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Proving Their Potential

Students shimmer at summer showcase

By Alisa Kim

On Aug. 20, 2014, Sunnybrook Research Institute (SRI) hosted its annual Best Summer Research Project competition.

The event capped the D+H SRI Summer Student Research Program, a four-month research-intensive program that allows undergraduates from Canadian universities to learn the fundamentals of scientific inquiry while being mentored by SRI faculty.

Students provided a “guided tour” of their posters to judges—comprised of SRI faculty, postdoctoral fellows and graduate students from each platform—and other passersby checking out the event. After outlining their aims, methodology and findings, students answered questions about their work.

“I’m really impressed with the quality of the work I’ve seen,” said **Dr. Saeid Amini-Nik**, a junior scientist in Biological Sciences and a judge in the competition. “These students have only been here a few months, but [their posters] show they’ve worked really



The winners of the 2014 Best Summer Research Project competition hosted by Sunnybrook Research Institute. Dr. Michael Julius (back row, centre) presented the awards. From left to right (back row): Ryan Gotesman, Shahmir Sohail, Mathew Nicholas and Michael Hynes; (front row): Vivian Tia, Chloe Gui, Thuy Linh Do, Olivia Hough and Claudia Dziegielewski.

hard. In the short time they’ve had, they’ve made huge accomplishments.”

There were 55 entrants in this year’s competition, including 16 from Biological Sciences, 19 from Evaluative Clinical Sciences and 20 from Physical Sciences.

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Summer's Bounty

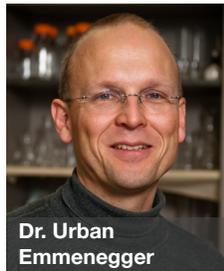
In the cooler-than-normal days of summer, the heat was on at Sunnybrook Research Institute (SRI). Thirteen scientists working in the areas of cancer, heart and brain sciences were successful in securing grants in the latest funding competitions.

"These investments across programs and platforms testify to the scientific excellence and hard work of our scientists. Kudos are due to them all," says **Dr. Michael Julius**, vice-president of research at SRI and Sunnybrook.

Dr. Charles Cunningham, a senior scientist in Physical Sciences, was awarded \$392,260 over three years from the Canadian Breast Cancer Foundation (CBCF). He will use the funds to investigate whether metabolic imaging using a new contrast agent for magnetic resonance imaging can be used to characterize early response to therapy.

A hearty congratulations goes to **Cunningham** and **Dr. Dan Dumont** who each received a one-year grant-in-aid from the Heart and Stroke Foundation. Cunningham was awarded \$82,625 to study metabolic imaging of the hypertrophic heart. Dumont, a senior scientist in Biological Sciences, was awarded \$79,930 to examine the angiotensin peptide mimetic vasculotide, as a treatment for atherosclerosis and ischemia.

The Canadian Cancer Society awarded **Drs. Hans Chung** and **Urban Emmenegger** each a 2013 Relay for Life Activities grant worth \$90,000. Chung, an affiliate scientist in Physical Sciences, will use the funds to study prostate cancer biobanking. Emmenegger, a scientist in Biological Sciences, will further his work on breast cancer molecular therapeutics.



Dr. Bob Kerbel, a senior scientist in Biological Sciences, was awarded \$350,650 over three years from the CBCF. He will use the funds to develop models of spontaneous breast cancer bone metastasis in mice.

Dr. Andrew Loblaw, a scientist in the Odette Cancer Research Program, received a Movember discovery grant from Prostate Cancer Canada. He will receive \$159,650 over two years for his research on pelvic lymph node stereotactic ablative radiotherapy for high-risk prostate cancer.

The agency also awarded Dr. John Bartlett and co-principal investigators **Loblaw** and **Dr. Eileen Rakovitch**, scientists in the Odette Cancer Research Program, a Movember team grant. They will receive \$4.9 million over five years for their project, which is aimed at rapid development of novel diagnostic markers for early prostate cancer.

The Canadian Cancer Society Research Institute (CCSRI) recognized **Dr. Anne Martel**, a senior scientist in Physical Sciences, with an innovation grant worth \$198,973 over three years to conduct a quantitative assessment of tumour burden in breast cancer.



The Allan Tiffin Trust awarded **Dr. Claire McCann**, an affiliate scientist in Physical Sciences, a Tiffin Estate Award worth \$70,000. She will use the funds to further her research on breast tumour microwave ablation.

Dr. Sara McEwen, a scientist in Evaluative Clinical Sciences (ECS), was awarded an innovation grant from CCSRI. She will receive \$191,930 over two years to develop a pilot study that will evaluate a rehabilitation consult for survivors of head and neck cancer.

The American Foundation for Suicide Prevention awarded **Dr. Mark Sinyor**, an associate scientist in the Brain Sciences Research Program, a grant worth \$85,000 USD over two years. He will use the funds to analyze media reports on suicide and its relationship to suicide deaths.

From the Office of Naval Research, an executive branch agency within the Department of Defense, senior scientist **Dr. Greg Stanisz** in Physical Sciences was awarded a grant worth \$1.5 million over four years. His team is exploring the immunomodulatory and neuroactive properties of specific gut bacteria to identify how elements of the gut microbiome can modulate the brain and some of its functions related to anxiety, fear and cognition.

Capping the hat trick, **Dr. Jill Tinmouth**, a scientist in ECS, won a prevention research grant worth \$393,753 over three years from CCSRI. She will use the funds to conduct a randomized controlled trial of an audit and feedback report to improve colonoscopy performance.

Scientists Receive Funding To Explore 'New Frontiers'

On Sept. 10, 2014, the Terry Fox Foundation announced a \$14.6 million investment to support researchers at six leading Toronto cancer centres. The announcement was made in celebration of the 34th annual Terry Fox Run held across Canada.

Dr. Greg Czarnota, director of the Odette Cancer Research Program at Sunnybrook Research Institute (SRI), and team members **Dr. Greg Stanisz**, a senior scientist in Physical Sciences at SRI, and colleagues from Ryerson University, received an award worth \$2 million over three years through the 2014 New Frontiers Program Project. The researchers aim to develop ultrasound and magnetic resonance imaging techniques to assess the effectiveness of chemotherapy and radiation therapy sooner than is done with conventional imaging methods.

News @ SRI

Celebrating Success in Image-Guided Therapeutics Program

On July 8, 2014, the Honourable Gary Goodyear, Minister of State for the Federal Economic Development Agency for Southern Ontario (FedDev Ontario), John Carmichael, member of Parliament for Don Valley West and Karen Ellis, president of FedDev Ontario, visited Sunnybrook Research Institute (SRI) for a celebration of its Image-Guided Therapeutics program. Invited guests, SRI scientists and their teams, and industry partners who matched FedDev Ontario's \$6.9 million investment into the program also attended the event. Read more about the showcase at sunnybrook.ca/research.



1. MP John Carmichael, Karen Ellis, Dr. Barry McLellan, president and CEO of Sunnybrook, the Honourable Gary Goodyear and Dr. Michael Julius, vice-president of research at SRI and Sunnybrook.

2. Goodyear with an SRI token made within the device development lab.



3. Dr. Daniel Pajek shows Goodyear and Carmichael the focused ultrasound system developed by FUS Instruments that can fit within a small-bore preclinical MRI system.



4. Drs. William Dominguez-Viqueira and Charles Cunningham show the hardware platform they created for metabolic MRI of breast cancer, which has been integrated with a commercial partner's MRI patient table system.



5. Drs. Kevan Anderson and Garry Liu hold the headsets of a wireless communication system they invented with Innovere Medical for use within the MRI suite.



6. Ben Lucht talks about an earlier stage of focused ultrasound technology developed at SRI in partnership with industry.



Tool Kit: Zeiss Observer Spinning Disc Confocal Microscope



The Zeiss observer Z1 spinning disc confocal microscope is used for live cell fluorescent imaging. It is located in SRI's Centre for Flow Cytometry and Microscopy in the Centre for Research in Image-Guided Therapeutics. [Photo: Eleni Kanavas]

Live cell imaging is a technique scientists use to study living cells with time-lapse microscopy. **Dr. Marc Jeschke**, a senior scientist in Biological Sciences at Sunnybrook Research Institute (SRI), acquired the Zeiss observer Z1 spinning disc confocal microscope to study and develop wound-healing therapy in burn patients using live cell fluorescent imaging.

Located in the Centre for Flow Cytometry and Microscopy in SRI's Centre for Research in Image-Guided Therapeutics, the Zeiss inverted microscope is equipped with high-speed lasers and two light-sensitive cameras for rapid imaging. It allows users to take images faster than they could do with a regular confocal microscope. It also has a humidifying chamber with a temperature controller, heater, and carbon dioxide (Co2) gas mixer to allow for flexible air, humidity and Co2 regulation to maximize cell growth and survival.

Scientists Score Tri-Council Funding

A baker's dozen of Sunnybrook Research Institute scientists were winners in the latest competitions funded by the Canadian Institutes of Health Research (CIHR) and the Natural Sciences and Engineering Research Council of Canada (NSERC). To read about the researchers awarded CIHR operating grants in the March 2014 competition, visit sunnybrook.ca/research.

Here are the recipients of NSERC's 2014 discovery research grants.

Dr. Michele Anderson, a senior scientist in Biological Sciences, will receive \$165,000 over five years to study differential control of gene expression by specific E protein dimers. Her research is aimed at understanding the role of transcription factors in T cell development.

Dr. Isabelle Aubert, a senior scientist in Biological Sciences, will receive \$125,000 over five years to study the effects of exercise on hippocampal plasticity in the brain. Aubert leads the Brain Repair Group at SRI, which focuses on developing therapies to stop neurodegeneration and promote regeneration under pathological conditions found in cases of Alzheimer's disease.

"The cool thing with this microscope is if you take a plate, [then] you can have different wells with different conditions. You can set it up [so] that it goes automatically to each well and scans the different places and it will focus itself. You can set it up to do as many wells as you can on a plate," says **Cassandra Belo**, a research technician in the Jeschke lab who uses the system for skin-printing projects in collaboration with researchers at the University of Toronto.

An integrated computer system allows users to drive all the functions of the microscope and offers a user-friendly interface for capturing and analyzing images with sophisticated software.

"That's the key. You want to have a system that's very powerful, but you [also] want software that people can use," says **Gisele Knowles**, manager of the Centre for Flow Cytometry.

Lab members working with **Dr. Kullervo Hynynen**, director of Physical Sciences, and **Dr. Isabelle Aubert**, a senior scientist in Biological Sciences, also use the system, which enables them to conduct whole tiling series of brain cell images, including those of the hippocampus, within a few hours.

The system can also do fluorescence recovery after photo bleaching and fluorescence resonance energy transfer, techniques that enable an area of a living, single cell tagged with fluorescent dyes to be interrogated for physiological response or activity.

Sunnybrook Research Institute installed the Zeiss spinning disc confocal microscope in July 2013. The system is worth \$445,000 and was purchased with funding from the Canada Foundation for Innovation. — Eleni Kanavas

Dr. David Goertz, a scientist in Physical Sciences, will receive \$135,000 over five years. The funds will support his work on the interactions between ultrasound-stimulated microbubbles and fibrin clots.

Dr. Avril Mansfield, a scientist in the Brain Sciences Research Program, will receive \$145,000 over five years to evaluate how patients learn balance control from falling. Her research focuses on understanding balance and mobility challenges of people who have had a stroke or who are undergoing physical rehabilitation.

Dr. Bojana Stefanovic, a senior scientist in Physical Sciences, will receive \$205,000 over five years to conduct a longitudinal recording of neuronal function using two-photon fluorescence microscopy in preclinical models. The focus of her research is to develop new methods for imaging brain function.

Dr. Juan Carlos Zúñiga-Pflücker, a senior scientist in Biological Sciences, will receive \$39,000 over one year to investigate the regulation of the Delta-like 4 protein in thymic epithelial cells. His research aims to understand how, in response to key molecular signals, stem cells develop into T cells, which are essential for immunity.

We Are SRI

CV: Dr. JoAnne McLaurin



Bio basics: A senior scientist in Biological Sciences and the Brain Sciences Research Program at Sunnybrook Research Institute (SRI). Also a professor in the department of laboratory medicine and pathobiology at the University of Toronto. Completed her PhD in clinical biochemistry at U of T. Born in Hamilton, Ontario and grew up in Burlington, Ontario.

Why did you want to become a researcher?

Science was always my favourite topic at school. I went to Queen's [University] and I did chemistry and I really liked it, except at the end of my fourth year, all these companies came to campus to recruit us. I looked at all the jobs and thought, 'I don't want to do any of that.' So I jumped on a cruise ship for six months. It was my 'What am I going to do?' plan. When I decided that was a boring job, I became a research technician. I worked for Dr. Choy Hew, who was a professor at U of T, for two years. That's when I went back to grad school.

What is your research focus?

I do Alzheimer's disease (AD) research. We are looking to understand the disease process and how the brain starts to deteriorate and develop memory and cognitive deficits, as well as some of the psychological problems that go along with AD. In doing so, we actually discovered a drug that's in clinical trials right now for AD; it's for the neuropsychiatric symptoms. Sunnybrook is one of the sites of the international trial. They expect the trial to end early next year.

Since discovering that drug, what we know about AD now is that there is this big prodromal phase, where the disease is going on but you have no clinical symptoms. Much of the research is trying to understand what happens in that prodromal period. If we can understand that, [then] we might be able to intervene earlier once we have a drug. There will always be people who get AD, so the other side of my work is looking at what other drugs can we use or develop that will help patients such that their quality of life is better.

Why Sunnybrook Research Institute?

SRI has a strong Brain Sciences group, especially centered around AD and neuropsychiatric symptoms. There's a number of people [doing this]. Together with the Physical Sciences group, and with all the imaging technologies that are available, it opens up so many more avenues of research with everything under one roof. The combination of the physical sciences and brain sciences really will provide a lot of opportunity for me.

Who do you collaborate with at SRI?

Dr. Isabelle Aubert, Dr. Bojana Stefanovic, Dr. Kullervo Hynynen and Dr. Sandra Black.

What is the most rewarding aspect of your job?

I enjoy the challenge of trying to figure things out and training my students. I think that's a big part of what we do. I also like going out and talking about my work, not just to other scientists, but also to the lay community.

Are there any activities or hobbies you enjoy doing?

Golfing and stand-up paddle boarding on Lake Ontario in the warm weather.

Behind the Scenes With Dr. Josée Guimond



Bio basics: Director, research operations at SRI. Born in Lachine, Québec. Grew up in Mississauga, Ontario. Did a B.Sc. in biomedical sciences and a PhD in immunology both at the University of Guelph; a postdoctoral fellowship in cancer research at Western University; and recently completed an MBA at Rotman (University of Toronto). She was the director, research at the Canadian Breast Cancer Foundation, Prostate Cancer Canada, Canadian Diabetes

Association and Cystic Fibrosis Canada. She was also director, research operations, at the Bloorview Research Institute (Holland Bloorview Kids Rehabilitation Hospital).

What are your responsibilities?

Building services for SRI, which involves taking care of SRI space, equipment, glass washing and deliveries. I oversee comparative research, information technology, health and safety, as well the work of two staff members from MaRS Innovation who help support SRI's intellectual property and commercialization activities. I also help oversee the operations of the core research

facilities like the Centre for Flow Cytometry and Microscopy. There's a little grants management in there too.

How did you get into research administration?

After my postdoc, I didn't feel being a principal investigator was the right career for me. I saw a job posting for director, research programs at Cystic Fibrosis Canada. I looked at all the qualifications—someone with a PhD who could understand the science, who could write in layman's terms, who knew the peer-review system and the research environment in Canada, and someone who could run a database—and I thought, 'that's me.' That's how I fell into the research administration world. I've been in it ever since and really enjoy it.

How are you finding things at SRI?

This is the largest organization I've ever worked for. I'm trying to find my way on whom to talk to, to get this or that. Everyone's been great and willing to help. There are some challenges I'm facing, and I was brought in to help resolve these challenges, like lack of processes and policies specific to SRI. I'm doing an operational review. That's my priority for this year—to see where there are gaps and opportunities for improvement, prioritize the work that needs to get done and then implement!

Trainees' Post: for Students and Postdocs

Communicating your research to someone without a science background

Dr. Daniel Pajek knows all too well that talking about your research to a nonscientific audience is no easy feat. "As PhD students, we spend a lot of time discussing the minutia of details that make up our projects, [and] the details may not be very interesting to people outside of the institute. It's difficult to summarize the impact of what you are doing in a few short sentences and figure out a succinct story to tell," says Pajek, who did his doctorate in the focused ultrasound lab of **Dr. Kullervo Hynynen**, director of Physical Sciences at Sunnybrook Research Institute (SRI), and defended his PhD thesis in July.

Pajek studied systems design engineering at the University of Waterloo and began his career working in a consulting role at Deloitte. His interest in the commercialization of medical technologies led him to pursue graduate studies in medical biophysics at the University of Toronto.

He is now the president of FUS Instruments, a start-up company spun out of SRI research to commercialize preclinical focused ultrasound devices. Here, he tells **Eleni Kanavas** how his experience has helped him explain his research to a variety of audiences.



Dr. Daniel Pajek learned to summarize and explain his research in plain language during his graduate studies in the focused ultrasound lab at Sunnybrook Research Institute. [Photo: Eleni Kanavas]

What is the focus of your research?

The goal of my thesis was to explore the application of focused ultrasound to treat acute ischemic stroke, where a blood clot causes a stroke in the brain. Essentially, we investigated using high-power ultrasound to break up clots in the brain.

Why is it important to be able to communicate your research in plain language?

For me, part of it is that medical technology is a field that requires cooperation among individuals with different expertise. At Sunnybrook, where we're working with clinicians, biologists, physicists, electrical engineers and machinists, it's important to be able to communicate what you are doing with all those individuals. I definitely think that Sunnybrook is a great environment to learn how to communicate complex ideas in a straightforward way, and I think learning those skills becomes important, [especially] as you want to work in those multidisciplinary teams.

How has your education helped you in your career?

Working in the lab has given me exposure to many aspects of medical device development, from simulations to preclinical research to working with clinical systems. The focus of FUS Instruments is to develop focused ultrasound research systems that can be used by labs at other institutes. My time in the lab has helped me understand the needs of researchers.

How would you describe your first time explaining your research project?

When I was becoming introduced to the subject, I would talk in-depth about some of the things I had learned and was excited about. All those details would quickly become uninteresting to the audience, so it took a number of tries before I landed on a succinct story that resonated well with people.

I also found nonscientific groups were often more interested in hearing about clinical applications that had occurred, as opposed to the science behind it. After the essential tremor trial happened, I would often discuss the trial and how impactful it was that someone could come in with an uncontrollably shaky hand and leave without a shaky hand, all in a same-day procedure.

How do you respond to someone's questions?

Very carefully, when talking to someone without a background in the same subject area. It can be difficult sometimes because someone will ask a question, and then you quickly need to think of the answer and think of a way to translate it to everyone. It's almost like speaking a different language; you have to think twice before the information comes out.

What advice do you have for trainees about explaining their research?

It's important to think about the impact of what you're doing, as this will resonate with people the most. I think it's also important to self-filter, to eliminate jargon from what you're saying. If you're ever entering a situation where you're expected to give a presentation or talk to a lot of people, it's useful to rehearse what you're going to say, because you're probably used to speaking about what you're doing with people in your own subspecialty.

One thing I've noticed throughout my degree is that I've benefited a lot from getting to work with people from other disciplines. I think that in doing this, you learn to distill concepts and communicate with people using plain language. You learn to respect the perspectives of people with different skills and get a sense as to how your work fits into a bigger picture.

Applause

Recognizing the scientific and scholarly achievements of Sunnybrook Research Institute faculty and trainees



Dr. Weidong Du, a postdoc in the lab of **Dr. Burton Yang**, a senior scientist in Biological Sciences, was awarded a fellowship worth \$135,000 over three years from the Canadian Breast Cancer Foundation. Du will use the funds to develop a breast cancer treatment using a microRNA ‘sponge,’ which can stop cancer-causing microRNAs from functioning.



Rafal Janik, a PhD student in the lab of **Dr. Greg Stanisz**, a senior scientist in Physical Sciences, received the “best presentation award” at the Gordon Research Conference in Andover, New Hampshire, U.S. He presented his work on the use of magnetic resonance imaging to investigate the gut-microbiome and brain connection.



Dr. Stuart Foster, a senior scientist in Physical Sciences, has secured a renewal of his Tier 1 Canada Research Chair in Ultrasound Imaging. The research professorship, worth \$1.4 million over seven years, is the most prestigious academic award given by the Government of Canada.



Dr. Laurence Klotz, a clinician-scientist in the Odette Cancer Research Program, received the Lister Prize from the University of Toronto’s department of surgery. The prestigious award recognizes his outstanding work in prostate cancer research. He also was recently awarded The Society of Urologic Oncology Medal for making a significant and far-reaching impact in the field of urologic oncology.



Dr. Andrea Gershon, a scientist in Evaluative Clinical Sciences, received a New Investigator award from the Canadian Institutes of Health Research. The award is worth \$300,000 over five years. Her research aims to improve the care of Canadians with chronic obstructive pulmonary disease, and reduce the burden of this disease on the health care system.



Dr. Andrew Lim, a scientist in the Brain Sciences Research Program, received a New Investigator award from the Canadian Institutes of Health Research. The award will support his research on identifying the genes that influence human sleep and circadian function. He is also studying the impact of sleep and circadian disruption on brain diseases like dementia and stroke.



Dr. Ben Goldstein, a scientist in the Brain Sciences Research Program, received an Early Researcher Award from the Ministry of Research and Innovation. The competitive prize recognizes researchers early in their careers. Goldstein is studying the link between mood and heart disease in adolescents with bipolar disorder.



Dr. Richard Swartz, a scientist in the Brain Sciences Research Program, received a New Investigator award, worth \$300,000 over five years, from the Heart and Stroke Foundation for his work on screening for depression, obstructive sleep apnea and cognitive impairment—common conditions after a stroke—to help identify high-risk stroke clinic patients.

Continued from page 1

Judges selected the top student from each platform, basing their decisions on the quality of the poster, the project’s scientific merit and the student’s communication skills. There were also second- and third-place winners due to the number of participants.

Ryan Gotesman, who was supervised by **Dr. Sandra Black**, placed first in Evaluative Clinical Sciences for developing an automatic algorithm to identify enlarged perivascular spaces on magnetic resonance imaging scans of patients with Alzheimer’s disease.

Olivia Hough, who was supervised by **Dr. Kullervo Hynynen**, placed first in Physical Sciences for her project on the role of nitric oxide in focused ultrasound-mediated blood-brain barrier opening.

Vivian Tia, who was supervised by **Dr. Juan Carlos Zúñiga-Pflücker**, placed first in Biological Sciences for her project, which was on the construction and functional analysis of the delta-like 4-IgM fusion protein and the potential to generate T cells in vitro.

Read the full story at sunnybrook.ca/research.

What's On

September to December

Schulich Innovation Seminar Series

Dates: Oct. 8; Nov. 12; and Dec. 10

Titles to be announced

8–9 a.m.

SG 22

September to December

Biological Sciences Seminar for Trainees

Dates: Oct. 8, 22; Nov. 12, 26; and Dec. 10

Titles to be announced

Noon–1 p.m.

SG 22

October 28

Physical Sciences Seminar

Speaker: Dr. Katherine Zukotynski

11:00 a.m.–noon

Jenkin Auditorium, TB 21

November 24

Schulich Heart Program Research Day

8 a.m.–4 p.m.

McLaughlin Lecture Theatre, EG 61

January 9, 2015

The Sunnybrook Research Prize

8 a.m.–4 p.m.

McLaughlin Lecture Theatre, EG 61

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



On Sept. 8, 2014, Sunnybrook's Dr. Barry McLellan, president and CEO, and Dr. Michael Julius, vice-president of research, welcomed Niklas Savander, president and CEO of Sweden-based Elekta, for a tour of Sunnybrook Research Institute (SRI) and the Odette Cancer Centre. Elekta and SRI have partnered to advance development of technology that marries a magnetic resonance imaging scanner with a linear accelerator, with the aim of making radiotherapy more precise. From left to right: Dr. Michael Julius; Dr. Arjun Sahgal, Odette Cancer Centre scientist; Dr. Calvin Law, chief of the Odette Cancer Centre; Dr. Barry McLellan; Niklas Savander; Dr. Greg Czarnota, director of the Odette Cancer Research Program; and Michael Power, vice-president and managing partner for Elekta Canada. [Photo: Doug Nicholson]