SPRING/SUMMER 2012

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A Steady Partnership

Federal award will help scientists develop and commercialize medical technologies

Bv Alisa Kim

Superior therapy and monitoring systems for cancer and heart disease are one step closer to the marketplace, thanks to a \$6.9-million investment in Sunnybrook Research Institute (SRI) made by the Federal Economic Development Agency for Southern Ontario (FedDev Ontario).

John Carmichael, MP for Don Valley West, announced the funding May 18, 2012, in the advanced machine shop that is part of the device development lab on M7, in the heart of SRI's Centre for Research in Image-Guided Therapeutics.

"Our government is proud to support such an innovative project that will bring better, less invasive treatment options to cancer and cardiac patients here and around the world. This investment will reinforce our world-class medical imaging sector and directly target the global market valued at \$16 billion," said Carmichael.

The investment was made through FedDev Ontario's Technology Development Program and will be matched by SRI's 19 industry partners. Western University in London, Ontario, is SRI's academic partner. It will provide additional research space and capacity at Robarts Research Institute and the Canadian Surgical Technologies and Advanced Robotics Centre. This partnership will hasten the development and commercialization of four new



treatment and monitoring systems that use aspects of existing image-guided therapies.

It is anticipated that the project, which lends laboratory and business support to image-guided therapy companies in southern Ontario, will lead to high-value jobs, attract investment and create economic growth across southern Ontario.

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News @ SRI

Continued from page 1

Dr. Michael Julius, vice-president of research at Sunnybrook Health Sciences Centre and SRI, thanked Carmichael for the government's backing and congratulated the scientists associated with the award. He also acknowledged the financial support of SRI's private-sector partners and spoke of the importance of these strategic linkages. "Partnerships between the public and private sectors are essential if we are to build a sustainable health care system and a resilient, forward-thinking economy," he said.

Dr. Kullervo Hynynen, director of the physical sciences platform at SRI and program lead of the grant, described the research projects the funding will enable. The first is focused ultrasound surgery, which pairs magnetic resonance imaging (MRI) with ultrasound energy to pinpoint and destroy tumours and other lesions in the body. This minimally invasive outpatient procedure reduces hospital stays and recovery time.

The second project involves the use of MRI to guide and monitor treatments such as noninvasive procedures to correct an irregular heart beat or unclog arteries.

The third project is therapy response monitoring, which can reveal early on whether chemotherapy has been effective in cancer patients. This technology will save time and money by allowing oncologists to rule out a costly, ineffective therapy in favour of a more appropriate treatment.

The last project is a hybrid catheter that combines optical and ultrasound imaging for the treatment of hardened and blocked coronary arteries. The catheter produces a single image that lets surgeons see the composition of blood vessels and plaques.

As the event drew to a close, Hynynen and **Dr. Rajiv Chopra**, a scientist in physical sciences at SRI, gave Carmichael a tour of the facility. Staff in the machine shop led by **Michael Pozzobon** then demonstrated the laser micromachining equipment, programmed to allow the MP to take home a



personalized souvenir made by the stateof-the-art apparatus.

Sunnybrook Research Institute is the only hospital-based research institute in Canada with a device development lab. It is a shared space that contains all of SRI's device-making equipment in addition to a clean room and laser machining equipment. Now open for business, it will enable scientists and teams to design and test the proofs of principle for new imageguided therapies.

Researchers Get Some Hearty Funding

Five scientists at Sunnybrook Research Institute received grants-in-aid from the Heart and Stroke Foundation of Ontario through its September 2011 competition.

Dr. Charles Cunningham, a scientist in physical sciences, will receive \$144,030 over two years for his work on the use of hyperpolarized carbon-13 in congestive heart failure.

Dr. Nilesh Ghugre, a junior scientist in the lab of **Dr. Graham Wright** in physical sciences, will receive \$140,000 over two years to use imaging techniques to study disease progression after myocardial infarction.

Dr. Dennis Ko, an interventional cardiologist and scientist in evaluative clinical sciences, was awarded \$321,264 over three years to improve the assessment and treatment of severe aortic stenosis by evaluating care gaps and advancing risk predictions.

Dr. Bojana Stefanovic, a scientist in physical sciences, will receive \$306,519 over three years to study the role of neurovascular remodeling in stroke rehabilitation.

Dr. Richard Swartz, a scientist in evaluative clinical sciences, was awarded \$143,598 over two years. He will use the funds to develop a post-stroke triage method that will screen for depression, obstructive sleep apnea and cognitive impairment.

Funding Advances Scientist's Alzheimer's Disease Research

The Canadian Institutes of Health Research awarded **Dr. Sandra Black**, director of the Brain Sciences Research Program, a grant worth \$300,000 over five years for the Alzheimer's Disease Cooperative Study, part of the Alzheimer's Disease Neuroimaging Initiative (ADNI). The aim of the study is to develop drug treatments for the cognitive and behavioural symptoms of Alzheimer's disease. The ADNI is also supported by the National Institutes of Health in the U.S., industry and foundations.

It's a Boy!

Congratulations to first-time parents Emily and Matthew

McGowan on the birth of their baby boy.

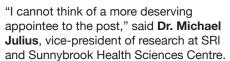
Gabriel George Samuel John McGowan was born on March 21, 2012 at Sunnybrook's Women & Babies birthing facility. He weighed seven pounds, nine ounces.



Emily McGowan is an administrative assistant to **Drs. Simon Graham**, **Bojana Stefanovic** and **Graham Wright** in physical sciences at Sunnybrook Research Institute. Mom, dad and their bundle of joy are all doing well.

University of Toronto Scientist Appointed Department Head

Dr. Juan Carlos Zúñiga-Pflücker, senior scientist and interim director of biological sciences at Sunnybrook Research Institute (SRI), has been named chair of the department of immunology in the faculty of medicine at the University of Toronto.





"Dr. Zúñiga-Pflücker is internationally recognized as a leading expert in his field of T cell development, and has made seminal contributions to that field. He sits on numerous editorial boards, has mentored some of the brightest graduate students and post-doctoral fellows to come out of the department, and has served senior administrative roles at the university, as well as here at SRI."

The five-year term will start July 1, 2012. Zúñiga-Pflücker has been a faculty member in immunology since 1994, and a senior scientist at SRI since 2001. He holds the Canada Research Chair in Developmental Immunology, which was recently renewed.

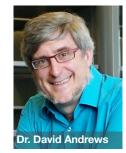
The incumbent chair, **Dr. Michael Ratcliffe**, is also a senior scientist at SRI. He has led the department of immunology for two terms, since 2001.

Biology Gets New Head

After an extensive search, Sunnybrook Research Institute (SRI) has recruited **Dr. David Andrews**, a professor of biochemistry

and biomedical sciences at McMaster University, as the inaugural director of the biological sciences platform.

"Dr. David Andrews is a scientific leader of international caliber. His recruitment will elevate SRI's biological sciences platform, already composed of a critical mass of recognized biologists, to a globally competitive level," said **Dr. Michael Julius**, vice-president, research.



Andrews studies protein-protein interactions; in particular, he is interested in how such interactions can be manipulated to cause or prevent cell death. He brings with him technology he developed for image-based, high-content screening and fluorescence lifetime imaging microscopy that can be used to study interactions in live cells.

Read more about his research in the cover story of the 2011 SRI magazine, *Inventing the Future of Health Care*, on news stands and online at **sunnybrook.ca/research**.

Andrews is set to arrive at SRI in July.

Biological Scientists Land Renewal of Canada Research Chairs

Drs. Dan Dumont and **Juan Carlos Zúñiga-Pflücker** have secured renewals of their Tier 1 Canada Research Chairs, each worth \$1.4 million over seven years.

Dumont, the Canada Research Chair in Angiogenic and Lymphangiogenic Signalling, studies the growth mechanisms of blood vessels and lymphatic vessels. His aim is to develop methods that can inhibit or promote these growth processes for



therapies in cancer, diabetes and arthritis, among others.

Zúñiga-Pflücker is the interim director of the biological sciences platform at Sunnybrook Research Institute and the Canada Research Chair in Developmental Immunology. He is trying to understand how stem cells develop into T cells, which are essential for immunity. Potential clinical applications of his research include enabling the development of stem-cell-based therapies for people whose immune systems have been damaged, for example, by the human immunodeficiency virus or cancer treatment.

The LOFs Are on Them

Congratulations to **Drs. Greg Czarnota**, **Graham Wright** and **Juan Carlos Zúñiga-Pflücker** on winning Leaders Opportunity Fund grants from the Canada Foundation for Innovation. These awards invest in infrastructure to enable Canadian institutions to attract and retain the world's best researchers by enabling them to do cutting-edge work.

Czarnota, director of the Odette Cancer Research Program, was awarded \$124,439 to purchase a quantitative, 3-D ultrasound imaging device. This technology will help him develop new imaging methods to detect cell death noninvasively. He will also purchase a new magnetic resonance imaging (MRI)-compatible ultrasound therapy system for preclinical studies. This equipment will enable him to develop further a method of improving the efficacy of radiation treatments.

Wright, director of the Schulich Heart Research Program and the Canada Research Chair in Imaging for Cardiovascular Therapeutics, was awarded \$294,414. He will use the funds to facilitate the upgrading of the MRI system in the Imaging Research Centre for Cardiac Intervention, on the third floor of M wing. The award will also be used to buy machining equipment to design and test interventional devices to be used in the facility.

Zúñiga-Pflücker, interim director of the biological sciences platform, was awarded \$276,275 to purchase a BD Influx cell sorter. This state-of-the-art equipment will enable Zúñiga-Pflücker to perform improved functional analyses of important cellular subsets of the immune system, and provide enhanced flow cytometry cell sorting capabilities to researchers at Sunnybrook Research Institute and the University of Toronto.

The awards generally are matched by the province's Ministry of Economic Development and Innovation; the results of that competition are pending.

Tool Kit: Hypersense Dynamic Nuclear Polarization System



Carbon-13 is a stable isotope that can provide insight into tissue biochemistry, but the relevant metabolites are in such low concentration that they escape detection by magnetic resonance (MR).

The dynamic nuclear polarization system by Oxford Instruments allows researchers to make hyperpolarized molecules in a solution that can be injected into preclinical models so that the products of metabolism can be imaged. Sunnybrook Research Institute (SRI) is one of only

two institutions in Canada to have the device. It is housed in the biomedical imaging research suite on the ground floor of S wing.

Dr. Charles Cunningham, a scientist in the physical sciences platform at SRI, uses the equipment to make hyperpolarized, carbon-13-labelled pyruvate that can be imaged through MR to study tumour metabolism.

"For a lot of cancers, we know that metabolism is very different

than it is for normal cells. That's one of the things we're working on—being able to detect aggressive cancers at an early stage. Alternatively, we can give a person a therapy and see if the metabolism returns to what it normally would be. That would be a marker of response to treatment," says Cunningham, who collaborates with cardiologists and oncologists on this research.

The short period of polarization is among one of the more finicky aspects of running the experiment, which Cunningham describes as particularly challenging. "We've spent years perfecting our methods and hardware, all of which we've had to develop inhouse," he says. Cunningham works with researchers inside and outside of Sunnybrook, who rely on his group's expertise to do hyperpolarized experiments.

By 2013, the current polarizer, used only for preclinical research, will be moved to a new laboratory on M7 that is part of the Centre for Molecular and Cellular Response and Repair, a core facility within SRI's Centre for Research in Image-Guided Therapeutics. In its stead will be a polarizer by Research Circle Technology that can produce sterile hyperpolarized solutions for use in clinical research. Sunnybrook Research Institute will be the first institution in Canada to have this system.

The clinical hyperpolarizer, worth \$2.2 million, is funded by the Canada Foundation for Innovation as part of the Centre for Research in Image-Guided Therapeutics. — Alisa Kim

CV: Dr. Philip Beatty



Bio basics: A scientist in physical sciences and the Odette Cancer Research Program at Sunnybrook Research Institute (SRI). Born in Richmond, Virginia. Grew up in Winnipeg, Manitoba; Los Angeles, California; and Toronto, Ontario. Completed his PhD in electrical engineering at Stanford University. Worked as a scientist at GE Healthcare before coming to SRI.

What is your area of research?

I'm really focused on the use of MRI (magnetic resonance imaging) for breast cancer screening in high-risk women. Magnetic resonance is typically used for patients that we know are sick. It's a very expensive test but has very high value. As we look at an application like screening, where there are much greater volumes [of patients], we have to look at being efficient. There are opportunities for early health and providing better health care.

Can you tell me about some of the things you've designed?

I've worked on image reconstruction algorithms—software that takes the data from the scanner and creates images from it. One of the things that's come along in the last decade is parallel imaging: multiple receiver channels that enable us to image faster, but it requires much more sophistication in how that data is processed. At GE, I did a lot of work developing parallel imaging algorithms, and I've done a lot of work on improving image quality.

What drew you to Sunnybrook Research Institute?

What attracted me to SRI first and foremost is the imaging group (now the physical sciences group). If you walk down this hall, there are world-class scientists and researchers who are also very approachable. They're very good at playing as a team. I think that's important as the solutions that are required in health care become more sophisticated. It's important to be part of an integrated team with different expertise. There's a great flow of ideas between the researchers. The other thing was being part of a hospital. Being tied to clinical care is really important for doing research in this area. Also, the facilities are phenomenal.

What have you learned from being an inventor?

The devil is in the details. Take Apple, for example. Were they the first to make a smart phone, tablet computer or MP3 music player? No. But they took those ideas and did a really good job implementing them. Microsoft was doing tablet computers for many years before the iPad came along and they weren't successful. Was the idea bad? Or did it need the right time, the right technology? All those details can make something successful. Also, if an idea doesn't work out, that doesn't necessarily mean it's a bad idea. Maybe it needs a better implementation.

What do you like to do outside of work?

Science is one of those things where there's always something chugging away in the background of one's brain. I have a two-year old and my wife also works, so when we're not working we like to spend as much time together as a family as we can.

Scientists Score High With Operating Funds

CIHR invests in eight researchers in its latest competition

By Eleni Kanavas

The Canadian Institutes of Health Research (CIHR) awarded eight researchers from all three research platforms at Sunnybrook Research Institute (SRI) operating grants totaling \$4.8 million through its September 2011 competition.

"In as competitive a funding climate as exists now, this is incredibly noteworthy, and a testament to the excellence of our faculty," said **Dr. Michael Julius**, vicepresident of research at SRI and Sunnybrook Health Sciences Centre.

The agency awarded **Dr. Michele Anderson**, a senior scientist in biological sciences, \$791,037 over five years. She is studying the roles of transcription factors HEBAlt and HEBCan in T cell development and gene expression. Research in this area will provide insights into the molecular control of immune cell development, and new targets for diagnostic and therapeutic applications for immunodeficiencies, autoimmune diseases and leukemia.

"I'm grateful to be given this funding because it is crucial for our research," says Anderson. "We're still in the early stages, and we have a lot of preclinical models that we are studying to understand better how HEBAlt works in stem cell culture. Its uniqueness makes it a possible target for therapeutics down the line."

Other SRI researchers granted funding through the CIHR competition are:

Dr. Jon Barrett, director of the Women & Babies Research Program, was awarded \$438,577 over three years. The funds will enable Barrett to continue a twin birth study. The multicentre, randomized controlled trial compares planned caesarean section births with planned vaginal births for twins at 32 to 38 weeks gestation. Obstetricians and other health care providers may be able to use the results to help women with twin pregnancies make an informed choice about the different approaches to delivery.



Dr. Peter Burns, a senior scientist in physical sciences, was awarded \$360,706 over four years to develop a new contrast agent using droplets of liquid perfluorocarbon for ultrasound imaging. His project aims to provide diagnostic information not available in current medical ultrasound images. This method may be used as a new technique to detect cancer.

Dr. Benjamin Goldstein, a scientist in evaluative clinical sciences, was awarded \$569,980 over five years for his research on the possible link between bipolar disease and heart disease. Goldstein directs the Centre for Youth Bipolar Disorder at Sunnybrook. He is leading a team of researchers who are investigating if specific markers in the blood can provide a better understanding of mood symptoms and the increased risk of heart disease in adolescents with bipolar disorder.

Dr. Kullervo Hynynen, director of the physical sciences platform, was awarded \$803,100 over five years. He will investigate the bioeffects of blood-brain barrier disruption by focused ultrasound. This research will guide the design of future clinical trials testing the technology.

Dr. Robert Kerbel, a senior scientist in biological sciences, will receive \$781,655 over five years to conduct a translational study on the resistance of antiangiogenic therapies undertaken in preclinical models of locally advanced or metastatic cancer.

Dr. Jonathan Rast, a scientist in biological sciences, was awarded \$361,800 over three years to study the gene regulatory network and central immune signaling factor IL17 to understand the coordination of immunity in the gut. Rast and his team aim to characterize the system and develop new approaches to controlling immune function.

Dr. Juan Carlos Zúñiga-Pflücker.

interim director of biological sciences, was awarded \$749,975 over five years. He is studying the characterization of progenitor thymocytes and developing an in vitro system that will support T cell differentiation. This research may have eventual clinical applications for the treatment of cancer, autoimmune disease and acquired immunodeficiency syndrome.

The agency received 2,294 applications through the competition and approved 506 of these, for a 22% funding rate.

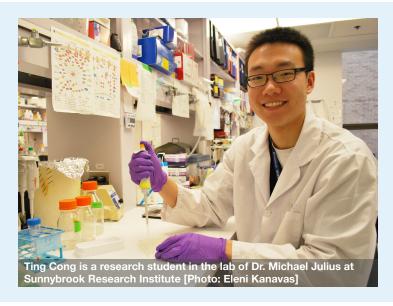
Trainees' Post

For Students and Postdocs

Applying to medical school: what it takes to stand out from the crowd

Ting Cong always knew he wanted to study medicine. It wasn't until he was in his third year of undergraduate studies at the University of Toronto that his passion for science grew stronger. Last summer, he completed a four-month studentship at Sunnybrook Research Institute in the lab of Dr. Michael Julius, vice-president of research at Sunnybrook and senior scientist in biological sciences. As a research student, Cong gained handson experience in the lab while working on a project that characterizes the role of glycosylphosphatidylinositol (GPI)-anchored proteins in T cell proliferation.

Now close to finishing his studies in immunology and enrolled in a fourth-year research experience course offered by U of T's immunology department, he tells **Eleni Kanavas** how his love for science and experience working in the lab strengthened his applications to medical schools in Canada and the U.S.



Why did you choose to study life sciences?

It was between science and engineering for me because my parents are both electrical engineers. But I thought science was really cool and medicine became one of the things that I really wanted to do. When I told my parents I wanted to study medicine, they were 100% supportive.

What did you want to be growing up?

I wanted to be a doctor. I can't imagine myself doing anything else. Medicine has always been an interest of mine, and research is a huge part of medicine. Everything that is used in medicine came from the laboratory bench at some point in the past. Knowing that process, going from the bench to the clinic, really helps with understanding how medicine works. I guess that's why in the application process, schools love to see that students have research experience because they want students that have a foundation in the sciences, as well as practical experience.

How did you find the summer studentship at Sunnybrook Research Institute?

[Dr. Julius] was one of my professors in third year [at U of T], and the way that most undergrads look for laboratory positions is they go out and email different researchers and professors and look for projects that they are interested in. I found a placement in Michael's lab and I emailed him.

How did your experience working in the lab strengthen your application?

In the summer of my first year, I had a laboratory position in the National Research Council (NRC) in Saskatoon, Saskatchewan. I worked in an organic chemistry lab making this plant hormone, which is even more molecular than what I am doing right now.

Although it was not directly applicable to medicine, my work at NRC likely helped my entrance into the Julius lab. Working in a lab certainly strengthens the application on its own, and the experience makes you stand out from a lot of the other students who are applying. But sometimes, as in my case, it can lead to bigger and better opportunities to make someone shine as an applicant.

Can you describe the application process to medical school?

The process of applying to medical school on its own is huge. It's extremely competitive, and to make yourself stand out you have to work really hard during the four years and find as much clinical and laboratory exposure as possible. That of course has to occur on top of maintaining good grades and doing well on the Medical College Admissions Test.

What advice do you have for other students looking for clinical and laboratory opportunities?

Don't be afraid to approach people and ask whether they would be interested in taking you on as a student in their lab. Definitely make sure that you would enjoy the project because every lab does something different. Students also have to be proactive. There are great opportunities in Toronto; you just have to get out there and find them.

In what do you want to specialize?

Almost 99.9% of medical students change their minds once they get into medical school and actually get to experience the different specialties during the clinical rotations. At the moment, I'm probably leaning toward something surgically related. I do like hands-on things. I guess the lab really helped me discover that.

Applause



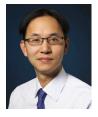
Dr. Sandra Black Order of Ontario

Dr. Sandra Black, director of the Brain Sciences Research Program, was named to the Order of Ontario. It is the province's highest honour. It recognizes individual excellence and achievement in any field. David Onley, lieutenant-governor of Ontario, gave Black and the other appointees the award at a ceremony held at Queen's Park.



Dr. Nick Daneman
Canadian Institutes of Health Research Clinician Scientist Award

Dr. Nick Daneman, a scientist in evaluative clinical sciences, received a phase two Clinician Scientist award from the Canadian Institutes of Health Research. The award enables highly skilled clinician-scientists to develop further their research programs. Daneman will use the funds, worth \$300,000 over three years, to study the optimal duration of antibiotic therapy for bloodstream infections.



Dr. Dennis Ko 2012 Dr. Subhash C. Verma Young Investigator Award

Dr. Dennis Ko, a scientist in evaluative clinical sciences and an interventional cardiologist at Sunnybrook, was awarded the 2012 Dr. Subhash C. Verma Young Investigator Award. The award recognizes outstanding achievement in the cardiovascular sciences. It was established by the Heart & Stroke/Richard Lewar Centre of Excellence in Cardiovascular Research at the University of Toronto.



Dr. Mario Masellis Ministry of Economic Development and Innovation Early Researcher Award

Dr. Mario Masellis, an associate scientist in evaluative clinical sciences, received an Early Researcher Award from the Ministry of Economic Development and Innovation. The competitive prize recognizes researchers early in their careers and provides support to build a research team and make new discoveries. Masellis is developing a genetic test to treat patients with dementia related to Parkinson's disease.



Dr. Alan Moody Chair of the Department of Medical Imaging, University of Toronto

Dr. Alan Moody, an associate scientist in physical sciences, was appointed Chair of the department of medical imaging in the faculty of medicine at the University of Toronto, for a five-year-term beginning July 1, 2012. He has been a faculty member at U of T and radiologist-in-chief at Sunnybrook since 2003. Moody's research focuses on imaging and vascular biology, and understanding the management of atherosclerosis.



Dr. Diane Nam Orthopaedic Research Society New Investigator Recognition Award

The Orthopaedic Research Society presented **Dr. Diane Nam**, an associate scientist in biological sciences, with the 2012 New Investigator Recognition Award at its annual meeting in San Francisco, California. Nam was given the award for her research on T lymphocytes in osteoblast maturation during the early phase of fracture repair.



Dr. Burton Yang Heart and Stroke Foundation Career Investigator Award

The Heart and Stroke Foundation awarded **Dr. Burton Yang**, a senior scientist in biological sciences, a Career Investigator Award worth \$415,000 over five years. He will use the funds to study the roles of microRNAs in regulating cell activities and angiogenesis.



Dr. Lorne Zinman
Governor General of Canada Queen Elizabeth II Diamond Jubilee Medal

Dr. Lorne Zinman, an affiliate scientist in evaluative clinical sciences, was awarded the Queen Elizabeth II Diamond Jubilee Medal. Zinman was recognized for his dedication and leadership in establishing the Canadian ALS (amyotrophic lateral sclerosis) Research Network, a national alliance of ALS clinicians and researchers. The ALS Society of Canada presented him with the award at its 2012 annual awards dinner on April 28, 2012, in Toronto.

WHAT'S ON

June to August **SRI Summer Student Seminars** 1:30–2:30 p.m. Schedule available on Intranet Room SG 22

June 11
5th Annual Canadian CTO Summit 2012
7:30 a.m.-4:00 p.m.
Harrison Hall, EG 21

June 15
6th Annual Career Day
9:30 a.m.-4:30 p.m.
Life Science Career Development Society
Medical Sciences Building
University of Toronto

June 25–27

Cardiac Tissue Characterization and Image-Based Models Workshop 8:30 a.m.–5:00 p.m.

Harrison Hall, EG 21

July 3–31
Field-Mitacs Summer Research School:
Mathematics of Medical Imaging
Fields Institute for Research in
Mathematical Sciences
Visit website for more information
www.fields.utoronto.ca

August 16 SRI Summer Student Research Poster Competition 2:00–4:30 p.m. McLaughlin Auditorium, EG 18

Editor: Stephanie Roberts Writers: Eleni Kanavas, Alisa Kim and Stephanie Roberts

Nexus is published by the office of communications, Sunnybrook Research Institute: sunnybrook.ca/research. We welcome your suggestions. Please send them to Eleni Kanavas at eleni.kanavas@sri.utoronto.ca.

