

“The Flow”

Newsletter of the
Cerebrovascular Research Network

SAVE THE DATE

CARNet 2024
Annual Meeting
October 29-31
Université Laval,
Québec City

CANADA

Stay tuned for
further details



New Steering Committee Members



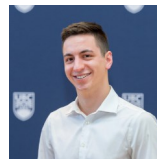
Welcome to the first issue of “**The Flow**”, the newsletter of the Cerebrovascular Research Network (CARNet). We will use this platform to regularly highlight CARNet events, initiatives, and news of CARNet members. Please [send us](#) your news, including your recent publications!

I am very excited to take on the new role as chair of the CARNet steering committee. I have been a member of CARNet since the very beginning in 2011; I was secretary of the steering committee from 2016-2022; and I was co-organizer of our very successful virtual cerebral blood flow seminar series in 2020-2021. I look forward to working with all of you as we continue to advance the mission of CARNet, and I will be seeking your input as we strengthen our existing activities, and develop new initiatives.

I would like to take this opportunity to offer my sincere thanks and appreciation to our out-going chair, **Stephen Payne**. Over his 6 years as chair, we increased our membership, including many new early career investigators; we continued to grow our team-based approach in developing guidelines for analysis of dynamic cerebral autoregulation, and applying this knowledge to address important research questions; we changed the name of our network to better reflect the diverse nature of the research of our membership (which included a new

logo); and we updated our website with a modern and interactive format. Stephen was also a guiding light as we worked through the unforeseen challenges of organizing our annual meetings during the height of COVID-19, and he was instrumental in hosting the first CARNet annual meeting outside of Europe and North America, with a very successful 2023 meeting in Taiwan! Thank you Stephen for your outstanding leadership!

Thank you also to our outgoing ordinary member **Jon Smirl** for his service to the CARNet steering committee (2017-2023). We appreciate your dedication and engagement in advancing the mission of the CARNet community. During our meeting in Taipei, **Ryan Hoiland** was elected as our new incoming ordinary member – congratulations, and welcome Ryan!



If you have any questions, comments, or concerns, please feel free to [reach out](#) to me directly.

I look forward to working with you all.

Caroline Rickards, PhD, FAPS | CARNet Chair

CARNet 2023 - Taipei, Taiwan

From October 25-27, 2023, CARNet members from around the world gathered in Taipei, Taiwan for the 12th Annual CARNet Meeting. Stephen Payne (CARNet Chair) and his team hosted the meeting at the Institute of Applied Mechanics, at the National Taiwan University (NTU). We enjoyed

an educational and intellectually stimulating [program](#), including an outstanding keynote presentation from **Farzaneh Sorond** from Northwestern University, USA, entitled “*Brain, vessels, and flow*”.

Other program highlights included invited speakers, Rong Zhang,

Nathalie Nasr, Takashi Tarumi, Andrew Robertson, and Victoria Haunton, and three “Rising Star” presentations from Agnieszka Uryga, Ryan Hoiland, and Sergio Brasil.

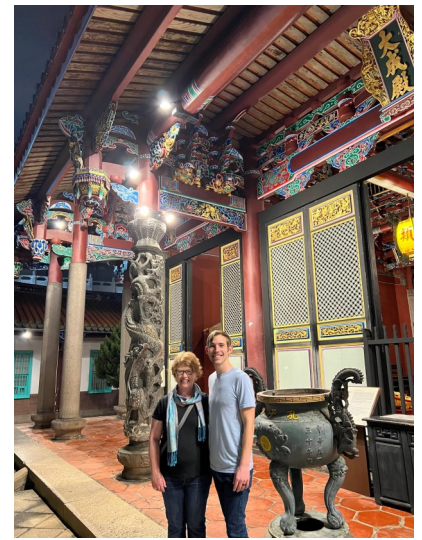
In addition to an excellent scientific program, attendees enjoyed

a rich cultural exchange with a traditional Taiwanese banquet at the Yangtse River Restaurant, and visits to the Bao'an Temple, and the Shilin Night Market.

A special thank you to **Oran Kao** for exceptional behind the scenes organization of the meeting!



CHECK OUT MORE PHOTOS FROM THE MEETING [HERE](#)



CARNet Member Spotlight!

Alicen Whitaker-Hilbig, PT, DPT, PhD



What is your current role?

I am a postdoctoral fellow with Dr. Matt Durand, in the Department of Physical Medicine and Rehabilitation at the Medical College of Wisconsin (MCW). My co-mentor is Dr. Allison Hyngstrom, Chair of the Department of Physical Therapy at Marquette University. I am supported by the a T32 training grant (Training in Signature Transdisciplinary Cardiovascular Sciences) at MCW.

What got you interested in cerebral blood flow research?

As a doctor of physical therapy (DPT) student, I had the unique opportunity to be awarded a DPT summer trainee research experience on the University of Kansas Medical Center's T32 Neurological and Rehabilitation Sciences Training Program working with Dr. Sandra Billinger. I worked on a study characterizing the kinetic middle cerebral artery blood velocity (MCAv) response to moderate-intensity aerobic exercise in individuals 3- and 6-months post-stroke. My love for science, vascular health, and stroke neurorehabilitation were all combined during this T32 experience. With Dr. Billinger's mentorship, I enrolled in the dual degree DPT/PhD program where I continued my interest in cerebrovascular research characterizing the MCAv and dynamic cerebral autoregulation response to high intensity interval exercise (HIIE) in individuals post-stroke.

What is your area of research?

I am a clinical scientist interested in the contribution of vascular physiology to stroke neurorehabilitation and recovery. My overall research interests include characterizing vascular dysregulation (both in the cerebral and peripheral vascular system) during exercise in individuals post-stroke and identifying therapeutic interventions to improve vascular health and optimize stroke recovery.

What is the most interesting/exciting finding from your research so far?

The most life-changing finding was that we found individuals post-stroke had a lower MCAv responsiveness during HIIE compared to neurologically intact age- and sex-matched controls, which was moderately associated with carotid-femoral pulse wave velocity (i.e arterial stiffness). This finding ignited my interest in learning more about mechanisms of vascular regulation, and led to a postdoctoral fellowship studying mechanisms of peripheral blood flow dysregulation and the association with stroke rehabilitation outcomes such as lower extremity strength and neuromuscular fatigue (R01 HD112258, Durand & Hyngstrom). As a future independent investigator, I plan to combine my training in cerebrovascular physiology and peripheral vascular mechanisms.

What advice would you give to new trainees just starting in this field?

Research takes time. Have patience with yourself and your studies. It takes time to learn all the background knowledge, techniques, and nuances to cerebrovascular physiology. In fact, the beauty of research is that you never stop learning. So, stay determined and find ways to keep your ambition!

Where is your favorite travel destination?

Science, and especially CARNet, has allowed me to travel to so many fantastic destinations such as London and Leicester, UK, and Taipei, Taiwan. However, my favorite travel destination, skewed by the fact that I was able to visit for 2-months, is Zambia, Africa. I had the amazing opportunity to complete a DPT clinical rotation at St. John Paul II Orthopaedic Mission Hospital. I had the opportunity to meet so many amazing people and really enjoyed the culture.

What is your favorite snack?

While I wish it was something healthy, my favorite snack would probably be popcorn. I love all the different flavors of popcorn and that you can share it while watching a movie!

CARNet Member Spotlight!

Wahbi El-Bouri, MEng, DPhil



What is your current role?

I am the Treasurer for CARNet. I make sure we have enough money in our account so that we can continue to put on the fantastic annual meetings! When not being Treasurer, I am a Lecturer (Assistant Professor) in in silico medicine at University of Liverpool, UK.

What got you interested in cerebral blood flow research?

Honestly, the past chair of CARNet, Stephen Payne. As an engineering undergraduate at Oxford learning about fluid dynamics, the physics of mass transport, and material properties, it seemed my only options were to join an engineering firm and start building planes or engines or oil rigs! Or go into banking of course. But Stephen introduced me to the world of engineering applied to the human body, and in particular to cerebral blood flow. Suddenly, the engineering principles I had learned at university could be applied to better understand the human body and help people live longer, healthier lives. I have been hooked ever since.

What is your area of research?

As alluded to in my previous response, I am very much an engineer with a background in mathematical and computational modelling of the cerebral circulation. I have focused on modelling the microcirculation and how that impacts what we see in clinically imaging. I am also particularly interested in creating digital twins – simulations of an individual's circulation that can help with treatment planning and developing in silico clinical trials (clinical trials run entirely on a computer with digital twins!). More recently, I have become interested in the link between the retinal circulation and cerebral circulation and how we can infer what happens beneath the skull through the eye...

What is the most interesting/exciting finding from your research so far?

It was very exciting to be part of a European project that was able to successfully develop an in silico clinical trial for ischaemic stroke treatment – the first ever! Some of the microcirculation modelling research I have done also demonstrated quite exciting results when it came to ageing and robustness of the microcirculation – the simulations show us that to a large degree our circulation is able to maintain perfusion despite changes in the microcirculation. However, as we age the robustness drops off so that minor changes we were able to withstand when we were younger cause much larger effects.

What advice would you give to new trainees just starting in this field?

Starting in the field of biomedical engineering you need to be curious – you straddle the domain of both biology and engineering. Seek out others who work in your field of interest and ask to collaborate with them – the field isn't large so there is a lot still to do! Creativity is really important as well, as biology is very different to standard engineering systems – it does strange things we often don't understand. And patience. Working with people is not like working with engines.

Where is your favorite travel destination?

Anywhere on the Iberian peninsula – excellent weather, great beaches, beautiful history and architecture, and friendly people. There's a joie de vivre in places like Barcelona that just makes you not want to go to bed!

What is your favorite snack?

Twiglets. They probably don't exist outside of the UK. They are an acquired taste, but when you acquire it there's nothing quite like them to satisfy that craving.

New Publications from CARNet Members

CARNet Steering Committee

- ◆ Bailey et al. Severe hypoxaemic hypercapnia compounds cerebral oxidative-nitrosative stress during extreme apnoea: Implications for cerebral bio-energetic function. *J Physiol* 2024. <https://doi.org/10.1113/JP285555>
- ◆ Beishon et al. Individual Patient Data Meta-Analysis of Dynamic Cerebral Autoregulation and Functional Outcome After Ischemic Stroke. *Stroke* 2024. <https://doi.org/10.1161/STROKEAHA.123.045700>
- ◆ Bird et al. Shining a light on cerebral autoregulation: Are we anywhere near the truth? *J Cereb Blood Flow Metab* 2024. <https://doi.org/10.1177/0271678X241245488>
- ◆ Burma et al. A systematic review, meta-analysis, and meta-regression amalgamating the driven approaches used to quantify dynamic cerebral autoregulation. *J Cereb Blood Flow Metab* 2024. <https://doi.org/10.1177/0271678X241235878>
- ◆ Labrecque et al. Directional sensitivity of the cerebral pressure-flow relationship during forced oscillations induced by oscillatory lower body negative pressure. *J Cereb Blood Flow Metab* 2024. <https://doi.org/10.1177/0271678X241247633>
- ◆ Machado et al. Measurement of resistance-area product by transcranial Doppler: An alternative tool for cognitive screening in hypertensive on drug treatment? *Cerebr Circ Cogn Behav* 2023 <https://doi.org/10.1016/j.cccb.2023.100191>
- ◆ Panerai et al. The effect of hypercapnia on the directional sensitivity of dynamic cerebral autoregulation and the influence of age and sex. *J Cereb Blood Flow Metab* 2024. <https://doi.org/10.1177/0271678X231203475>
- ◆ Payne. Dynamic cerebral autoregulation is governed by two time constants: Arterial transit time and feedback time constant. *J Physiol* 2024. <https://doi.org/10.1113/JP285679>
- ◆ Rosenberg et al. Hemorrhage at high altitude: impact of sustained hypobaric hypoxia on cerebral blood flow, tissue oxygenation, and tolerance to simulated hemorrhage in humans. *Eur J Appl Physiol* 2024. <https://doi.org/10.1007/s00421-024-05450-1>
- ◆ Tymko et al. Acute isometric and dynamic exercise do not alter cerebral sympathetic nerve activity in healthy humans. *J Cereb Blood Flow Metab* 2024. <https://doi.org/10.1177/0271678X24124>
- ◆ Weijis et al. Cerebrovascular CO₂ reactivity and dynamic cerebral autoregulation through the eighth decade of life and their implications for cognitive decline. *J Cereb Blood Flow Metab* 2023. <https://doi.org/10.1177/0271678X231219568>
- ◆ Whitaker et al. Lower dynamic cerebral autoregulation following acute bout of low-volume high-intensity interval exercise in chronic stroke compared to healthy adults. *J Appl Physiol* 2024. <https://doi.org/10.1152/jappphysiol.00635.2023>

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Membership Enquiries:

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