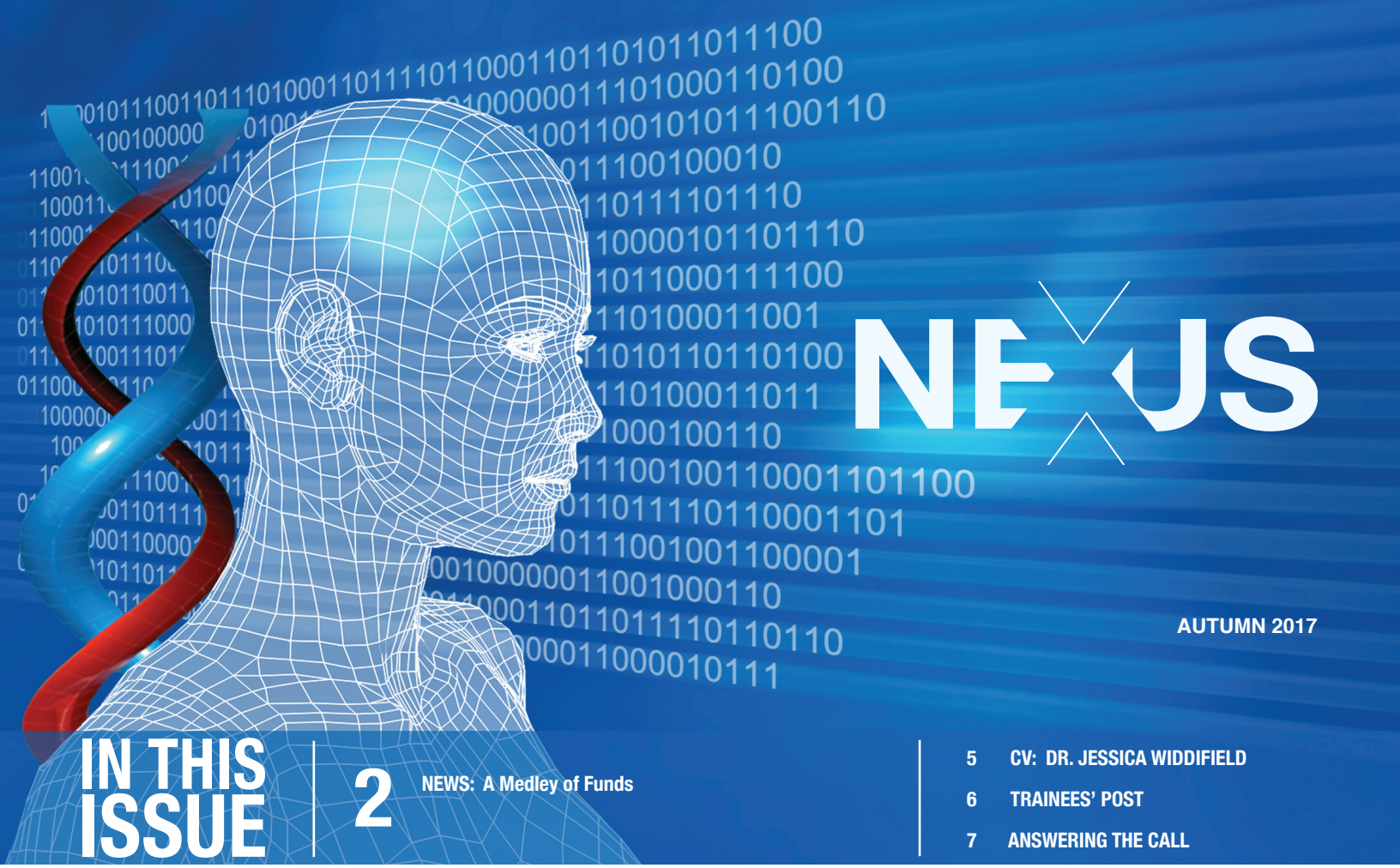

NEXUS

AUTUMN 2017

IN THIS ISSUE

Pioneering Science Rewarded

Canada Foundation for Innovation invests in image-guided therapeutics research

By Matthew Pariselli

Three science teams at Sunnybrook Research Institute (SRI) have received 2017 Innovation Fund grants from the Canada Foundation for Innovation (CFI). Overall, the CFI contributed more than $6.6 million to advance the research carried out by SRI scientists.

"The proposals that the CFI has funded centre on trailblazing work. Research into image-guided therapeutics is a field in which SRI leads globally. This investment will help us to remain at that vanguard," says **Dr. Michael Julius**, vice-president of research at SRI and Sunnybrook. "I applaud the hard work of the scientists and their teams who made this happen."

Dr. Kullervo Hynynen, senior scientist and director of Physical Sciences, was awarded $2,510,000 to develop further focused ultrasound (FUS) technology. Hynynen, who pioneered the development of the noninvasive technology decades ago, will work with fellow SRI researchers, including **Drs. Isabelle Aubert**, **Sandra Black**, **David Goertz**, **Simon Graham**, **Robert Kerbel**, **Nir Lipsman**, **JoAnne McLaurin**, **James Perry** and **Greg Stanisz**.

The Canada Foundation for Innovation has given science teams at Sunnybrook Research Institute over $6.6 million to advance their work. Dr. Kullervo Hynynen is one of the three lead researchers who secured a grant. [Photo: Kevin Van Paassen]

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Sunnybrook RESEARCH INSTITUTE

News @ SRI

A Medley of Funds

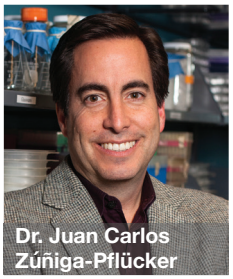
The Canadian Institutes of Health Research (CIHR) awarded a quartet of scientists Foundation Grants in the 2016–2017 competition.


Dr. Andrea Gershon

Dr. Andrea Gershon, a scientist in Evaluative Clinical Sciences, was awarded $962,746 over five years for research that seeks to improve care for Canadians with chronic obstructive pulmonary disease and asthma. She will use data from millions of Canadians, including age, sex, ethnic background, immigrant status and medical information to learn the best way to prevent acute exacerbations of these respiratory conditions.

Dr. Kullervo Hynynen, director of Physical Sciences, was awarded $2.3 million over seven years to develop the next generation of focused ultrasound therapy devices. The grant will enable him to optimize focused ultrasound for the treatment not only of brain tumours and Alzheimer's disease, but also of stroke and deep vein thrombosis.

Dr. Dennis Ko, a scientist in the Schulich Heart Research Program, was awarded $2 million over seven years to determine how to improve transitions in care, from hospital to home, or from the emergency department to home or a rehabilitation facility, for patients with cardiovascular disease. Ko will also create a learning health system tool to align the priorities of patients, clinicians and policy makers.


Dr. Juan Carlos Zúñiga-Pflücker

Dr. Juan Carlos Zúñiga-Pflücker, a senior scientist in Biological Sciences, will receive $2.8 million over seven years to study blood cell development and how T lymphocytes, a subset of white blood cells, are generated from stem cells. T cells regulate the immune system, which protects the body from cancer and infectious diseases. The research is discovery-focused, but has an ultimate goal of realizing cell-based, immune-reconstitution and immune-therapeutic applications.

Two clinician-scientists in Evaluative Clinical Sciences and the Odette Cancer Research Program were awarded CIHR operating grants through the Partnerships for Health System Improvement for Cancer Control program.


Dr. Kelvin Chan

Dr. Kelvin Chan was awarded $970,638 over four years to develop a framework for the incorporation of real-world evidence into cancer drug funding decisions in Canada.

Dr. Natalie Coburn was awarded $758,176 over four years to evaluate survival, patient-reported outcomes and costs for advanced gastrointestinal cancers.

South of the border, the National Institutes of Health (NIH) awarded four scientists funding in 2017. As a bonus, the grants are in U.S. funds.

Hynynen will receive more than $1.5 million across four years to further his work on developing a noninvasive focused ultrasound method for high spatial resolution brain surgery and drug delivery. He has received continual funding from the NIH for 20 years.

Dr. Andrew Lim, a scientist in the Hurvitz Brain Sciences Research Program, received a five-year grant of $3.2 million to study sleep, circadian rhythms and mechanisms of cognitive decline in the human brain. It is his first NIH award.


Dr. Meaghan O'Reilly

Dr. Meaghan O'Reilly, a scientist in Physical Sciences, was also awarded her first NIH grant. She will receive $296,887 spanning two years to examine the feasibility of using ultrasound-mediated drug delivery, targeted through the intact spine in the treatment of leptomeningeal metastatic disease in the spinal cord.

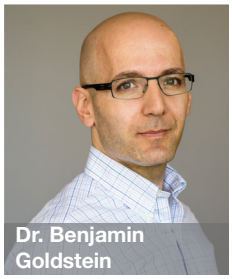
Dr. Hannah Wunsch, a senior scientist in the Trauma, Emergency & Critical Care Research Program, received a four-year funding infusion of more than $2 million to study acute pain management and long-term opioid use after surgery. It, too, is her first NIH grant.

The aim of the Terry Fox New Frontiers Program Project Grant is to explore new frontiers in cure-oriented cancer research. To this end, **Dr. Stuart Foster**, a senior scientist in Physical Sciences, was awarded $6.6 million over five years to study porphysome nanoparticle-enabled image-guided cancer interventions.


Dr. Chinthaka Heyn

Rounding out the medley, associate scientist **Dr. Chinthaka Heyn**, also in Physical Sciences, was awarded a New Investigator grant from SickKids Foundation and the CIHR Institute of Human Development, Child and Youth Health. He will receive $292,234 over three years to study brain energy metabolism and heat production in adolescents with bipolar disorder.

A Royal Prize


Dr. Benjamin Goldstein

Dr. Benjamin Goldstein, a senior scientist in the Hurvitz Brain Sciences Research Program at Sunnybrook Research Institute and director of the Centre for Youth Bipolar Disorder at Sunnybrook, is the 2017 recipient of the Royal-Mach-Gaensslen Prize for Mental Health Research. He was recognized for his work exploring the links between bipolar disorder and cardiovascular health in teens. The prize, worth $100,000, is presented annually to an early-career researcher who demonstrates excellence in clinical research and innovative thinking. Goldstein received the award on Oct. 5, 2017 in Ottawa, Ont.

News @ SRI

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The funds will be used to upgrade 3T MRI and FUS systems, and to purchase equipment to enable ultra-high-speed video microscopy. Building on a long list of firsts in the field, Hynynen and his team will engineer the next generation of MRI-guided FUS technology for the brain. The research goes from basic science to clinical translation, with the ultimate aims of developing new commercial devices and leading first-in-human clinical trials of this powerful new technology.

Hynynen's proposal was exceptionally well received by the committee charged with reviewing it. It was deemed to exceed significantly the objectives in the areas of global leadership, research capacity and benefits to Canadians, a rare feat.

Another senior scientist in Physical Sciences to secure an Innovation Fund was **Dr. Greg Czarnota**, who is also director of the Odette Cancer Research Program. As project leader, he garnered $3,231,400. Rounding out the team are SRI researchers **Drs. Stanley Liu**, **Andrew Loblaw**, **Eileen Rakovitch**, **Arjun Sahgal**, Stanisz and **Danny Vesprini**, along with collaborators elsewhere in Toronto, Ont. and in Utrecht, the Netherlands.

Together, they will work to develop better radiotherapy technology. Among these is a unique device that pairs a magnetic resonance linear accelerator (MR-linac) with a FUS therapy system. The platform will allow clinicians to use FUS with microbubbles while administering radiation under MRI guidance. Czarnota's research has found that injecting microbubbles into the circulation during treatment can increase tumour radiosensitivity 40- to 60-fold. Czarnota says the investment will enable him to "conduct important first-in-human research in cancer patients to make their treatments more potent." He adds that without this funding the specialized equipment would be unobtainable.

Dr. Graham Wright, senior scientist in Physical Sciences and director of the Schulich Heart Research Program, also received an Innovation Fund. With the $869,131 he was awarded, he will work with SRI cardiac researchers **Drs. Brian Courtney**, **Eugene Crystal**, **Nilesh Ghugre**, **Mihaela Pop**, **Sheldon Singh** and **Brad Strauss**, along with colleagues at the University Health Network, to develop imaging technologies and therapeutics to treat people prone to heart failure and sudden cardiac death.

"The CFI-funded infrastructure expansion will facilitate 'clinical-grade' cardiac electrophysiology characterization and interventions, as well as cardiac stem cell therapy development and evaluation in preclinical models, a critical step toward first-in-patient studies," Ghugre says.

Minister of Science Kirsty Duncan announced the recipients—117 new projects worth $554 million across 61 institutions—Oct. 12, 2017 in Winnipeg, Man. "Our government understands that scientists need to have the best labs and tools if they're going to make discoveries that will pave the way to a brighter future for all people," says Duncan. "That's why today's funding announcement is so important; it gives scientists and their students the opportunity to further their research in areas where Canada has a competitive advantage."

"The Innovation Fund encourages institutions and its researchers to think big and strive to be global leaders by conducting world-class research," says Dr. Roseann O'Reilly Runte, president and CEO of CFI. "With this support, institutions can build on their current research strengths and set their sights on accelerating research that will create social, health, environmental and economic benefits for all Canadians."

The CFI provides up to 40% of the total cost of a project. A further 40% is sought from the institution's home province, with the remaining 20% provided by the institution.

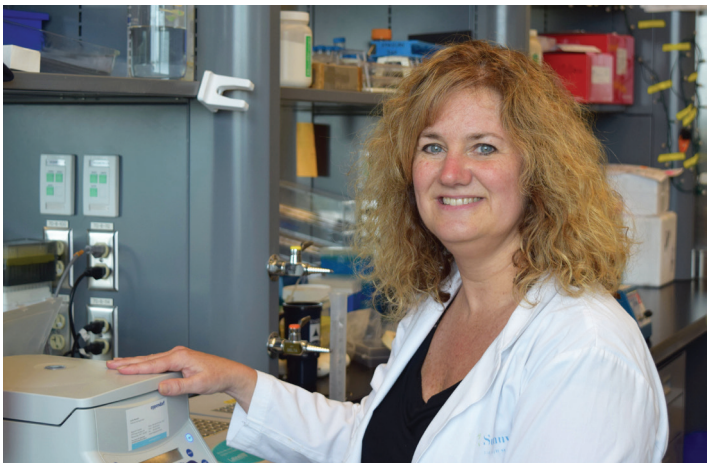
Adding a Pivotal Piece to the Human Development Puzzle

By Matthew Pariselli

Dr. Michele Anderson, senior scientist in Biological Sciences at SRI, has uncovered the significance of a transcription factor known as HEB in the early developmental processes of humans. She collaborated with a team—including fellow SRI senior scientist **Dr. Juan Carlos Zúñiga-Pflücker**, also in Biological Sciences—to instruct human embryonic stem cells to become T cells. Before inducing development, however, they used an innovative gene-editing technique called CRISPR-Cas9 to knock out HEB and assess its importance.

"From the very early stages of human development, there was a partial block in the formation of a tissue type known as mesoderm, and in the ability to make tissues that arise from mesoderm, such as blood and heart muscle cells, without HEB," Anderson says.

Their discovery contributes to a new basic understanding of human development, and Anderson adds that it "has a profound impact in knowing what to look for in human diseases." Moreover, their findings—published in the journal *Stem Cell Reports*—



Dr. Michele Anderson has made a breakthrough in T cell development research. [Photo: Matthew Pariselli]

could lead to promising applications. Down the road, the goal is to manufacture T cells for people who have lost them owing to HIV, radiotherapy or bone marrow transplant, for example.

Read more about Anderson's work on HEB, and some of her other achievements, by visiting **sunnybrook.ca/research**.

Tool Kit: Rapid Prototyping Machines

Real-time 3-D printing technology is transforming medical device development. At Sunnybrook Research Institute (SRI), researchers in Physical Sciences are using two rapid prototyping machines, or 3-D printers, to design and fabricate technologies like therapy delivery probes and imaging detectors inside the device development lab (DDL) at SRI's Centre for Research in Image-Guided Therapeutics.

The Viper SLA (stereolithography) by 3D Systems uses a liquid photopolymer resin and an ultra violet (UV) laser to build parts of a model layer by layer. A laser beam forms each layer by drawing a cross-section pattern on the surface of the liquid resin. The UV laser light then cures and solidifies the pattern outlined on the resin and sticks to the layer below. Once a complete 3-D part is formed, the plastic model is cured in a UV oven.

The machine can print models up to 10 inches in size in anywhere from 30 minutes to 40 hours, depending on the intricacy of the design. The parts are waterproof and ideal for devices that are small, thin and finely detailed. Most projects are used in MRI testing. Examples include a part for an MRI jig or a tiny, fine-line grid that makes up a transducer array. The plastic material is of medical grade and can have contact with skin, but cannot be implanted in patients.

The second 3-D printer is the Fortus 400 FDM (fused deposition modeling) by Stratasys. It can build larger parts with the choice of using thermoplastic polymer materials like ABS (acrylonitrile butadiene styrene), polycarbonate and ultem, an amber-to-transparent thermoplastic.

"You can do things on a 3-D printer that you cannot do in a machine shop. [These] machines are capable of doing custom or prototype parts at a quicker speed and cheaper price," says **Michael Pozzobon**, manager of SRI's advanced machine shop in the DDL. "Our machines are good for end-use parts. They are repeatable and consistent. If you can draw it up, we can make it."

A demo depicting white matter in the brain printed with the Viper SLA. [Photo courtesy of Michael Pozzobon]

Several researchers at SRI use the industrial machines, including **Drs. Brian Courtney**, **Kullervo Hynynen** and **Graham Wright**, as well as clinicians at Sunnybrook. External users include those from Princess Margaret Cancer Centre, SickKids and St. Michael's Hospital.

The 3-D printers were purchased with funding from the Canada Foundation for Innovation. — Eleni Kanavas

And Baby Makes Four

Dr. Andrew Lim, a scientist in the Hurvitz Brain Sciences Research Program, and his wife Sheila Hew welcomed their second child, Constance Lim, into the world on Aug. 4, 2017. Constance was born in Sunnybrook's Women & Babies unit, weighing eight pounds.

Big sister Grace is thrilled to have a little sister. Mom, dad, Grace and baby Constance are all doing well.

[Photo courtesy of Dr. Andrew Lim]

Girl Meets World

Dr. Meaghan O'Reilly and David Killing welcomed the arrival of their baby daughter, Ramona Grace Killing, four days earlier than expected.

O'Reilly, a scientist in Physical Sciences, gave birth to a healthy baby girl on July 13, 2017 at Sunnybrook's Women & Babies birthing unit. Baby Ramona, the couple's first child, weighed eight pounds, four ounces at delivery.

Mom and dad say they are a little tired, but extremely happy to be parents to a wonderful baby.

Ramona Grace Killing [Photo courtesy of Dr. Meaghan O'Reilly]

We Are SRI

CV: Dr. Jessica Widdifield

Bio basics: A scientist in Evaluative Clinical Sciences and the Holland Musculoskeletal Research Program at Sunnybrook Research Institute (SRI). Completed her undergraduate degree at the University of Guelph, her PhD at the University of Toronto's Institute of Health Policy, Management & Evaluation, and a postdoctoral fellowship at McGill University and the Institute for Clinical Evaluative Sciences. Born in Sault Ste. Marie, Ont. and raised near Sudbury, Ont. Joined SRI in September 2017. Has lived in Toronto, Ont. since 2006.

How did you become interested in research?

The great thing about research is it's always evolving and it's dynamic; it's continued learning. Research methodology is always improving, and you're constantly advancing skills and gaining knowledge. I love the collaborative opportunities where we use evidence to improve practice, policy, care and the lives of patients!

What is your research focus?

I evaluate the health care system to understand whether physicians are providing care appropriately and to identify gaps in care. I also help to develop strategies and tools to support physicians in optimizing care, and to understand whether we have the resources to manage patient populations. The goal of my research is to optimize the evaluation, care and outcomes of patients with musculoskeletal [MSK] conditions. I work with an interdisciplinary team of rheumatologists, orthopaedic surgeons and primary care physicians. One of my central goals is to improve the primary care-specialist interface for patients with MSK conditions.

Why have you chosen to frame your research around MSK conditions, specifically arthritis?

Musculoskeletal conditions like arthritis are a leading cause of disability and have one of the largest impacts on population health in terms of death and disability. The burden is increasing. The aging demographic is not properly managed, and there aren't enough care providers. Canadians with MSK conditions face unacceptably long wait times and variations in care, which result in suboptimal outcomes, increased costs and reduced quality of life. Innovation is needed to transform the system.

Aside from research and science, what are some of your interests?

Travel, even though everyone says it. When I'm traveling, I like to go without a plan and get lost in cities, just walk out of my hotel room and see where I end up. I like to go scuba diving. I love diving with sharks. My desktop background is an image of sharks. [laughs] I like live music, too. The last band I saw play was Arkells.

For a longer transcript visit **sunnybrook.ca/research**.

Behind the Scenes With Dr. Nickett Donaldson-Kabwe

Bio basics: Operations manager of the Good Manufacturing Practices (GMP) Facility at Sunnybrook Research Institute (SRI). Previously worked as a research associate at McMaster University. Completed her PhD in cell and molecular biology, a certification as a clinical research associate at McMaster University and an undergraduate degree in biotechnology at Brock University. Born in Jamaica and immigrated to Canada two days after her 12th birthday. Resides in Mississauga, Ont. with her husband and two children. Joined SRI in April 2014.

What is the GMP facility?

It is a Health Canada-regulated facility producing new cell and gene therapy products for use in human clinical trials. The facility is equipped with four Grade B and C cleanrooms used to process and manufacture these products. These controlled cleanrooms have very low levels of environmental contaminants like lint, dust, aerosol particles and airborne microbes, because strict cleanroom practices are in place. The volume of air in each of our cleanrooms is exchanged over 260 times per hour, making the room air at minimum 1,000 times cleaner than outside air. The facility employs strict practices to deliver quality across all facets of its operations.

What are some of your responsibilities?

I develop most of the protocols, write a lot of SOPs [standard operating procedures] and review projects. We make sure the cleanrooms are certified and are fit for clinical projects. Some of my responsibilities include pricing out services, writing service contracts, organizing operational logistics and creating the facility operating budgets. I also meet with the clients to determine their needs, assess our capabilities to deliver these and price out whatever services they need. It's a busy place. We make sure that it's always certified and ready to go.

What's the most rewarding part of your job?

Getting the products out of the lab and into the clinics—that's the whole objective of the GMP facility. Current projects include isolating and culturing islet cells from the pancreas to treat diabetes; aseptic expansion of T cells; and viral transduction of T cells for treating a genetic disorder. **Dr. Charles Cunningham**, a senior scientist in Physical Sciences, is producing a hyperpolarized compound to detect early-stage heart failure and understand if metastatic cancers are responding to therapy.

Why did you choose a career in science?

I love experimenting, and I've always been drawn to anything scientific, the unknown, basically, just finding out how something works. Biological systems have always fascinated me. I've seen myself in a lab coat ever since I was a little girl.

The GMP facility is part of the Centre for Research in Image-Guided Therapeutics, funded by the Canada Foundation for Innovation. For a longer transcript visit **sunnybrook.ca/research**.

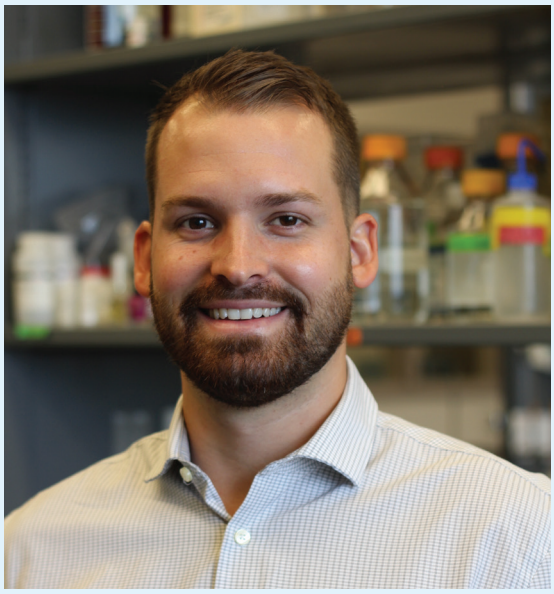
Trainees' Post: for Students and Postdocs

Finding the right postdoctoral fellowship—stay or go?

Upon finishing high school **Nick Fischer** was torn between two interests. An avid musician—he plays the accordion, piano and guitar—Fischer seriously considered studying music. He instead chose his other interest, science, knowing that music would always be part of his life. Fast forward a decade and Fischer, who is wrapping up his PhD in the lab of Sunnybrook Research Institute (SRI) senior scientist **Dr. Jean Gariépy**, faced another dilemma. In pursuit of his goal of running his own lab, he plans to do postdoctoral research. The question is: where?

"Leaving to go somewhere new and gain international experience is really good for one's career. It shows you can work in different places, pick up new skills and work with different people," says the 28-year-old, who defends his thesis at the end of 2017. While searching for opportunities in the U.S., however, Fischer was offered a postdoc with Dr. David Malkin, a clinician-scientist specializing in cancer genetics at SickKids Research Institute. Fischer accepted the offer because it is a good opportunity. Malkin, in turn, supports Fischer's intention to gain further training outside Canada.

Here, Fischer talks with **Alisa Kim** about his research, what he is looking for in a postdoc and why his next position is a good stepping stone to becoming an independent researcher.



Nick Fischer is finishing up his PhD in the lab of Dr. Jean Gariépy. His research is on the biology of the p53 gene. He plans to do a postdoc abroad. [Photo: Alisa Kim]

What is your PhD on?

It's on the tumour-suppressor protein p53. It's mutated in up to 60% of all cancers. This protein oversees control of cell growth and cell division; if your cell's damaged, it makes the decision to either repair the damage or commit suicide.

My thesis is on the functional effects of mutations in the p53 gene and the clinical consequences of them in cancer. I focused on the oligomerization of p53—the LEGO-like ability of p53 to interact with itself to form units that we call dimers (two p53 molecules) or tetramers (four p53 molecules). When any cell of your body is stressed out or damaged, p53 will form tetramers—the fully active form of the gene—then it can do its signalling cascade and kill the cell. If there's only one of them, called a monomer, it's inactive; that's what we found. If there are two p53 molecules, called a dimer, it can stop cell growth, but it can't kill the cell. We discovered that the structural form of p53 in cancer patients is a predictor of survival.

What are your main considerations in searching for a postdoc?

Finding a good institution and a city I like. There are large biotech centres in Boston and California with both academic and industrial research opportunities.

I also think it's important to have a good relationship with your supervisor. Before I go anywhere to do a postdoc, I want to make sure I sit down with the professor and really get to know them and the lab members. I want to see everything is functioning well.

What are some of the challenges?

When you're graduating, you're trying to publish your last papers and going to conferences. I haven't had time to look into things. I'm just searching for whatever looks interesting to me, and there's a lot that looks interesting. That's the problem—there are almost too many options. I think I could go to many different labs, but will I be happy, fit in and like the project? It's really trial and error.

Why did you accept the position at SickKids?

My PhD work doesn't end with my defense. I have a lot of loose ends to tie up—projects I want to pursue. I hope that at SickKids I can finish these projects and have something that leads into a postdoc abroad. I'm always looking to get more tools in my 'tool kit.' At Dr. Malkin's lab, they do more genomics work, and they're working on CRISPR gene editing technologies, so I hope to learn some of that, too.

Did the last six years feel like it went by fast?

It did—really quickly. I like being here at SRI. I know everyone. I know what to do. That next step, the postdoc, is a bit worrisome, but exciting. I'm looking forward to a new project. That's another consideration: do you stray from your current focus, or choose a new topic? Both can be beneficial. If you change fields, you have more diversity. If you stay in the same field, I see benefits to that too, because I'm kind of in this niche area.

What skills that you've acquired in Jean's lab will you bring to your next position?

We do so many different types of experiments. We span chemistry, biochemistry, cell biology and immunology. I feel lucky to have worked in such a lab. We have really great instruments, like the surface plasmon resonance system. We study protein-protein interactions or DNA-protein interactions. I noticed in a posting for an industrial postdoc they were asking for students with experience with surface plasmon resonance. We're one of the only labs in Toronto with [this machine]. I'm happy I have experience with that because that's something most students don't get.

Answering the Call

Researchers devise remedy for skin burns during radiotherapy

By Alisa Kim

If necessity is the mother of invention, then there's no shortage of progenitors in health care. In oncology, for example, opportunities for innovation abound—from finding ways to detect cancer earlier, to customizing treatment and reducing adverse effects.

Researchers at Sunnybrook's Odette Cancer Centre (OCC) who were alerted to a complication of radiation therapy have come up with a simple, elegant solution. Drs. Anthony Kim and Alex Karotki, medical physicists, and Harry Easton, a technologist, were informed by oncologists at OCC that some patients receiving therapy for rectal cancer were developing skin peeling and redness on the buttocks and back during radiation treatment. **Dr. William Chu**, a clinician-investigator at Sunnybrook Research Institute, was one of the doctors who raised the issue. He recalls one case in particular: "It was definitely noticeable. [Her skin] was developing more redness than usual as the weeks went by," he says, noting that patients who have radiotherapy are treated for 10 minutes every day for nearly six weeks.

The need for the apparatus arose about two years ago when the centre switched to a new treatment delivery technique called volumetric arc therapy, or VMAT, which allows radiation beams to be shaped precisely around a tumour. The technique enables patients to be treated lying on their backs; elsewhere, it is standard practice for patients to lie on their stomachs during radiotherapy. "With the VMAT technique we can 'scallop' the dose around the target, so we can treat patients supine, which is more stable and comfortable," says Karotki.

Lying face down during treatment is especially difficult for patients who are elderly and frail, and thus, more likely to fall off the equipment, notes Kim. He and his team did research comparing the positions. Their data, which Kim says will be published soon, show that the supine position is safer and more comfortable. Moreover, lying on one's back enhances the ability of clinicians to reproduce the treatment setup, owing to the stability of the position. The only wrinkle, however, is that lying on the table supine puts patients at greater risk of skin side effects. Kim explains: "This is how the radiation beam enters into tissue: it builds up from a very low dose, spikes and then falls off. The problem is, when you have these beams going through the treatment table that the patient lies down on, it 'eats up' some of that build-up area, so that the dose spikes close to the skin, as opposed to deeper into the tissue, and skin is radiation-sensitive. So we built this," he says, pointing to the device.

Their workaround has patients lying on the skin-sparing board during treatment. Measuring about six feet tall and 20 inches wide, and made of Styrofoam, the board sits on top of the radiation equipment and acts as a buffer between the table and the patient's backside, thus minimizing build-up of radiation at the skin's surface. Wrapped around the board is a textured, black adhesive covering made by 3M. The team tested several materials before Easton found the wrap—used mainly to decorate cars—online. The protective layer needed to be durable, thin, cost-effective and, importantly, easy-to-clean and nonporous to prevent infection. The 3M wrap, which adheres to the board in a single piece, fit the bill.

Applying what is essentially a giant piece of tape to the foam board was "tricky," says Easton, who notes it is a two-person job. He and a colleague have made 10 of them so far. "We got better and better at it as we went on," says Easton, smiling.

The simple design of the device belies the research behind it. Before it could be used clinically, the researchers had to run tests to determine the effect it would have. They did experiments to measure how much radiation a patient would receive at the skin's surface with and without the board. They found the board had a skin-sparing effect of about 10%. "When translated to a standard rectal cancer patient, that's equivalent to about four to five Gray [units of radiation], which is enough to reduce skin toxicity," says Kim.

The device has been used clinically for about a month, with no reports of radiation burns. There are eight of them in service at the OCC, which is one of the busiest cancer centres in Canada. Chu estimates more than 100 people are treated for rectal cancer at Sunnybrook each year.

Kim and his colleagues seek to commercialize the device via a licensing agreement to improve treatment of rectal cancer patients everywhere. The skin-sparing board would be a fraction of the cost of the "belly boards" used in other cancer centres, which runs a few thousand dollars. "It would be great to have this out there because I think every radiation therapy clinic would benefit from this," says Kim. "Nothing like this exists on the market. If we could have bought this, we wouldn't have done this."

L to R: Dr. Anthony Kim, Harry Easton and Dr. Alex Karotki, of Sunnybrook's Odette Cancer Centre, with the device they developed to prevent skin burns during radiotherapy.
[Photo: Kevin Van Paassen]

Bulletin Board

October and November
Medventions Lecture Series
Dates: Oct. 19, 26; Nov. 2, 9, 16, 23 and 30
Titles to be announced
5 p.m.
M6 502 lecture theatre

October to December
Cancer Research Rounds
Dates: Oct. 17, 31; Nov. 21, 28; Dec. 5 and 19
Titles to be announced
1 p.m.
Jenkin auditorium, TB 21

February 8, 2018
Medventions Innovation Day
7:30 a.m.–4 p.m.
McLaughlin lecture theatre, EG 61

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

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We welcome your suggestions. Please send them to Eleni Kanavas at eleni.kanavas@sri.utoronto.ca.

On July 22, 2017, Sunnybrook installed Canada's first MR-linear accelerator. The technology fuses a radiation therapy system with real-time MRI to target tumours with immense precision. Dr. Arjun Sahgal, a clinician-scientist at Sunnybrook Research Institute and deputy chief of radiation oncology at Sunnybrook, stands behind the equipment as it is lowered through the roof of the Odette Cancer Centre. The MR-Linac will enable radiation oncologists at Sunnybrook to treat cancers of the central nervous system, pancreas and esophagus. [Photo: Doug Nicholson]