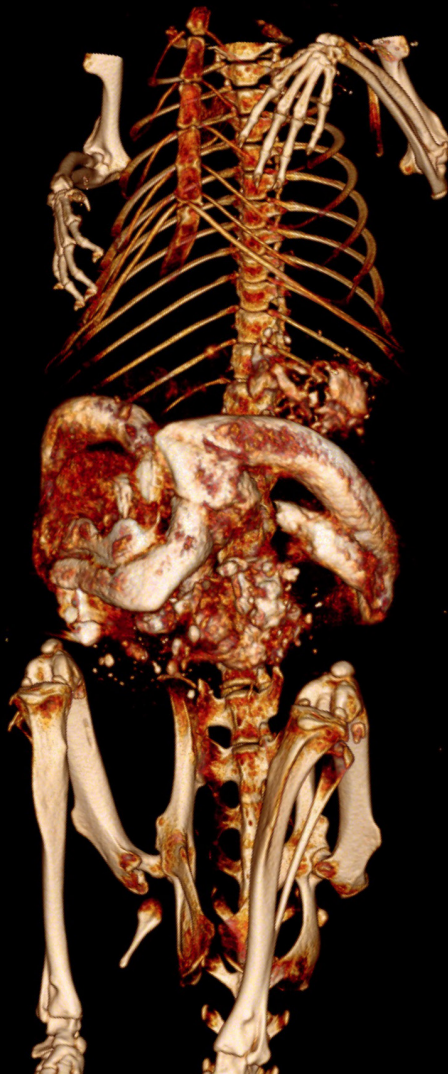




DEPARTMENT OF

Medicine 2022

Queen's CardioPulmonary Unit (QCPU)



Cover Photo captured by Dr. Elahe Alizadeh for Dr. Stephen Vanner and team from the Gastrointestinal Disease Research Unit (GIDRU) for the published study entitled: *Evolving acidic microenvironments during colitis provide selective analgesic targets for a pH-sensitive opioid*. Image denotes contrast-enhanced CT scan of the gastrointestinal tract of mouse with acute colitis (pre-treatment).

MESSAGE FROM OUR DIRECTOR



Dr. Stephen Archer,
MD, FRCP, FRSC, FAHA, FACC
Scientific Director of QCPU

2022, our 5th year in operation, has been another year of growth for QCPU. We now support the research of 66 faculty members from 27 Departments spread across 3 faculties. Projects range from sequencing the genome of prawns, to imaging bones, asphalt, gemstones, beating mouse hearts (and making the occasional CT scan of a Kinder Surprise to delight visiting school children).

QCPU was originally envisioned as a center to support heart and lung research, with an emphasis on diseases like pulmonary hypertension; however, it has long since evolved into a broad research core facility that advances all forms of research, including science outside the biomedical field.

The QCPU model is unique. We use state-of-the-art research core platforms, each to connected to Queen's high-performance Center for Advanced Computing, to elevate the science generated by faculty members at Queen's University. Each QCPU research platform is operated by one of our six expert scientists. These scientists work with faculty members and their trainees to optimally plan studies, perform the research, and then return data to the faculty member. The users pay an hourly fee or a bundled SuperUser package and own their data. This highly competent core model has elevated the quality and quantity of science performed at Queen's. For example in 2022, QCPU's scientists were acknowledged in 28 publications, and we

wrote 9 letters of support for large grant applications, 4 of which were awarded.

What is less well known about QCPU is our educational impact. On a daily basis we train the undergraduate and graduate students of our faculty clients. This year 11 TMED students have benefited from hands on training by QCPU scientists, who provide invaluable practical training as they pursue their research aspirations.

QCPU and its 6 scientists are highly engaged in outreach and capacity building in science. Our scientists are highly involved in Canada's scientific platform associations including the Canadian Cytometry and Microscopy Association (CCMA) and the Canadian Network of Platform Scientists (CNSP). This year we hosted a Diplomatic mission of 13 represented countries in partnership with the City of Kingston, focused on building scientific liaisons with Queen's University. In addition, through our outreach programs, such as Science Rendezvous, we inspire the next generation of school children to aspire to careers in science through videos, live shows and summer camp programs. QCPU also supports Women in Science at Queen's (WISQ), a grass roots group that supports women across all STEM research fields. WISQ was founded by one of our scientists, Dr. Patricia Lima.

Another aspect of QCPU that may not be widely known is our partnership with Kingston Health Science Center (KHSC). We are in our 5th year as a satellite of KHSC and are home to a clinical echocardiography laboratory for patient studies as well as clinics that provide service for pediatric patients.

While we charge users for the scientific services we provide, this fee is highly subsidized. I want to thank the physicians of the Department of Medicine and philanthropists, notably the WJ Henderson Foundation for their ongoing trust and financial support. It is these two funding sources that allow us to keep users fees low.

2023 promises to be exciting as we await the results of a \$17M CFI application for TIME Core, submitted with Co-PI, Dr Lynne Postovit. If funded, TIME Core will add exciting new research platforms to our armamentarium and establish TIME-QCPU at the forefront of Canadian translational research platforms. In 2024 we also plan to open a pulmonary hypertension clinic at QCPU.

A handwritten signature in black ink that reads "Stephen Archer". The signature is fluid and cursive, with the first name "Stephen" and last name "Archer" clearly distinguishable.

Dr. Stephen L Archer
Scientific Director of the Queen's CardioPulmonary Unit (QCPU)
Director of the Translational Institute of Medicine (TIME)

The Queen's Cardiopulmonary unit (QCPU) is an 8000ft² translational research center which was created 7 years ago based on \$10 million funding from the Canada Foundation for Innovation (CFI) and the Government of Ontario. QCPU is an infrastructure platform within TIME (Translational Institute of Medicine), a research institute based in the Department of Medicine.

QCPU's mission includes growing the externally funded research enterprise for the Department of Medicine and QHS, while assisting our faculty and trainees in their efforts to produce cutting-edge research publications and competitive grants. QCPU aspires to embody research excellence and to ensure that Queen's University is recognized internationally as a center for translational research.

Housed within the Bioscience Complex, QCPU is strategically located in the heart of Queen's campus, within a short walk to the School of Medicine Building, Kingston Health Sciences Centre (KHSC) and many departments within the Faculty of Health Sciences (QHS). QCPU has a Bench-to-Bedside philosophy, meaning it endeavours to advance human health by connecting patient care with discovery science. Although we initially had an emphasis on heart, lung, blood and vascular diseases, QCPU has evolved into a broad, translational research facility which provides three faculties of the Queen's research community access to an expert team of scientists and various state-of-the-art research platforms. QCPU is a unique research core not only at Queen's University, but nationally, as its collaborative design allows our team of scientists to conduct a wide variety of research services including histology, super-resolution confocal microscopy, microCT/PET/SPECT-scanning, cell culture, flow cytometry and cell sorting, and next-generation sequencing, and mass cytometry all under one roof. The QCPU scientists not only perform and analyze research, they also provide training for dozens of graduate students and staff each year.

We are also home to a KHSC satellite clinic with clinical trials

capacity. QCPU's KHSC satellite contains a patient reception, echocardiography and pulmonary function laboratories (activation pending), and four patient examination rooms. Historically, the QCPU clinic performs eight echocardiograms (ECHO) per day; however, the clinic operated at a reduced capacity for portions of 2022 due to sonographer shortages caused by the pandemic. The echocardiography laboratory represents a beneficial partnership which provides KHSC with a state-of-the-art imaging facility, and Queen's researchers with access to the services of expert sonographers and ongoing maintenance of the equipment. Since 2021, the QCPU clinic also became home to a paediatric cardiology and a respirology clinic.

Built on existing institutional investments by Queen's University, QCPU enhances existing links between clinical and basic investigators at Queen's and fosters new collaborations between researchers in other faculties and at other universities. QCPU is funded by users-fees, cost-recovery for services provided. We also have received generous gifts from the WJ Henderson Foundation.

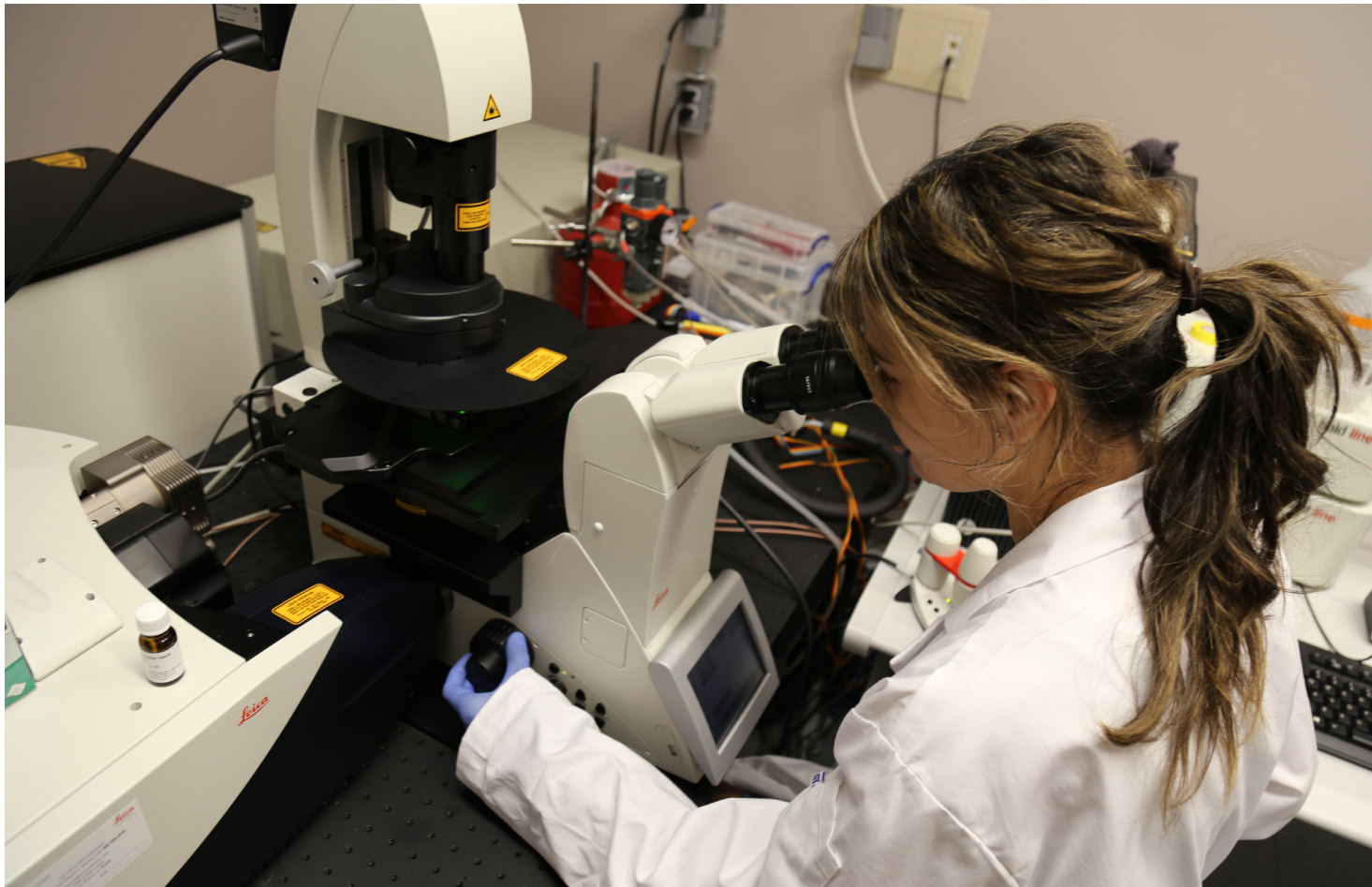
Finally, we thank Dr.
Chris Smith, Head Dept

of Medicine, and our colleagues in the Department of Medicine and Dr Jane Philpott, Dean of Queen's Faculty of Health Sciences (QHS) for financial support of our parent institute, TIME

QCPU is staffed by 6 scientists and is comprised of 5 different laboratories including:

- Physiology and experimental therapeutics
- Molecular and cellular imaging
- Cell culture and flow cytometry
- Genomics, transcriptomics and molecular medicine
- Mass cytometry, proteomics and histology



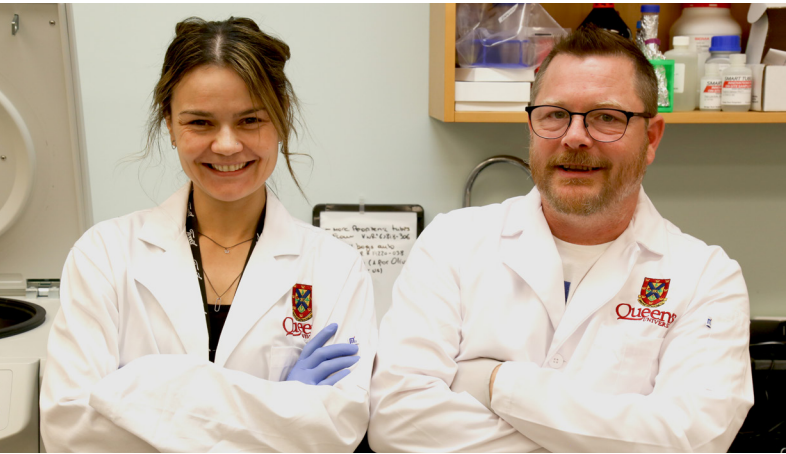


The centre offers faculty and students access to state-of-the-art equipment, much of which exists only within QCPU. Our model is innovative in that services are provided by QCPU's scientists on a cost-recovery basis. This gives the faculty the support of our expert scientists, with their formidable skill sets, as well as access to well-maintained, complex, research platforms.

Examples of key equipment include:

- MILabs Tri-modality micro-CT/SPECT/PET nuclear imaging platform
- Illumina NextSeq550 Sequencing for next-generation sequencing services
- Sony SH800S flow sorter and cytometer
- Leica SP8 confocal and super-resolution microscope upgraded with the 2-photon laser and the OkoLab live imaging system
- Fluidigm Helios/Hyperion mass cytometer
- XCelligence cell culturing system
- Lonza nucleofactor transfection system
- Histology services and electron microscopy
- Luminex MagPix multianalyte analyzer
- Queen's only BioRender license distributor

QCPU BY THE NUMBERS



In 2022, QCPU boasted 13 SuperUsers, defined as users who purchase service in blocks of 208 hours/year (SuperUser A plan) or 104 hours/year (SuperUser B plan) hours/year. Early Career Researchers received a 15% discount on SuperUser packages and hourly usage. SuperUsers also include recipients of an incubator grant from the Translational Institute of Medicine (TIME) competition. We served 66 research groups across 25 departments, and three faculties. QCPU scientists have assisted or mentored over 120 trainees, including research staff, medical students, post-doctoral fellows, graduate students and undergrads.

2022 Metrics:

28

Publications

66

Users

3

Faculties

25

Departments

CLINICAL SATELLITE UNIT

5-Year Metrics:

81

Users

3

Faculties

27

Departments

120

Trainees

623

Citations

In 2022 we continued to provide a vital space for the paediatric congenital cardiology clinic, led by cardiologists Dr. John Smythe and Dr. Mahmoud Alsalehi. In the spring, QCPU's clinic welcomed the establishment of a paediatric respirology clinic for asthma screening, led by Dr. Michael Derynck. This enterprise is advancing patient care in Kingston and the surrounding areas, as well as establish exciting new research projects.



QCPU PROFILES



TRANSLATIONAL RESEARCH UNIT TEAM



Dr. Stephen Archer

**Head, Department of Medicine,
Scientific Director, QCPU**
stephen.archer@queensu.ca

Dr. Stephen Archer is a clinician-scientist and graduate of Queen's University (Meds '81). He is a practicing cardiologist who specializes in the care of patients with various forms of pulmonary hypertension. He is currently the scientific director of the Translational Institute of Medicine (TIME) and QCPU. He enjoys time with family and is an avid hockey player, guitarist,

and coffee drinker.

Dr. Archer returned to Queen's University in 2012 as the Head of Medicine and Program Medical Director for Kingston Health Sciences Center (KHSC; includes Hotel Dieu Hospital, Kingston General Hospital, and Providence Care).

Dr. Archer directs a CIHR-funded research lab, where he and his international team of researchers study basic mechanisms of oxygen sensing, mitochondrial metabolism, mitochondrial dynamics, epigenetics and cardiac inflammation. His team endeavours to translate these basic science discoveries into experimental therapeutics for patent ductus arteriosus, pulmonary hypertension and cancer. Dr. Archer is specifically interested in the cellular and molecular mechanisms by which mitochondria regulate cell proliferation (a process called mitotic fission). He holds several patents for repurposed and novel therapeutics, including the use of inhibitors of pyruvate dehydrogenase kinase (PDK) to treat cancer and inhibitors of dynamin related protein1 (Drp1) to treat cancer and cardiovascular diseases.

He has over 300 publications, and his H-index is 110, with over 52,000+ citations. He has mentored over 70 trainees, many of whom are leaders in science and medicine. His translational cardiovascular research has been recognized with numerous awards, including being elected as a Fellow of the Royal Society of Canada and being awarded Distinguished Scientist Awards from the American Heart Association and American College of Cardiology. He received the AFMC President's Award for Exemplary National Leadership in Academic Medicine in 2019 and was named the Chicago American Heart Association Coeur d'Or recipient in 2013 for leadership in establishing a STEMI network of care for the city of Chicago, while President of the Chicagoland American Heart Association.

tion. In 2020 he was awarded the School of Medicine's C. Franklin and Helene K. Bracken Chair.



Brooke Ring-Snetsinger

Manager, Facilities & Operations QCPU, Research Scientist at QCPU
ringb@queensu.ca

Brooke has 10 years of research experience specializing in molecular biology, cytometry, microscopy and laboratory management.

She graduated with a BSc. Hons In Biochemistry and Molecular Medicine and MSc. in Life Sciences from Trent University. She managed a virology laboratory at Trent University and taught Virology and Infectious Diseases before coming to Queen's University in 2012.

Prior to joining QCPU, Brooke worked as the research assistant for clinician-scientist Dr. Michael Rau in Pathology and Molecular Medicine and provided lab management for multiple research labs in the Pathology department, including the Queen's Laboratory for Molecular Pathology (QLMP). She has expertise running confocal microscopy, flow cytometry, NanoString Technology and Next-Generation Sequencers.

In 2019, she became the Manager of Operations and Facilities at QCPU. Brooke oversees the operation of both the KHSC satellite clinic's daily operations, as well as the state-of-the-art research centre. She not only lends her strong background in lab management to QCPU, but her significant bench experience as a Research Scientist, performing research in the Genomics, Molecular Imaging and Cytometry labs.



Dr. Charlie Hindmarch
Assistant Professor | Genomics, Transcriptomics and Molecular Medicine Specialist | Scientific Operations Director, Translational Institute of Medicine (TIME)
c.hindmarch@queensu.ca

Dr. Charlie Hindmarch is Assistant Professor (DBMS/ DOM) and Director of the Genomics, Transcriptomics, and Molecular Medicine laboratory within Queen's CardioPulmonary Unit (QCPU). Dr Hindmarch is also the Scientific Operations Director for the Translational Institute of Medicine (TIME).

Dr. Hindmarch graduated in 2001 with a BSc in Marine Biology in 2002 (University of Plymouth, UK), in 2003 with an MSc in Biochemical Pharmacology (University of Southampton, UK) and in 2009 with a PhD in Neuroscience and Endocrinology (University of Bristol, UK). Following his PhD, Hindmarch held two consecutive Postdoctoral Fellowships before taking the role of Senior Research Associate at the University of Bristol. Dr Hindmarch has been at Queen's University since early 2016 and currently has 60 published papers (h-index= 26, i10=40).

Dr Hindmarch has research interests within three overlapping domains; 1. The role of hypothalamic, and brainstem structures in the control of sympathetic tone in cardiovascular diseases such as essential hypertension; 2. The role of the right ventricle in pulmonary arterial hypertension (PAH) with specific reference to biological sex, and; 3. Homeostatic control in healthy animals, including both oxygen and hydromineral homeostasis. Dr Hindmarch utilizes well controlled pre-clinical models, and 'omic techniques (genomics, proteomics, transcriptomics etc), together with bioinformatic analysis to investigate these questions.



Dr. Elahe Alizadeh

Assistant Professor (Adjunct) | Imaging & Radiation Physics Specialist
elahe.alizadeh@queensu.ca

Dr. Elahe Alizadeh is QCPU's Imaging and Radiation Physics Specialist. Elahe graduated with a BSc in Applied Physics and an MSc. in Medical-Radiation Physics Program, both from

Amirkabir University of Technology (Tehran Polytechnic), Tehran, Iran. She then obtained her PhD in Nano-Bio-Physics from the University of Innsbruck, Austria. In 2010, she joined Prof. Sanche's lab at the Department of Radiobiology (at Université de Sherbrooke, QC, Canada) as a postdoctoral research fellow; where she designed and constructed a new X-ray apparatus to investigate radiation damage in chemoradiation therapy. Her achievement was recognized with the Radiation Research Society Jack Fowler Award in 2013 for outstanding research in medical physics and radiobiology. She has more than 50 publications with 1600 citations (an h-index = 19, i10 = 29).

In January 2016, she joined the Department of Medical Imaging at the University of Saskatchewan to establish a pre-clinical research program for developing novel radiopharmaceuticals for therapeutic and diagnostic purposes. There she managed an imaging facility which included a micro-PET/SPECT/CT scanner and a radio-chemistry lab.

QCPU PROFILES

Since July 2018, Elahe has implemented and led the nuclear imaging facility within QCPU. She is responsible for the coordination and performance of pre-clinical imaging projects using tri-modality, micro-PET/SPECT/CT scanner (VECTor4CT from MILabs; Utrecht, Netherlands). She also oversees the quality assurance and troubleshooting of radiation equipment. She is a member of the Canadian Radiation Protection Association (CRPA) and serves as a member of the Queen's Radiation Safety Committee in the Department of Environmental Health and Safety. Elahe is also a handcraft designer specializing in Amigurumi (handmade crochet / knitting stuffed animals and toys). In her spare time, she grows collectible houseplants, like different varieties of African violets, succulents and sansevierias.



Dr. Patricia Lima

Assistant Professor (Adjunct) | Molecular Imaging & Cytometry Specialist

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Dr. Lima is a scientist and an Assistant Professor of Medicine (Adjunct) at QCPU. She is QCPU's Molecular Imaging and Cytometry Specialist and provides scientific assistance

for over 30 ongoing research projects. Driven by the philosophy of "let's get this done and get it right", Dr Lima is well known for her enthusiasm, competence, organization skills and scientific knowledge. She co-supervises graduate students focusing on developing their scientific skills and critical thinking. At QCPU, Dr. Lima directs the Imaging Lab (housing the super-resolution SP8 Leica MP and confocal microscope) and the Cell Culture and Cytometry Lab (a fully equipped, biosafety level 2+ facility with a cell sorter and an environmentally controlled cell culture system).

Dr. Lima graduated with a degree in Biological Sciences and obtained her Ph.D. in one of the top Universities in Brazil – UNICAMP. She has focused her graduate studies on Reproductive Immunology, specifically looking into the regulatory mechanisms of Natural Killer cells (NK) during pregnancy and the role of these cells in complications such as miscarriages and preeclampsia. During her postdoctoral training (Queen's University and Ottawa Hospital Research Institute), Dr. Lima focused her research on the study of the immunological and metabolic aspects of women's health, with an emphasis on diabetes during pregnancy and infertility related to endocrine and metabolic disorders, such as polycystic ovarian syndrome (PCOS). Dr. Lima has published 85 publications with 1208

citations and a H-index of 18. She has received several awards recognizing her excellence in research. Her own research program, in collaboration with Dr. Archer, focuses on the role of mitochondria in activating the NLRP3 inflammasome and causing right ventricular failure in pulmonary arterial hypertension (PAH). She is co-PI with Dr. Archer on a CIHR grant to support this research which was ranked #1 in the CVB committee.

Aside from science, Dr. Lima dedicates her time giving back to the community. She is also a volunteer firefighter at the Athens Fire Department where she is a member of the executive, a fire prevention officer, and part of the training and rapid intervention teams. She also leads the Muscular Dystrophy Canada fundraising for research ("The Boot Drive"). At Queen's, Dr. Lima is the founder of the Women in Science at Queen's (WiSQ), which is one of the most active employee resource groups (ERG) at Queen's, with outreach power amongst the scientific community.



Oliver Jones

Histologist and Electron Microscopist

oj3@queensu.ca

Oliver Jones the Histology and Transmission Electron Microscope specialist at QCPU. In 2005, Oliver graduated from Lancaster University (United Kingdom) with a degree in Biochemistry with Biomedicine.

After completing his degree, he was employed as a trainee in histopathology at Manchester Royal Infirmary. During this training, he completed a Post Graduate Certificate (PGC) in Biomedical Sciences, which allowed for his formal registration with the Institute of Biomedical Scientists in the UK. While in this position, he was trained to operate the on-site Transmission Electron Microscope.

In 2010, he was offered a position within Dr. Elaine Petrof's research laboratory at Queen's University, as a histologist, performing image analysis on murine tissue (mainly colonic). Then secured a position within the Queen's Laboratory for Molecular Pathology (QLMP) within the Pathology and Molecular Medicine department. Between 2013 and 2019, he performed a range of histological and microscopy services to the Queen's research community within the scope of a cost recovery model. He has built on his previous experience with electron microscopy providing services for researchers at Queen's University, KHSC, Canadian Cancer Trials Groups (CCTG). In this

time, he also engaged in continuing professional development; training at Sick Kids Hospital in Toronto to prepare and analyze blood samples for dense granule testing on the electron microscope, and training at Queen's where to use an updated electron microscope in the Radioactive Materials Testing Laboratory. Oliver is now one of a few authorized electron microscope operators at Queen's University and performs this service for QCPU users.

In 2018, he was recruited to teach histopathology to students undertaking the Medical Laboratory Assistant (MLA) course. He joined the Queen's CardioPulmonary Unit (QCPU) in the summer of 2020 as the Histology and Transmission Electron Microscope specialist and provides his experience, knowledge and skills as a service to the Queen's research community. Recently, he has been engaged in several research projects with Dr Stephen Archer using electron microscopy to acquire images of mitochondria exposed to *S. aureus* and human coronaviruses.



Curtis Noordhof

**Molecular Imaging &
Cytometry Specialist**
nordhoof@queensu.ca

Curtis Noordhof graduated with a degree in Biological Technology from St Lawrence College. He has 17 years of research experience at Queen's University. During this time, he has been involved in

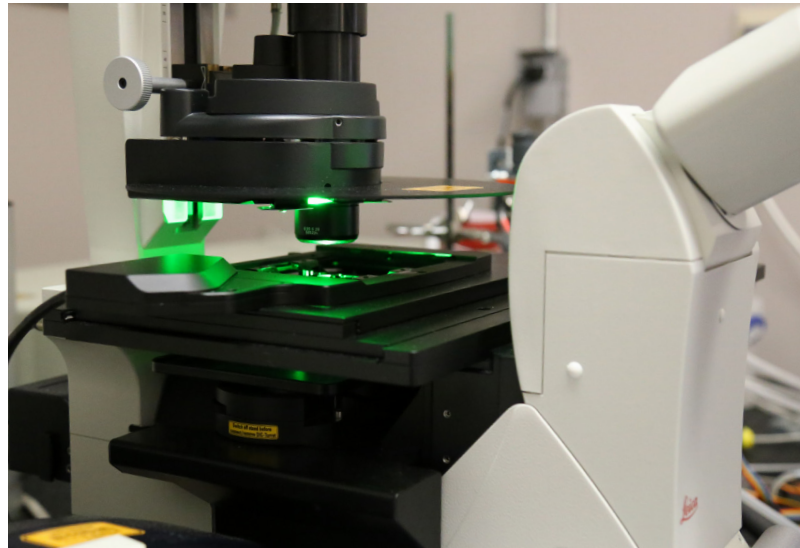
designing and implementing a Health Canada-approved research lab, has inventorship on a patent pending discovery (therapeutic use of bacterial derived proteins) and managed research projects funded by the National Institute of Health (NIH) and the Bill and Malinda Gates Foundation.

Curtis's expertise includes cell culture, molecular biology, animal handling, tissue and cell labelling, microscopy and flow cytometry. In addition, he has experience with budget development, financial management and justification, human and animal work ethics submissions, and biosafety certifications. Before joining QCPU, he worked as a research assistant at the Department of Biochemistry. After that, he took the role of laboratory manager and senior research assistant at the Gastrointestinal Disease Research Unit (GIDRU). At GIDRU, Curtis had the crucial role of maintaining and operating the "robo gut" bioreactor.

In 2021, Curtis joined the QCPU team to follow his passion for technology and applied science. He saw QCPU as an opportu-

nity to work with state-of-art technology and improve his scientific skills while offering his long-term expertise to the Queen's community. Curtis has gained tremendous experience in molecular imaging, flow cytometry and sorting. He has already helped several QCPU users to build panels and run and troubleshoot experiments. Examples include cell sorting of various stem-cell populations and absolute quantification of biofilm-forming bacteria in Kingston drinkable water using flow cytometry. He assists Dr. Patricia Lima in managing the Cell Culture and Cytometry and the Molecular Imaging laboratories.

Outside of the lab, Curtis is a dog-lover and appreciator of the country lifestyle. Curtis is a talented and passionate musician that has gained Kingston nights as a professional guitar player and vocalist! His weekends are filled with fun band practices, music composition and family. His sense of humour and positivity at the QCPU are contagious, which makes him a perfect team player.



CLINICAL SATELLITE TEAM



DR. JOHN SMYTHE

**Paediatric Cardiologist |
Associate Professor,
Department of Paediatrics**

Dr. John Smythe is a full-time Associate Professor of Pediatrics and Pediatric Cardiologist. Dr. Smythe is a graduate of the Queen's School of Medicine. He completed his

residency training in General Pediatrics at the University of Ottawa and his fellowship in Pediatric Cardiology at the University of Toronto.

His work in Pediatric Cardiology includes consultation on a broad range of cardiac diseases in children and congenital heart disease in adults. He is an accomplished educator and is a member (and past program director, of the Pediatric Residency Program. Dr. Smythe is also a former Associate Dean of Student Affairs and remains actively involved in student wellness. His research interests include mindfulness training and its relevance to personal and professional well-being and competence for physicians and medical trainees.



DR. MICHAEL DERYNCKS

**Paediatric Cardiologist |
Assistant Professor,
Department of Paediatrics**

Dr. Michael Derynck is an Assistant Professor of Pediatrics and Pediatric Respirologist at Queen's University. He joined the department in September 2019 and was cross appointed

to the Department of Medicine in 2021. Dr. Derynck cares for patients with asthma, interstitial lung disease, congenital lung abnormalities and sleep disordered breathing. Dr. Derynck is also the medical director of the Pediatric Cystic Fibrosis (CF) Clinic and CF Newborn Screening programs at KHSC and provides inpatient coverage of the pediatric ward and critical care unit.

Dr. Derynck completed medical school at the University of Western Ontario in 2013. He completed pediatric residency at Queen's University in 2017 and subspecialty training in

pediatric respirology at the University of Calgary in 2019.

Dr. Derynck collaborates in research focused on CF genetics, CF newborn screening, and pediatric tracheostomy care. He enjoys teaching pediatric and pediatric respiratory medicine to medical students and postgraduate trainees. Dr. Derynck enjoys kayaking, choral singing and travelling.



DR. MAHMOUD ALSALEHI

**Paediatric Cardiologist |
Assistant Professor,
Department of Paediatrics**

Dr. Mahmoud Alsalehi is an Assistant Professor of Pediatrics and Pediatric Cardiologist at Queen's University. He joined the department in January 2022. His work includes management of

pediatric patients with congenital heart disease, acquired heart disease, heart failure or arrhythmia. He also runs a Fetal Cardiology Clinic for prenatal diagnosis of congenital heart disease by fetal echocardiography, in addition to delivery planning and family counselling.

Dr. Alsalehi was a graduate from Al-Quds University in Jerusalem in 2007. He completed his residency training in General Pediatrics at the Al-Naser Pediatric Hospital in Gaza, Palestine. He subsequently completed his Pediatric Cardiology fellowship training in 2019 at Hospital for Sick Children, University of Toronto.

Upon completing his fellowship, Dr. Alsalehi moved to China, where he worked as a pediatric cardiologist at TEDA International Cardiovascular Hospital (TICH) in Tianjin. His work was a part of the SickKids International (SKI) collaborative. Dr. Alsalehi was instrumental in supporting the project and teams to sustain positive change and improve the clinical outcomes produced through the collaboration between SickKids and TICH.

Dr. Alsalehi is very interested in medical education. He worked as a clinical coordinator of the pediatric training course in the Faculty of Medicine in Gaza for two years. Being a part of SickKids-TICH collaborative between 2019 and 2021. He also practiced different models of clinical education and guided many teaching sessions in pediatric cardiology medicine.

His research interests include coronary anomalies in children and quality improvement of pediatric cardiology service in low resource settings. In his off hours, he enjoys playing soccer, travelling, and reading.



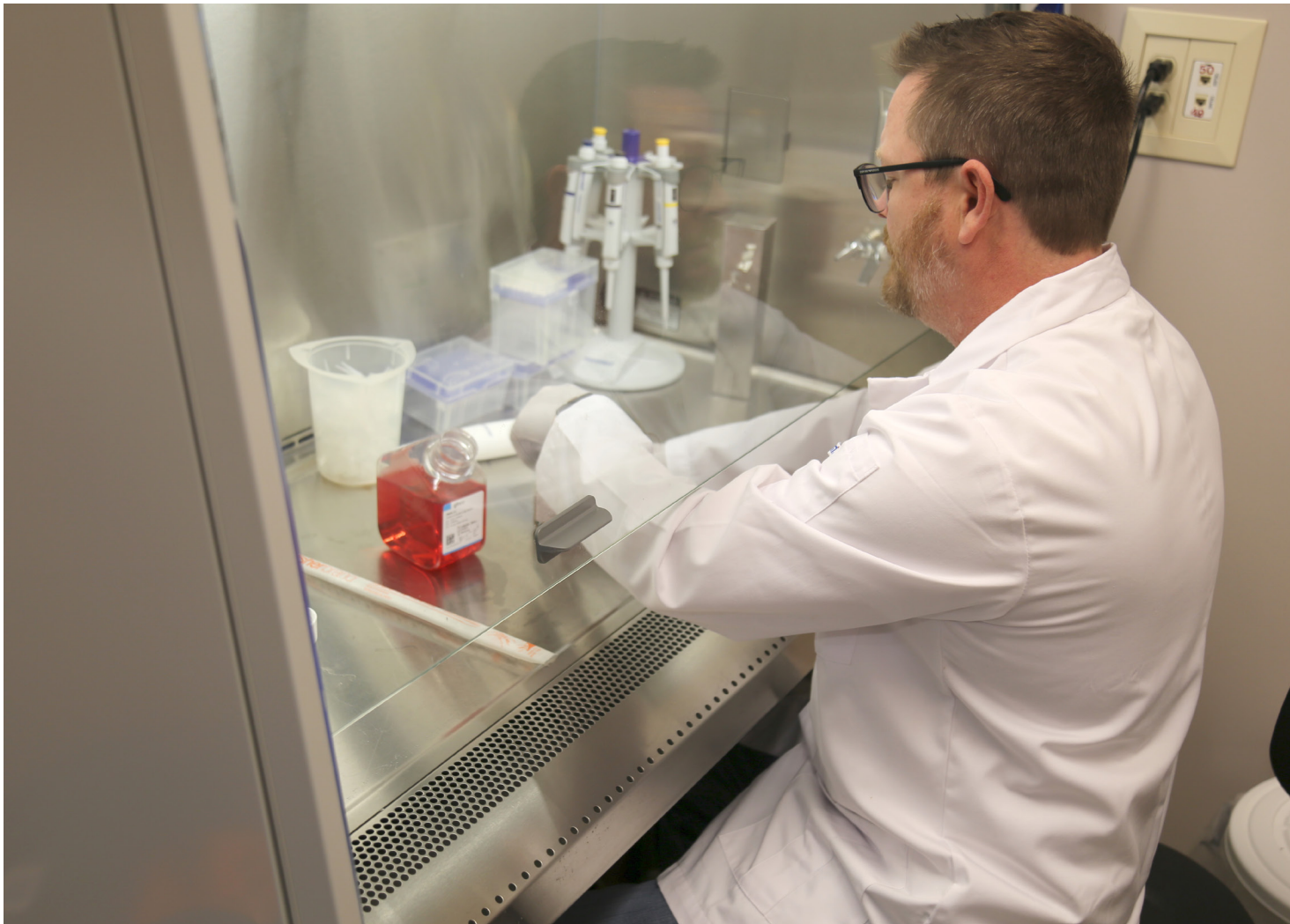
Casey Salata
ECHO Lab Sonographer



Jennifer Hutchinson
ECHO Lab Paediatric
Sonographer

Cheryl Shaw
ECHO Lab Paediatric
Sonographer

Liz Bullet
QCPU Clinic Administrator



USER LISTS (PI, DEPARTMENT)

USER				QHS																	FAE					FAS				
	SuperUser	Hourly	BioRender	Medicine	DBMS	PMM	GIDRU	CRI	CNS	Surgery	Urology	ObsGyn	Critical Care	Paediatrics	Ophthalmology	PM&R	SKHS	Psychology	Animal Care	Psychiatry	Civil Eng	Chemical Eng	E&CE	GeoEng	Mechanical Eng	Biology	Chemistry	Geology Sci	Computing	Industry
Archer Stephen	●		●	●																										
Abraham Sheela	●	●	●		●																									
Dunham-Snary Kimberly	●		●	●	●																									
Johri Amer	●		●	●		●																								
Lillicrap David	●					●																								
Maslove David	●		●	●									●																	
Mulder Dan	●		●		●		●							●																
Petkovich Martin	●				●			●																						
Postovit Lynne	●				●																									
Reed David	●		●	●			●																							
Rullo Jacob	●				●										●															
Sheth Prameet	●					●	●																							
Vanner Stephen	●		●	●			●																							
Adams Michael		●			●						●																			
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Amsden Brian		●	●																			●								
Andrew RD			●		●																									
Appireddy Ramana			●	●																										
Banfield Bruce		●	●		●																									
Bardana Davide		●								●																				
Bendena William			●																							●				
Boehnke Susan		●			●				●																					●
Champagne Pascale		●																				●					●			
Chin-Sang Ian			●																							●				
Colautti Robert			●																							●				
Colpitts Che		●	●		●																									
Craig Andrew			●		●			●																						
Crocker Susan			●			●			●																					
Davies Peter		●	●		●																									
DeFelice Fernanda			●		●				●											●										
Dick Sarah			●		●																									
Feilotter Harriet			●			●																								
Fillion Yves		●						●														●								
Fitzpatrick Lindsey			●		●																	●								
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USER LISTS (PI, DEPARTMENT)

USER				QHS																	FAE					FAS					
	SuperUser	Hourly	BioRender	Medicine	DBMS	PMM	GIDRU	CRI	CNS	Surgery	Urology	ObsGyn	Critical Care	Paediatrics	Ophthalmology	PM&R	SKHS	Psychology	Animal Care	Psychiatry	Civil Eng	Chemical Eng	E&CE	GeoEng	Mechanical Eng	Biology	Chemistry	Geology Sci	Computing	Industry	
Gallivan Jason			●	●														●													
Gee Katrina				●																											
Ghasemlou Nader		●		●																											
Graham Charles		●	●	●			●																								
Iftene Felicia		●																		●											
James Paula		●	●	●		●																									
Kan Frederick		●		●																											
Kontopoulou Marianna		●																				●					●				
Koti Madhuri		●		●			●				●	●																			
McGlory Chris		●		●													●														
Melanson Michael		●		●												●															
Milev Roumen		●							●									●		●											
Monaghan Jacqueline			●																							●					
Mousavi Parvin		●																					●						●		
Mulligan Lois		●		●	●		●																								
Munoz Doug		●							●																						●
Natale David		●		●								●																			
Neuractas Neuractas		●																													●
Oleschiuk Richard		●																									●				
Ormiston Mark		●		●						●																					
Ozolins Terence		●		●																											
Panchenko Anna			●	●			●																								
Payne Sarah Jane		●																			●										
Ploeg Heidi		●																						●							
Purzner James		●		●						●																					
Rauh Michael			●		●		●																								
Renwick Neil			●		●																										
Snedden Wayne			●																							●					
Tayade Chandra			●	●																											
Walia Jagdeep		●			●									●																	
Winterborn Andrew		●																	●												
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Toastmasters @ Queen's University meets at the QCPU Boardroom in the Biosciences Building on the Queen's campus weekly from 5:30-6:30 p.m. on Thursday evenings. Toastmasters is a global organization that was first formed over 100 years ago. This organization is geared toward assisting individuals develop leadership and communication skills within their own contexts.

At present, our club has 16 members and the QCPU Boardroom provides an excellent venue for us to meet in a hybrid format. The room has two large screen televisions that permit mirroring of Apple devices that include Mac laptops and iPads with HDMI connectivity. When paired with online platforms such as Zoom and in-room device cameras, it enables online guests/members to fully view the boardroom. Furthermore, in person members/guests can interact with online audience with ease through this set up. Other technical items/services that enhance the overall experience include camera stands, guest WiFi, and additional power cords.

With this spacious room and cozy seating at our disposal, it creates a comfortable and welcoming environment that will continue to support the growth of our club. Overall, this is an outstanding facility and we are very grateful that QCPU has granted us the use of their boardroom. Going forward, this will continue to help us develop our club, attract new members, and maintain the high standards and traditions of Toastmasters.

AL MACVICAR
President 2022-2023
Toastmasters @ Queen's

SUPERUSER PROFILES



Dr. Stephen Archer

Dr. Archer is a CIHR funded cardiologist and clinician-scientist. *See introduction.*



Dr. David Lillicrap

Dr. Lillicrap is a CIHR and CRC Tier 1 funded researcher. His research explores the molecular aspects of blood coagulation to improve the diagnosis and treatment of patients with bleeding disorders. His research team use a combination of molecular technologies to improve the understanding of common inherited bleeding disorders, such as hemophilia and von Willebrand disease to identify cures.



Dr. Lynne Postovit

Dr. Lynne Postovit is a CIHR, CFI and CCSRI-funded researcher. The focus of her research program is to determine what types of microenvironments regulate normal and cancer stem cell plasticity and function, and to elucidate the mechanisms by which such microenvironments elicit their effects. Ultimately, these studies will lead to the development of methods to maintain normal stem cell pluripotency and to inhibit cancer cell plasticity and metastasis.



Dr. Stephen Vanner

Dr. Stephen Vanner is a CIHR funded researcher and is the scientific director of the Gastrointestinal Diseases Research Unit (GIDRU) and Translational

Institute of Medicine (TIME). Dr. Vanner has expertise in gastrointestinal motility disorders. He has an established translational research program that examines mechanisms underlying pain signaling and motility in the gastrointestinal tract, relevant to irritable bowel syndrome (IBS) and inflammatory bowel disease (IBD).



Dr. Daniel Mulder

Dr. Daniel Mulder is a pediatric gastroenterologist who studies the effects of the immune system on the gastrointestinal tract, his research program aims to use laboratory-based immunophenotyping techniques to create molecular “fingerprints” of individual IBD patients to improve patient outcomes.

SUPERUSER PROFILES (CONT'D)



Dr. Prameet Sheth

Dr. Prameet Sheth is a clinical microbiologist, his research laboratory aims to identify bacteria and define bacterial communities that can be used to treat colitis as well as other illnesses linked to dysfunction in the gut microbiota.



Dr. David Reed

An early career researcher with a clinical interest in gastrointestinal motility disorders. His research interest is how the interaction of luminal factors (e.g. dietary components) with stress or the microbiota modulates pain signaling and motility in disorders such as irritable bowel syndrome.



Dr. Martin Petkovich

Dr. Martin Petkovich a senior researcher whose lab's focus is on understanding the role of hormone receptor signalling in health and disease. Current efforts of investigation include retinoic acids effects on osteoblast differentiation in diseases such as chronic kidney disease (CKD) which can result in inappropriate ectopic phosphatemic activation of osteochondrogenic pathways, resulting in mineralization of cardiovascular tissues.



Dr. Amer Johri

Dr. Johri is a mid-career researcher funded by CIHR and the Heart and Stroke Foundation. He serves on the management board of QCPU. He is also

founder and director of the Cardiovascular Imaging Network at Queen's (CINQ). His research interests include 3D echocardiography, quality control in the echo lab, interventional echocardiography, and Hand-Held Cardiac Ultrasound. He also has extensive experience in echo-guided CRT optimization and TEE-guided percutaneous aortic valve replacement (TAVI). Dr. Johri's current research interests include the investigation of carotid intimal medial thickening as a readily accessible surrogate to diagnose vulnerable coronary artery atherosclerotic plaques.



Dr. David Maslove

Dr. Maslove is a NSERC-funded young investigator and clinician-scientist with the Department of Medicine, and the Critical Care Department. His research focuses on informatics, genomics, and the use of biomedical Big Data to address current challenges in Critical Care Medicine. The Maslove lab leverages the power of randomization in a clinical trial of vitamin C in sepsis to ask: Are there molecular subtypes of sepsis that portend a positive response to treatment, and why do certain subtypes respond to vitamin C better than others?

SUPERUSER PROFILES (CONT'D)



Dr. Sheela Abraham

Dr. Sheela Abraham is an early career researcher who studies interrogating signalling events critical to the development and maintenance of both normal haematopoietic and cancer stem cells. To accomplish this, her research integrates biochemical and molecular biological techniques, primary human tissue culturing techniques, nanoparticle characterization and sizing, chromatography, mass spectrometry (MS), RNA sequencing (RNAseq) microscopy, flow cytometry, bioinformatics and network analyses.



Dr. Kimberly Dunham-Snary

Dr. Kimberly Dunham-Snary is an early career research who established the MitoMetaLab, which studies cardiometabolic disease, CMD. This lab investigates the links between mitochondrial genetics, mitochondrial dynamics, metabolomics - large-scale studies of small molecules that are the products of caloric intake (metabolites), and the cell signalling pathways that control proliferation. They use preclinical models of CMDs and patients with differing mitochondrial genetic ancestry to elucidate how these key players are linked. Her longterm goal is to identify circulating biomarkers of CMD and develop a mitochondrial-metabolomic fingerprint for CMDs that can be deployed in the clinic. Using this interdisciplinary approach, The Dunham-Snary lab strive to i) improve early intervention for subpopulations at increased risk for CMD; ii) identify new therapeutic targets to ease the current healthcare burden; and iii) provide new tools to advance the initiative of precision/personalized medicine.



Dr. Jacob Rullo

Dr. Jacob Rullo is a SEAMO-funded translational clinician-scientist in the Department of Ophthalmology, cross-appointed to the Departments of Biomedical and Molecular Sciences and Medicine. His primary focus is neuro-ophthalmology, which deals with diseases of the eye-brain axis. More specifically his research focuses on characterizing differences in the ocular microenvironment with respect to the discovery of novel biomolecules/biomarkers, understanding intraocular immune mechanisms, and the immune biology of the external ocular surface.

2022 HIGHLIGHTS

HIGHLIGHTS

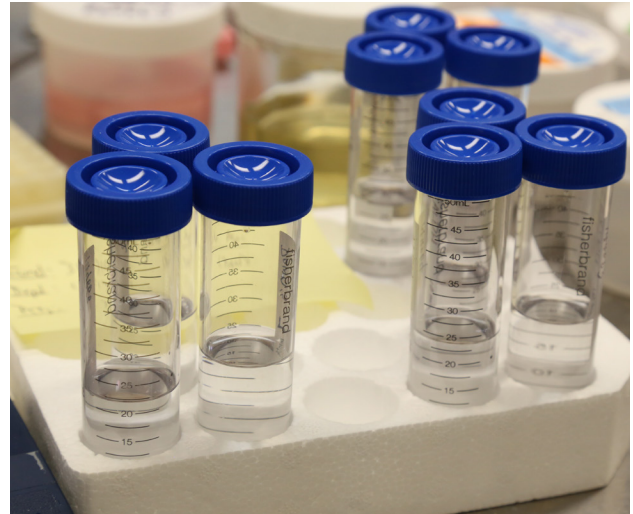
Diplomatic Visit


On September 2nd, 2022, the Queen's CardioPulmonary Unit (QCPU) was honoured to host a global diplomatic delegation in partnership with Kingston Economic Development Corporation (KEDCO). The purpose of the visit was to build awareness and attract international companies and investments opportunities to Kingston – particularly in the Health Sciences. The visit was hosted by the International Vice-Provost, Dr. Sandra den Otter and the director of the Office of Partnerships and Innovations, Dr. Jim Banting. Representative from the countries included: Austria, Belgium, Denmark, Germany, Greece, Hungary, Iceland, Japan, Malaysia, Portugal, Slovenia, Spain, and Switzerland. Diplomats were given a VIP tour of QCPU by Scientific Director Dr. Stephen Archer, and met QCPU scientists, saw state of the are equipment in action and witnessed key research projects within the Queen's research community the scientists, see some of the state-of-the-art equipment in action and showcase some of the critically important research happening in the Queen's research community.



TIME Core

In 2022, Dr. Archer, and Dr. Postovit are co-PI applicants , with a team of 18 additional faculty members on an ambitious CFI grant application to create TIME Core. Those project includes 8 other named investigators at Queen's. The writing of this \$17M grant was ably assisted by Dr. Hindmarch and Brooke Ring who provided administrative and intellectual input.



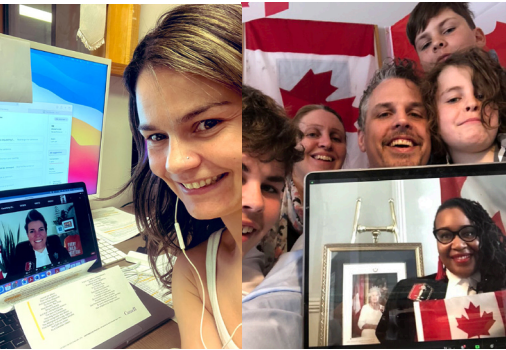
A woman with long dark hair, wearing a white lab coat and a black face mask, is working in a laboratory. She is holding a small object, possibly a pipette tip, and looking down at it. The background is a blurred laboratory setting with various equipment and shelves.

"Our research group investigates the formation of biofilms inside drinking water infrastructure using full scale experiments. Experimental challenges include the monitoring of bacterial populations in the water and biofilm, as well as producing microscopic evidence of biofilm development on inner surfaces of pipes. Connecting to QCPU almost three years ago was a game changer for our research group, since not only did it give us access to key technology to support our experiments, but also because the staff at QCPU have devoted an important amount of time in helping us advance our research goals. Dr. Patricia Lima and Curtis Noordhof have embraced the new challenges that our research has brought to their facility and they have helped our research group analyze a large number of flow cytometry samples to monitor bacteria in drinking water. Dr. Patricia Lima has also become our main technical reference in fluorescence microscopy, while her advice over the years was also a large determinant for our success in producing biofilms images."

ARTUR SASS BRAGA, PH.D.

Adjunct Professor and Postdoctoral Fellow
Civil Engineering Department under the supervision of Dr. Yves Fillion

NOTABLE MOMENTS OF 2022



- Dr. Lima and Dr. Hindmarch became Canadian citizens!
- QCPU celebrated 5-years of sciences with the Queen's research Community
- Dr. Hindmarch gave a 5a7 research talk entitled "Reading the Book of Life: Turning the Page for Discovery Science."
- Dr. Hindmarch awarded Outstanding Volunteer for Science Rendezvous
- Dr. Lima went to PVRI in Greece and presented her abstract: Sexual dimorphism in the immune system in group 1 pulmonary hypertension: does it play a role in right ventricular failure's
- Dr. Lima conducted a Flow Cytometry at the Federal University of Sao Paulo (UNIFESP) Brazil
- Dr. Hindmarch was invited to the Illumina Headquarters in Sao Paulo Brazil to deliver two workshops, one on the analysis of single-cell transcriptome data and the other on basic coding in the R environment for molecular biologists

OUTREACH

SCIENCE RENDEZVOUS

Science Rendezvous Kingston is part of the annual Canada-wide Science Rendezvous events and is a not-for-profit organization dedicated to providing programming by bringing exciting research and stem experiences to the public. The science rendezvous program is a free family festival that takes science out of the lab and onto the streets, or virtually into the classroom and homes of scientifically curious minds. In 2022, the Kingston chapter had a hybrid event with a virtual experience and returned to a (scaled back) in-person event at the Leon's Center, downtown Kingston.

As part of our participation in Science Rendezvous, QCPU created the 'QCPU Edu-Lab' a YouTube Kids video series about DIY at home science projects and 2 more videos contributed to the virtual version of Science Rendezvous Kingston for 2022. The first video was Dr. Elahe Alizadeh's 'Learning about X-Rays', where she teaches about the theory of X-rays and gives a few demonstrations using her CT-scanner

– including seeing the toy inside a Kinder egg surprise without unwrapping it. The second video was created by Dr. Charlie Hindmarch our resident 'mad British scientist' who shows viewers how to make a working stethoscope at home. We were also very fortunate this year to be included in the in-person event at the Leon's Center and were visited by over 2,500 participants. Our booth included microscopes with slides for kids to observe cells at 400X magnification and some working models with take-home handouts to continue the science fun at home!



OUTREACH

Women in Science at Queen's University (WiSQ)

The Women in Science Queen's (WiSQ) was founded in 2019 by Dr. Patricia Lima. She envisioned promoting a healthy and inclusive environment in the scientific community at Queen's. The idea of fostering discussions about equity, wellness, career development, and means to retain women in science at Queen's was endorsed by the Human Rights and Equity Office and funded by the Inclusive Community Fund (ICF). Since then, the WiSQ group has grown in leadership and gained several followers within the Kingston community. Other QCPU members volunteering in the WiSQ executive activities are Brooke Ring, Dr. Elahe Alizadeh, Rachel Bentley and Dr. Ruaa Al-Qazazi.

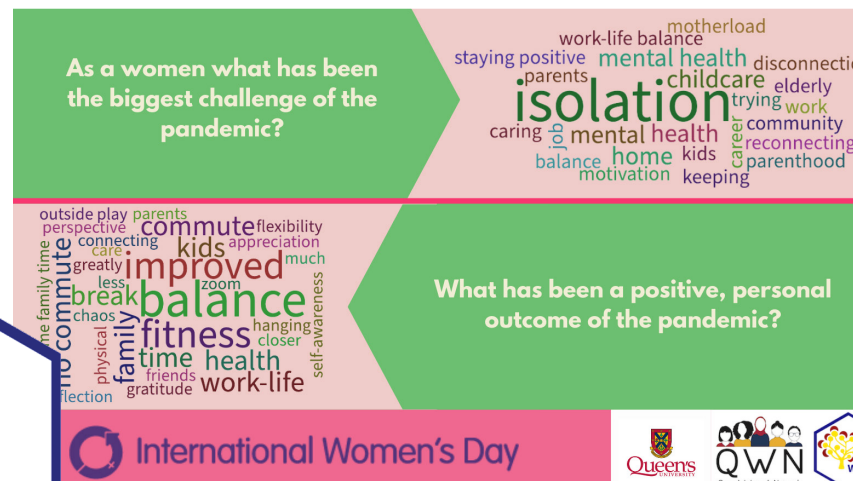
In 2022, we were awarded \$1500 in funding to continue our programing, we pivoted the focus of our events to be less frequent – but featuring more notable speakers. We hosted four high impact events, including three seminars with the local speakers, QHS Dean Jane Philpott, Vice Principals of Research (Nancy Ross) and Equity (Stephanie Simpson) and Equity Nancy Ross and Stephanie Simpson and a work life balance from FAS faculty member Megan Edgelow. We also co-hosted an event for International Women's Day on March 8th with the Queen's Women Network (QWN) – another ERG group.

WiSQ seminars were also part of Queen's Global Summer Program (QGSP), a course which provides an introduction to the United Nations Global Goals (currently, Sustainable Development Goals or SDGs) aimed at providing foundational knowledge on the range of issues addressed by these goals, and skills necessary to begin evaluating these goals. The course com-

bines lectures, supervised groupwork, experiential learning opportunities, and independent research on individual global goals as a means for interdisciplinary problem solving. Specific modules focus on inequity, food security, gender equality, health and well-being, Indigeneity, biodiversity, climate action, policy. Individual capstone projects will put particular emphasis on the sustainable development goals in practice and practical means for apprehending global problems.

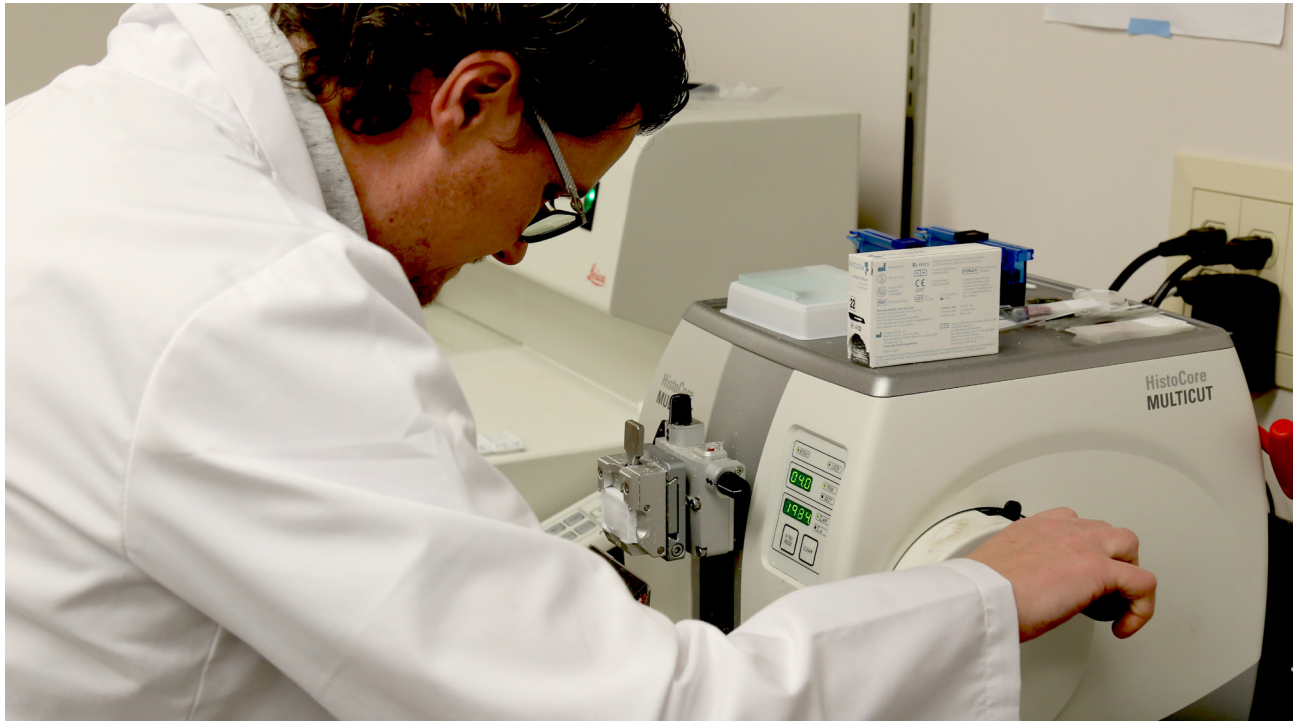
Additionally, WiSQ also continues with their mandate of outreach by touring 25 participants from Girls Inc. through our state-of-art QCPU. WiSQ and QCPU's are looking forward to maintaining this partnership into 2023 and continuing to promote outreach & inclusion in science!

Please follow us on Twitter ([@womeninscience6](https://twitter.com/womeninscience6)) to find out about our events or add our group (Women in Science at Queen's – WiSQ) to Queen's outlook calendar.



Live wordcloud captured on Queen's IWD 2022

GRANT SUPPORT



GRANT SUPPORT *(submitted)*

Canadian Foundation on Innovation (CFI)

Translational Institute of Medicine - Core Facility (TIME Core)

Gairdner Ontario Science

Science Rendezvous Kingston & Queen's CardioPulmonary Unit Science literacy program at Queen's University

Harrington Scholar Innovation

Targeting Dynamin Related Protein 1 (DRP1)-Mediated Mitochondrial Fission in Alzheimer's Disease

Heart & Stroke

The role of Dynamin 2 as a novel regulator of mitochondrial fission in

human and experimental pulmonary arterial hypertension: Epigenetic regulation and therapeutic implications

Canadian Institute of Health Research (CIHR)

The role of Dynamin 2 as a novel regulator of mitochondrial fission in human and experimental pulmonary arterial hypertension: Epigenetic regulation and therapeutic implications

Spatial Gene Profiles for New Bone Formation in Ankylosing Spondylitis Spondyloarthritis Research and Treatment Network (SPARTAN)

Targeting the mitochondrial fusion protein Opa1 in breast cancer

The Role of Mitochondria and the

NLRP3 Inflammasome in Right Ventricular Failure in Pulmonary Arterial Hypertension

Innovative Pathways to Impactful Treatment Of Chronic Schizophrenia: Disrupting The Status-Quo Moving Toward Biologically-Driven, Combined Pharmacological And Non-Pharmacological Therapeutic Approaches To Define Markers Of Therapeutic Improvement In Cognitive Behavioral Therapy For Psychosis Promoted Recovery" & "Implications of brain-derived neurotrophic factor, interleukin-1-beta, and cortisol levels on the therapeutic response to befriending + cognitive behavioral therapy for psychosis

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" My group has been using the QCPU for over 2 years for analysis of our human skeletal muscle and blood samples. We initially worked with Oliver Jones to assess mitochondrial volume density using transmission electron microscopy and are now using the facility to perform some cell culture experiments lead by Curtis Noordhof. The state-of-the art facilities and high-quality analysis delivered by the QCPU have been invaluable in the development of my research program and the acquisition of external grant funding. Specifically, the scientists work with you to develop the analysis and are always willing to go the extra mile to get things right, even if that takes time. One unique aspect of the QCPU is that my students and trainees received expert tuition on the techniques involved in the analysis of the samples we send. So, in addition to delivering robust and reproducible data my trainees are also exposed how the techniques are performed. In sum, I look forward to continuing to work with the excellent scientists at the QCPU and highly recommend their services.

DR. CHRIS MCGLORY, PHD

Assistant Professor
School of Kinesiology and Health Studies

FUTURE DIRECTIONS

What is on the horizon for QCPU?

We are making progress in establishing QCPU as one of the premier translational research facilities in Canada. In 2023, **The Translational Institute of Medicine - Core Facility (TIME Core)** If funded, TIME CORE will consist of world-class research platforms that will allow investigators to move bidirectionally from scientific discovery to the treatment of patient populations. The overarching mission of TIME Core is to deliver state-of-the-art research tools that enable fundamental discoveries and facilitate translation of this new knowledge into diagnostic tests and therapies for some of the major diseases affecting the health of Canadians, including Cancer, Cardiopulmonary Diseases, Inflammatory Diseases and Neurodegenerative Diseases. This will be accomplished by offering six contiguous platforms within the BioSciences building (adjacent QCPU) run by expert scientists. TIME Core will catalyze the translation of discovery science by ~20 research groups and over 100 trainees within Queen's Health Science (QHS). TIME Core would elevate Queen's to the forefront of training in areas such as biotechnology, clinical research, and biomolecular sciences, providing our learners and faculty with infrastructure tailored to their research needs. Importantly, it would also accelerate the translation of discoveries into new medicines and biomarkers. For example, **TIME Core** has the potential to enable the delivery of cell

therapies to cancer patients, the development of a microbiome-based therapy for analgesia in inflammatory bowel diseases (IBD), and the elucidation of biomarkers for the early detection of neurodegenerative disorders, like Alzheimer's Disease (AD). It will also catalyze first-in-person clinical trials that will test whether novel mitochondria-targeting agents can be used for the treatment of pulmonary hypertension (PAH). It is our hope that TIME Core will constitute the next step in the evolution of TIME and realize our goals of elevating translational medicine research at Queen's University. In the year ahead, we also plan on creating more opportunities for public outreach and engaging educational programs by taking advantage of the ability to host summer camps and engage more classroom-based lectures with local schools and libraries. We are also looking forward to expanding our clinic's ability to serve more patients in the Kingston and surround areas.

QCPU is dedicated to the enhancement of local, national and international collaboration, and we hope to see an expanse of our metrics of success including increasing our publications, funding and research partnerships, and expanding our interdisciplinary and multi-faculty research while engaging in more education and knowledge translation to elevate research at Queen's!



DEPARTMENT OF

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depmed.queensu.ca/research/teams/qcpu or follow us on Twitter ([@QueensuCPU](https://twitter.com/QueensuCPU)).

