Faculty Of Health Sciences | School of Medicine

# DEPARTMENT OF Queens NOTE OF 2021

Queen's CardioPulmonary Unit (QCPU)



# **ABOUT THE COVER**

Title of photo: The Tiniest Tree of Life Image captured by: Elahe Alizadeh

Description: COVID-19 is an ongoing global health emergency that is often characterized by pneumonia and hypoxemia. Therefore to understand the basis of hypoxemia that occurs in COVID-19 pneumonia, Dr. Archer and team created coronovirus pneumonia in mice by infecting them with MHV-1, a murine coronovirus. The hearts and lungs of mice were perfused with a radio-opaque material (barium). MicroCT images allowed us to evaluate the effects of this coronavirus in mice. The research showed that coronaviruses cause lung injury by damaging mitochondria in airway epithelial cells and vascularcells. This study was published in Redox Biology in 2022. In this control mouse the organs were fixed and scanned using VECTor4CT scanner. The VECTor4CT is the first tri-modality imaging system at Queen's University and combines ultra-high resolution microcomputed tomography ( $\mu$ CT) with positron emission tomography (PET) and SPECT imaging.



#### **MESSAGE FROM OUR DIRECTOR**



Dr. Stephen Archer, MD. FRCP, FRSC, FAHA, FACC Scientific Director of QCPU Greetings to the friends and users of Queen's Cardiopulmonary Unit (QCPU). As most of you know we are a CFI-funded translational research center located within the BioSciences Complex at Queen's University. QCPU is a major scientific infrastructure platform that is part of the Translational Institute of Medicine (TIME). QCPU is supported by cost recovery for services rendered to users, by funds from the physicians in the Department of Medicine, and by philanthropy.

In 2021, QCPU grew by leaps and bounds, supporting the research of faculty and trainees in domains that we could not have envisioned when it opened in 2017 as a heart, lung and vascular research center, focused on pulmonary hypertension. We dealt with the ongoing COVID-19 pandemic, doubled our number of scientific users, created a new clinic for children with congenital heart diseases, and increased our outreach to youth in the community to excite them about careers in science and research. In 2021 we also secured important philanthropic donations from the W. J Henderson Foundation and the physicians of the Department of Medicine.

Originally focused on human and animal health-related research, our team has expanded the breadth of our studies to support scientific enquiry in fields ranging from engineering to chemistry. In 2021, we imaged paving materials, gemstones, and bones with our super-resolution confocal microscope and micro-PET-SPECT CT scanner. We have also sequenced prawns with our NextGen sequencer and performed histology on blueberries and chicken livers. If a project is of interest to our users, and we have the necessary tools and expertise, QCPU is always happy to help bring science to life!

One of my proudest memories of 2021 is that of the QCPU scientists performing research, day in and day out, despite a raging pandemic. For some researchers we were the main scientific platform available during this pandemic year and helped sustain their lab and support the education of their trainees. Through school closures, COVID-19 waves, and personal illnesses, team QCPU enthusiastically performed science on behalf of, and in collaboration with, 55 research groups spread across three faculties at Queen's University. Through their expertise and the mastery of state-of-the-art research platforms, QCPU's team of scientists provided faculty and their trainees with services including transcriptomics, mass cytometry, histology, cell culture, advanced confocal molecular imaging, and micro-PET-SPECT-CT imaging. In partnership with Kingston Health Sciences Centre, we were also home to a clinical cardiac ultrasound satellite in which ~1000 patient echocardiograms were performed. We were also thrilled to be able to provide Dr. John Smythe and Dr. Mahmoud Alsalehi with clinic space in which to run a pediatric congenital heart clinic. These partnerships with KHSC reflect the translational nature of QCPU, which emphasizes a seamless, bidirectional flow from patients to preclinical sciences.

# **MESSAGE FROM OUR DIRECTOR**

In 2021, QCPU hosted numerous engagement activities to advance outreach to the general public and youth, in partnership with the Women in Science at Queen's (WiSQ), Girls Inc, and Upper Canada Girls. We also proudly participated in national science engagement events such as Discovery Day, led by the Medical Hall of Fame, and Science Rendezvous, to create the 'QCPU Edu-lab', a YouTube series to excite school kids about science and inspire them to become researchers.

An exciting milestone in QCPU's 4th year was securing a philanthropic donation of \$500,000 from the W.J. Henderson Foundation. A special thanks to Dr. David Pattenden and Mr. Michael Hickey for their stewardship of this gift and their belief in QCPU and TIME. Inspired by this gift, the physicians of the Department of Medicine matched the gift, with the result that QCPU and TIME received a total of \$1 million, which will be used to support our scientific team and keep our infrastructure platforms up to date.

In the coming year, I look forward to QCPU offering even more foundational and practical training to dozens of graduate students and post-doctoral fellows. We also anticipate pursuing new national grant opportunities, such as CFI, which offer us the opportunity to expand QCPU and secure it's success for years to come.

I leave you with my favourite quote regarding the nature of scientific discovery, from Albert Einstein.

In the light of knowledge attained, the happy achievement seems almost a matter of course, and any intelligent student can grasp it without too much trouble. But the years of anxious searching in the dark, with their intense longing, their alterations of confidence and exhaustion, and the final emergence into the light - only those who have themselves experienced it can understand that. —Albert Einstein

I am proud of the small part team QCPU plays in helping our colleagues emerge into the light.

Stephen Ander

Stephen Archer Scientific Director, QCPU

" I have been lucky to have had access to the services at QCPU for a significant amount of time during my doctoral degree. Although my research only required the flow cytometer/cell sorter, it was reassuring to know that I could advance my hypotheses and research aims in many different directions if I wanted to. However important machines are at doing good, sound, and robust research, they are nothing without the people operating them. In addition to performing the requested assays/services, Dr. Patricia Lima and Curtis Noordhof showed genuine interest in my project and research goals. Knowledgeable, dependable, and flexible – I would not have been able to complete my experiments without them and their drive to generate excellent data. They continue to be fantastic to me and my fellow lab members, and I appreciate their dedication to my many projects."

MATT CORMIER (PhD Candidate in Dr. Lillicrap lab)

# INTRODUCTION



The Queen's CardioPulmonary Unit (QCPU) is an \$8 million, 8000 ft<sup>2</sup> translational research facility. Housed within the Bioscience Complex we are strategically located in the heart of Queen's campus, QCPU is within a short walk to the School of Medicine Building, Kingston Health Sciences Centre (KHSC) and the many departments within QHS. The centre has a Bench-to-Bedside philosophy, meaning it endeavours to advance human health by connecting patient care with discovery science. QCPU was funded by a Canadian Foundation for Innovation (CFI) grant, with matching funds from the Ontario government. QCPU opened in 2017 with Dr. Stephen Archer as the founding scientific irector. Although it initially had an emphasis on heart, lung, blood and vascular diseases QCPU has evolved into a broad, full-service, translational research facility which provides the research community access to an expert team of scientists and many state-of-the-art research platforms. The QCPU scientists not only perform and analyze research, they also provide training for dozens of graduate students.

We are also home to a satellite echocardiography laboratory, which is part of KHSC. This satellite typically performs 8 echocardiograms (ECHO) per day; however, the clinic operated at a reduced capacity for portions of 2021 due to public safety concerns and staff ortages caused by the pandemic. The clinic is home to a full time receptionist and four sonographers; and all clinical images are linked and stored on the Xclera server at KHSC. QCPU has a unique partnership with KHSC which allows 25% of the imaging capacity to be used for clinical research studies. This mutually beneficial partnership provides KHSC with a state-ofthe-art imaging facility, and our researchers with access to the services of expert sonographers and ongoing maintenance of the equipment. We are also home to paediatric cardiology clinics. QCPU also contains patient examination rooms and offers clinical trials capacity.

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 the Department of Medicine, the Queen's Faculty of Health Sciences (QHS) and through cost-recovery for services provided. QCPU's mission includes growing the externally funded research enterprise for the Department of Medicine and QHS and 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.

# **CLINICAL SATELLITE UNIT**



In 2021 we welcomed a paediatric cardiology clinic to our space, led by cardiologists Dr. John Smythe and Dr. Mahmoud Alsalehi. In 2022, QCPU's clinics hope to support establishing a paediatric respirology clinic. This enterprise would advance patient care and establish exciting new research projects.

We welcomed a paediatric cardiology clinic to our space

# TRANSLATIONAL RESEARCH UNIT



This portion of 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 cytometry
- Genomics, transcriptomics and molecular medicin
- Mass cytometry, proteomics and histology



05

Number of laboratories within QCPU

The centre offers faculty access to state-of-the-art equipment, much of which exists only within QCPU. Our model is innovative in that services are provided for faculty by QCPU's scientists on a cost-recovery basis. This gives the faculty the support of our master scientist, with their powerful 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
- 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 Real-Time cell culturing system
- Lonza Nucleofector Transfection System
- Histology services and electron microscopy
- \*NEW\* Luminex MagPix multianalyte analyzer
- \*NEW\* BioRender License Distributor

# **BY THE NUMBERS**

QCPU by the numbers: QCPU was established as a cost-recovery funding model. Our team and our cutting-edge technology helps elevate their research to the next level. In 2021 QCPU boasted 13 SuperUsers, defined as users who purchase service in blocks of 208 (SuperUser A plan) or 104 (SuperUser B plan) hours/year. Superusers also include recipients of an incubator grant from the Translational Institute of Medicine (TIME) competition. We serve 55 research groups across 18 departments, and 3 faculties. QCPU scientists have assisted or mentored over 120 trainees, including research staff, medical students, post-doctoral fellows, graduate students and undergrads.



# **QCPU PROFILES**



#### **Dr. Stephen Archer**

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

Dr. Stephen Archer is a physician-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. His other interests include strategies for improving cardiovascular care and training the next generation of physician-scientists. In his spare time, he enjoys time with family and is an avid hockey player, guitarist, and coffee drinker.

After training at the Royal Columbian Hospital in BC and the Minneapolis Veteran Affairs Medical Center, he joined the faculty at the University of Minnesota in 1988. He spent a decade on faculty and attained the rank of Professor under the guidance of his mentor and friend, Dr. E.K. Weir. He then served as Chief of Cardiology at the University of Alberta (1998-2007) and Chair of Cardiology and Harold Hines Jr Professor at the University of Chicago (2007-12). Dr. Archer then returned to Queen's University 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 in the vasculature in a variety of tissues and disease contexts. Dr Archer is specifically interested in the cellular and molecular mechanisms by which mitochondria, regulate cell proliferation and apoptosis. Dr Archer holds several patents for repurposed and novel therapeutics, some of which target mitochondrial function. He has over 300 publications, and his H-index is 108, with over 47,000 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. In 2020 he was awarded the School of Medicine's C. Franklin and Helene K. Bracken Chair.

#### **Brooke Ring**

Manager, Facilities & Operations, QCPU | Research Scientist ringb@queensu.ca @Brooke\_Ring

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 Rauh in Pathology and Molecular Medicine and also 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, aiding in the Genomics, Molecular Imaging and Cytometry labs.

# 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. 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 care of Pediatric patients with conge-



ni-tal heart disease, acquired heart disease, heart failure or arrhyth-mia. 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 is 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 subse-quently completed his Pediatric Cardiology fellowship training in 2019 in 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, traveling, and reading.

#### Dr. Amer Johri

Associate Professor, Department of Medicine | Director of the CINQ lab <u>cinq.research@gmail.com</u> @amerjohri



Dr. Amer Johri, MD, MSc, FRCPC, FASE is a Professor of Medicine and Director of the Cinqlab.com. This facility and team were awarded two CIHR grants in

2021 (>\$1M). An area of focus for the CINQlab includes Point-ofcare ultrasound (POCUS) which has revolutionized the clinical examination by providing the ability to assess the heart and lungs immediately at the bedside. However, even though POCUS has now emerged as a clinical standard, a major geographic disparity remains - practitioners working in remote areas cannot access POCUS training due to geographical barriers and low resources, contributing to a profound diagnostic care gap in their communities. Rural, Northern, and Indigenous communities are particularly vulnerable due to the lack of imaging access, infrastructure, and investment in training. The Accelerated Remote Consultation Tele-POCUS In Cardiopulmonary Assess-ment (ARCTICA) project addresses these healthcare challenges by: Accelerating virtual teaching of POCUS to geographically remote physicians and provides virtual ongoing live-imaging consultation expertise to Northern or remote communities for continuous quality maintenance.

Dr. Johri and CINQ have been funded by the Canadian Cardiovas-cular Society Challenge for Canada Award and also received an award from the 2021 Spring CIHR & CMA Priority Research

# **QCPU PROFILES**

Announcement. A second area of focus for the Cinqlab includes Vascular Health. Dr. Johri leads the CIRCE Study (Combining Intraplaque Neovascularization with Risk Stratification by Carotid Stress ECHO) which assess the clinical efficacy of carotid ultrasound combined with stress echocardiography. Stress echo (SE) is one of the most accessible tests used to select patients for angiography, but suffers from moderate sensitivity and specificity for cardiovascular (CV) outcomes. Plaque can develop intraplaque neovascularization (IPN) in response to hypoxia or inflammation within the lesion. IPN occurs when vessels grow from the vasa vasorum into the lesion, resulting in a fragile and leaky network at risk of rupture and hemorrhage. IPN can now be quantified using contrast ultrasound. Dr. Johri's research plans to demonstrate that plaque inflammatory activity, detected by IPN, serves as a powerful imaging biomarker to predict CV events and can improve the sensitivity of SE. The proposal is founded upon a simple, inexpensive, and safe addition to the workflow of an existing non-invasive test. This multi-center study in 1,500 patients is expected to establish a new standard for CV risk stratification. Recently, the CIRCE study was the top ranked proposal in its committee and awarded a 2020/2021 CIHR Project Grant. Dr. Johri has supervised numerous students and has published over >130 manuscripts. He is founder of the Echo Fellowship Program at KHSC and is founding editor of the POCUSJournal.



Casey Salata ECHO lab sonographer



Jennifer Hutchinson ECHO lab paediatric sonographer



Peter Leaman ECHO lab manager



Liz Bullet QCPU Clinic Administrator

# TRANSLATIONAL RESEARCH UNIT TEAM



#### **Dr. Charlie Hindmarch**

Assistant Professor (Adjunct) Research Scientist | Genomics, Transcriptomics and Molecular Medicine Specialist| Scientific Operations Director, Translational Institute of Medicine (TIME) <u>c.hindmarch@queensu.ca</u> <u>@DrHindmarch</u>

Dr. Charlie Hindmarch is research scientist, Assistant Professor of

Medicine (Adjunct), Director of the Genomics, Transcriptomics, and Molecular Medicine laboratory within Queen's CardioPulmonary Unit (QCPU), and co-supervises graduate students. Dr Hindmarch is also Scientific Operations Director for the Translational Institute of Medicine (TIME). Dr. Hindmarch graduated in 2001 with a BSc in Marine Biology (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 served as a Senior Research Associate at the University of Bristol. Dr. Hindmarch has previously held visiting Professorships at the University of Malay (Malaysia) and at the Federal Rural University of Rio de Janeiro (Brazil). Dr. Hindmarch has been at Queen's University since early 2016 and currently has 56 published papers (h-index= 22, i10=36). Dr. Hindmarch is Director of the Genomics, Transcriptomics and Molecular Medicine laboratory at QCPU where he is responsible for Next Generation Sequencing and bioinformatics. Dr. Hindmarch also runs the mass cytometer (Cytometric Time of Flight; CYTOF) which is a high throughput proteomic tool that can resolve over 50 antibodies in both cell suspension and in tissue (using laser ablation). In 2021 he received a National Scientist Award from the Canadian Network of Scientific platforms, and in 2022 received national recognition for his public



engagement work with Science Rendezvous. While Dr. Hindmarch has a broad portfolio, his main research interests are centred around the molecular ecology of neural and cardiovascular tissue. For example, in collaboration with Stephen Archer, he is interested in identify-ing the molecular signature of the right ventricle of the heart in pulmonary arterial hypertension in response to different treatments and within different models. He is also collaborating with Dr. Archer on a project to determine the mechanisms that underpin the oxygen response of ductus arteriosus closure in neonates following the 'first breath'. Lastly, Dr. Hindmarch has significant research interest in the role of hypothalamic and medullary brain structures in the control of hydromineral and blood pressure homeostasis.



### Dr. Elahe Alizadeh

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

Elahe Alizadeh graduated with a BSc in Applied Physics and an MSc. in Medical-Radiation Physics Program, both from Amirkabir University of

Technology, 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 / radiobiology.

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. She was also a member of the Occupational Health Committee at the Saskatchewan Cyclotron Centre (Sylvia Fedoruk Canadian Centre for Nuclear Innovation) and obtained the Radiation Safety Officer (RSO-1) certificate from the Radiation Safety Institute of Canada in May 2018.

Since July 2018, Dr. Alizadeh has implemented and led the nuclear imaging facility within QCPU. She is responsible for the coordina-tion 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 Commit-tee in the Department of Environmental Health and Safety.



#### **Dr. Patricia Lima**

Assistant Professor (Adjunct) | Research Scientist | Molecular Imaging & Cytometry Specialist pdal@queensu.ca @Limapda

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

tific 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 – UNI-CAMP, 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

# **QCPU PROFILES**

polycystic ovarian syndrome. Dr. Lima has 35 publications with 784 citations and an H-index of 14. 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).

Aside from science, Dr. Lima dedicates her time giving back to the community. She is also a volunteer firefighter at 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 scientistic community.



#### **Oliver Jones**

Histologist and Electron Microscopist oj3@queensu.ca @OliverJ45751384

Oliver Jones is a histologist working for Queen's University, Ontario, Canada. Following his graduation in 2005 with a degree in Biochemistry with Biomedicine at Lancaster Uni-

versity (United Kingdom), he was employed as a trainee in histopathology at Manchester Royal Infirmary, a large teaching hospital serving a city with a population of ~3 million people. During this training, Jones 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, Jones was trained to operate the on-site Transmission Electron Microscope and was able to receive samples, process them for imaging and the generation of electron micrographs for pathologist review; his training here was conducted by clinical scientists working with the UK Health Protection Agency. In 2010, he was offered a position within Dr. Elaine Petrof's research laboratory at Queen's University, Canada, where he adopted an instrumental role in within the lab as a histologist, performing image analysis on murine tissue (mainly colonic); this role allowed Jones to complement his clinical research background with experience within a non-clinical, laboratory research environment, working with academic faculty and graduate students to achieve research goals. He then secured a position within the Queen's Laboratory for Molecular Pathology (QLMP) within the Pathology and Molecular Medicine department. Between 2013 and 2019, Jones performed a range of histological and microscopy services to the Queen's research community within the scope of a cost recovery model. In addition to the histology services that he provided, Jones built on his previous experience with electron microscopy providing services for researchers at Queen's University, Kingston Health Science Centre (KHSC), Canadian Cancer Trials Groups (CCTG). In this time, Jones 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 only a few authorized electron microscope operators and performs this service for QCPU users.

In 2018, Jones' considerable experience was recognized by St. Lawrence College, where he was recruited to teach histopathology to students undertaking the Medical Laboratory Assistant (MLA) course. The successful MLA students may then register to work in clinical support laboratories in the hospital environment. The course was a combination of lecture-based theory and laboratory-based hands-on techniques. He officially 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. Jones has recently 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@gueensu.ca

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

As a scientist, Noordhof's expertise includes cell culture, molecular biology, animal handling, tissue and cell labelling, microscopy and flow cytometry. In addition to his research expertise 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) in the Department of Medicine. At GIDRU, Noordhof had the crucial role of maintaining and operating the "robo gut" bioreactor. His expertise with this equipment resulted in several collaborative relationships between his lab and other scientists at Queen's and outside of Queen's.

Noorhof decided to join the QCPU team to follow his passion for technology and applied science. He saw QCPU as an opportunity to work with state-of-art technology and improve his scientific skills while offering his long-term expertise to Queen's communi-ty. In the past two years, he has gained tremendous experience in molecular imaging, flow cytometry and sorting. He has already helped several QCPU users to build panels and run and trouble-shoot experiments, therefore assisting in their scientific progress. Examples include cell sorting of various stem-cell populations and absolute quantification of biofim-forming bacteria in Kingston drinkable water using flow cytometry. His extensive experience perfectly aligns with his role at QCPU, assisting 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, family and his loyal dog, Rudy. His sense of humour and positivity at the QCPU are contagious, which makes him a perfect team player.





Keywords captured from our Sample Intake form showing the many interests of QCPU users in 2021 - At our heart, we are here to advance science!

# USER LISTS (PI, DEPARTMENT)

USER TYPE	PRINCIPAL INVESTIGATOR	FACULTY	DEPARTMENTW
SuperUser	Stephen Archer	QHS	Medicine
SuperUser	David Lillicrap	QHS	Pathology & Molecular Medicine
SuperUser	Don Maurice	QHS	Biomedical and Molecular Sciences
SuperUser	Lynne Postovit	QHS	Biomedical and Molecular Sciences
SuperUser — TIME	Rachel Holden	QHS	Medicine / Nephrology / Biomedical and Molecu- lar Sciences
SuperUser — TIME	Amer Johri	QHS	Medicine
SuperUser — TIME	David Maslove	QHS	Medicine / Critical Care
SuperUser – GIDRU	Dan Mulder	QHS	Medicine / Gastroenterology
SuperUser – GIDRU	David Reed	QHS	Medicine / Gastroenterology
SuperUser – GIDRU	Prameet Sheth	QHS	Medicine / Gastroenterology
SuperUser – GIDRU	Stephen Vanner	QHS	Medicine / Gastroenterology
User – External	Andrew Lingard	Industry	Neuractas
User	Michael Adams	QHS	Biomedical and Molecular Sciences
User	Brian Amsden	FEA	Chemical Engineering
User	Bruce Banfield	QHS	Biomedical and Molecular Sciences
User	Davide Bardana	QHS	Surgery
User	Pascale Champagne	FAS/FEA	Chemistry / Chemical Engineering / Civil Engi- neering
User	Che Colpitts	QHS	Biomedical and Molecular Sciences
User	Peter Davies	FEA/QHS	Biology / Biomedical and Molecular Sciences
User	Christopher Doiron	QHS	Urology
User	Yves Fillion	FEA	Civil Engineering
User	Nader Ghasemlou	QHS	Biomedical and Molecular Sciences
User	Charles Graham	QHS	Biomedical and Molecular Sciences
User	Michael Hendry	QHS	Surgery / Biomedical and Molecular Sciences
User	Simon Hesp	FAS	Chemistry
User	Paula James	QHS	Medicine / Pathology & Molecular Medicine
User	Frederick Kan	QHS	Biomedical and Molecular Sciences

" Our lab has been investigating the role of human OVGP1, an oviductspecific glycoprotein, in gamete maturation, sperm capacitation, fertilization, early embryonic development, and transport of the embryo to the uterus. We have successfully produced, for the first time, a recombinant human OVGP1 (rHuOVGP1). Recently, we investigated the effects of recombinant human oviduct-specific glycoprotein (rHuOVGP1) alone and in combination with progesterone (P4) on intracellular Ca2+ concentration [Ca2+]i and examined if rHuOVGP1 in combination with P4 can further enhance tyrosine phosphorylation (pY) of sperm proteins, a biochemical hallmark of sperm capacitation which is essential for fertilization. QCPU provided us with the state-of-the-art facilities and services where we utilized fluorometric flow cytometry and confocal microscopy in conjunction with live cell imaging to examine the effects of rHuOVGP1 and P4 on [Ca2+]i in human sperm during capacitation, and to examine the involvement of CatSper channels in the effects of rHuOVGP1 on [Ca2+]i. With the highquality services provided by QCPU, we were able to successfully complete the work which resulted in the publication of a full-length paper in Journal of Assisted Reproduction and Genetics in August this year. We are particularly grateful to Dr. Patricia Lima of QCPU who helped us to standardize the live cell imaging analysis of [Ca2+]i in human sperm. Our work has attracted the interest of Dr. Vanessa Vendramini of the Federal University of Sao Paolo who will be coming to my lab next spring as a Visiting Professor. We look forward to utilizing the state-of-the-art facilities in QCPU to continue our work on human sperm and on another project in our lab involving cell culture that requires live cell imaging."

DR. FREDERICK KAN Professor in the Department of Biomedical & Molecular Sciences

# USER LISTS (PI, DEPARTMENT)

USER TYPE	PRINCIPAL INVESTIGATOR	FACULTY	DEPARTMENTW
User	Marianna Kontopoulou	FEA	Chemical Engineering
User	Madhuri Koti	QHS	Biomedical and Molecular Sciences / Obstetrics & Gynaecology / Urology
User	Chris McGlory	QHS	Kinesiology & Health Studies / Medicine
User	David Natale	QHS	Obstetrics & Gynaecology / Biomedical and Molec- ular Sciences
User	Richard Oleschluk	FAS	Chemistry
User	Mark Ormiston	QHS	Biomedical and Molecular Sciences / Surgery
User	Terence Ozolins	QHS	Biomedical and Molecular Sciences
User	Martin Petkovich	QHS	Biomedical and Molecular Sciences
User	Heidi Ploeg	FEA	Mechanical and Materials Engineering
User	James Purzner	QHS	Surgery
User	Michael Rauh	QHS	Pathology & Molecular Medicine
User	Neil Renwick	QHS	Pathology & Molecular Medicine
User	Jacob Rullo	QHS	Optometry & Opthomology / Biomedical and Molecular Sciences
User	Robert Seimens	QHS	Urology
User	Myron Szewczuk	QHS	Biomedical and Molecular Sciences
User	Chandra Tayade	QHS	Biomedical and Molecular Sciences / Pathology & Molecular Medicine
User	Jagdeep Walia	QHS	Pediatrics / Biomedical and Molecular Sciences / Paediatrics
User	Andrew Winterborn	VPR	Animal Care
User – BioRender	Ramana Appireddy	QHS	Medicine
User – BioRender	RD Andrew	QHS	Biomedical and Molecular Sciences
User – BioRender	Fernanda De Felice	QHS	Biomedical and Molecular Sciences
User – BioRender	Kimberly Dunham-Snary	QHS	Biomedical and Molecular Sciences / Medicine
User – BioRender	Jason Gallivan	QHS	Biomedical and Molecular Sciences
User – BioRender	Katrina Gee	QHS	Biomedical and Molecular Sciences

# SUPERUSER PROFILES



# **Dr. Stephen Archer**

Dr. Stephen Archer is a CIHR and CRC Tier 1 funded cardiologist and physician scientist. Dr. Archer is the scientific director of QCPU, his research focus is on defining molecular mechanisms of oxygen sensing, defining mechanisms of disordered mitochondrial metabolism and dynamics and development of mitochondrial metabolic therapies for pulmonary hypertension (PH), cancer and COVID-19.



# **Dr. David Lillicrap**

Dr. David 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. Don Maurice**

Dr. Don Maurice is a CIHR funded researcher, his lab studies the role of cyclic nucleotide (cAMP and cGMP) compartmentalization and cyclic nucleotide signaling in human arterial endothelial cells and arterial smooth muscle cells. Since virtually all cells are either directly or indirectly influenced by cAMP and or cGMP, this pathway represents a potential therapeutic target in multiple cardiovascular diseases, such as atherosclerosis and restenosis, and is also important for angiogenesis.



### **Dr. Lynne Postovit**

Dr. Lynne Postovit is a CIHR, CFI and CCSRI funded researcher whose 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 the 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



# **Dr. Prameet Sheth**

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

### SUPERUSER PROFILES

## **Dr. David Reed**

Dr. Reed is a young investigator with a clinical interest is 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. 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, guality 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 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 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?

# **Dr. Rachel Holden**

Dr. Rachel Holden is a nephrologist and an Associate Professor in the Department of Medicine with a cross-appointment to the Department of Biomedical and Molecular Sciences at Queen's University. She joined the faculty in 2001. She currently holds a Clinician Scientist award. Dr. Holden and her associates study basic mechanisms of vascular calcification in chronic kidney disease. A focus of her research program is clinical, basic and translational aspects of vitamin K metabolism and specifically the role of vitamin K in the inhibition of vascular calcification. Dr. Holden's clinical interests include mineral bone disorders in chronic kidney disease and hemodialysis patients.



Dr. Archer Lab in the QCPU Conference room

"We have been very fortunate over the past three years to have access to the superb facilities and expertise that the QCPU has to offer. The imaging facility, led by Dr Elahe Alizadeh, has provided rapid access to state-of-the-art microCT imaging, allowing us to evaluate the impact of genetic and therapeutic changes in normal and aberrant bone in various models of disease – in both tissues and live animals. Dr Alizadeh has provided excellent support for our research program; she is professional, reliable, and she exhibits a profound passion for research which extends beyond just image acquisition. Our studies have been very successful, thanks in no small part to the exceptional scientists working at the QCPU, and as our drug development program grows over the next few years, it is our intention to expand our use of their facilities."

DR. MARTIN PETKOVICH Professor in the Department of Biomedical & Molecular Sciences DR. TRACIE PENNIMPEDE Adjunct Assistant Professor in the Department of Biomedical & Molecular Sciences

# **NOTABLES, HIGHLIGHTS**

#### Paediatric Cardiology at QCPU:

In the Fall of 2021, we were approached by the departments of Paediatrics to host a Paediatric Cardiology clinic under physician Dr. John Smythe. Dr. John Smythe is a graduate of the Queen's School of Medicine, now a full-time Associate Professor of Pediatrics and a Pediatric Cardiologist. His work in Pediatric Cardiology includes consultation on a broad range of cardiac diseases in children and congenital heart disease in adults. The clinic relies on already established infrastructure to conduct ECGs and ECHO's on younger patients, and created more training opportunities for sonographers. After running a few pilot clinics, the clinic became permeant at QCPU after patients expressed enthusiasm over the site's accessibility and comforting atmo-sphere. The clinic is currently running under the direction of Dr. Mahmoud Alsalehi (newly recruited in January 2022), an experienced paediatric cardiologist from the International Children's Hospital in China. Dr. Alsalehi's clinic is a site of training for Pediatric residents and is currently seeing ~8 patients weekly. In 2022 the clinic hopes to expand to full days and increase the number of patients he sees to tackle the exceptionally long patient waitlist for paediatric congenital heart screening.

#### **BioRender:**



QCPU is Queen's University first and only license provider of BioRender! BioRender is a powerful online, graphic design software, specifically created for scientific figures. In minutes, you can use BioRender to create professional, intuitive visuals for publications, grants, presentations

or posters. QCPU can offer researchers an amazing institutional discount of up to 50% off and provides workshops on how to use BioRender; all workshops are available for free on YouTube. Since becoming a provider in November, we have reached our quota of 30 seats and have generated 591 figures! QCPU is hoping to double the number of seats (licensed user) for BioRender in 2022. If you are interested in using BioRender contact us first!

#### **Impact Reception:**

In October, QCPU hosted an Impact Reception in celebration and to give thanks for the generous contributions of a \$500,000 donation to TIME and QCPU from the W.J. Henderson Foundation. This donation received equal matching funds from the Department of Medicine faculty, raising the gift size to \$1 million. The reception included special guests from the WJ Henderson Foundation board, David Pattenden and Michael Hickey, Dean of the Faculty of Health Sciences, Dr. Jane Philpott and new Vice-Principal of Research, Dr.



To the W.J. Henderson Foundation and DOM faculty for supporting research at Queen's!





Nancy Ross. The event included opening remarks, presentations and a VIP, interactive tour of QCPU, which highlighted research projects across the Queen's research community. The \$1 million dollar donation will be used by TIME and QCPU to maintain the operations of OCPU, fund scientists, support trainees and contribute to TIME Incubator awards in 2023.

# **MEDIA CONTENT & OUTREACH**

# Get to Know a Scientist Series featuring the QCPU scientists - 4 part series



Get to Know a QCPU Scie

the office as source its save .

#### Virtual Tour of QCPU



#### **BioRender 101**



#### Red Cross Fund for Covid-19 Crisis in India:

In the spring, QCPU (on behalf of the Department of Medicine) was proud to set up a Red Cross fund to provide aid to India during the COVID-19 crisis. By the end of the month the fund had raised over \$10,000.



#### **Science Rendezvous:**

QCPU created the 'QCPU Edu-Lab' a YouTube Kids video series about DIY at home science projects and contributed two of these videos to the 2021 all virtual version of Science Rendezvous Kingston. The first video was created by Oliver Jones and his son Marshall, who teach the audience how to make a working heart model at home, explaining the parts of the heart and how blood pumps through it. The second video was created by Dr. Charlie Hindmarch playing an enthusiastic, 'mad British scientist' who shows viewers how to extract DNA from a strawberry and explains some introductory molecular biology.

Science Rendezvous Kingston is part of the annual Canada-wide Science Rendezvous events and is a not-for-profit organization dedicated to bringing exciting research and stem experiences and programming to the public. The science rendezvous namesake program is the annual 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 2021, the Kingston chapter won the National COVID Creative Award for its content.



#### **Discovery Day:**

In May, QCPU participated in the Canadian Medical Hall of Fame's virtual Discovery Day in Health Sciences at Queen's University. One of 10 workshops available at Queen's, QCPU was showcased in a live, 75-minute interactive tour for 25 high school students with an interest in perusing Health Sciences. The students got to virtually tour the laboratories of QCPU and meet an international team of diverse scientists, engineers and technicians working together to help better understand cardiovascular and respiratory health. The tour provided an inside glimpse into cutting-edge medical research technology and how experiments are done in a real laboratory. The tour was followed by a Q&A session about research, training and pursuing a career in health sciences.



Live-cell image of a human sperm. Cells were loaded with Fluo3 (green) and imaged for up to 21 minutes using a live-cell imaging system and the SP8 Leica microscope. Intracellular calcium measurements were obtained in different part of the sperm (tail vs. head). Image captured by Dr. Patricia Lima and shared with the permission of Dr. Frederick Kan.

# Women in Science at Queen's University (WiSQ)

The Women in Science Queen's (WiSQ) was founded in 2019 by one of our QCPU scientists, Dr. Patricia Lima. She envisioned promoting a healthy and inclusive envi-ronment 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. In 2020, WiSQ was joined by Brooke Ring, QCPU's op-era-



tions manager, who plays a critical role as financial officer and helps with WiSQ communications. Other QCPU members volunteering in the WiSQ executive activities are Dr. Elahe Alizadeh (another QCPU scientist), and Rachel Bentley and Ruaa Al-Qazazi (QCPU trainees).

WiSQ events are monthly, and comprise of specific and friendly discussions led by invited experts. In 2021, the WiSQ embraced the pandemic style of zoom meetings and hosted 4 major events, one of them led by the QCPU director, Dr. Stephen Archer. WiSQ was part of the Employment Equity Forum at Queen's in 2021 and partnered with the Upper Canada Girls Inc to celebrate the International Day of Girls and Women in Science by virtually touring 25 children through our state-of-art facility at QCPU. WiSQ and QCPU's are looking forward to maintaining this partnership into 2022 and continuing to promote outreach & inclusion in science!

Please follow us on Twitter (@womeninscience6) to find out about our events or add our group (Women in Science at Queen's – WiSQ) to your outlook calendar.



# **VISITORS AT QCPU IN THE PAST YEAR**

**Dr. Jane Philpott** (Dean of Faculty of Health Sciences)

**Dr. Nancy Ross** (Vice Principal of Research)

**David Pattenden & Michael Hickey** (Board members of the WJ Henderson Foundation) **Jim Balsillie** (Former CEO of Research in Motion) and **Neve Peric** (Vice President of Operations for the Centre for International Governance Innovation)

**Dr. Steve Abman** (Director of the Pediatric Heart Lung Center at the Children's Hospital in Colorado)

**Dr. John Ryan** (Cardiologist from the Universiy of Utah)

# FUNDING AND PUBLICATIONS

### **GRANT PARTICIPATION**

#### Alzheimer's Drug Discovery Foundation (ADDF)

Targeting Dynamin-Related Protein 1 (Drp1)-Mediated Mitochondrial Fission in Alzheimer's Disease: Therapeutic Potential of Novel Drp1 GTPase Inhibitors - *SUBMITTED* 

#### Alzheimer's Research United Kingdom (ARUK)

Targeting Dynamin 1 Like Protein, Drp1 (DNM1L), Mediated Mitochondrial Fission in Alzheimer's Disease - *SUBMITTEED* 

#### Canada Institute Health Research (CIHR)

Nutritional attenuation of skeletal muscle-disuse atrophy in women and men – *FUNDED 2021* 

Targeting the mitochondria in COVID-19 pneumonia: The cardiopulmonary effects of a SARS-CoV2 mitochondriopathy - *FUNDED* 

Molecular identification of the oxygen sensor(s) in the fetal ductus arteriosus and pulmonary artery: an integrated multiomic comparison of mitochondria in vital fetal arteries with opposing oxygen responses - *FUNDED* 

Harnessing cellular antiviral responses to inhibit coronavirus replication - *FUNDED* 

Capturing an immunological snapshot of human mucosal immunity at the periocular mucosa: Using the eye as a window to understand host susceptibility to SARS-CoV-2 - *SUBMITTED* 

#### **Cancer Research Society (CRS)**

Mitochondrial Drp1 receptor proteins MiD49 and MiD51 are epigenetically upregulated in cancers: a novel mitochondrial-targeted approach to cell cycle regulation and cancer therapy - SUBMITTED

#### National Institute of Health (NIH)

Multi-scale investigation of Sex Differences in Right Ventricular Function via Estrogen-Microtubule Interactions - *SUBMITTED* 

Targeting Mitochondrial Injury to Improve Post-Cardiac Arrest Resuscitation Outcomes - *SUBMITTED* 

#### **Ontario Institute for Cancer Research (OICR)**

Mitochondrial Drp1 receptor proteins MiD49 and MiD51 are epigenetically upregulated in cancers: a novel mitochondrial-targeted approach to cell cycle regulation and cancer therapy - SUBMITTED

#### **Faculty of Health Science SPEAR Grant**

The Role of TET2 in the Metabolic Programming and Polarization of Macrophages in Pulmonary Arterial Hypertension (PAH)

#### - SUBMITTED

#### **Wicked Ideas Competition**

SARS-CoV-2-mitochondriopathy impairs oxygen-sensing and causes lung injury: discovery and pre-clinical evaluation of new therapies to treat happy hypoxemia and COVID-19 pneumonia - SUBMITTED

### **PUBLICATIONS BY QCPU USERS**

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Graham CH, Paré JF, Cotechini T, Hopman W, Hindmarch CCT, Ghaffari A, Marginean D, Chenard S, Koti M, Siemens DR. Innate immune memory is associated with increased disease-free survival in bladder cancer patients treated with bacillus Calmette-Guérin. Can Urol Assoc J. 2021 Aug;15(8):E412-E417. doi: 10.5489/ cuaj.7066. PMID: 33410746; PMCID: PMC8418256.

# **AWARDS**



**Dr. Archer** *Reached an h-index of 100* 

#### Dr. Archer

Expertscape World Expert in Pulmonary Hypertension

#### Dr. Archer

2021 Healthcare Management Forum Article of the Year

**Dr. Charlie Hindmarch & Brooke Ring** Distinguished Service Awards from the Department of Medicine



**Dr. Charlie Hindmarch** National Scientist Award from the Canadian Network of Scientific Platforms (CNSP)

# What is on the horizon for QCPU?

Our main goal is to establish ourselves as a premier translational research facility at Queen's University. In the year ahead, we also plan on creating more opportunities for public outreach and engaging educational program by taking advantage of the ability to host both online and in-person tours and lectures. 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.

As we head toward 2022 Dr. Archer has partner-ing with Dr. Postovit to write a CFI grant application to create TIME Core. The Translation-al Institute of Medicine - Core Facility (TIME Core) would be a core facility consisting of six 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 Canadi-ans, including Cancer, Cardio-pulmonary Diseases, Inflammatory Diseases and Neurode-generative Diseases. This will be accomplished by offering six contiguous platforms run by experts, and by coordinating our impressive resources for patient centred research (Cana-



di-an Cancer Trials Group (CCTG), Queen's Cardiopulmonary Unit (QCPU), and the W.J. Henderson Center for Patient Oriented Research, a clinical trials unit in Kingston Health Sciences Center (KHSC). TIME Core is not meant to support a single researcher or research project; rather, it will catalyze the translation of discovery science by ~20 research groups within Queen's Heath Science (QHS). If funded by CFI, TIME Core would have tremendous impact, elevating 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. It will also accelerate the translation of several ongoing and new research projects. In the first five years, TIME Core will enable the delivery of cell therapies to cancer patients, development of a microbiome-based therapy for analgesia in inflammatory bowel diseases (IBD), elucidation of bio-markers for the early detection of neurodegenerative disorders, like Alzheimer's Disease (AD) and bring novel mito-chon-dria-targeting compounds to first-in-person clinical trials for the treatment of pulmonary hypertension (PAH). TIME Core has the potential to be an engine for discovery, education, and purposeful translation, leading to innovations in healthcare at Queen's - fingers crossed for a positive funding decision!







**Biosciences Building** 116 Barrie Street Room 1625H Kingston, ON, K7L 3J9 613-533-6000 Ext. 74648 | Fax: 613-533-2061

To learn more about our research and service, please visit our website: <u>depmed.queensu.ca/research/teams/qcpu</u> or follow us on Twitter (@QueensuCPU).

