious recognition of Brad's career to date, which has focused on excitation-contraction coupling and calcium regulation in skeletal muscle. Prof. Andy Hill, from Victoria University, will deliver the keynote lecture around his life-long work on the molecular mechanisms underlying neurodegenerative disorders. A total of 14 symposia spanning all disciplines of physiology will be offered across the three days.

In the broader scheme of things, I have recently been involved in two key panels working to ensure equal representation of female models and participants in basic medical research in Australia. While Australia is late to the party, both the NHMRC/MRFF (Statement on Sex and Gender in Health and Medical Research) and the Association of Australian Medical Research Institutes (Sex and Gender Policies in Health and Medical Research Project) have recently made the systemic issue of female underrepresentation in basic biomedical research a priority. Physiology is doing notoriously poorly in this space. It is at the core of the values of our Society to ensure equal opportunities for all but, as physiologists, our research focus still lags behind. I am hoping that, in the coming months, our Society can join the voice of other scientific disciplines to start levelling this incredibly important part of the field.

Stay warm during the winter and I will be looking forward to seeing many of you later this year in Melbourne. - Séverine

Congratulations!

The Society would like to congratulate longstanding member Professor Mark Hargreaves (Melbourne University) for being acknowledged in the King’s Birthday 2023 Honours List as a Member (AM) In the General Division For significant service to tertiary education, to sports administration, and to physiology.



Professor Mark Hargreaves

The Society also wishes to congratulate Professor David Adams (University of Wollongong) and Professor Robyn Murphy (La Trobe University) for being inducted as IUPS Academy fellows.

Education Section

At AuPS news, we are starting a dedicated section in the newsletter to physiology education. If you wish to contribute, be sure to email your article idea to associateeditor@auaps.org.au

This issue we have Assoc. Prof Christian Moro discussing planetary health education in physiology, research he is completing with the aid of an AuPS education grant awarded in 2022.

Does Planetary Health education have a role in physiology?

A couple of years ago, I was asked to outline which topics in our physiology course map to the United Nations 2030 Sustainable Development Goals (SDGs). Well, at that point I hadn’t really given it much thought. The focus of physiology tends to be on the internal system. We do mention some external influences, such as stresses and pharmaceuticals for example, but I’ve always taught with a focus on the inside rather than the outside. In that case, I thought

that mapping to the SDGs would be quite a futile endeavour and wasn’t sure that teaching about the health of the planet would have a place at all in our discipline. So, at the time, I set about mapping some of our subjects (even loosely) to as many of the 17 SDGs as possible. For example:

- Good Health and Well-Being (SDG 3) was able to be slotted in against content on nutritional needs and normal development.
- Quality Education (SGD 4) was an easy one, we’re teaching content, right?

- Clean Water and Sanitation (SDG 6) might fit in a little bit with the ‘defence against microbes’ section.
- Sustainable Cities and Communities (SDG11) spends some time on city safety, so this can be placed alongside the bone fracture and repair content.



So sure, the physiology lectures did map a little bit and I was able to finish the task. But doing it this way felt tokenistic and inauthentic. Was there actually a benefit in teaching planetary health from a physiological perspective? The more I read up on this, and talked to experts in sustainability, the more I saw the potential for this type of thinking to enhance what was being taught in physiology. For example, when discussing the homeostasis involved in cooling down from a run (of course, temperature homeostasis is the staple of all Week 1 physiology lectures), the whole process requires a cool external environment to whisk that heat away from the body. If the outside environment heats up (SDG 13, Climate Action), the capacity of the human body to dynamically reduce internal changes is greatly affected. We are reliant upon a habitable external environment, and our homeostatic mechanisms do not work without one. Of course, saying it now seems a bit obvious, but at the time I’d never really given it much thought. It raised the question, should we be adding slides throughout the homeostasis lecture that outlined the internal system’s reliance upon the external

environment, and how this environment is changing? Well, that might be nice, but either way, in my subjects I already had pretty maxed-out slide decks and was pushing the timeslot already. There was not really any way to remove any other content from the weeks, so just didn’t have the space to add anything new in.

Instead, in one subject, I decided to at least give it a go. I was hesitant to devote any actual time to planetary health, so thought that perhaps some ‘facts’ could be randomly slotted-in throughout slides. This would allow the lecture to incorporate relevant information on how the week’s content relates to planetary health, along with a reference link to further reading. To find relevant facts, I met with experts in planetary health and asked them to contribute some ideas for what was vital and important in the field (and a big thank you to Professor Michelle McLean for this!). Our TA, Charlotte Phelps, helped out a lot as well, as we brainstormed where each fact could go, which ones were linked to the SDGs, and simply which were important facts to know.

I agree, sneaking facts in without any actual time devoted to teaching planetary health was a half-hearted approach. The content was excluded from any assessments as well, providing even less motivation for students to bother looking up the resources. I kept track of what was being reviewed through the learning management system and surveyed the students at the start and end of the semester to see if this approach made any impact. However, evaluation showed that it did not. I’d set out to incorporate relevant planetary health content into physiology and had failed. The article (which also has the ‘facts’ and other information) outlining this approach and our findings can be read here:

Christian Moro, Michelle McLean & Charlotte Phelps (2023) Embedding planetary health concepts in a pre-medical physiology subject, *Medical Teacher*, 45:2, 179-186.

<https://doi.org/10.1080/0142159X.2022.211804110.1080/0142159X.2022.2118041>

The more we've looked into it, the more some of the contexts appear to be vital for physiology student awareness. More pollution in cities affects the mucosa, impacting respiratory physiology. Limited access to clean drinking water impacts physiology. Planetary changes affect crops, risking starvation and malnutrition, which impacts physiology.

So how do we do it right, and what is the right way to go about this?

To answer this question correctly will require a bit of thought. Using a design-based approach, we've started working with students and academics to come up with ways that this can work. Adding this to assessment in some way is also probably important, so students actually have to take note. Other questions have arisen as well, such as who decides what planetary health concepts are 'important'. This has formed quite the educational research project this year. Thankfully, the AuPS Physiology Education Grant scheme has supported this, enabling focus groups and formal discussions to take place.

Although we failed in the first published attempt, this has been a learning journey. It does feel like at least some focus on the changing external environment, and how the body will cope, will certainly benefit student understanding regarding the internal processes. However, how much of this content, and what areas to focus on, still require evidence-based guidance. We're on the case and look forward to reporting back soon!

- Christian Moro
Associate Professor of Physiology,
Biomedical Sciences and Medicine Programs
Bond University, Gold Coast.

Member profile:

Catherine Dimasi

The University of South Australia

Winner: best student oral presentation at the 2022 AuPS in Hobart.



What sparked your interest in physiology?

Firstly, thank you to the society for allowing me to present my work, I was honestly surprised and delighted to win best oral presentation. I think my interest in physiology has always been there, I remember asking my older brother (whom is a post-doc in glaucoma research) what DNA stood for at age 4. I credit pursuing my interest in physiology and science to my older brother and his wife (she is also a post-doc in immunology research). They have both mentored and nurtured me through many years and answering my endless questions about what it is like to be a scientist! Dinner table conversations can get interesting, especially when we get off-topic and start talking about western blots, RNA sequencing or grants.

I have especially always taken an interest to reproductive, fetal and maternal physiology. This interest led me to pursuing my honours in the ovarian cell biology group under the supervision of Prof. Rebecca Robker, where I researched how oxidative stress can affect pre-implantation embryo development. I realised just how fascinating, amazing, and complex embryology and fetal physiology can be! After honours I took a slight segway into vascular research where I worked as an RA for a couple years under Prof. Peter Psaltis. I realised I really loved cardiology too. Keen to start a PhD, I was keeping my eye out for a group where I could meld my two interests, and that's where I met my current supervisor, Prof. Janna Morrison. We designed a project where I could investigate how adverse intrauterine environments can affect cardiac development in the fetus. Our group is very diverse in its research, but at heart we are a fetal physiology research group, and through exposure to other PhD student and post-doc projects, I now know a fair bit about lung, brain, liver, and placental physiology too.

Tell us more about the research you presented at AuPS 2022

This is a super exciting project we are currently working on. Basically, whilst a fetus is in utero, it can repair its heart if there is damage. This contrasts with the adult heart, where damage to the heart, such as after a heart attack or myocardial infarction is permanent. This is because cardiomyocytes in the adult heart cannot proliferate or repair themselves, whilst fetal cardiomyocytes can proliferate. This switch from proliferative to quiescent cardiomyocytes occurs roughly in late gestation in large mammals (humans, sheep etc). This cardiomyocyte transition period is highly complex, and whilst is well characterized in zebrafish and mice, is not well understood in large mammals.

There is no 'cure' for heart damage, we can only manage symptoms, and until we understand what controls this switch at a molecular level, we cannot

develop interventions for cardiomyocyte repair. Our group has identified 3 miRNAs we believe regulate this switch in cardiomyocytes from proliferative to quiescent. The research I presented at AuPS is on one of those miRNAs, miR-558. We hypothesise in a fetal heart (which is capable of repair), this miRNA is lowly expressed, but in an adult heart, is highly expressed and inhibits cardiomyocyte proliferation. In order to test this, we gave lambs a heart attack, and either injected a miRNA scramble, or miRNA-558 inhibitor at the site of the infarction and allowed the lambs to recover. We performed cardiac MRI immediately after the infarct, 7 days and 14 days after the infarct and then collected the hearts for analysis. Whilst this data is preliminary, we found several genes involved in proliferation were significantly upregulated in the inhibitor group compared to scramble, and several genes involved in cardiac hypertrophy (which occurs after an infarct) were downregulated in the inhibitor group. However, our MRI data did not show differences between treatment groups. This research is ongoing with other miRNAs, both in lambs (inhibiting our miRNAs of interest) and fetuses (overexpressing miRNAs with mimics) and we hope to elucidate this change further.

What research or projects are you undertaking currently?

I am doing my thesis by publication, so each of my projects is a different chapter/paper. The overall theme of my thesis is regulation of cardiomyocyte maturation, and each chapter investigates a different aspect of this. My first two chapters focus on how fetal growth restriction (FGR) effects the fetal heart. My next chapter focuses on normal cardiomyocyte maturation, investigating the critical transition process in late gestation mammals where cardiomyocytes exit the cell cycle and change their metabolism. My last chapter is what I presented at AuPS with using miRNAs to induce proliferation after myocardial infarction.

Where do you see yourself in the future?

I plan on submitting my thesis at the end of this year, and the feeling of impending doom is fast hitting me. The honest answer is I don't know where I see myself, maybe it's still in basic science as a post-doc, or perhaps I've jumped into clinical research, or the illusive industry position. I believe the key is being flexible and keeping an open mind about my future career, skills learned in a PhD can be highly transferrable. Not to get sentimental but this quote has stuck with me recently "Deciding everything is falling into place perfectly, as long as you don't get too picky about what you mean by place. Or perfectly."

Member profile:

Nykola Kent

University of Queensland

Runner up best student oral presentation at the 2022 AuPS in Hobart.

What sparked your interest in physiology?

From about the age of 15, I had big dreams of becoming an obstetrician after watching a TV series about the chaotic life of an obstetrician living in Melbourne. When I got to university, I did a Bachelor of Science and completed all the physiology subjects that were pre-requisites for getting into medicine. Then I decided to do an honours year in a lab that researched the effects of exposure to alcohol during the periconceptional period. During that year, I learnt so much about research in physiology and became particularly fascinated by the placenta, and how perturbations, even in the stages just prior to conception, can program placental dysfunction. My plans then shifted, and I decided to do a PhD. During my PhD my understanding of the physiology of the placenta deepened as I learnt about how this incredible transient organ alters the maternal

physiology in the different phases of pregnancy to firstly to facilitate nutrient storage, and then to assist in providing fuel for rapid fetal growth at the later stages of pregnancy. Beyond pregnancy and the placenta, there is something so fulfilling about understanding how the human body works. Every cell, vessel and organ has a critical role to play. But I definitely would say that I have that TV series to thank for sparking my interest in physiology.

Tell us more about the research you presented at AuPS 2022

I presented some data from the final data chapter of my PhD thesis which focused on a rat model of autoimmune thyroiditis in pregnancy. We had hypothesized, based on the other chapters in my thesis and clinical studies, that the presence of antibodies to thyroglobulin (a protein in the thyroid that serves as a structure upon which thyroid



hormones are synthesized) in pregnancy would be associated with a phenotype that was similar to gestational diabetes mellitus. Surprisingly, we found that our rats were not glucose intolerant and had no changes to insulin levels during an intraperitoneal glucose tolerance test, but that they did have high random blood glucose levels prior to pregnancy and at the end of pregnancy, which was accompanied by random lower insulin levels. We concluded that there was still some degree of maternal hyperglycemia, and that women with antibodies to thyroglobulin should be monitored in their pregnancy for risk of developing gestational diabetes mellitus.

What research or projects are you undertaking currently?

I am currently working a couple of jobs in two very successful research groups – one group focusses on the health of women across the life course and the other group, in a kind of full circle moment, researches fetal alcohol spectrum disorder. I just completed my PhD and I am going to be taking some time off to travel overseas for five months. I am looking forward to seeing where I end up upon my return.

Where do you see yourself in the future?

I would really like to continue to work in the space of reproductive physiology, whether that may be as a researcher or in some other capacity. I would like to move more towards the study of infertility and would really like to help women who struggle with fertility to have a baby. I'm not sure what that job looks like at this point, but I am very excited to see where my career will take me.




THE AUSTRALIAN PHYSIOLOGICAL SOCIETY
SCIENTIFIC MEETING
Melbourne, Victoria
26th – 29th November 2023

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This issue of AuPS News was compiled by Ben Perry with many thanks to the generous contributors. The next issue of AuPS News will be distributed to members in September 2023. All contributions for AuPS News should be sent to: associateeditor@aups.org.au before the end of August.

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