

AuPS News – March 2023

Member Profile:

Assoc. Prof.

Elizabeth Beckett

University of Adelaide

Winner of the 2022 Michael Roberts Excellence in Physiology Education Award

Congratulations on winning the award. Can you tell us about your career in Physiology Research and Education to date?

Thank you! I was really overwhelmed and delighted when the award was announced. There are so many amazing physiology educators in Australia, and to be honest I feel many of them are likely so much more deserving than me, so I'd love to take this opportunity to encourage them to apply! I feel exceptionally fortunate that my career journey in physiology research and education has spanned three continents - having been an undergraduate student in the UK, a PhD candidate and postdoc in the USA, and with my current academic position in Adelaide, Australia. During this time, I have had the opportunity to learn from and be mentored by some of the all-time physiology greats!

In retrospect, my rather impulsive selection of a Neuromuscular Physiology topic at the start of the second year of my undergraduate BSc. Physiology degree at The Queen's University Belfast, Northern Ireland turned out to be quite the 'life-altering decision'. Having enrolled in this subject meant I was



offered the opportunity to “press pause” on my degree to gain a year-long work placement at The University of Nevada, Reno (UNR). It was during this extremely formative year at UNR that my eyes were opened to the world of physiology research. I will be forever grateful for the training, mentorship and opportunities provided by Sean Ward and Kent Sanders during that year of work experience. My task was to record electrical and mechanical activity from gastric and intestinal smooth muscle segments and investigate the functional importance of intramuscular interstitial cells of Cajal in motor neurotransmission. It sure was a challenge, with LOTs to learn – but it was immensely enjoyable! I loved the excitement of ‘getting a cell’ and the careful craft of preparing tissues for immunohistochemistry. I also really enjoyed making figures from my recordings (a process which required many late nights with my precious rolls of chart paper and the new latest technology - a flat-bed scanner!).



all the laughs during that year! The lymphatic project did prove to be a challenge, with many late nights spent in the MBC trying desperately to get sustained recordings to investigate the effects of noradrenaline and various channel manipulations! I was super proud to record a diverse range of electrical activity from the little vessels and answered some questions regarding their electrical basis. As an Hons student it sounded extremely thrilling that my Hons project had been sent (via email attachment – still a bit of a novelty back then!) to a Professor in the distant land of Australia - a Prof Dirk van Helden, no less! How amazingly special for me that Dirk was bestowed as a lifetime member of the AuPS for his vast contributions to the discipline of physiology on the same evening as I received the Michael Roberts Teaching Award. It was such an honour to have my photo taken with Dirk, who I have revered as a total physiology “legend” for many years!

Following graduation, I returned to UNR to undertake a PhD, again under Sean and Kent’s supervision. My PhD project continued to explore the functional importance of intramuscular and myenteric interstitial cells of Cajal within the gastrointestinal tract which kept me out of too much trouble for the next 3.5 years. As a junior post doc within the same department, I was delighted to have opportunity to develop and teach an endocrinology module as part of the post graduate medical course. I absolutely loved swotting up about the subject, preparing my teaching materials to try to make the classes as engaging as possible, and the interaction with the students.

Having the teaching experience at UNR was likely ‘a feather in my cap’ when, in 2007, I applied for a lectureship at the University of Adelaide, Australia. If I thought transitioning from being a student in Belfast to electrophysiology lab work in Reno was being thrown in the deep end, the move from post doc to academic was being chucked in the ocean! Now I was lab head, grant writer, account balancer, lecture writer, supervisor of students, assessment marker,

When this amazing year concluded there was still the small matter of an Honours degree to finish back in Belfast, so I had to say bye-bye to the bright blue Nevada skies and get reacquainted with the grey clouds of Northern Ireland. It wasn’t all doom and gloom however – the buzz inside the Molecular Biology Centre at Queen’s University at that time was literally electric... in the form of electrophysiology! The Smooth Muscle Research Group at Queens encouraged and supported me to share what I had learnt “way out west” and, with Sean’s continued help, set up an intracellular recording rig to record from (sheep) mesenteric lymphatics. Being part of the lab with Karen McCloskey, Gerard Sergeant, Mark Holywood, Keith Thornbury and Noel McHale was another extremely enjoyable chapter, and I am profoundly grateful for all their support, advice, knowledge and, importantly,

journal reviewer... I needed to get my head around unfamiliar IT systems, educational program, course formats, department structures and ‘politics’, ethics applications, funding agencies and the one that I needed to ensure didn’t get pushed to the back burner – tenure application! [Note to faculty who are considering setting up that mentorship program for new academics, particularly those from overseas - please do! I know first-hand how overwhelming this transition can be].

During my academic appointment at Adelaide (since 2008) I have headed my own laboratory, developed curricula in health science, dentistry and medicine courses and became sole coordinator of a couple of large undergraduate physiology courses. Over the last few years in particular I have taken on key leadership roles within learning and teaching, making contributions to course review and improvement across the Faculty.

Can you describe your achievements and teaching innovations for which you received the award?

Since the start of my academic appointment in 2008 I have been a proponent of high quality, student-focused, physiology education - particularly the retention of interactive physiology practicals so that students can experience “physiology in action”. This is despite the challenges of increased cohort sizes, the COVID pandemic and austerity within the tertiary education sector. I have been the coordinator of a level 2 physiology subject (180 increasing to 340 students) since 2012 and each year teach physiology to over 1500 students across multiple degree programs (health science, dentistry and medicine).

I have continually reflected on aspects of curriculum design and delivery, including assessment approaches and have adjusted accordingly. I have utilised both digital platforms and face to face sessions to engage learners and provide progressive, systematic attainment of research skills and alignment to subject themes.



I provide students with digital and in-person workshops that help explain key concepts of research ethics, experimental design and statistics before they embark on organ system themed physiology practicals. Each practical is supported by self-paced online pre-practical activities that includes demonstration videos and information about concepts that will be investigated in the practical. There has been increased student satisfaction and our physiology students report being well prepared for their level 3 subjects and capstone research projects.

I am currently serving as the curriculum development lead and Science and Scholarship domain lead for our new Bachelor of Medical Studies/Doctor of Medicine degree, of which the first subjects started in 2022. In these new medical courses, I have “made it my mission” to bolster physiology teaching and research skills training, and have implemented student-centric,

multi-disciplinary practicals and workshops to replace didactic lectures and instructor-focused sessions.

What does the society and award mean to you?

I am very grateful for the opportunity to attend AuPS Education Symposia which facilitate the exchange of knowledge and best practice in physiology teaching and education research. I have always found the AuPS Education Symposia extremely enlightening and the workshops to be practical and supportive places to learn from peers and form useful, productive networks and collaborations.

I have thoroughly enjoyed meeting and getting to know the amazing group of physiology educators that attend the AuPS symposia each year - they have always been so supportive and encouraging. I see the Michael Roberts award as being an extension of that support and encouragement. It is particularly special to me that Michael Roberts, who I know was highly respected as a physiology researcher and educator, worked within the same department at The University of Adelaide that I joined in 2008. I am disappointed that I didn't get a chance to meet Michael, but I have heard he was a really 'top bloke' and student-centric educator and I am truly honoured that my (very modest) contributions to physiology education to be recognised in this way.

What do you see as the current and future challenges in physiology education?

Have space in the curriculum for higher level learning and discovery

I think one of the big challenges for us in physiology education presently is to ensure the importance of the discipline doesn't get diluted as we feel the pressure to design and deliver more and more vocational, job-ready degrees. Physiology is obviously the cornerstone of medical advancements and new discoveries, but physiology as a subject

within biomedical science degrees almost seems to be shrinking to make way for a whole plethora of vocational topics. Without students having space in their curriculum to engage with and consider physiological concepts and mechanisms at a reasonably detailed and advanced level there is possibility that the 'higher level thinking' that encourages students to embark on discovery projects to explore gaps in knowledge will be diminished. I am likely biased (given my physiology 'upbringing') but in my work to develop new courses within the new medical program at University of Adelaide, I will be emphasising clinical relevance of physiology as the foundation of scientific medical practice and its applicability both at the bedside and for the development of new, improved therapeutics. We need to keep the subject of physiology relevant for students but we need to keep challenging students to think deeply.

Provide authentic work experience opportunities

When I travelled to Reno to work for a year in a research lab during my Physiology undergraduate degree had never heard the acronym WIL – Work Integrated Learning. (I don't think the term had been invented back in 1998!) However, having that year of work experience was the absolute epitome of "WIL done right"! It was a totally immersive, authentic experience and I learnt so much more than any undergraduate physiology syllabus could ever attempt to cover with its intended learning outcomes. For many of the researchers at UNR it was also a beneficially symbiotic arrangement – they had motivated (hopefully bright!) and enthusiastic students working in their laboratories for a very (very!) modest stipend payment. I do however appreciate that these types of yearlong work experience opportunities would not be logistically feasible for large numbers of students, but providing rich authentic opportunities to experience "physiology in the workplace" is one of our greatest challenges, but one that could reap amazing rewards.



Assoc. Prof. Elizabeth Beckett with Prof. Dirk van Helden

Dr. Noni Frankenberg

La Trobe University

In 2022 Dr. Noni Frankenberg was the recipient of the Postdoctoral publication prize

Publication: Frankenberg, N.T., Mason, S.A., Wadley, G.D. *et al.* Skeletal muscle cell-specific differences in type 2 diabetes. *Cell. Mol. Life Sci.* **79**, 256 (2022). <https://doi.org/10.1007/s00018-022-04265-7>.

Congratulations on the prize. Can you tell us about your award-winning publication?

This publication took a considerable amount of time to produce and I am delighted with the outcome as the study generated some surprising findings that altered my understanding of glycogen. One of the major findings of this paper was the isolation of a considerable pool of free cytosolic glycogen in human skeletal muscle and this proportion is different in muscle from people with type 2 diabetes (T2D). We also examined key glycogen regulatory proteins in individual fibre segments to address muscle heterogeneity. Using this specialised technique, we found that there was a lower abundance of Type I fibres found in muscle from T2D compared with age-match control. AMPK- β 2, glycogen branching enzyme (GBE), glycogen debranching enzyme (GDE), and glycogen phosphorylase (GP) were differentially localized between fibre types and in fibres from control and T2D individuals. By using a cell-specific technique we demonstrated varying glucose handling abilities in specific muscle fibre types in T2D and generated a model to provide an overview of cell-specific difference in glycogen metabolism in type 2 diabetes.



What is your current position/role?

I am both a post-doctoral researcher in Robyn Murphy's muscle biochemistry group and an Academic Coordinator for the La Trobe- PSB Academy Transnational Education Partnership at LaTrobe University. I am based at the Bundoora campus in the Department of Biochemistry and Chemistry. I have a unique role which sees me working with local subject coordinators and teachers at PSB Academy in Singapore to support offshore management and delivery of La Trobe University Bachelor of Science and Biomedical Science degrees as well as the Master of Biotechnology and Bioinformatics to our partners PSB Academy in Singapore. My current research investigates examining skeletal muscle function at the level of single muscle fibres using physiological and biochemical methodologies. Specifically, I am investigating various aspects of skeletal muscle physiology in health and disease including calcium dependent processes, metabolic, structural, and

protective proteins using exercise and disease models in humans as well as animal models.

What made you want to follow a career in research, and where do you see yourself heading professionally?

I have always loved Science and learning about how things worked, especially Biology. I find research intellectually stimulating and fulfilling, and take pride in the knowledge that I can contribute and promote Science to the community. I really enjoy fundamental physiology and connecting physiological responses to their biochemical properties. Professionally I am really excited to further explore utilizing new techniques such as single fibre proteomics and high-resolution microscopy to explore muscle heterogeneity in various disease conditions.

Outside of work/research, what do you do to relax?

Relaxing is one word for it, but I am a mother of two amazing kids who fill my time with all the best bits of life. They have recently taken up team sports, so I am currently living my sporting prowess vicariously through their endeavours. Although I do play social netball and umpire once a week, so luckily my sideline fever is somewhat suppressed.

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