Interactions

50TH ANNIVERSARY EDITION

Message from the Chair

Welcome to the Fall 2017 Issue of Interactions, the Department of Physics newsletter.

In this issue we celebrate the 50th Anniversary of the opening of the McLennan Physical Laboratories (pages 2 to 3). Designed and built during a time of optimism and growth in the University, the building was for many years an iconic landmark on the Toronto skyline, now somewhat diminished by surrounding condo buildings and office towers. McLennan Physics has hosted well over 100,000 undergraduate lectures, and it has been the scene of some of the best physics and astronomy research in the country. Although there are reasons to complain of the actual design – especially the tall, narrow Burton Tower (explained by Stephen Morris on page 4) – the lecture theatres work well for students and professors, and the large, lofty spaces in the basement make ideal physics labs (provided you aren't doing something that demands constant temperatures!). Unbeknownst to many who pass through the building, McLennan Physics also has a huge sub-basement, that originally hosted a linear accelerator, and then the Isotrace facility, whose decommissioning is documented on page 23.

Of course a building isn't much without people. If you want to remember some of your former professors, we have a picture from the emeritus lunch (page 15). We also have features on our truly wonderful staff (page 22), and faculty members Stephen Morris (page 4)and a description of Aephraim Steinberg's day as a TV star (page 5). You can meet two of our graduate students, Jesse Cresswell (page 6)and Olinka Bedroya (page 7), and some of our undergrads on pages 8-9. In addition, there are photo features on our Outreach activities (pages 16 to 18) and other Department events (pages 14-15, 19-21).

As always, we love it when alumni get involved in the Department. If you want to be a mentor in the Mentorship Program (page 20) or a speaker at the Career Fair, please contact Sheela Manek at mentorship@physics.utoronto.ca. Or, if you have stories to share of McLennan Physics or of your life after McLennan, please email newsletter@physics.utoronto.ca.

Finally, even if you can't get involved in any other way, don't forget to come to the next Tuzo Wilson Lecture on November 21st at 8pm in the Isabel Bader Theatre (page 18). I look forward to seeing you there!

Yours Sincerely,

Stephen Julian


STAR MAY 7th 1964

—Star Photo

FURTHER GROWTH AT U. OF T.

O. D. Vaughan, chairman of the property committee of the board of governors of the University of Toronto, holds miniature replica of regular shovel he used yesterday to turn sod for the university's new $6,000,000 Physics Building on Huron St.


HE GLOBE AND MAIL, THURSDAY, MAY 7, 1964 5

—Globe and Mail, University of Toronto

SOD TURNED FOR PHYSICS BUILDING AT THE UNIVERSITY OF TORONTO

O. D. Vaughan (left, with hand on spade), board vice-chairman of the University of Toronto, yesterday turned the first sod for the new physics building on the West Campus. The $6,000,000 structure is expected to be completed within 18 months. New building's 14-story tower will be topped by an observatory for the Astronomy Department. Architects are Shore and Moffatt.

This was the scene in 1905 at the sod-turning for McLennan Laboratories, the present home of physics. From left: Professor J. Square, French Department head; next two men unidentified; Dr. C. A. Chant (at rear, wearing boater), astronomy head; Frank Darling of Darling and Pearson, architects; next man unidentified; Dr. J. T. Fotheringham of Medicine; Dr. R. A. Reeve, Dean of Medicine; next man unidentified; J. C. McLennan (in western-style hat), physics head; Dr. John Hoskin, board of trustees chairman who turned sod; F. A. Moure, bursar; Goldwin Smith; unidentified men and women; Sir Thomas White (right).

50th Anniversary of Mclennan Physical Laboratories

McLennan Physical Laboratories opened on September 14, 1967. In this issue of Interactions, we look back at the history of the Physics Department and McLennan Physical Laboratories.

If you have memories from the early days, please get in touch to newsletter@physics.utoronto.ca. We would be happy to share them in the next newsletter.

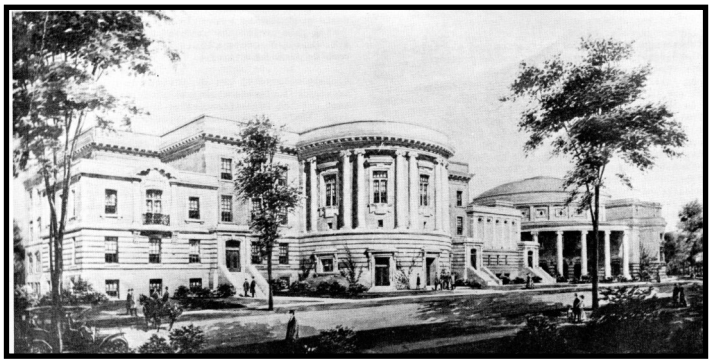
Please see page 14 for the 50th Anniversary Celebration that was held on June 3, 2017.

Left: Official Opening of McLennan Physical Laboratories
In this photo: O.M. Solandt, H.L. Welsh,
J.H. Sword, R.A.K. Richards and G. Herzberg

Sir John C. McLennan

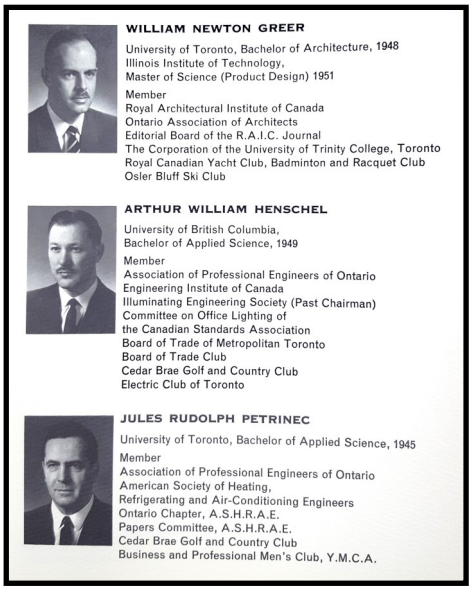
John Cunningham McLennan (1867-1935) served as the director of the Department of Physics from 1907 to 1932. Canadian-born and educated, McLennan worked as a school teacher before receiving an undergraduate degree in Mathematics and Physics from the University of Toronto in 1892—he was immediately granted an assistantship which led to a PhD. With James Loudon, then a Professor and McLennan's mentor, also the President of the university, McLennan became an important figure in the department, and was instrumental in the funding and design of the first purpose-built physics building at Toronto, opened in 1906. Appointed as Director a year later, and overseeing the department at a time of massive growth and development, McLennan's aspiration to replicate the successes of Cambridge's Cavendish Laboratory set the department's teaching style and research direction for the much of the first half of the 20th century. With a keenness for efficient administration, dedication to his students and colleagues, political and scientific contacts, and a flair for the dramatic, McLennan oversaw the transition of the department to a significant North American teaching and research centre, and stoked interest in physics at the local and national level. His varied research career covered electricity, gaseous ionization and radioactivity, spectroscopy and radium treatment for cancer. Following his work in WWI on the British helium supply, McLennan seized upon a large spare quantity of the gas to launch a liquification project. A collaboration between McLennan's colleagues, and departmental technicians and students, the liquification of helium and the associated low-temperature research drew international attention to U of T's Department of Physics. When he left Toronto for England in 1932, the Physics Building (now Sanford Fleming) was renamed in McLennan's honour; upon the department's transfer to its new home on St George in 1967, the chosen name—McLennan Physical Laboratories—was retained.

By: Victoria Fisher



Photograph of an architect's water colour of the old Physics Building that opened in 1907 (photo credit: Physics in Canada article by Professor Elizabeth Allin).

Early on the morning of February 11, 1977 the Sanford Fleming Building of the University of Toronto, formally the McLennan Laboratory was partially destroyed by fire. Toronto Star Photo by Dick Darrell



WILLIAM NEWTON GREER

University of Toronto, Bachelor of Architecture, 1948
Illinois Institute of Technology,
Master of Science (Product Design) 1951

Member
Royal Architectural Institute of Canada
Ontario Association of Architects
Editorial Board of the R.A.I.C. Journal
The Corporation of the University of Trinity College, Toronto
Royal Canadian Yacht Club, Badminton and Racquet Club
Osler Bluff Ski Club

ARTHUR WILLIAM HENSCHEL

University of British Columbia,
Bachelor of Applied Science, 1949

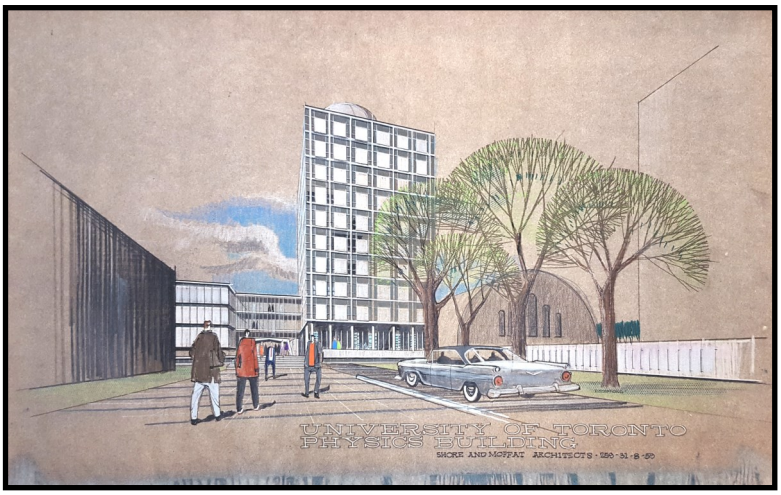
Member
Association of Professional Engineers of Ontario
Engineering Institute of Canada
Illuminating Engineering Society (Past Chairman)
Committee on Office Lighting of
the Canadian Standards Association
Board of Trade of Metropolitan Toronto
Board of Trade Club
Cedar Brae Golf and Country Club
Electric Club of Toronto

JULES RUDOLPH PETRINEC

University of Toronto, Bachelor of Applied Science, 1945

Member
Association of Professional Engineers of Ontario
American Society of Heating,
Refrigerating and Air-Conditioning Engineers
Ontario Chapter, A.S.H.R.A.E.
Papers Committee, A.S.H.R.A.E.
Cedar Brae Golf and Country Club
Business and Professional Men's Club, Y.M.C.A.

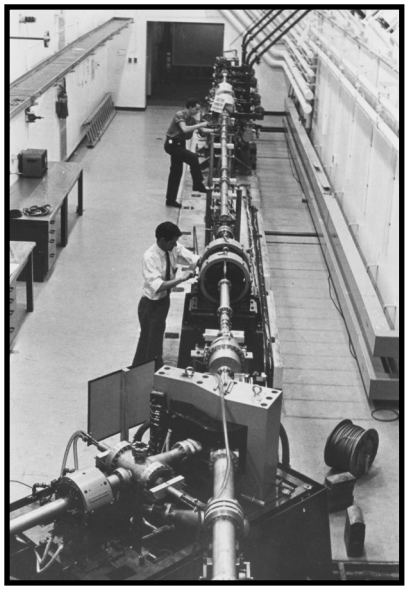
Architects from Shore and Moffat were selected to design the new building by 1959.

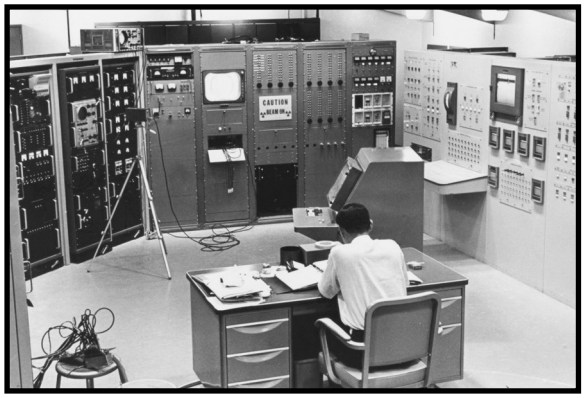


1959 concept drawing of the new building by Shore and Moffat .

Turning of the sod ceremony on May 6, 1964. The general contractor for the construction of MP was Anglin and Norcross, who also built the new Toronto City Hall. The company went bankrupt the same month that the MP building opened.

Above: opening ceremonies of McLennan Physical Labs on September 14, 1967





Left: Linac machine in the sub-basement
Above: Linac control room

U of T opens new lab Thursday

The University of Toronto's $12 million McLennan physics laboratories, with everything from its own glass-blowing shops downstairs to two telescopes on the roof of its 16-storey tower, will be opened Thursday by Dr. Gerhard Herzberg, director of the National Research Council's pure physics division.

Before opening the lab, Dr. Herzberg will lecture on "the problem of diffuse interstellar lines" in Convocation Hall—one of a number of distinguished guest lecturers at the university for the lab opening.

Credit: Toronto Star

Photo Credits pages 1-3: University of Toronto Archives.

Thank you to Victoria Fisher, Stephen Morris and Erich Weidenhammer for their help in compiling the information for the 50th Anniversary piece.

Faculty Profile

Stephen Morris
Professor

Stephen Morris

You did your BSc and MSc in Physics at the University of British Columbia, why did you choose to study physics? What was your inspiration?

I went into physics for 2 reasons. First, everybody in my family were and are biologists. My dad was a wildlife management MSc, my mother, an agriculturalist and landscape architect. My sisters have degrees in forestry and zoology. So I had to do something different. Secondly, I had a very inspirational high school teacher, Arthur Nordman at Point Grey Secondary School. A rock of stability. He put me on the path. That, and reading a lot of hard-core science fiction.

You did your PhD at U of T, what was it on and why?

I came to UofT partly because my wife wanted to do her degree in Classics and it had to be UBC or Toronto for that. We'd already done UBC, so we came to Toronto. I first thought I wanted to learn laser physics to get a job, so I started a PhD with Dave May on laser polarimetry. My idea was to use this complicated laser trick on very thin films of liquid crystals, which I had studied for my MSc. One day, I applied a voltage to a film and it flowed in an interesting way. One thing lead to another and I ended up doing my PhD on an experiment about electrically driven convection in thin films of liquid crystals. This was my intro to the field of nonlinear physics.

Your current area of physics at U of T is nonlinear physics. Can you tell our readers a little about what that is?

Everything is nonlinear if you push it a bit hard. Lots of surprising things happen in the nonlinear regime of classical physics. Patterns form that don't exist in equilibrium systems. In practical terms, I make laboratory experiments to study things like fluid flows, mud cracks, chemically reacting flows, icicle formation and many other things. Many of these things have real world implications for the Earth Sciences, so I sometimes call this "laboratory geomorphology".

You do a lot work with icicles, why icicles?

Icicles are nice examples of self-organized patterns; their shape emerges from a complex feedback between the flow of super cooled water and the evolving shape. They often have regular-looking ripples, whose origin is still mysterious. We know that the ripples arise from impurities in the water, but we still do not know why. Icicles are morally close to stalactites, whose evolution is a classic problem in geomorphology, but icicles are much easier to study in the lab.

Your work with icicles has given you the ability to merge science and art. Can you tell our readers a little bit about that?

I have been doing outreach using art for a number of years now. I help run the ArtScience Salon, a discussion group that meets at the Fields Institute. The science of pattern formation naturally lends itself to making images for people to look at and appreciate. So even before my icicle work, I have been collecting interesting pictures of natural and laboratory patterns (I have a big collection in Flickr). During my last sabbatical, I started exhibiting enlarged photos (including many of icicles) in art shows and galleries around town. Last year, I had a shared show with artist Ron Wild at the Red Head Gallery. I have an exhibit coming up in April at the Oakwood Village Library and Arts Centre.

Your other passion is the history of science and the history of McLennan Physical Labs. Why is it important to preserve our history and what is one fascinating fact that people may not know about McLennan Physical Labs?

Being a classical physicist in the 19th century mold, I am naturally interested in history. I am also interested in the history of our department (a habit I picked up from Allan Griffin). The opening of our building (whose architecture has always annoyed and puzzled me) was a watershed moment in the history of our department. Why is the Burton Tower so tall? It was supposed to be taller than the stack on the steam plant next door, so that the view of the telescopes on the roof was not distorted. Unfortunately, the old steam stack was replaced by a taller one a few years after the building opened. We have lived with that mistake for 50 years.

What is new and exciting in Morris lab at U of T Physics?

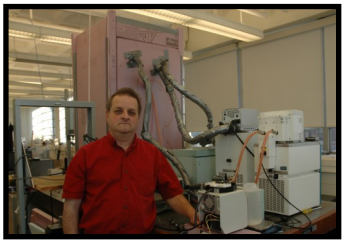
The icicle machine is perking along under the supervision of graduate student John Ladan, who is also working on the theory of icicle ripples. Grad student Alex Cabaj is dribbling viscous syrup onto a moving belt, a device known as the "fluid mechanical sewing machine". I am building several fluid mechanics labs for the advanced physics lab.

Links:

Art Science Salon: http://artscisalon.com

Flickr page:
http://www.flickr.com/photos/nonlin/

The Icicle Atlas:
https://www.physics.utoronto.ca/Icicle_Atlas/



Professor Morris and his icicle machine.

Is the Force with Us? Our Professor Aephraim Steinberg helps explain in Through the Wormhole!

Professor Steinberg was filmed for a segment in season 8, episode 1 of Through the Wormhole. A show on the Discovery Channel that is hosted by Morgan Freeman.

Airing around the time of the 40th anniversary of Star Wars, episode 1 of season 8 asked IS THE FORCE WITH US? This episode explored new research that is beginning to reveal a hidden force in the universe – one that penetrates space with trillions of invisible connections, instantly linking every place in our world and joining our future with our past.

The film crew came to Department of Physics for a full day in June 2016 to interview Professor Steinberg and film his lab in the basement (we couldn't publish a story on this until after the episode aired on May 4, 2017). Pictures from the shoot can be seen below.

We asked Professor Steinberg questions about this episode and the experience of filming it.

What was your contribution to this episode?

Much of the episode focuses on entanglement and quantum uncertainty, and in the segment I participated in, they wanted to talk about "trajectories" in quantum mechanics. This was based on some experiments we had done on David Bohm's interpretation of QM, and in particular a recent one on what are sometimes known as "surrealistic" trajectories.

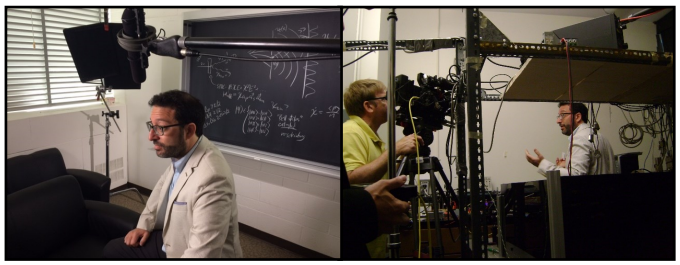
How did you use your research to explain the keys concepts of the episode?

For a segment which lasts maybe 6 minutes, it was impressive to see how much time and effort went into it. The producer who contacted me, Adam Feinstein, exchanged many emails with me and we had a few hour-long phone calls, in which he asked questions about physics and I tried to explain to him as much as I could about entanglement, weak measurement, Bohmian trajectories, and our experiments. But in the end, they had a pretty good idea of which aspect of the physics they wanted to cover, even if it wouldn't have been my first choice. They tried to come up with a variety of visual analogies to give viewers a sense of the physics, and I spent a lot of time critiquing them and offering other options, and the resulting spirit of compromise left us with weather reports and umbrellas and cars with entangled turn signals… Earlier there had been some talk of interesting scenarios for trying to convey the concept of "monogamy of entanglement," but they must have decided that all of the metaphors we found quickly turned too risqué for an American audience, so that went the way of the dodo.

In the end, a crew of 4 or 5 of them showed up with a rough "script," and we spent about 10 hours filming, in an office in Burton tower, in and around our labs in the basement, and finally out on the street in the Annex, where at the last minute someone in California had managed to arrange to have a church let us film in their parking lot. (I think we spent about 2 hours filming in the labs, and they probably used about 10 seconds of that footage. If I look bored and fidgety while standing between two parked cars, it's because we spent over an hour filming even that segment, having to redo it each time a cloud passed by and they decided the lighting wouldn't match a previous take, or a parishioner showed up to get their car.) Although they had their own ideas about what they wanted to discuss (unfortunately for scientific accuracy, they were very attached to celebrating Star Wars's anniversary by referring to "The Force" at every possible occasion), and I couldn't entirely control the scientific story, they did their best to understand the concepts before writing their script and then correct anything I thought was too glaring. After the filming, they sent me a script for Morgan Freeman's voiceover, and again, added or subtracted things when I insisted that it was absolutely essential. And then no, I didn't get to meet him, but I was happy enough to hear he at least pronounced my name right!

Was filming a show like this fun?

It was a fun thing to do once, despite how much time it took! I really hope that even if a show like this can't teach anyone physics, it can at least do its part to keep getting people excited about some of the concepts. I think of the remarks one of our Welsh lecturers this year made about the influence on him of The Dancing Wu Li Masters, and my similar experience as a kid reading The Tao of Physics, and remember that while scientific accuracy has its place, so does a light-hearted attempt to just engage people's interest.



The preview can be seen here on Crave Tv:
http://www.craveonline.ca/entertainment/1253217-preview-wormhole-morgan-freeman-season-7-5

If you subscribe to the Science Channel, you can watch the full episode here:
https://www.sciencechannelgo.com/through-the-wormhole-with-morgan-freeman/is-the-force-with-us/

Graduate Student Profile

Jesse Cresswell

PhD
Theoretical High
Energy Physics

Jesse Cresswell
(photo credit: Hudson Pimenta)

Popular science books are sometimes derided by physicists for giving readers an incomplete understanding of the physics, but they can serve a useful role by getting young people interested in science. In high school, Jesse read books about quantum mechanics and particle physics, deciding already at that time to pursue theoretical physics research.

Jesse attended the University of British Columbia's Okanagan campus in his hometown, Kelowna BC. In his third year he went on exchange to the National University of Singapore, followed by a summer NSERC USRA research position. He graduated in 2014 with the Distinguished Graduate in Physics Award.

After staying in Kelowna for his undergraduate degree, Jesse felt the need to make a big change. While smaller undergraduate programs have some advantages, like better access to professors, excellent research at the graduate level benefits from access to a critical mass of supporting researchers. Rather than going with nearby UBC, he chose UofT and moved across the country to Canada's largest university.

Jesse completed his Master's degree in 2015 and has devoted his Ph.D. research to the study of quantum gravity under the supervision of Prof. Peet. While physicists do not yet have a complete theory of quantum gravity, aspects of quantum gravity can be studied using the AdS/CFT (Anti-de Sitter / Conformal Field Theory) correspondence. This duality relates theories of quantum gravity in a curved spacetime, called Anti-de Sitter, to quantum field theories without gravity but with extra conformal symmetry, hence CFT. Jesse's research uses tools from quantum information theory to study CFTs, and through them quantum gravity.

Even without a complete theory of quantum gravity, the general properties of CFTs and quantum information allow physicists to make universally true statements about quantum gravity in AdS. Research in this direction has recently produced many insights into the structure of quantum gravity, and has constrained the characteristics that any valid theory must have. Relatively simple laws from quantum information theory imply far reaching bounds on quantum gravity systems.

In his spare time, Jesse turned the backyard of his apartment building into a productive garden. Nothing compares to a homegrown tomato; even the squirrels agree! Gardening supplements his other summertime hobby of foraging for wild berries to make jam, a task much easier to do in the forests of BC than downtown Toronto. Jesse is also a Junior Fellow at Massey College, a great environment to learn about student life in all other graduate programs at UofT.

Jesse was the recipient of the Vanier Canada Graduate Scholarship and we asked him what that meant to him.

What does winning the Vanier CGS mean to you? - I was very surprised to win the Vanier scholarship as my application was evaluated side by side with much more practical proposals in chemical engineering, AI research, and the like. Having the scholarship will allow me to work fewer TA hours and devote that extra time to research and collaboration. I had many colleagues give advice and input on my application and would like to thank them all for their help.

Finally, I would strongly encourage every graduate student reading this to consider applying for the award, as very few people usually do.

Graduate Student Profile

Olinka Bedroya

PhD
Quantum Information

Olinka Bedroya

Olinka is a fourth-year Ph.D. candidate. Under the supervision of Professor Hoi-Kwong Lo and Professor Li Qian, she works on quantum cryptography or to be more specific, quantum key distribution (QKD).

QKD allows two parties to share a secret key which can then be used to secure both parties' communications. Most of the encryption schemes we are using today are taken to be secure because they are very hard to break. Future quantum computers would be able to easily break these schemes, placing the security of communications and stored data at risk. One promising solution is QKD and it is growing fast as more QKD systems become commercially available today. Even though QKD is fully secure in theory, imperfections in its implementation mean that these systems are not yet fully secure in practice, leaving researchers trying to spot and plug these loopholes.

In the lab that Olinka works in, information is encoded on the polarization degree of freedom and measurement-device-independent quantum key distribution (MDI-QKD) is used. The MDI-QKD scheme has successfully plugged all loopholes on the detection side, once the most vulnerable part, of conventional QKD systems. As the MDI-QKD structure can be easily shared between multiple users, it is a great candidate for future quantum internet and it can use currently available fiber infrastructure. The fly in the ointment for polarization encoding MDI-QKD lies in the challenge to maintain polarization in long fibers under conditions such as temperature fluctuations and birefringence of the fiber. Olinka focuses on developing an efficient polarization compensation scheme for a multi-user MDI-QKD network which would use fewer resources compared to other schemes.

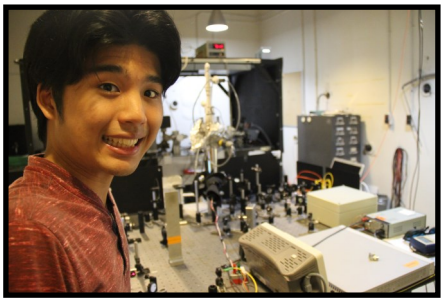
Before coming to UofT to pursue a Master's and then Ph.D. degree in physics, Olinka completed a dual degree undergraduate program in electrical engineering and physics at Sharif University in Iran. She chose physics because it challenged her mind and through it, she got a glimpse into the beauty of science that describes our world. By the end of her undergrad, she knew she wanted to focus on quantum optics. She chose the physics department at U of T because the variety of research topics in quantum optics were all of interest to her, and the groups at U of T are each well known in their own field. Since she had a background in interdisciplinary work, she preferred an environment with ongoing collaborations between different departments.

Aside from her work in the lab, Olinka is passionate about pursuing her Christian faith. She loves to help out at her church and with campus groups such as Power to Change. She also loves spending time with her friends and family and tries to make new friends. She enjoys attending some of the workshops offered by Graduate Professional Skills Program, and The Teaching Assistants' Training Program, as they have equipped her with some of the skills needed for graduate life.

Undergraduate Student Profile

Hiromitsu Sawaoka

Physics Specialist



Hiromitsu Sawaoka

Why did you decide to major in Physics? What was your inspiration?

I pursued what I like doing, and ended up in physics.

What do you enjoy most about the physics program?

I enjoy the colloquia and seminars offered by the department. The Welch Lectures and the Quantum Optics Seminars are my favorites.

What other extra-curricular activities are you involved in during your degree?

I have been on the executive team of Physics Student Union (PhySU) since my second year. We hold both academic and social events for the physics students throughout the year. We also have our annual liquid nitrogen ice cream sale every summer. Through PhySU I made a lot of friends in physics to help each other on assignments and play foozball in the PhySU lounge.

What are your research interests?

I am interested in experimental quantum optics. I have been astonished by the various techniques in laser spectroscopy that take advantage of the atomic structures and laser fields, such as Rabi oscillations and Acousto-optic modulator (AOM)s. Rabi oscillations allow exchanging the population between two atomic states by applying a laser field. AOMs can shift the frequencies of lasers by applying radio frequency waves. In fact, both phenomena can be interpreted as the classical coupled oscillators applied in quantum mechanics.

What is your favorite course and why?

My favorite course so far is APM346: Partial Differential Equations. Although this course was offered by the math department, it was the course where I developed my understandings in physics most deeply. In physics, there are many fundamental equations that are described as PDEs; Wave equation, Schrodinger's equation, Maxwell's equations, and so on. In the physics courses, we only learn the techniques to solve these equations, but not the actual structure behind them. However, I realized in APM346 that PDEs are just combinations of linear algebra and ordinary differential equations. In other words, if you know linear algebra very well, a PDE can be reduced to a system of ODEs.

Moreover, the linear algebraic structure hidden in the PDEs lead to physical concepts such as eigenstates and normal modes. The course made me recognize how useful linear algebra is in physics.

What are your future plans?

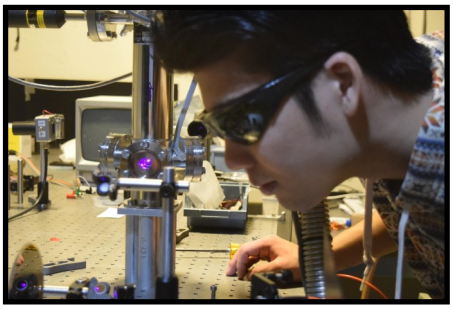
My future plan is to become the best physicist in the universe.

Where do you see yourself in 10 years?

I see myself as a professor, struggling to put my research on a stable path. Although I will be occupied with writing my research grants, I will try to be in my lab as often as possible and enjoy building and fixing the experiments with my students. Some undergraduate students will blow up laser diodes, like I did, and I will let them learn a lot about lasers through fixing the lasers.

Tell me something interesting about yourself.

I "discovered" Newton's second law before learning it in class. In our first physics lab in Grade 9 (in Japan), we had to measure the acceleration of a cart on different surfaces, as a kinematics experiment. There I realized the acceleration was proportional to the sine of the angle of the slope the cart was sliding on. I made a hypothesis that the acceleration was proportional to the component of gravity along the surface.

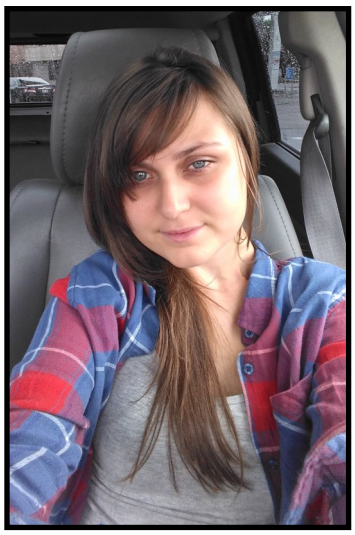


Hiromitsu doing experimental research for an optical clock using solid-state Samarium ions.

Undergraduate Student Profile

Katrina Hooper

Honors Bachelor of Science, Physics Specialist, Math Minor



Katrina Hooper

Why did you decide to major in Physics? What was your inspiration?

I decided to major in physics after exploring the life sciences program in physiology. I found my passion for physics took over my studies and captured my interest above my other courses. My inspiration was my desire to learn about how everything works, down to the basics and physics displayed this in a way that captured all my focus.

What do you enjoy most about the physics program?

I really enjoy the freedom we are given to learn about what sparks our interest and the encouragement to further our studies by our professors. I also really enjoy the learning style of working through problems and the encouragement to learn from our peers. This helps students to meet friends in the program who can relate to their academic struggles. Together, they work through those struggles and learn something from each other.

What other extra-curricular activities are you involved in during your degree?

I was President and Co-Founder of the University of Toronto Juggling club, I also volunteered for the Physics outreach programs which help enrich those thinking of this program. I was a part of the University of Toronto Emergency First Responders and on their Response team.

What are your research interests?

I really enjoy the physics of vehicular dynamics and fluid dynamics, which I find I can best relate to the everyday world and can see in practice just about anywhere I look.

What is your favorite course and why?

I really enjoyed my third year Classical Mechanics course. Not only did I have an amazing professor, but I really loved the applicableness of the course and how you can apply it to everything.

What are your future plans?

I hope to pursue either a Masters in Automotive Engineering or work at an automotive plant as an engineer to help better our current modes of transportation.

Where do you see yourself in 10 years?

I see myself working in automotive development for Chrysler, GM or Ford.

Tell me something interesting about yourself.

When I was younger I was diagnosed with a type of cancer. I survived and continued my studies in school striving for medical school, but always keeping my passions for loving how things worked. When I got to UofT and began studying physics it gave the ability to really pursue my passions and help me realize what I path I wanted to take and provide me with the background to take me there.

Alumni Profile - Andrea Vargas Sanchez

By the time that University application deadlines approached Andrea knew that she wanted to go to the University of Toronto and that physics was her favorite subject in school. There was no doubt when she enrolled as a Physics specialist at UofT that she belonged there and that she would love her studies.

Her favourite memories included having Dr. Sabine Stanley as her instructor for PHY151, working on problem sets with friends and taking a leading role in the student community by joining the Physics and Astronomy Students Union (PASU).

During her third year of undergrad, she participated in the first year of the Physics Mentorship program. Her mentor introduced her to the Jurisica Lab at the Ontario Institute for Cancer Research (OICR). She was introduced to the world of image processing in cancer research. There she developed an image processing system for high throughput analysis of the Wound Healing Assay, a standard technique used to identify potential drugs for cancer treatment.

Andrea also completed a research course with Dr. Sabine Stanley where she developed image processing routines to estimate the size of a planet's inner core from surface magnetic field maps. *Continued on next page….*

…..*Continued from page 9*

Andrea pursued graduate studies at the Department of Medical Biophysics. Her Master's thesis specialized in improving Magnetic Resonance Imaging methods of cervical cancer by reducing imaging time and increasing contrast of tissues. Knowing that MRI is a technology of great potential she decided to continue her career in the medical technology industry.

Andrea recently joined Synaptive Medical Inc., an emerging medical technology company specializing in offering solutions for neurosurgery. These solutions include cutting-edge software to improve neurosurgical planning by visualizing whole brain tractography. In her role as a system test specialist she works closely with development teams to effectively design, develop, and execute verification and validation test protocols.

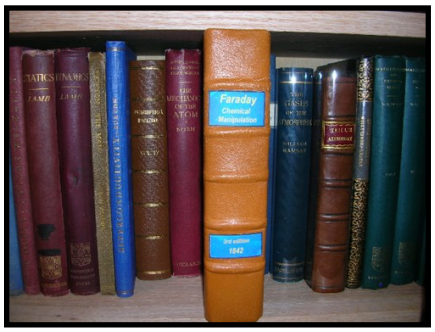
Andrea always finds a reason to return to the Physics Department. She initially participated in the Mentorship program as a mentee and is grateful for all the doors that opened following that. Since graduating from her undergraduate program she has been a mentor three times, and has participated in the job shadowing program giving tours of her previous labs to 2nd year students.

Andrea was also a part of the organizing committee of the Women in Physics Conference 2015 where she made meaningful connections with fellow physicists around the world.

Additionally, she has been a camp leader for Science Unlimited Summer Camp for two years, and loves to see the great enthusiasm of high school students for science.

The Department of Physics at the University of Toronto has been a part of her life in various capacities. She is happy to see how the Mentorship Program has evolved. As an alumna who has experienced being a mentor and a mentee, she encourages students to take advantage of the opportunity and encourages other alumni to participate. It makes a big difference!

Professor Emeritus Malcolm Graham's donation to the Thomas Fisher Rare Book Library



A sample of Professor Grahams's collection

In 2015, Professor Emeritus Malcolm Graham generously donated his collection of British, nineteenth century historical works on physics to the Thomas Fisher Rare Book Library.

245 items consisting of monographs, periodicals, lectures, and offprints were donated. Within these donations were a number of landmark publications and foundational discoveries.

"The earliest volume is a copy of Robert Boyle's The Usefulness of Experimental Natural Philosophy, published at Oxford in 1664, and is in remarkable condition, considering its age. The majority of the works in the collection were published in the nineteenth and twentieth centuries, with the latest being Max Born and E. Wolfe's Optics, in 1959" says Lauren Williams - Special Collections Librarian, Fisher Library

When asked why it was important to Professor Graham that the books in his collection be preserved, he said "The books are mostly very important ones in the history of physics and many are quite rare or in some cases unique. In one sense their preservation is not important as there are lots of reprintings of archival quality, but a booklover will always regard the original as the greater thing."

We also asked why he chose to donate his collection to the Fisher Library, he replied "Apart from wanting a good home for my darlings (and the Fisher is the very best), the tax receipt was very welcome."

Items from this collection will be used by scholars for their research, and by librarians to show to visiting science classes.

The materials in the Graham Collection make a compelling case for the importance of teaching science history to current science students.

The Fisher library encourages professors from all science disciplines to contact the library to arrange class visits, and to discuss ways in which historical materials can be incorporated into their courses.

If you would like more information or would like to arrange a class visit, please contact Special Collections Librarian Lauren Williams: lm.williams@utoronto.ca.

The Small Matter of Mapping the Universe

A scholarship can make a big difference to a student's life and the U of T physics community

When Philippe Berger was finishing his Masters in Geneva in 2014, he felt the pull to return to his homeland to achieve his PhD. Born and raised in Montreal, he was offered the opportunity to study at a number of universities across Canada. Ultimately it was the Canadian Institute for Theoretical Astrophysics (CITA) that drew him to U of T. "It seemed like a really dynamic environment," he says, "a really great place to do research."

Berger, who is finishing up his PhD with the Department of Physics, received the James Gordon Steele Scholarship to support his studies at U of T. "My scholarship was essential in allowing me to focus on research full-time."

Berger is part of the research team working on a new radio telescope called CHIME (Canadian Hydrogen Intensity Mapping Experiment). The team is employing a new technique—neutral hydrogen intensity mapping—to carry out galaxy surveys. Among the highlights of Berger's time at U of T have been his trips to the Dominion Radio Astrophysical Observatory (DRAO) in Penticton, British Columbia for shifts to operate the Pathfinder telescope—a prototype of the new CHIME telescope, which will see first light this September.

"Previously when people mapped galaxies they had to measure the spectra of one galaxy at a time, which was a very laborious process and took a lot of telescope time," Berger explains. "This new technique enables us to map enormous volumes of galaxies simultaneously. The main goal of the telescope is to study the time evolution of dark energy, but the technique also holds promise for the study of gravity, high energy particle physics of the early universe, and the astrophysics of galaxy formation."

To support more Physics students like Philippe, please make a donation at:
www.donate.utoronto.ca/physics

June 2017 Graduates

Back row from left: Chav Chhiv Chau, Keven Roy, Debora Griffin
Front row from left: Zhenfu Zhang, Xiaoyi Zhao, Joseph Mendonca

Physics PhD Degrees Awarded in June 2017 at the University of Toronto

C.C. CHAU, "Measurement of di-photon induced production of W-boson pairs and limits on anomalous quartic gauge couplings", (W. Trischuk)

M. DIAMOND, "Search for dark gauge bosons decaying into displaced lepton-jets in proton-proton collisions at √s=13 TeV with the ATLAS detector", (W. Trischuk)

G. EDGE, "Imaging fermionic atoms in a quantum gas microscope", (J.H. Thywissen)

D. GRIFFIN, "Investigation of tropospheric pollutants and stratospheric ozone using infrared Fourier transform spectrometers from the ground, space, and balloons", (K.A. Walker)

G. MCGOLDRICK, "Measurement of tt-bar polarization with the ATLAS detector", (W. Trischuk)

J. MENDONCA, "Improving the retrievals of greenhouse gases from ground-based absorption spectra", (K. Strong)

K. ROY, "High quality constraints on the glacial isostatic adjustment process over North America: the ICE-7G_NA (VM7) model", (W.R.Peltier)

Z. ZHANG, "Single molecule spectroscopy of disordered states and dynamics in proteins", (C.C. Gradinaru)

X. ZHAO, "Studies of atmospheric ozone and related constituents in the Arctic and midlatitudes", (K. Strong)

Awards

The Van Kranendonk Teaching Award

The Van Kranendonk Award is given every year at the beginning of September to four graduate students who have held Teaching Assistantships during the current academic year.
Nominations come from undergraduate students enrolled in courses in which the TAs are working.

This year the recipients are:


Jesse Cresswell


Hazem Daoud


Sylvia Swiecicki


Dan Weaver

2017 CAP University Prize Exam Results

U of T took 3 of the top 10 spots!
2nd – Andrew Gomes, University of Toronto
3rd – Hiromitsu Sawaoka, University of Toronto
6th – Beichong Lou, University of Toronto

Vanier Canada Graduate Scholarship

Jesse Cresswell

The University of Toronto Excellence Award (UTEA) - Jim Cui

The University of Toronto Excellence Award (UTEA) program is funded by the Vice-President Research and Innovation. The UTEA program provides eligible undergraduate students with opportunities to conduct summer research projects under the supervision of eligible U of T faculty members.

As an engineering physics major, I was taking a thesis research course supervised by Professor Zilman in collaboration with a clinical research group at CAMH lead by Professor Rajji in Psychiatry. My thesis project was focused on developing computational and machine learning based models capable of behavioral prediction by analyzing neuroimaging data recorded by electroencephalography. It's a very interdisciplinary field of research involving biomedical engineering, computer science, statistical and biophysics as well as psychology and psychiatry.

Coming from an engineering and physics background, I enjoy bringing a fresh perspective towards tackling problems traditionally studied in psychology, medicine and the social sciences.

The University of Toronto Excellence Award (UTEA) was brought to my attention by Professor Zilman and so we applied for it.

I wish to thank the Vice-President Research and Innovation for this award and the opportunity it provided me to continue this line of inquiry this past summer.


Jim Cui

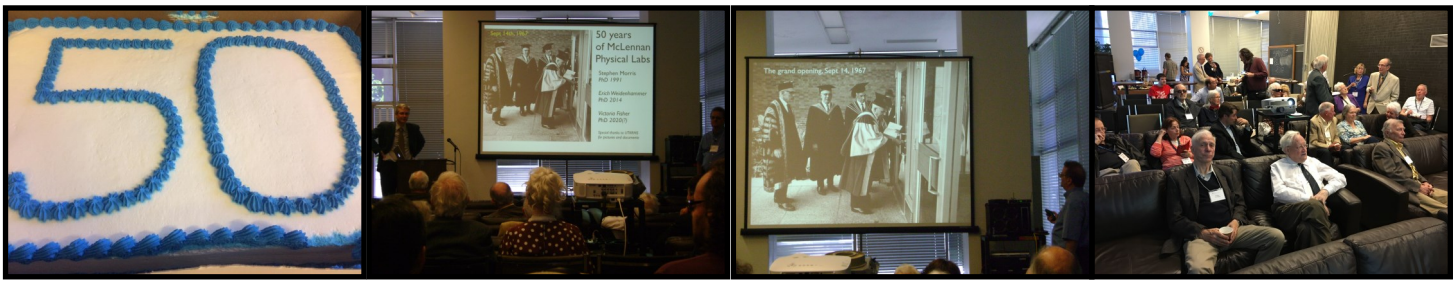
Events

Spring Reunion/50th Anniversary of the opening of McLennan Physical Labs - Saturday, June 3, 2017

The University of Toronto's Annual Spring Reunion took place on Saturday, June 3, 2017. This year, the Department combined Spring Reunion with a 50th Anniversary Celebration of McLennan Physical Labs. The building opened in September 1967 and Spring Reunion provided the opportunity for alumni and emeritus faculty to come and hear about the history of the building.

Stephen Morris gave a very detailed and entertaining talk on the history of the building and this was followed by reminiscences and stories from our Emeritus Faculty.

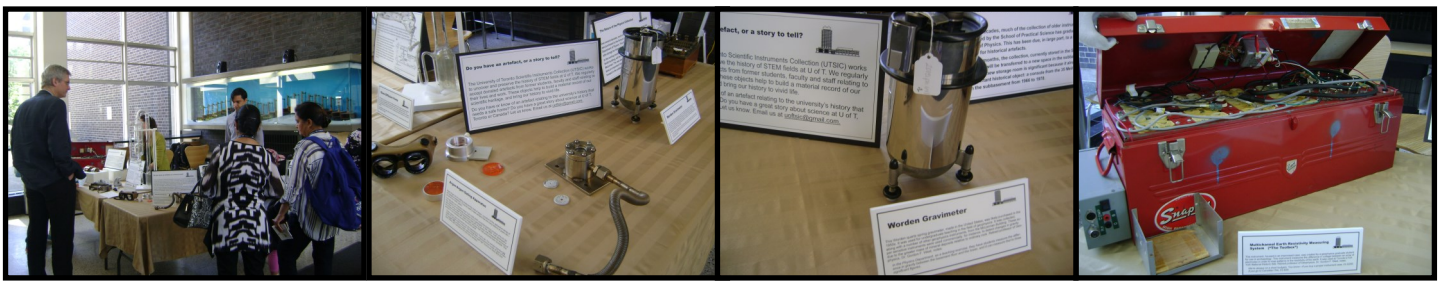
To see Professor Stephen Morris' talk, visit:
https://youtu.be/5kLdpSHi138 (talk is unlisted, do not share on social media)



Historical Instrument Display

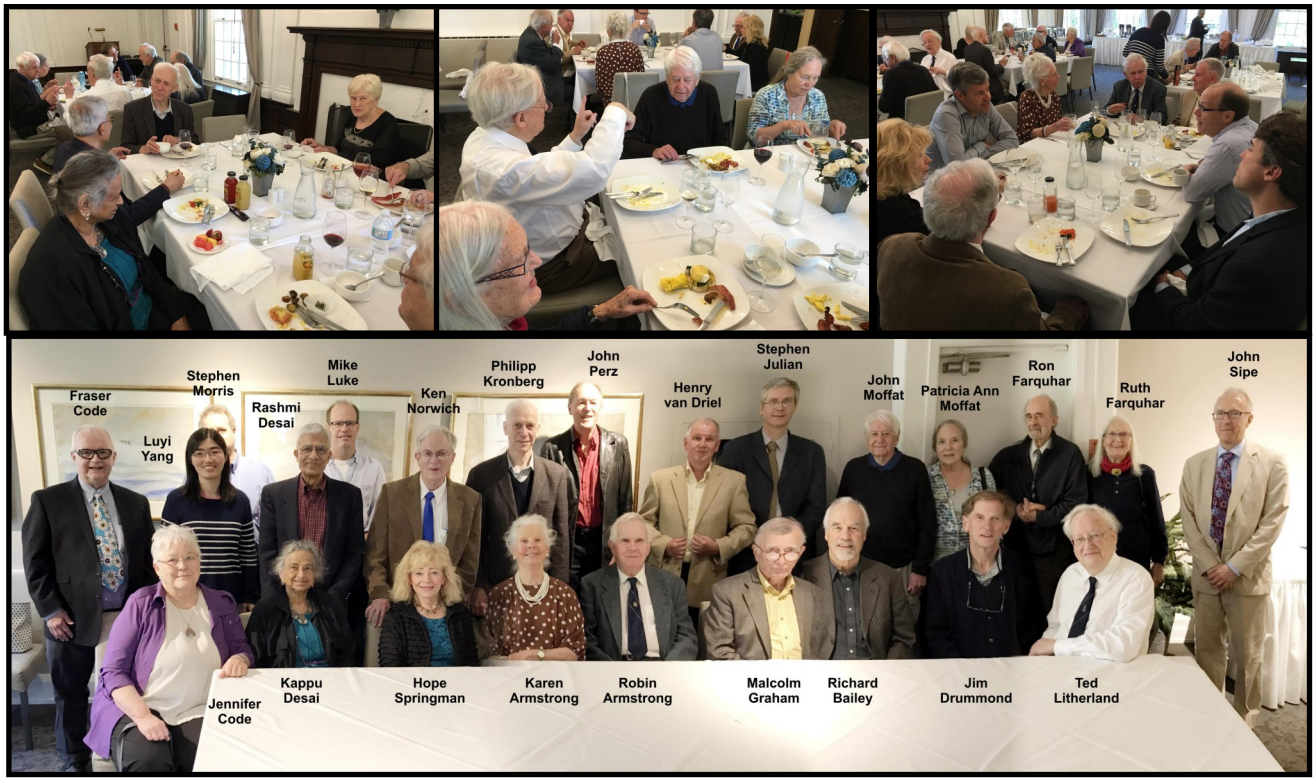
Over several decades, much of the collection that was purchased by the School of Practical Science left the Department, due in part to the lack of space for historical objects. Items are currently stored in the Sidney Smith Building, but in the coming months they will be stored into a new space in the sub-basement of McLennan Physical Labs. For Spring Reunion, Erich Weidenhammer and Victoria Fisher from the University of Toronto Scientific Instrument Collection showcased some instruments for guests to see. Pictures are right and below.

Also on display in the lobby (glass cabinet in left picture) was a tuning fork installation by artist Rick Hyslop. The installation was called " – "I don't know where but she sends me there" and it was part of the Cabinet Project.



Emeritus Reunion - Saturday, June 3, 2017

The 4th Annual Emeritus Reunion took place during Spring Reunion this year. Our Emeriti had brunch at the Faculty Club with some current faculty. They had the opportunity to catch up with colleagues and hear about what our current faculty are up to.



Kid's Passport 2017

For the second year in a row, the Department participated in the Spring Reunion children's event that is held across various departments at U of T. At Physics, Professor Amar Vutha and nine undergraduate volunteers hosted a drop in session for the children and their parents. Our guests were amazed by pattern formation, chaos theory, kinematics, superconductivity and more! Please see the pictures from the event below.

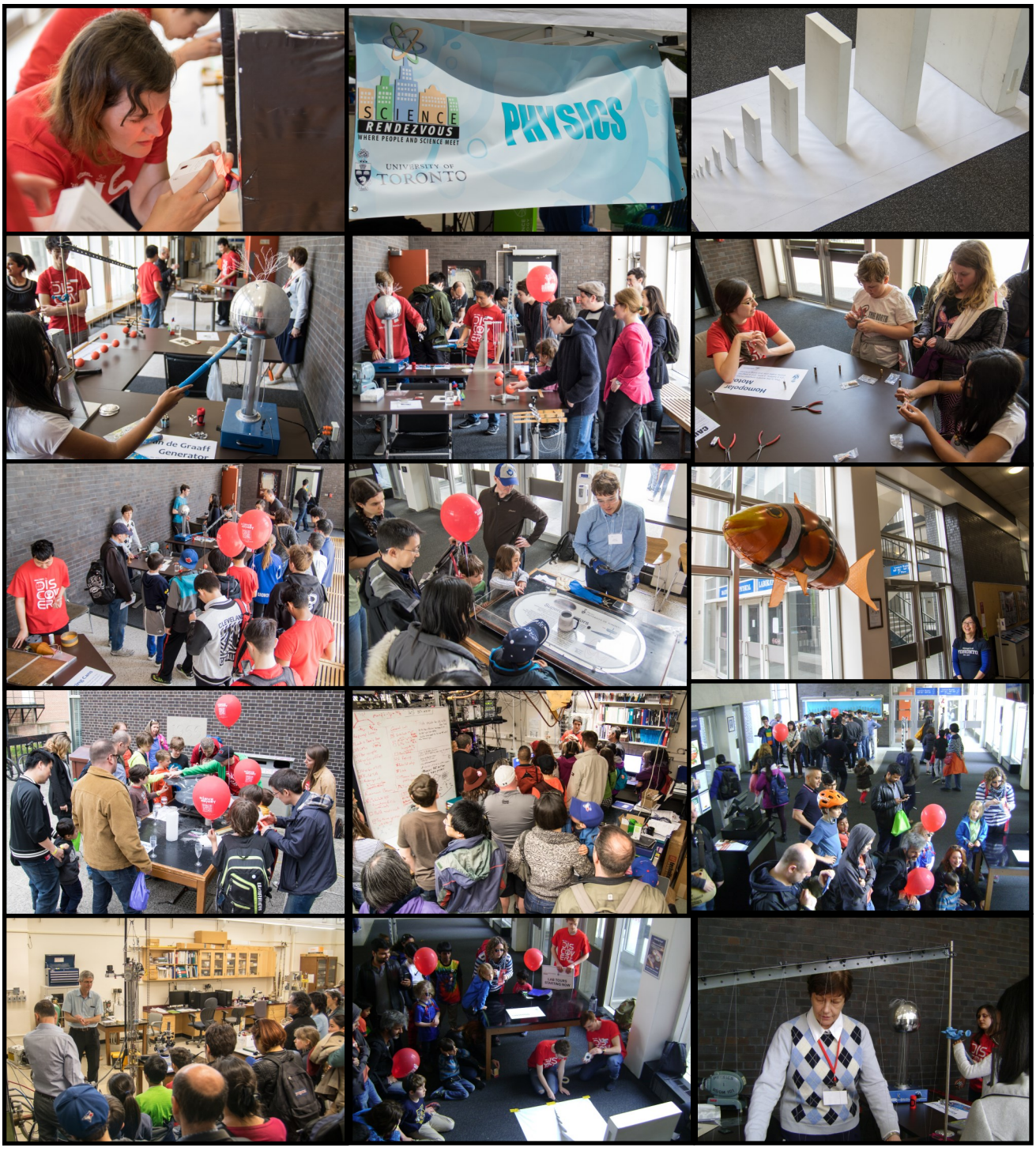
Outreach in Action

Science Rendezvous - May 13, 2017

On Saturday, May 13, the Department participated in Science Rendezvous. Science Rendezvous is Canada's largest Science Festival and is free for everyone. There were over 300 events across 30 cities and 1000s of mind-blowing exhibits.

At Physics, 40 student and faculty volunteers made the event a huge success, 100s of people came through the doors from 11:00am-5:00pm for the variety of demonstrations, talks and tours.

Demonstrations included: Sound Waves & Pendulum Waves , Bernoulli Tricks, Singing Wine Glasses, 1m tall dominos, Cosmic rays, Classic Van de Graaff generator, the Superconducting Train and more. Talks were on Icicles, Gravitional Waves and Condensed Matter. There were also tours to labs with Ultra Cold Atoms, Condensed Matter and Icicles. Pictures from the event are below.



Outreach in Action - Spring 2017 School Visits

As part of the Department's ongoing Outreach initiatives, the Outreach Committee continues to offer visits for high school students. Usually, Physics teachers from high schools across GTA contact the department to arrange a visit for an entire class. The visits typically consist of a talk about the Physics Department, tours and/or workshops.

In the Spring of 2017, three classes visited the Department.

St. Paul's Catholic Secondary School - April 13, 2017

22 Grade nine pre-IB students visited the Department for some demos and tours. The demos on fluids and electricity were run by undergraduate volunteers. Then the students were taken on tours of the undergraduate labs and research labs that included Condensed Matter and Atmospheric physics. Our undergraduate volunteers also hosted a Q and A about life at U of T and what classes and professors like are.

Photos on left: Undergraduate volunteer Wilson Wu showing students demos, graduate student Armanpreet Pannu showing students more demos and students on a tour of Stephen Julian's Condensed Matter lab.

Grove Community School - May 11, 2017

18 grade two students visited the Department in May. Professor Kaley Walker talked to them about what a scientist is and the work that they do. Professor Paul Kushner showed the students the superconducting train and the helium filled balloon. The children were delighted by the demos and a had really nice afternoon, they sent thank you letters and drawings to the Department the following week

Professors Paul Kushner and Kaley Walker with the students from Grove Community School

Weston Collegiate Institute - May 16, 2017

30 grade eleven students from the physics class at Weston CI visited the Department for tours and a workshop. The tours were of the undergraduate teaching facilities and research labs. Instructor Xingxing Xing ran a workshop on Python for the students. This visit gave students a taste of what it would be like to study physics at U of T.

Python Workshop in MP 257

Class photo outside McLennan Physical Labs

Bring Our Children To Work Day - April 27, 2017

This event provides an opportunity for children in Grades 4 – 7 to step outside of their classrooms for a day and become an active participant at the University of Toronto. Children are able to job-shadow their parent/guardian, attend a lecture / performance, and participate in different activities from which they can explore their interests and talents. At Physics, Professors Jason Harlow and Kaley Walker provided the students with a presentation and some hands-on activities. Pictures are below.

Outreach in Action - Science Unlimited Summer Camp 2017

Science Unlimited Summer Camp took place August 14-18, 2018. 50 high school students had the once in a lifetime opportunity to participate in a week of workshops from the Departments of Astronomy and Astrophysics, Chemistry, Computer Science, Earth Sciences, Math, Physics and the School of the Environment.

At Physics, students learned about scientific computing, magnetic propulsion and atmospheric science. They even sampled liquid nitrogen ice cream, yum!

For more information visit: https://scienceunlimited.physics.utoronto.ca/

You are Invited to the 2017 Tuzo Wilson Lecture

Date: Tuesday, November 21, 2017
Time: 8:00pm
Location: Isabel Bader Theatre - 93 Charles St W, Toronto, ON M5S 2C7

Speaker: Peter Molnar of the University of Colorado at Boulder

Talk: Plate Tectonics Meets Climate: the Tibetan Plateau and the Indian Monsoon

https://www.physics.utoronto.ca/news-and-events/special-events/lectures/tuzo-wilson

Welsh Lectures 2017

The Welsh Lectures are an annual highlight in the life of the Department of Physics. They are held in honour of Harry L. Welsh, a former Chair in the Department of Physics. In the 1960s, during his years as chair, Professor Welsh helped guide a period of rapid growth in the Department of Physics. The Welsh lectures began in 1975 to honour his 65th birthday

These lectures focus on a variety of discoveries in physics and their impact, making these lectures very popular and highly attended.

This year, the lectures took place on May 4 and 5, 2017. The speakers were Professor Nergis Mavalvala of MIT who spoke on Gravitational Waves and LIGO and Professor Leon Balents of University of California spoke about Quantum Spin Liquids. Both the public program and colloquia were well attended by faculty and students.

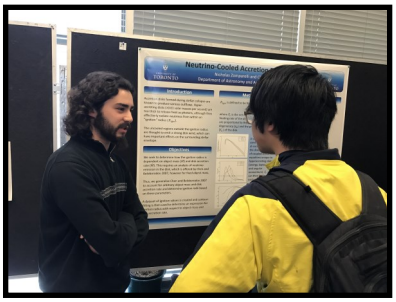
Harry L. Welsh

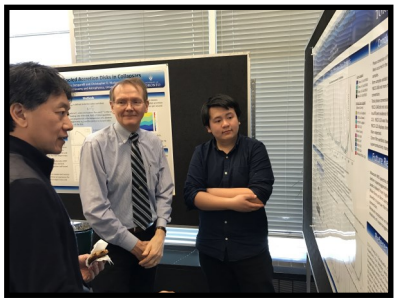
Left to Right: Speakers Leon Balents and Nergis Mavalvala with the` Chair of the Welsh Lecture Committee Dylan Jones

Undergraduate Research Fair

On Friday, April 7, 2017 the Undergraduate Office and PhySU (Physics Student Union) hosted the Undergraduate Research Fair in the Physics Lounge. This fair was an opportunity for our undergraduate students to showcase their work.

Associate Chair of Undergraduate Studies Jason Harlow said his "favourite part of the undergraduate research fair was chatting with students about their research. It's a great opportunity for a kind of role-reversal, where I become the student, and the student becomes the teacher. I learned about some amazing new theories, ideas, and innovative research techniques".





physCAP recap - Mentorship Program

Here are some photos from the 2016-2017 Mentorship Program. We had 49 student mentee and mentor matches. Our mentors consisted of alumni, faculty and graduate students who met with their mentees once a month.

Mentees were given advice on careers, grad school and more and they say "*Getting some first hand guidance with this is helpful and it's hard to find elsewhere*"

Mentors have told us it's a good feeling to give back and that they enjoy being helpful to students. Thank you to our mentors!

Here is what the mentors had to say about the program:

⇒ "The pairings have been good, and I like when my mentees stay in touch afterwards. Also the mentorship parties are great!"

⇒ "Feels like I have made a difference."

⇒ "The delight in a student's eyes when you help them feel more welcome here. Sharing joy in their academic successes."

If you want to be a mentor in this valuable program, contact mentorship@physics.utoronto.ca

2017 CAP/DCMMP Brockhouse Medal Recipient – Professor Yong Baek Kim

The Canadian Association of Physicists (CAP) announced that the 2017 CAP/DCMMP Brockhouse Medal was awarded to Professor Yong Baek Kim, for his leading work on the effects of large spin-orbit coupling on exotic ground states in geometrically frustrated and highly correlated quantum materials.

The CAP Brockhouse Medal, which is sponsored jointly by the Division of Condensed Matter and Materials Physics (DCMMP) and the Canadian Association of Physicists (CAP), recognizes outstanding experimental or theoretical contributions to condensed matter and materials physics.

It is named in honour of Bertram Brockhouse, whose outstanding contributions to research in condensed matter physics in Canada were recognized by the 1994 Nobel Prize for Physics. The annual Brockhouse medal was introduced in 1999.

Professor Kim was presented with his medal at the Recognition Reception at Queen's University on Thursday, June 1, 2017. The Awards Reception is the closing event of the CAP Congress hosted by Queen's University in Kingston, Ontario, from May 29-June 1.

Yong Baek Kim

Physicist Arthur McDonald received an honorary Doctor of Science on June 8, 2017

On June 8, 2017 Arthur McDonald received an honorary degree, Doctor of Science, from the University of Toronto "for his excellence in the academy, for his exceptional advancements in particle astrophysics." Nominated jointly by the Departments of Physics, and Astronomy and Astrophysics, this was an opportunity to celebrate the impact of world-leading science led by an outstanding Canadian.

McDonald is the former director of the Sudbury Neutrino Observatory (SNO), an experiment that took place 2 km underground in a nickel mine in northern Ontario. The measurements that he and his collaborators made in the early 2000s demonstrated that neutrinos oscillate, changing identities or "flavours." By the rules of quantum physics, that also means they have mass.

In 2015, McDonald shared the Nobel Prize in physics with Takaaki Kajita of the University of Tokyo for contributing to the discovery that neutrinos have mass. These neutrinos are the second most abundant subatomic particle in the universe after photons, and are produced in nuclear reactions such as beta decay. Yet the fact that they interact very weakly and there are three types, that we know now mix, are two of many properties that make them quite mysterious to particle physicists. The study of neutrinos has become an important area of research today, with laboratories in North America, Europe and Asia mounting extensive programs.

Here in Canada, the SNO experiment was followed by the development of SNOLab, a larger multi-purpose facility located in the same nickel mine where the SNO experiment did its seminal work.

"Art McDonald is an extraordinary scientist and scientific leader," U of T Physics Professor Pekka Sinervo told The Toronto Star after McDonald won the Nobel prize. "He kept the (SNO) collaboration moving forward, even in dark days when nothing seemed to be going right."

McDonald was born in Sydney, N.S. he has Bachelor's and Master's degrees in physics from Dalhousie University and a PhD from the California Institute of Technology. He has taught at Princeton and Queens University and One of Canada's leading physicists, he and his collaborators have had strong ties to the Department of Physics. Several of the department's particle physicists served as experts brought in to give advice to the SNO collaboration when they were constructing the experiment, and have been involved in the evolution of SNOLab. Professor McDonald has been a frequent visitor, and was one of the speakers for the 2004 Welsh Lectures.

The conferral of the honorary degree was an opportunity to celebrate these ties, as the ceremony was followed by a formal lunch at Massey College hosted by Meric Gertler, President of the University, and a dinner that brought together members of the departments that have been long-time colleagues of Art McDonald.

Arthur McDonald receiving an honorary Doctor of Science. (Photo Credit: Lisa Sakulensky)

Back row left to right: William Trischuk, Linda Johnston, Richard Bond, Stephen Julian, Meric Gertler, Pekka Sinervo, Corina Nantais, Raymond Carlburg, Hirohisa Tanaka
Front row left to right: Michael Wilson and Arthur McDonald (Photo Credit: Lisa Sakulensky)

Employee News

2017 Staff Awards

Staff awards are handed out every June at the end of term party. The Department recognizes the outstanding support and hard work of two staff members: one member of the administrative group and one member of the technical group.

Outstanding Administrative Support - April Seeley
Outstanding Technical Support - Robert Morley

Employee Anniversaries

40 years

Raul Cunha

September 2017 marked Raul's 40th year with Physics. Raul is our resident Graphics Artist and provides poster printing services for conferences, colour and black & white printing, lamination, photography work and graphic design. Students, staff and Faculty have come to appreciate his friendliness, his willingness to work with clients to get the best possible results and timely delivery of printed materials. Raul enjoys his work and the people he interacts with. This shows in all that he does.

Things tend to get done at the last minute which often makes it a challenge for Raul. When there is a major conference people wanting posters printed are frequently lined up at the door. It gets chaotic but Raul adjusts his work schedule accordingly and makes sure that everyone gets their poster.

The biggest change over his forty years has been the move to computer based design software. When Raul started we had two graphic artists and everything was drawn by hand or literally "cut and pasted". Now graphics work is computer based and Raul has become computer savvy after mastering graphic design software packages. He still has his drawing tools though, just in case.

When not at work Raul is into photography and working with photos. He loves old movies, particularly westerns and enjoys playing with his young grandkids. That's his favourite part!

30 years

Rob Henderson

Cryogenics technology has gone through many revisions during Robert's 30 years in the Department and while challenging, he has successfully kept the Physic's cryogenics facility at state-of-the-art. When the building was built, cryogenics compressors for making both liquid nitrogen and liquid helium filled both rooms 063 (current cryogenics room) and room 072. Four staff members were required to operate them. By the time Robert started in 1987, the nitrogen compressors had been turned off in favour of purchased liquid nitrogen that was stored in a large liquid storage tank. Since then Robert has participated in the daunting task of replacing the tank on 2 occasions. Even more challenging has been the evolution of helium liquefaction technology, which has resulted in Robert mastering 3 generations of equipment and methodology. All of these changes were accompanied by a gradual staff reduction from four to one, and a greatly increased emphasis on customer service for customers both inside and outside the Department.

In addition to his cryogenics responsibilities, Robert supervises our pool of casual student helpers in the many tasks that they accomplish on our behalf, including moving furniture, installing bulletin boards and providing back-up to stores, reception and mail services. Although Robert's efforts are often literally in the back rooms and basement of the building, they are very important to the Department and essential to research, and greatly appreciated.

10 years

Lilian Leung

Lilian has been with Physics for ten years this year. Working in the Learning Services group, she is responsible for lecture demonstrations (demos) and the first year teaching labs. Almost all her day is spent in motion! Gathering equipment and supplies, taking it to where it needs to be, setting up, assisting the demonstrator, afterwards tearing it back down and putting it all away. She often has to support several classes at the same time. In between she's also kept busy maintaining and repairing apparatus, projection equipment and the portable computers needed for effective teaching as well as ordering supplies.

While her job can be physically demanding, she enjoys her work and it shows in Lilian's positive and cheerful manner. Her favourite part of the job is interacting with colleagues and she appreciates how well they support one another. Each day is different and she also enjoys tinkering with new equipment and applying her creativity and resourcefulness in working with demonstrators to create new demos.

At home Lilian is busy with her three year old son and together they like to watch trains, buses and pretty much anything that has an engine. Lilian also plays the keyboard and is learning to play a pipe organ.

10 years

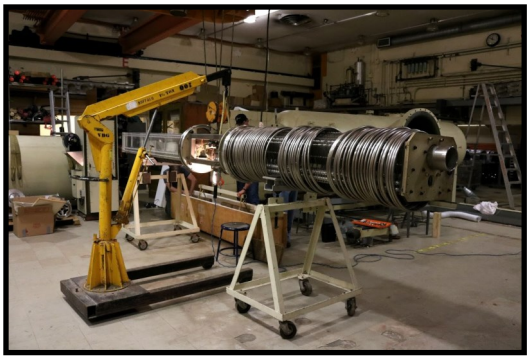
Crystal Liao

Crystal has also been with the Physics department for ten years. She started as a part-time administrative assistant for the geophysics group, moving to full-time position three years ago when she added the experimental particle physics group to her portfolio. Crystal has thrived in this new role, enthusiastically taking on the additional responsibilities necessary to keep the ATLAS-Toronto research group of six faculty members and their twenty graduate students and postdocs working efficiently both on campus and at CERN in Geneva Switzerland where the experiment is taking place. She has contributed in numerous ways to the research student experience in both the geophysics and particle physics groups over the years, helping to organize summer student and graduate student social events but also, more importantly, ensuring that all the paperwork was in place to make sure their financial support was processed in a timely manner. Crystal has played a leading role in the organization of the last nine Tuzo Wilson lectures with Professors Nigel Edwards and Stephen Morris. In 2015 she helped Professor Sabine Stanley organize the second annual Canadian Women in Physics Conference in Toronto. She is now looking forward to building on her grant administration experience, with the recent awarding of funding from the Canada Foundation for Innovation that will pay for the Canadian contributions to the upgraded ATLAS experiment, to be delivered to CERN over her second decade in the department. Besides her great work in her "day job" Crystal is a regular contributor to Physics Outreach activities, contributing her excitement and energy to events like Science Rendezvous.

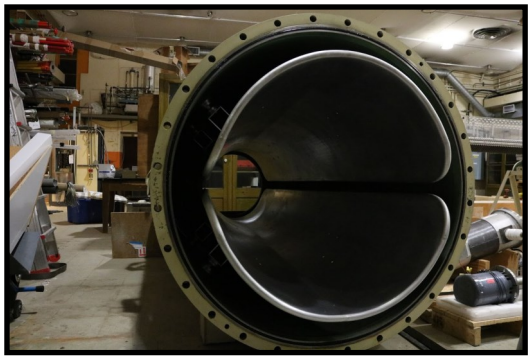
Dismantling of the IsoTrace Accelerator

The tandem electrostatic accelerator component of the IsoTrace equipment was dismantled in April, in preparation for its eventual shipment to a company in the United States in August 2017. Other components of the IsoTrace equipment were moved to the A. E. Lalonde AMS Lab at the University of Ottawa during the summer of 2014, where they have been incorporated into a research injector line for the new accelerator mass spectrometry (AMS)system installed there earlier that year.

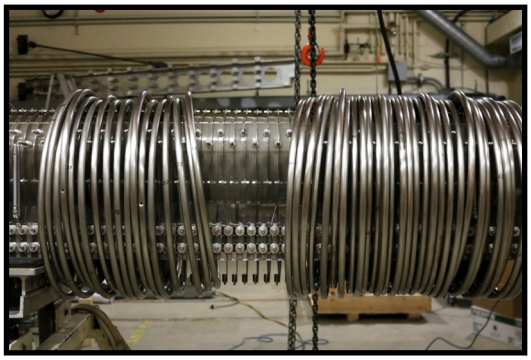
The 3 MV power supply tank (right side behind the ladder) separated from the accelerator tank (left). Photo Credit: Victoria Fisher



Removing the equipotential rings from the accelerator column. Photo Credit: Victoria Fisher



View inside the power supply tank with the central column removed. Photo Credit: Victoria Fisher



Side view of the accelerator column with the equipotential rings parted to show the high energy accelerator vacuum tube (top) and the column grading resistors (bottom). Photo Credit: Victoria Fisher

Letters to the Editor

"Greatly enjoyed reading the newsletter so that I could catch up with the latest activities of the Department. I attended the festivities associated with the opening of the new McLennan Lab in 1967, but did not witness the "turning of the key" depicted on the first page. That's a delightful picture of a costume party that seems to be fitted out with oversized boots." - **Vic Gaizauskas Ottawa, PhD Physics, 5T5**

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Physics Funny

Two atoms are walking down the street

One atoms says to the other, "Hey! I think I lost an electron!"

The other says, "Are you sure?"

"Yes, I'm positive"