Physics
UNIVERSITY OF TORONTO

Fall 2020

INTERACTIONS

The Department of Physics Newsletter

MESSAGE FROM THE CHAIR

Welcome to the Fall 2020 issue of Interactions, the Department of Physics newsletter!

Dear Physics community,

I'm very pleased to introduce our Fall 2020 newsletter. This is our second using the new electronic format, and as you can see, we have a jam-packed issue. I hope you will enjoy reading the various profiles, articles, and updates.

Continued on next page.

A new academic year is well underway here. September is always an exciting and energizing time as we are joined by new faculty, students, and postdocs, and as new courses and research projects get underway. However, although the trees that were blossoming when I wrote my Spring message are now losing their leaves, the COVID-19 pandemic remains with us. This Fall term is unlike any other and much work has been going on to keep Department business running, to move courses online, and to enable laboratory research to resume. I would like to express my deep appreciation to our administrative and technical staff, our faculty and course instructors, our teaching assistants, our students, and our postdocs and research associates, for all you have done, and are continuing to do, under challenging circumstances.

I'd particularly like to thank our Associate Chairs, Peter Krieger and Young-June Kim, for all their work to keep our undergraduate and graduate programs running, as well as our CAO, Peter Hurley, who has 'held the fort' for all of us since mid-March with great dedication. COVID-19 resources and information for the Department can be found at https://www.physics.utoronto.ca/physics-at-uoft/covid-19-resources-physics/. You can read here about some of the ways that we have adapted our teaching and programs, including an article by Carolyn Sealfon describing how she has developed online practicals for the 900 students in PHY131F.

Our PhySU and PGSA student groups continue to be active and have moved their events to the virtual world. The PGSA has also helped to bring members of the Department together by running a weekly Coffee Hour on Zoom. Meanwhile, a team of volunteers organized a Virtual Summer Colloquium series, which brought us fascinating talks about some of the great research going on in the Department.

The regular Physics Colloquium series is now running online – you can view previous talks or subscribe to the mailing list for future talks at https://www.physics.utoronto.ca/news-and-events/events/colloquium/. Our Physics Career Accelerator Program is also underway, with 54 mentor/mentee pairs in Mentorship Program. We have gone totally virtual this year, which has resulted in more mentors from around the world! It is wonderful to see our alumni involved as both mentors and speakers at various physCAP events.

Despite the pandemic, we are also continuing our School Visits for Students and offering a series of online interactive workshops and lectures developed by some of our faculty and graduate students. Any alumni who are teachers can sign up for workshops at https://www.artsci.utoronto.ca/future/contact-us/teacher-resources.

Continued on next page.

Looking ahead, the annual J. Tuzo Wilson Lecture is being moved to the spring, while the Department will be hosting the Martin Family Lecture online at 4PM on November 30, with Chris Monroe (University of Maryland) talking about the rapidly growing field of quantum computing. Keep an eye out for announcements about both events.

Also in the quantum domain, this issue's Research Spotlight focuses on a recent breakthrough study by Aephraim Steinberg and his group, in which they report on how long it takes ultracold rubidium atoms to tunnel through a micron-thick laser beam. More research highlights can be found at Physics News.

As usual, the Fall newsletter profiles several members of the Department. We introduce our newest faculty member, Zhan Su, who arrived in September and is an Assistant Professor in theoretical ocean dynamics and climate, and interview Nikolina Ilic, who started in March 2019 as an Assistant Professor and Institute of Particle Physics Fellow in experimental high energy physics. You can also read about Physics Specialist Samuel Li, PhD Student Laura Saunders, and Post-Doctoral Fellow Nava Leibovich. Our Alumni Profile highlights Petar Tomic, who tells us how his Physics degree led to his current position as an Associate with TD Securities in Credit Management. We are pleased to introduce an Emeritus Profile section, and to kick it off with an engaging interview with Henry van Driel, whose connection with UofT goes back to 1966, when he started here as an undergraduate student. We highlight our PhD graduates, our 48 incoming graduate students, and our scholarship recipients, including Louden-Hines Gold Medalist Celina Pasiecznik.

We mark three retirements with this issue. Pierre Savaria retired on July 1 after many years as a valued faculty member, particularly as Course Coordinator for PHY138Y and as TA Coordinator. David Rogerson will be leaving us at the end of December after many years supporting the Department's technical operations, most recently as Manager of Physics Learning & Research Services. And after more than 40 years in the Department, our Undergraduate Coordinator, Teresa Baptista, will be retiring in March, leaving big shoes to fill on the third floor. We plan to celebrate all of our recent retirees in person when that becomes possible.

We remember three colleagues who have passed away since May: David Rowe, who was internationally known for his work in theoretical nuclear physics; Rashmi Desai, who was a leader in theoretical condensed matter physics, and Colin Hines, who did ground-breaking work on atmospheric gravity waves. All three are greatly missed by their friends and colleagues in the Department.

Continued on next page.

In honour of Lecturer Natalia Krasnopolskaia, who passed away last January, the Physics Summer Undergraduate Research Fellowship (SURF) program was renamed as the "Natalia Krasnopolskaia Memorial Summer Undergraduate Research Fellowship". Donations can be made at https://donate.utoronto.ca/give/show/49 and will be used to expand and strengthen these student fellowships.

The start of the academic year is an appropriate time to emphasize the importance of creating and maintaining an inclusive environment that welcomes and supports everyone in the Physics Department, including those who are underrepresented in physics. I would like to thank our Inclusivity Committee (with faculty, staff, and student representatives) and Physibility, a student-run equity group, for their efforts in this area. We want to take positive action against racism, and as one example, the Department is taking the lead on PURSUE STEM, a new outreach program to encourage and support Black high school students in a partnership with Leadership by Design (https://llileaders.com/leadership-by-design/). There is certainly more for us to do, and if you have any suggestions on how we can improve, please send them to me at chair@physics.utoronto.ca.

We also welcome your feedback on Interactions – please contact our Editor, Sheela Manek at newsletter@physics.utoronto.ca with your comments and news.

I wish everyone good health – let's continue to support each other in these uncertain times.

Kimberly Strong

Professor & Chair

McLennan Physical Labs (credit: University of Toronto)

Events

The 2020 Martin Lecture in Physics
Quantum Computers – Spooky but Powerful

Speaker: Christopher Monroe
(University of Maryland, Duke University, IonQ)

November 30, 2020
4pm EST
via Zoom

Photo Credit:
University of Maryland

Click here to register or visit:
https://www.physics.utoronto.ca/news-and-events/events/dept-events/quantum-computers-spooky-but-powerful-the-martin-lecture-in-physics/

ABSTRACT: Quantum computers exploit the bizarre features of quantum physics -- uncertainty, entanglement, and measurement -- to perform tasks that are impossible using conventional means, such as computing over ungodly amounts of data, and communicating via teleportation. I will describe the architecture of a quantum computer based on individual atoms, suspended and isolated with electric fields, and individually addressed with laser beams. This leading physical representation of a quantum computer has allowed unmatched demonstrations of small algorithms and emulations of hard quantum problems with more than 50 "quantum bits." While this system can solve some esoteric tasks that cannot be accomplished in conventional devices, it remains a great challenge to build a quantum computer big enough to be useful for society. But the good news is that we don't see any fundamental limits ahead.

BIOGRAPHY: Christopher Monroe is a leading atomic physicist, quantum information scientist, and quantum computer engineer. He demonstrated the first quantum logic gate realized in any system and has since pioneered new ways to scale individual atoms as quantum bits and simplify their control with semiconductor chip atom traps, ultrafast lasers, and photonic interfaces for long-distance quantum networking. He is Co-Founder, former CEO, and Chief Scientist at IonQ, Inc., a startup in College Park, MD that makes full-stack quantum computers. He is also an architect of the US National Quantum Initiative and a member of the US National Academy of Sciences.

Christopher Monroe's web page is: http://iontrap.umd.edu/

Faculty Profile

Nikolina Ilic

Assistant Professor

Experimental Particle Physics and Astrophysics

Welcome back to the Department Dr. Ilic. You obtained your PhD from the University of Toronto in High Energy Physics, can you tell us about the work you did during that time?

I was lucky that my entrance into the PhD program coincided with the start of the Large Hadron Collider. This meant that for the first two years, I obtained a lot of experience on hardware related projects, as well as the operation of the ATLAS detector. I worked on the high voltage system of ATLAS's calorimeter, as well as spent quite some time in the control room ensuring that it operated smoothly. After the initial data taking period, I worked on analyzing data, looking for the Higgs Boson, which we found in 2012.

Why did you choose High Energy Physics?

My father was also a physicist, so his stories about the universe likely had a strong impact on me. In addition, when I was in high school, we had to select a topic to research for our physics class. My teacher suggested that I research something called Dark Matter and Dark Energy. I soon found out that 95% of the universe is made of these mysterious constituents, and that we have no idea what this stuff actually is. It was surprising to realize how little we know about the universe and how much is left to discover. This prospect of discovery excited me, and persuaded me to choose a career in High Energy Physics.

Continued on next page.

Can you tell us about working on the discovery of the Higgs Boson and what it was like to be part of something so significant?

In short, it was very exciting. We worked in large international teams, which required a lot of communication and collaboration, much of which happened at workshops abroad. This experience, combined with the many hours we poured into the data analysis, made the entire team very close. Working with a team of good friends on a ground breaking discovery was an amazing experience.

What excites you the most about being back in Toronto?

I am excited to be working again with my previous collaborators. The Toronto group is a very large and productive one within the ATLAS experiment, so I am looking forward to collaborating with them again. I think that University of Toronto has some very talented students, so I am also looking forward to exploring new ideas and projects with them.

Finally, what do you like to do in your spare time?

I enjoy a wide variety of outdoor activities, including hiking, climbing, snowboarding, wake boarding and kite surfing. I also enjoy reading about a wide variety of topics from history, psychology, archaeology and other sciences.

Can you tell us a little about what it was like to work on the ATLAS (A Toroidal LHC Apparatus) detector at CERN?

The ATLAS detector consists of many different technologies and has collected unprecedented amounts of data on potential new high energy interactions. This means that you can spend a life time on ATLAS and never stop learning about different types of hardware, electronics, data analysis techniques and computing. In addition to the exciting prospect of discovering new physics processes, there is endless opportunity for people to develop skills in their areas of interest. The job never feels boring or like a routine.

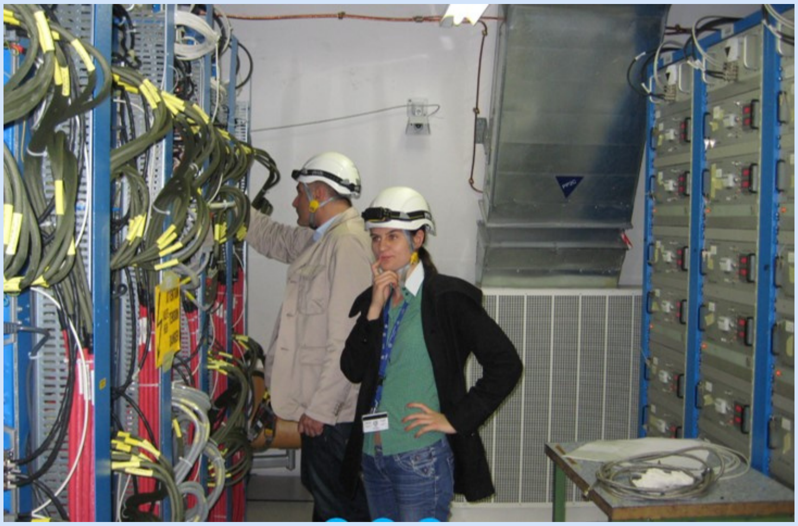
Left: Installing the chassis used to house the Fast TracKer electronics

You did your postdoctoral fellowship at Stanford University, what did you work on?

With the discovery of the Higgs Boson, came the next big questions regarding its nature and properties. While at Stanford, I worked on processes in which two Higgs Bosons are produced. This was an attempt to measure how the Higgs particle interacts with itself. We did not have enough data to properly measure this process, but we laid the groundwork for the techniques that will be used in the measurement once sufficient data is gathered. In addition, I worked on the installation and commissioning of an upgrade to the ATLAS experiment, called the Fast Tracker. It consisted of hundreds of electronic boards containing modern FPGAs and custom readout chips.

Now that you are back at U of T, what are your research plans?

Discovering the Higgs Boson was the final confirmation of the accuracy of the Standard Model, a theory that describes how the fundamental particles and forces interact with each other. However, the model has several deficiencies: it fails to provide an explanation for gravity, it fails to explain the experimental observation that neutrinos have mass, as well as the fact that most of the universe consists of Dark Matter and Dark Energy. I am now focused on searching for exotic particles, whose existence could resolve some of these remaining deficiencies, including gravitons, heavy neutrinos, leptoquarks, and dark matter candidates. In addition, I am also becoming involved in a new experiment, called DUNE, that aims to measure the properties of the most mysterious particles in the Standard Model, the neutrinos. Both ATLAS and DUNE will utilize the same electronics system to read out the data, which is another recent focus of my research. Finally, I am starting to explore how quantum computing can be utilized to solve problems in high energy physics.



Right: Fixing the high voltage system of ATLAS's liquid argon calorimeter

Faculty Profile

Zhan Su

Assistant Professor

Earth, Atmospheric and Planetary Physics

Welcome to the Department of Physics Dr. Su. Your PhD is in Oceans Physics from the California Institute of Technology. Can you tell us about your research?

My research aims to apply mathematical and modeling techniques to study ocean fluid dynamics, mainly the theoretical part, such as ocean turbulence, as well as the associated climate effects. Due to the essentially nonlinear and stochastic nature of these processes, I need to develop sophisticated quantitative models or statistical methods to study them, as well as using big datasets. My PhD work is mainly about the theory of ocean deep convection and mesoscale eddies. I found that a special type of ocean convection, called thermobaric convection, can occur very abruptly and strongly. Within a few days, the ocean column can be totally mixed due to such convection, which impacts ocean tracer transports and the global ocean circulation. I have developed a theory of the energetics of such convection that helps to understand and quantify such convection.

I also worked on ocean mesoscale eddies (at scales of roughly 50-200 km). The ocean is full of mesoscale eddies and these mesoscale eddies account for the majority of oceanic kinetic energy. An important energy source for these mesoscale eddies comes from the release of Available Potential Energy (APE) through Baroclinic instability. My research better characterizes the general relations between APE and Eddy Kinetic Energy (EKE).

. *Continued on next page.*

Why did you choose to study the oceans?

I liked the courses of mechanics, physics and applied mathematics, when I was in undergraduate school. When I started my graduate studies at Caltech, after trying a few very different projects, it seems that ocean fluid dynamics captured my interests the most. I felt that I could apply my skills of applied mathematics in such research, including the skills of modeling, theory, and big data analysis. Also, I liked the fact that ocean motions are so stochastic; but the physics behind them is so beautiful and organized.

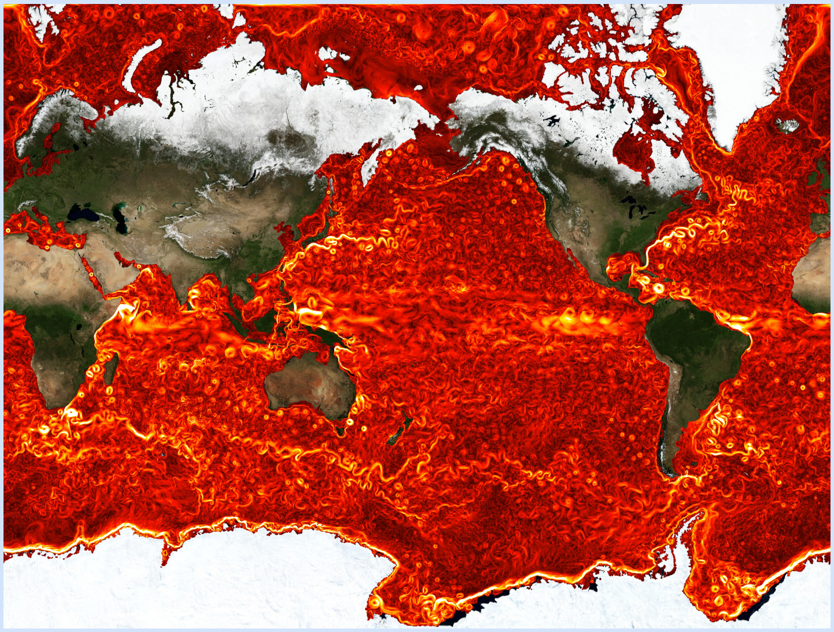
You did your post-doctoral fellowship at NASA and Caltech. What did you work on during that time?

I worked on the modeling and analysis of ocean submesoscale turbulence (at scales of 0.1-10km), by taking advantage of the powerful supercomputer and their datasets at NASA. Also, I studied the dynamics behind the trend of Antarctic sea ice. Both are exciting.

It must have been really cool to work with NASA, what was your favorite part of the experience?

NASA provided lots of resources for computing and it was a lot of fun to handle ~5 petabytes of big datasets. Also, they have an excellent animation group that can make very beautiful movies based on the datasets you provide. The collaborations with experts there was very helpful as well. You also spent time as a post-doctoral researcher at MIT. What did you work on during that time? I used machine learning, including neural network and random forests algorithms, to parameterize the ocean turbulent heat flux.

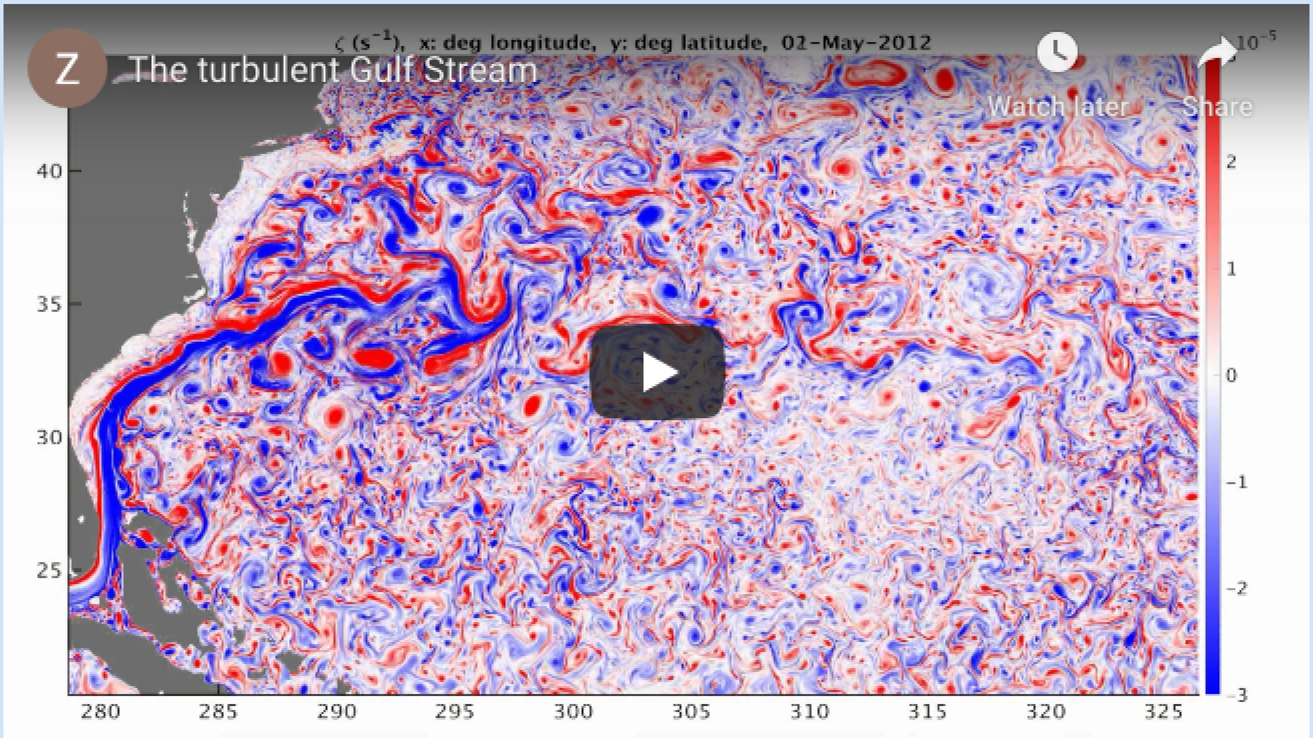
Continued on next page.



Left: A look of global ocean circulation and turbulence based on sea surface speed of ECCO2

What are your research plans at the University of Toronto?
Iwill focus on the research of ocean fluid dynamics, including large-scale ocean circulation, ocean turbulence, and ocean-ice-atmosphere interaction, as well as the resulting effects on the climate. Specifically, by taking advantage of the current quick improvement of computing power and more datasets from observations, I believe it is a time that we can make lots of progress in this field.

Can you tell us about your YouTube movie The Turbulent Gulf Stream that we are sharing with our readers below?
This movie shows our simulated ocean turbulence at the North Atlantic at a very high resolution (~2 km resolution). The quantity shown is relative vorticity, a measure of the spin of fluid parcels, that emphasizes the turbulent nature of ocean motions across a broad range of scales. We find that such fast-rotating turbulent motions are crucial to transport physical and biogeochemical tracers (e.g. heat, carbon), and power the large-scale ocean circulation, which impact on the global climate.



View the movie here: https://www.youtube.com/watch?v=QxG-PCNmYA0

What are you most excited about being in Toronto?
In addition to the research at the University of Toronto, I am also very excited about the food in Toronto. It seems so convenient to get the diversity of food of any country in Toronto.

Post-Doctoral Fellow Profile

Nava Leibovich

Biophysics

Nava Leibovich is a post-doctoral fellow at the Department of Physics since January 2020. She is part of the biophysics research groups of Professors Siddhartha Goyal and Anton Zilman.

Her current work focuses on the theoretical examination of ecosystems evolving under mutual competition between species. Her research is supported by the Council for Higher Education of Israel and by the Ben-Gurion University of the Negev, Israel. Nava obtained her BSc in Mathematics and Physics, and MSc and PhD in theoretical Physics from Bar-Ilan University in Israel. Her research is concentrated on studying stochastic processes.

Although every theoretical study uses simplified models, she believes that the role of theory is to provide a framework to interpret the real world and to predict its behavior. For example, in her PhD research, she predicted the characteristic behavior of non-stationary power spectra and, in particular, the phenomenon called aging noise. The non-stationarity of the noise was measured in two different experimental systems; blinking-quantum dots, and growing interfaces in liquid-crystals turbulence. Both experiments agreed nicely with the theoretical predictions. In 2019, as part of a post-doctorate research at UTM, Nava developed a new method to evaluate reaction rates of biochemical molecules. This method is general, and can be applied to other processes as well. The novelty of her approach can be captured by three key features: First, only the stationary distribution is used for the birth-rate inference, without any dynamical information. Second, the dependence of the production rate of a given molecule on the number of other molecules in the system is considered. Third, because the structure and topology of the entire reaction network may remain arbitrary, only the specified part of the network for the relevant species is recorded.

Besides her research work, Nava likes to go hiking with her family and friends, meet new and interesting people and go jogging while listening to music.

If you would like to read more about Nava's research visit:
https://www.researchgate.net/profile/Nava_Leibovich

Graduate Student Profile

Laura Saunders

PhD Candidate

Physics, Collaborative Specialization in Environmental Studies

Laura ended up in physics by process of elimination. In high school, she knew she liked math and science, but never had a specific interest in any particular subject. By the end of her first year at McGill, she had discovered that she found chemistry labs stressful, biology labs boring, and physics labs surprisingly bearable. She therefore decided to major in physics, but with much trepidation.

After all, physics is only for really really smart people! After a few months in the program, she realized that this was a complete lie that was probably preventing lots of perfectly capable people from pursuing physics. This sparked Laura's interest in working to make physics more accessible to people who would not typically consider it as an option.

Laura found the problem-solving aspect of undergraduate physics enjoyable, but was not enthusiastic about the underlying subject matter. She did not consider graduate school until discovering the Atmospheric Physics group at U of T. This excited her because of the possible applications outside of academia – perhaps in government or legal decision-making. Now, Laura is starting her third year working with Professor Kaley Walker on evaluating climate models from a variety of international climate agencies. This involves comparing climate model output of atmospheric gas concentrations to satellite measurements in order to diagnose issues with the models, which requires a comprehensive understanding of how the atmosphere works both chemically and dynamically. Knowing where models need improvement helps to better understand existing model predictions and to efficiently upgrade the models, both of which are crucial to determining how the climate will change in the coming decades.

Outside of research, Laura is the Director of Communications for the PGSA and co-chairs Physibility, a group dedicated to increasing the visibility of underrepresented people in physics by hosting social events and spreading awareness of challenges faced by marginalized groups.

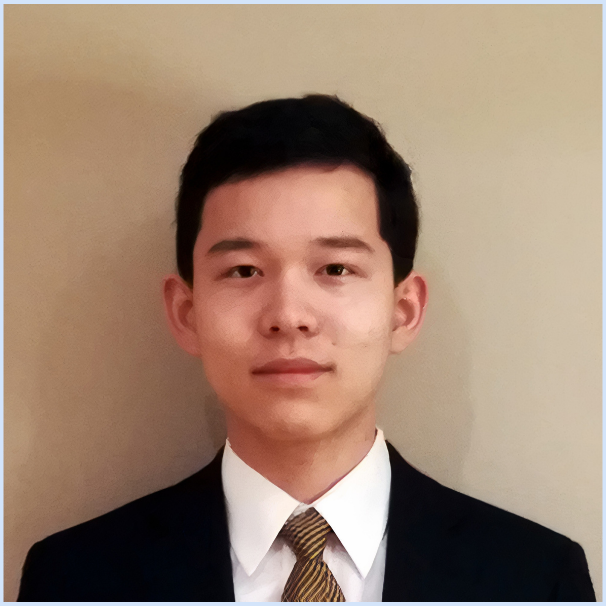
When she's not staring at maps, screaming at Python, or writing e-mails, Laura normally participates in a variety of sports: volleyball, rock climbing, inner tube water polo, soccer, softball, and most recently, Australian football. Since these haven't been available in recent months, she has adopted a 1-year-old mystery shepherd mix named Nala and spent countless hours training her to do useless but adorable tricks. Her current favourite is "roll over," which she now does unprompted in the hopes of being offered some chicken (Nala, not Laura).

Undergraduate Student Profile

Samuel Li

Program: Physics Specialist, Mathematics Specialist, CS Minor

Year of Study: 3



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

Physics has always stood out to me as the one field that offered a deep, satisfying understanding about the real world. It's situated right at the boundary between the fascination of theory and the fun of actually doing stuff. The questions that arise in physics generally require an even mix of both abstract insight and careful real-world experiments, which makes them doubly interesting.

What do you enjoy most about the physics program?

The freedom of choice – even at the specialist level, there's plenty of options for the required courses, and usually plenty of leeway for topics/elective classes. I really think the physics program at UofT offers everyone the opportunity to figure out what they like and pursue their interests in more depth.

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

Among a few other things, I'm quite enthusiastic about the Putnam club, which I regularly attend and occasionally run. In addition to being an exceedingly fun math competition (who a certain Richard F. once won), training for the Putnam is a great socialization opportunity and a tool to keep your problem-solving skills sharp.

What are your research interests?

To be honest, at the moment, I haven't got a clue – and I think that's ok! I find interesting tidbits in nearly every field I've bumped into, from quantum optics to algebraic number theory. Perhaps I just need a bit more time to settle into one area.

Continued on next page.

What is your favorite course and why?
PHY324 (and perhaps PHY224), by a long shot. Even though I'm deeply into theoretical math, nothing quite compares to the feeling of getting your hands dirty in the data, figuring out the inevitable mistakes in your analysis, and ending up with a final result derived from real measurements you took. Bonus points if your answer isn't horribly off. The course is an embodiment of the unreasonable effectiveness of physics at describing the real world.

What are your future plans?
I would like to become a professor, but am also well aware of the struggle and practical issues associated with the process. I plan to apply to graduate school in both mathematics and physics, pick the best of my options, earn a PhD, and see how I feel then. (A lot can change in a few years!) If it doesn't work out, data science or software engineering is always a good option.

Where do you see yourself in 10 years?
In an ideal world, happily as a professor doing physics! In reality, things aren't so certain – I could end up as a software developer, a professor, an entrepreneur, or anywhere in between. (To the aspiring first- and second-years out there: this is ok! You don't need to have your life figured out yet. Just throw yourself at anything you find interesting and see what sticks.)

Tell me something interesting about yourself.
I strive to learn as broadly as possible – I like to pick up the basics of everything from cooking, to electronics, to video production, to machining. Could I have gotten a bit farther in physics by working tirelessly to maximize my depth of knowledge? Sure. But I think true insight almost always comes from where you least expect – not from within your field, the obvious place everyone has already checked.

Left: Sidney Smith Hall stairs
(credit: University of Toronto)

Emeritus Profile
Henry van Driel

Welcome to our first Emeritus Profile where we ask one of our emeritus faculty questions about their careers and what they have being doing since retirement.
Is there a faculty member that you recall from being a student and are you wondering what they are up to? Do you have fond memories of a certain instructor?
Tell us who they are and we will try and connect with them for an update.

Thank you Professor van Driel for speaking to Interactions. How many years were you a faculty member at the Department of Physics?
Before I answer that let me thank you for inviting me to participate. My thoughts often turn to the department, especially during this pandemic, and I feel for students, staff and faculty who are faced with numerous personal and professional challenges.

Now to answer your question, I joined the faculty of U of T in 1976 through Erindale College (now UTM) where I taught and conducted research until 1988. I then transferred to the Physics Department on the St. George campus, retiring in 2014.

Can you tell us about your educational background from your undergraduate degree to your PhD?
I was fortunate to be admitted to U of T's 4-year honours Mathematics, Physics and Chemistry (MPC) undergraduate program in 1966 and had my first year physics classes in the old physics building, now part of Sanford Fleming. After first year I focused on mathematics and physics with my physics classes now in the "new" building. I fondly recall many inspiring teachers such as Derek York, Rashmi Desai, Jan Van Kranendonk and Harry Welsh. Before Christine and I married in 1970 we knew we wanted to remain in Southern Ontario and I applied to and was accepted in the physics graduate program here at U of T. Robin Armstrong recruited me to be a MSc graduate student and I was happy to remain for my PhD.

Continued on next page.

What was the focus of your PhD and how did you choose it?

I was particularly interested in condensed matter physics because of its fundamental and applied nature. Robin got me interested in using nuclear quadrupole resonance (NQR) techniques to probe lattice dynamics and phase transitions in antifluorite and perovskite crystals. He gave me considerable independence and I became involved in all aspects of my project including growing samples, constructing and using a pulsed radio frequency spectrometer and developing theoretical formalism for interpreting data. After finishing my PhD thesis in late 1974, I took an NRC postdoctoral fellowship to the Optical Sciences Centre at the University of Arizona and began work in ultrafast optical spectroscopy of semiconductors, with carrier frequency and pulse widths differing from ones used in my PhD by 6 orders of magnitude.

What kind of physics did you teach? And why?

At Erindale College in the 70s and 80s there were only 6 physics faculty and, like my colleagues, I taught nearly every course once, from first year physics to advanced classical and quantum mechanics. Upon transfer to the St. George campus I mainly taught first year physics to Physics Specialists or Engineering Science students. In the first-year courses I basked in the incredible energy and enthusiasm of highly motivated students. I particularly enjoyed doing demonstrations. Whether they “worked" or not, and perhaps more so if they didn’t, the students and I had a lot of fun. When I was chair of the department for four years I taught a first-year seminar course for about 20 Humanities students on the Riddle of Light, first taught by Boris Stoicheff. We discussed light in art, religion, theatre, medicine, etc. and I brought in external experts from time to time as guest lecturers. Although the course was quite enjoyable, the dynamics and questions were very different from those in other first year courses I had taught since mathematics was verboten. During the 10-minute break of a two hour lecture I served juice and cookies (paralleling what is done before or after research seminars) and learned a lot about the students’ ambitions. I also taught modern optics to 3rd and 4th year students and laser physics or nonlinear optics to graduate students. These courses were more directly related to my research, and because the classes were much smaller than the large first year ones, it was possible to get to know all the students as I did in the seminar course.

What are your fondest memories of being a faculty member in the U of T Physics Department?

There are so many. I’ve already discussed all the rewards of teaching. On the research side, my fondest memories are of working with highly motivated, bright graduate students and postdocs. I was proud to graduate 30 PhD students and it’s great to see that so many have obtained prominent positions in academia, industry and government labs.

Continued on next page.

I miss our weekly group lunches and meetings where we would all take turns chairing the meeting and taking notes. Over the years, we also had several stimulating interactions with John Sipe and his group as well as visitors from Israel, Germany, Russia, the US and the Czech Republic. On the administration side, when I was chair of the department I enjoyed helping to recruit 15 new faculty members and launch their careers which I continue to follow with great interest.

What have you been doing during your retirement?

Before the onset of the pandemic I mainly divided my time between personal and professional volunteering activities. With our 6 grandchildren Christine and I went golfing, hiking, biking, swimming and canoeing in the summer and skiing, skating, bowling, etc. in the winter. Christine and I would also have them stay over for a few days at our house, one at a time, two at a time, or four at a time, which 5-year-old Claire refers to respectively as private, semi-private and public vacations...but a vacation for whom? From time to time I would golf with Robin but that was always quite competitive. I also served my church on several committees overseeing such matters as maintenance and finance. Professionally, as an Associate Editor I helped to launch the new Optical Society of America journal, Optica, and also served on research review panels in Canada, the USA, and Ireland. During the pandemic some of my activities have been altered, although on the professional front I had already begun to wean myself of grant and manuscript reviews since I no longer feel I have the expertise to assess forefront research.

You have been a mentor to 3rd and 4th students in the Physics Mentorship Program for over five years. Why do you mentor students? And why do you think mentoring is important?

I've enjoyed mentoring graduate students, summer research students and undergraduates for nearly 50 years. I agreed to help with the Physics Mentorship Program after I retired in order to maintain contact with young scholars. I benefited enormously from the great mentors I had as an undergraduate so I hoped to bring similar insights to students today. Besides having been a professor and researcher I have also done consulting work with large and small companies so I felt I could offer perceptions into how careers in areas outside of academia might begin and evolve.

Continued on next page.


Left to Right: Mentee Alex Cabaj and Henry van Driel

Each student is different and we tailor our interactions accordingly. Some students have well-defined plans and only ask specific questions about, e.g., graduate school. However, one of my mentees was quite open-minded and came with a page full of questions every time we met. At the first meeting the questions were about what it's like to work in academia. Another time they were about work at a small company. At the 3rd meeting it was about what it might be like to start a company. This went on for 6 meetings, after which I felt like we had exhausted all possibilities apart perhaps from a career in Hollywood! Another mentee was torn between a career in music and going to graduate school. It was easy to sense that his real love was music (and indeed he already had part time employment) and I simply advised him to follow his passion. However, years earlier I also had a very productive summer undergraduate researcher who faced the same dilemma. I gave him the same advice and now I break into a smile whenever I hear him on the radio.

Anything else you would like us to know or share?

One often hears that retirement is about attaining freedom but for a faculty member that's rarely a consideration, especially after the end of mandatory retirement in 2004. Indeed, ever since I was a child I've never really thought about freedom. Parents today would be shocked at the amount of independence my parents gave me when I was growing up in Invermere, a small town in British Columbia, with no TV reception and where I had to be creative in finding adventures or projects to pursue as I tried to cheat the second law of thermodynamics. Looking back, I was lucky to survive childhood but all the experiences helped develop imagination and resourcefulness. I was fortunate too when Robin Armstrong allowed me to define my own PhD. program. And as a faculty member, as my colleagues know, the university administration makes little demands on you and you can choose which courses to teach, what research to do and with whom, how much administration to help with, etc. And now in retirement, even as Christine and I navigate through the pandemic, there are still all my outdoor activities to pursue, plenty of books to read, projects to finish in my workshop, and new people to engage, even if most of them cringe when I reveal my background in physics.

Alumni Profile

Petar Tomic

Class of 2010 - Physics (Specialist), Mathematics (Minor)

What can you do with a physics degree? "Anything" says alum and mentor Petar Tomic

For the last two years I've been an Associate with TD Securities in Credit Management. Our group owns the counter party risk of all non-direct lending (i.e. derivatives, trading, etc.) relationships for the investment banking division of TD.

We assess each client in the context of any potential credit risks that may arise as part of establishing/maintaining a business relationship with them. Then we determine the level of exposure we would be comfortable with, within the context of TD's overall risk appetite.

I also completed and obtained the Chartered Financial Analyst (CFA) designation over the course of the past few years which has been a whole separate journey in and of itself!

I initially chose physics and mathematics because I always had deeper questions about the universe that I wanted to explore and to be able to understand one day. Seeking to understand nature at the fundamental level and constantly pushing the questions "why" and "how" were what drove me to continue and ultimately graduate. I maintain this deep rooted passion for physics, astronomy, and cosmology to this day and make sure to check up on the latest developments, discoveries and publications!

This same curiosity drove me towards the financial markets as it was a few years after the crisis in 2008/2009 and literature was only just starting to emerge about what had caused the implosion and ultimately, the Great Recession.This was my first exposure to advanced mathematics being applied to areas other than physics, and armed with my newfound understanding of PDE's (Schrodinger equation), probabilities (quantum and statistical mechanics) and tensor calculus (GR), I was able to quickly grasp financial concepts that were being discussed at the time such as the Black-Scholes model and Copula Function.

I believe that the rigorous physics and mathematics programs at U of T ultimately trained me to be a problem solver, to approach issues from multiple angles and be efficient in finding the optimal solution. In my first few interviews after graduating, I very confidently

Continued on next page.

(and perhaps arrogantly) answered the age-old question, "so what can you do with a physics degree?" with the only answer that I could possibly think of: "Anything".

This remains my answer to this day and is what I wish to pass on to all students and mentees who are struggling to find the answer within themselves. Any problem you are faced with in your professional career, and life to a large extent, rest assured that your training as a physicist, problem solver and critical thinker will always be there to guide you to the optimal solution, or at the very least, optimal direction.

I also know what it feels like to be in love with and entirely consumed by physics and science for many years that are comprised of long days and even longer nights. It is a love that is very hard to let go of – to allow oneself to pursue other interesting fields that may intrigue you along the way. All the while you are reading about new particles being discovered or gravitational waves being detected or pictures of black holes! But it's only when you step outside the box and give other fields a chance with your own unique perspective, that you discover, that one can be just as (or even more) passionate about new topics once we broaden our horizon and dare to explore new worlds.

It is said that we never forget our first love. Thankfully, Shankar and Griffiths will always be there for you for some light reading if one day you too, decide to venture out and explore new fields and new worlds with the mindset that you can do anything.

Interactions asked Petar why he mentors students:
"I decided to be a mentor because I wanted to give back to the university and the program responsible for training me to become a problem solver and critical thinker. I remember what it felt like to be graduating in 6 months and still being unsure as to whether I would seek out a career in finance, pursue graduate studies, try my hand in engineering or spend some time post-graduation reflecting on this very question. All of my mentees throughout the years have faced similar dilemmas at one point and I hope I was able to offer them some perspective and guidance as to how to face and approach these pivotal decisions when the time came."

For more information on the Physics Mentorship Program, visit:

https://www.physics.utoronto.ca/undergraduate/physics-career/mentorship/

Interactions encourages all alumni to reach out and tell us what they are up to.
Email: newsletter@physics.utoronto.ca
Let us know where your physics degree took you!

2020 PhD Graduates

March 2020

Cormier, Kyle - A Study of Highly-Energetic Top Quarks Using the ATLAS Detector. (supervisor R. Teuscher)

Les, Robert - Exotic Diboson Production in the Semileptonic Channels with the ATLAS Detector. (supervisor W. Trischuk)

June 2020

Wang, Wenyuan - Adaptive Techniques in Practical Quantum Key Distribution. (supervisor H.K. Lo)

Zhang, Chen - New Physics of the Standard Model and Beyond. (supervisor B. Holdom)

2020 Incoming Graduate Students

Doctoral

Khodr Badih
Anjishnu Bose
Juan Felipe Castaneda
Camilo Castellanos Sanchez
Christian Drago
Aleksandra Elias Chereque
Victoria Flood
Baizhi Gao
Matthew Louis Gerry
Sobhan Ghanbari
Christopher Heath
Alvin Heng
Ezekiel Horsley
Chris Hudson
Jiayang Jiang
Matthew Man
Erin McGee
Michael O'Brien Morris
Harshil Neeraj
Mohammadreza Noormandipour
Ali Emre Ozer
Sebastien Roy-Garand
Serene Shum
Sophia Simon
Sean Snider
Kevin Xie
Xiaohan Zhou

Masters

Brendan Barry
Apurba Biswas
Daniela Breitman
Olivier Cardinal
Jiefu Cen
Felix Desrochers
Ephraim Dublin
Andrew Hardy
Joseph Hung
Muhammad Osama Ishtiak
Ariel Kelman
Alexandre Khoury
Maria-Fernanda Lozano
Yevgen Moskalenko
Vida-Michelle Nixon
Emaad Paracha
Lucas Perna
Brandon Shew
Robin Theriault
Takahiro Tow
Gang Yang

Awards and Scholarships

Graduate Student Awards

2020 Ontario Graduate Scholarships

Alexandre Audette
Nazim Boudjada
Joseph Eli Bourassa
Li Ern Chern
Andrew Cox
Christian Drago
Aaron Goldberg
Seshu Iyengar
Perry Mahon
Kamdin Mirsanaye
Adarsh Patri
Panagiotis Stavropolous
Trevor Towstego

2020 Queen Elizabeth II Graduate Scholarship in Science & Technology

Madeleine Bonsma-Fisher

2020 Walter C. Sumner Memorial Fellowships

Aaron Golberg
Seshu Iyengar

2020 Natural Sciences and Engineering Research Council of Canada

Jared Barron
Christian DiMaria
Laura Saunders
Jesse Velay-Vitow
Emily Zhang
Aleksandra Elias Chereque
Matthew Gerry
Michael O' Brien
Felix Frontini
Chan Gwak
Sabrina Madsen
Daniel Schultz

2019-2020 Van Kranendonk Teaching Awards

Eli Bourassa
Nariman Khazai
Sophie McGibbon
Jesse Velay-Vitow

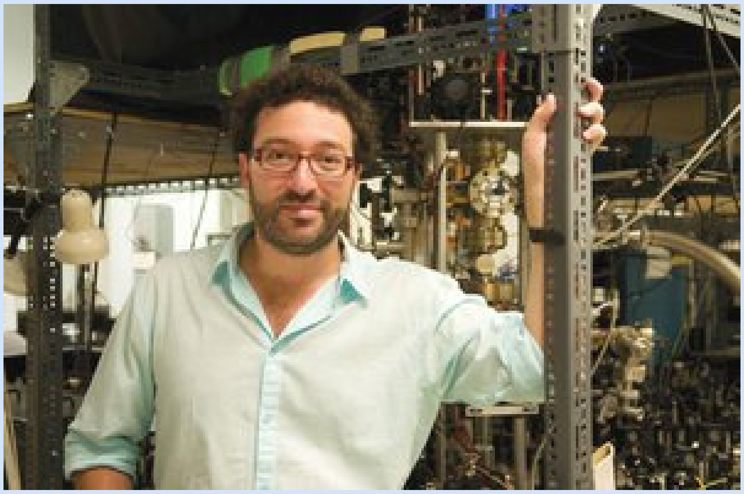
Undergraduate Student Awards

2019-2020 Loudon-Hines Gold Medal and Scholarship in Physics

Celina Pasiecznik

Research Spotlight

Aephraim Steinberg



In a study that was published in Nature in July 2020, Professor Aephraim Steinberg's group reported that it takes about one millisecond for atoms to tunnel through a micron-thick laser beam. The story is summarized below in an article for CIFAR by Jon Farrow, followed by a Q and A with Professor Steinberg with Interactions.

Aephraim Steinberg, co-director of CIFAR's Quantum Information Science Program, led a team that timed atoms' mysterious quantum behaviour.

How long does it take to do the apparently impossible? Knowing might unlock better quantum computers and a deeper understanding of physics.

The fact that quantum-scale objects like atoms or photons can appear on the other side of apparently insurmountable barriers would not surprise most quantum physicists. This effect, known as quantum tunnelling, was first reported in the 1920s. It's so well-established that we harness it for advanced microscopes and quantum computers and we now know it is essential for photosynthesis and nuclear fusion.

"We wouldn't even be here if not for tunnelling," says Aephraim Steinberg, the co-director of CIFAR's Quantum Information Science program and a professor of physics at the University of Toronto. "The first steps in fusion in the sun require one nucleus to tunnel into another nucleus. So tunnelling is a very fundamental process that actually happens in the universe, not just in quantum mechanics textbooks.

"The details of this phenomenon, however, remained mysterious. For 90 years, physicists have argued about how exactly this tunnelling happens, what the atoms do as they tunnel, and how long they take to make the journey.

Steinberg's team, seeking to provide clarity on how long particles spend tunnelling, timed how long ultracold rubidium atoms took to tunnel through a micron-thick laser beam that should have reflected them. In a paper published in Nature in July 2020, they reported a result of about one millisecond.

Continued on next page.

This breakthrough, built on nearly 20 years of refining experiments in his lab, is the world's first such measurement and uncovers deep truths about the physical laws that govern quantum interactions.

"Steinberg and co-workers have accessed a very deep, hidden domain—the classically forbidden region where quantum tunnelling prevails—providing further insight into what information can ultimately be known about a physical system," says Irfan Siddiqi, an expert in quantum control, a fellow in CIFAR's Quantum Information Science program, and a professor of physics at the University of California Berkeley. "Developing new measurement methods that access long-lived, unique quantum signatures are key to developing advanced quantum information processing architectures."

A quantum clock that only ticks when tunnelling

To examine quantum tunnelling, Steinberg's team set up a system where they would push atoms of rubidium, which they had cooled down to a billionth of a degree above absolute zero, into a laser barrier.

"We made one beam [of light] that acted like a guiding fibre for the atoms and held them in this line. Then we intersected that with a second beam that we set up so that it would repel the atoms," says Steinberg. "That second beam acted like a barrier, and we could very carefully adjust the "height" of that barrier. Our setup also allowed us to give the atoms a little push so we could adjust whether or not they had enough energy to classically surmount the barrier.

"They chose the alkali metal rubidium as their tunnelling clocks because its atoms flip back and forth between two states in a precise and predictable way. Indeed, the oscillations of a related atom, cesium, define the second. Mathematically, this oscillation can be treated like a clock hand that points in a certain direction and can move over time.

"Since we wanted [the atoms' clock hands] to only tick in that one micron region where the barrier is, we used the barrier light itself to also tickle the spin of the atoms and make it oscillate at a frequency that we knew," explains Steinberg.

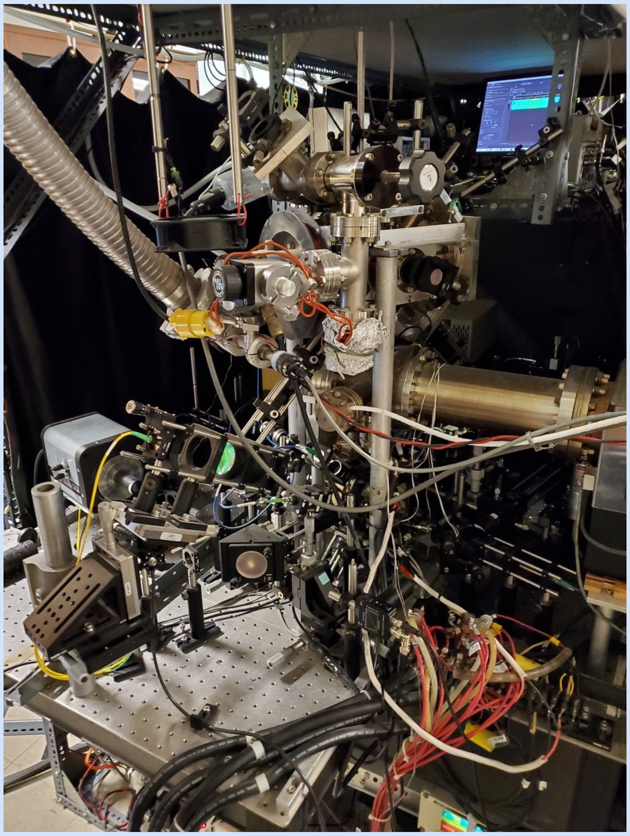
Once they had particles that could tunnel, the particles carried clocks, and the clocks only ticked when they were in the barrier, they had to take photographs that showed where the clock hands were pointing once they reached the other side in order to calculate the amount of time the atoms must have spent in the barrier.

Continued on next page.

A result worth waiting for

"This whole idea of probing the history of a quantum particle is one that's been central to my research and it's come up over and over again in discussions at CIFAR program meetings," says Steinberg, who was appointed a fellow of the Quantum Information Science Program in 2003 and became co-director during the program's renewal in 2018. He has been thinking about, building, testing, and iterating on this delicate and complex experiment since 2001.

"There is no free lunch in quantum mechanics," says Siddiqi. "For example, a route to robustly store information in quantum systems is to hide it from the classical world, thereby creating a fundamental engineering challenge in developing hardware where quantum coherence is long-lived yet controllable.



This is the apparatus used to carry out the experiment.Visible is the vacuum chamber in which the atoms are trapped, and several of the optical beam lines which are used to trap, cool, and probe the atoms.

"The result is not only proof that it is possible to time the tunnelling process, but also that there is much more to learn to get the full picture of quantum systems. It will spur new ideas about what can be learned about a quantum particle's past from observations in the present in CIFAR's Quantum Information Science Program, which brings together theorists and experimentalists to address the field's most fundamental questions.

"This had been kind of a niche topic in quantum optics," says Steinberg. "But I think as the technology evolves, and as we're building these larger scale agglomerations of qubits and trying to learn how to characterize and control each of them, this has renewed practical importance."

By: Jon Farrow (CIFAR)

Continued on next page.

Interactions sat down with Professor Aephraim Steinberg to ask him some questions about this amazing discovery.

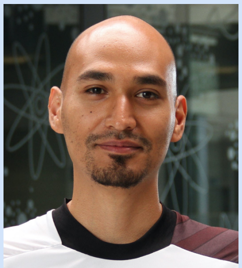
Hi Professor Steinberg, congratulations on your breakthrough. This was 20 years in the making for your group, how does it feel?

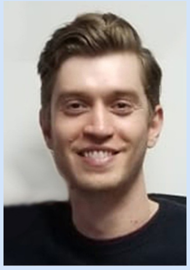
Honestly, it's hard to express just how amazing it is to finally see the result of something you've been pushing towards so long that it's become a sort of white whale. When I was a new assistant prof and gave colloquia where I described some of these ideas, I would say "hopefully, I'll be able to come back in a few years and tell you how it turned out!" And then I'd laugh, "Well, okay, maybe 10 years." I guess, not quite 30 at the time, I couldn't even imagine working on something for twice that long. We'd thought we were "almost there" so many times before discovering a new wrinkle that it was hard for me to believe when we finally saw that we had the results we'd been hoping for for so long. But it was a bit surreal, because I'd been "living with" the project for so long that at the same time, I almost felt like I'd already seen them.

Can you tell us a little bit about your lab and the team that made it happen?

Well, this was the long-term goal that I used to frame the construction of our cold-atoms group, even though we knew we'd spend most of our time on shorter-term projects along the way. And of course, most often we got fascinated by some of these other projects, and left the tunnelling experiment on the back burner for a while. Early on, I thought we could do an "end run" around all the groups trying to achieve Bose-Einstein condensation (back when it wasn't so routine), and we studied some ideas for getting here in a "quick & dirty" way. Well, it turned out the ideas were dirty enough but not so quick, so in the end, we built a new apparatus to go ahead and push for BEC. We only did this when I had a student, Ana Jofre, who got excited enough about the project that she said she wanted to leave the team she was working in and take charge of the new effort, knowing she would certainly not be in the group once we got up to tunneling experiments, and might not even see the BEC. But after Ana, there were several generations of students who each made their own creative contributions, step by step turning this into a powerful and robust machine, and then innovating in terms of how we could implement tunnelling and carry out these sensitive measurements.

Continued on next page.





The team that was on the final paper was from left to right:
Isabelle Racicot, Ramón Ramos and David Spierings

What are you most proud of?

It's a cliché but it's true: I'm proud of the students who made this insanely complicated thing all work, and I'm proud of the role I played in helping them get to the point where they could invent all the stuff they did. I guess I'm also proud of the original theory work I did as a grad student which we're now testing. I still believe that it helps reveal an important perspective on the quantum world, and the fact that 20 years on, people are so excited by our results shows that we still have work to do to get the community to appreciate how much one can actually calculate and measure about the past of quantum systems.

What does the timing of the tunneling process mean for quantum physics and how can we see it applied to technology in the world outside the lab?

As I tried to suggest above, I'm more excited about getting physicists to think more about what we can say about the "past" of quantum systems in general, and tunnelling is just one example. Soon we hope to show even more surprising results: that while reflected particles only see the "entrance" of a barrier but transmitted particles spend as much time near the entrance as near the "exit," essentially no particles spend much time in the middle. I think we still don't really grasp what that all means. We're also going to use this system to probe what happens to tunnelling times in complex, many-body systems, a problem I don't think any one has solved yet. And we have some very promising ideas about studying what it takes to "collapse" a wave function, which we think we can implement in the lab. Of course, tunnelling is at the heart of many physical phenomena, and used in devices ranging from high-speed electronics to superconducting qubits to SQUID magnetometers; as a physicist, you can only believe that we'd better understand everything about this process, even if I can't name a device today that we can't build without knowing this particular number.

What is next for the Steinberg group?

Well, part of my group is very excited about the extensions to our tunnelling work I mentioned above. But in parallel, we continue to study applications of quantum concepts to imaging and to precision measurement, how to use cold atoms to make photons interact with each other or carry out quantum simulations, what it means to observe a quantum system, and other questions about "quantum histories," such as how much time a photon spends "inside atoms" while it's travelling through an absorbing medium.

Read the full article on the CIFAR website here:

https://www.cifar.ca/cifarnews/2020/07/22/cifar-researchers-measure-the-duration-of-quantum-tunnelling

See the article in Nature here:

https://www.nature.com/articles/s41586-020-2490-7S

Teaching and COVID-19

Graduate Office

The COVID-19 pandemic's impact has been also huge on the graduate program and education. Most notably, all laboratory-based research activities stopped for a few months, affecting a large number of graduate students' research progress. The graduate office had to quickly adapt to the "new normal," and continue to facilitate many on-line exams and meetings. Using the new departmental Zoom account, the graduate office was able to schedule exams, provide instructions for the convenors, and ensure that the students were equipped with necessary writing devices. To date 30 PhD qualifying exams, 13 PhD departmental oral exams, 13 SGS final oral exams qualifiers, and 10 MSc (Option II) exams all went without a glitch.

In addition, 67 students had their annual committee meetings via online. The graduate office was also responsible for helping graduate students in need of financial assistance during the pandemic. To date 37 graduate students received around $19,000 from the Graduate Student Emergency Bursary, which was created to address short term financial challenges resulting from the COVID-19 pandemic.

Young-June Kim, Associate Chair, Graduate Studies

Undergraduate Office

The COVID-19 pandemic has obviously created significant challenges for our undergraduate program, for both faculty and students. In March 2020, courses that were already in progress had to be quickly transitioned online, which went relatively smoothly, under the circumstances. Over the summer, following the guidance of the Faculty of Arts & Science, plans were developed to teach most of our fall courses in "dual-delivery" mode, where lectures would be given in-person, to a reduced number of students (those willing and able to attend) and streamed online to the emainder of the class, including students who chose not (or were unable) to return to Toronto for the fall term.

Continued on next page.

Over the summer, due to the evolution of public health situation, as well as student and faculty concern about in-person classes, many of the courses that had been planned a dual-delivery were transitioned fully online. A few dual-delivery courses were maintained, but these too were required to move fully online in mid-October, following a decision by the Arts & Science leadership team, reacting to updated public health advisories for Toronto.

In order to accommodate students who are in very different time zones, lectures in many courses are also being recorded and made available for offline viewing, to allow students the option of watching these at a time which is convenient for them. In some cases this is being done also for tutorials, though clearly this option is less effective in this case, given that tutorials are the main forum in which student interactions with course instructors or Teaching Assistants can take place. Assessments have also been challenging, in terms of scheduling, format, and maintaining academic integrity.

Physics is an inherently experimental field, so an important part of our undergraduate programs relates to experimental work, which is introduced as part of our first-year courses, and covered by dedicated courses in each of the later years of our programs. These are courses for which the learning objectives cannot be met by an online course. So while online practicals are being offered for our large first-year courses, lab courses for later years, PHY224, PHY324 and our Advanced Physics Lab, are being offered only in-person, with slightly reduced enrollment caps in some cases, due to physical-distancing requirements. In the case of the Advanced Lab, which is most commonly taken in the final year of our Specialist programs, students unable to take the course in-person are being accommodated in line with the Dean's Promise, which states that a student's graduation will not be delayed due to an inability to take a required course in-person. View the Dean's Promise here: https://www.artsci.utoronto.ca/current/faculty-registrar/graduation.

Continued on next page.

Left: University College Courtyard in the Fall (Credit: University of Toronto)

Another important part of the undergraduate experience, for many students, is the opportunity to engage in research, either over the summer or during the Fall and Winter academic term, either as part of a program, such as the NSERC USRA program, or the Summer Undergraduate Research Fellowship (SURF) program that is run by the department, or as a supervised research course (PHY478H1, PHY479Y1). These opportunities were obviously also affected by the pandemic, due the shutdown of on-campus research activities. However, some activities were able to continue remotely. In particular, both the USRA and SURF programs were able to proceed with 21 USRA holders and six SURF recipients working on research projects that were adapted to not require a campus presence. Students who have engaged in research projects over the past year will be given an opportunity to present the results of their work at this year's Undergraduate Research Fair, which has been delayed by the pandemic, but which we hope to hold in January 2021. The number of students enrolled in PHY478 and PHY479 this year are consistent with numbers from recent years and do not appear to be affected by COVID-19

The Winter 2021 term will start in much the same way as the Fall 2020, with courses mostly fully online, but with a few dual-delivery courses (public-health considerations permitting), and with the lab courses referred earlier being offered only in-person.

Walkway to King's College Circle in the fall
(Credit: University of Toronto)

Teaching and COVID-19

Undergraduate Office

Physics 131 Practicals During COVID-19

What is the value of an introductory physics course in the middle of a global pandemic and continental racial reckoning?

An introductory physics course can bring people together and empower them to wield the tools of physics to solve problems and help people. In science, as Richard Feynman famously said, “The first principle is that you must not fool yourself—and you are the easiest person to fool.” As we confront the coronavirus infodemic and pervasive racist ideas, we urgently need to refine and develop our tools to not fool ourselves. Physics offers a powerful toolbox to propose and test our ideas. It is this toolbox, more than any specific physics content, that I hope students take with them from Physics 131-132.

Wherever we are, we can experiment with ideas from introductory physics. Not only does today’s everyday technology allow us to communicate while physically distanced, it also provides a pocket laboratory to quickly and creatively test hypotheses about motion. We can take a quick video of a ball moving through the air or of a pendulum moving back and forth. We can slide a shoe or roll a can down a tilted surface. We can compassionately collaborate and practice applying the tools of science with everyday objects in an hour or two.

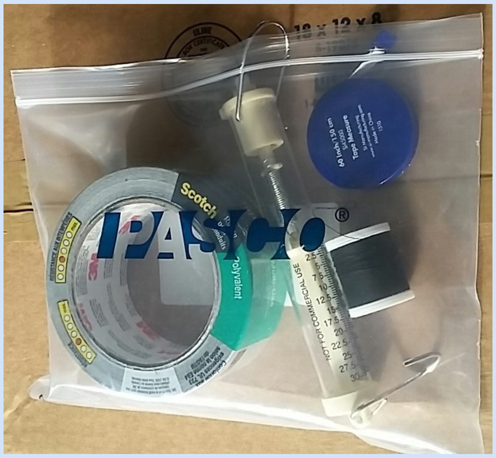
In Physics 131-132, we use an approach validated by physics education research called the Investigative Science Learning Environment (ISLE). This approach has been developed over the past few decades by Eugenia Etkina, Distinguished Professor of Science Education at Rutgers University, and collaborators. It centers on two core intentions: (1) We want students to learn physics by thinking like physicists; by engaging in knowledge-generating activities that mimic the actual practices of physics and using the reasoning tools that physicists use when constructing and applying knowledge. (2) The way in which students learn physics should enhance their well-being.

Continued on next page.

This summer, two graduate teaching assistants, Nariman Khazai and Emily Tyhurst, and I wrestled with the challenge of how to design ISLE labs for an online version of Physics 131 with over 900 students. Small-group collaboration has been vital both to student learning and to social well-being in Physics 131, since David Harrison and collaborators first implemented the Practicals and designed the Practical rooms with that in mind. In lieu of the whiteboards on which pods of 3 or 4 students would collaborate and present their results, we are using shared online documents that each pod of students can co-edit. The university-endorsed platform that permits this functionality is Microsoft Teams, where students can video-chat, text-chat, and co-edit a shared document all within a permanent Teams Meeting. Each lab is spread over two weeks. In the first week, each pod of students designs an experiment together that they can each do at home with the materials they have available to them. The Physics Department is providing a financial credit to each student to offset the cost of basic useful materials, such as a spring scale, tape measure, and string. In the second week of each lab, each student conducts the experiment their pod designed, collects and analyzes the data, and then the pod collaborates on combining their results and drawing conclusions. For some labs, we provide easy-to-run Python notebooks, created by Emily Tyhurst, that produce plots from data files to help students present and interpret their data. To help teaching assistants facilitate productive group dynamics remotely, we asked each pod to create a Team Charter in the first week, and each student also completes a brief pod dynamics survey every week.

Applying the tools of science to teach science, we are continually adapting our approaches. I am grateful for an amazing team of teaching assistants and supportive colleagues, administration and staff as we run online Practicals for such a large class for the very first time. As we strive to inspire our diverse students to generate and test their own knowledge, we also have a lot to learn from them. I look forward to sharing what we learn.

Carolyn Sealfon - Teaching-Stream Faculty and Lecturer



Left: Basic Materials Kit for PHY 131
(credit: Carolyn Sealfon

Virtual Summer Colloquium

Bringing people together scientifically in the era of social distancing

By: Ellen Eckert

A few years ago, the Physics Graduate Students' Association set up a Summer Colloquium series, primarily oriented towards graduate and undergraduate summer students.

The Physics Summer Colloquium was designed to inform students of the wide variety of research that is performed at the University of Toronto's Department of Physics. Because of this particular focus, the Summer Colloquium has always been somewhat unique. However, it was quickly apparent that, due to COVID-19, this year's series would be very different from previous years. Nevertheless, there was consensus that now, more than ever, it was important to bring people together, spark curiosity, and inspire future graduate students.

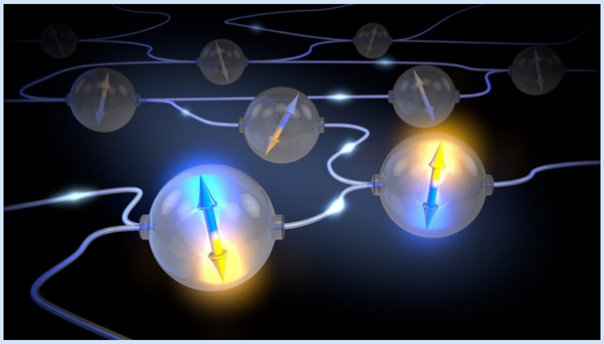
Chair of the Department Professor Kimberly Strong reached out in a call for volunteers and within a few days the organizing committee was formed: Assistant Professors Miriam Diamond and Nikolina Ilic, Professor John Sipe, postdoctoral fellow Ellen Eckert and graduate students Milica Banic, Ahmed Rayyan and Sreekar Voleti. Logistically and technically they were supported by staff members Joanafel Magnaye, Lilian Leung, Pius Santiago and Sheela Manek.

The 2020 Physics Summer Colloquium was entirely virtual and thus it came with new challenges for the speakers, the technical staff, and the organizing committee. So it also served as a pilot to pave the way for the changes needed for the regular Physics Colloquium series and brought valuable insight into the dos and dont's of hosting a series of virtual talks. Zoom was selected as the platform of choice. The talks would be about 30 minutes long and they would be recorded with the speaker's permission to be made available through the colloquium website. All talks would be announced via Facebook, Twitter, and Instagram featuring an image related to the talk. Only a week after the first committee meeting, the first talk of the Summer Colloquium series took place, with several more planned. Interest in the talks was reflected in strong attendances of up to 90, interesting and interactive Q&A sessions and undergraduate students reaching out to inquire about graduate work opportunities. The committee was genuinely pleased with how things came along and the wide variety of talks that were hosted.

Continued on next page.

Physics on large and very small scales

Development of CHORD: The Candadian Hydrogen Observatory and Radio-transient Detector.



Do qubits dream entagled sheep?

Thirteen speakers, drawing from graduate students, postdoctoral fellows, research associates and professors in our Department, presented excellent talks on their research areas.

The list of speakers is:

- Enze Zhang "SuperCDMS SNOLAB Experiment"
- Prof. Anton Zilman "Biophysics of COVID-19"
- Prof. Nikolina Ilic "The Dune Experiment: Physics Research and Progress on Prototyping"
- Prof. R.J. Dwayne Miller "Mapping Atomic Motions with Ultrabright Electrons: Fundamental Space-Time Limits to Imaging Matter in Action"
- Vincent MacKay "Development of CHORD: the Canadian Hydrogen Observatory and Radio-transient Detector"
- Sreekar Voleti "Multipolar Magnetism: A Detective Story"
- Dr. Aharon Brodutch "Do qubits dream of entangled sheep?"
- Mohamed Shaaban "SuperBIT: A diffraction-limited to near-ultraviolet wide-field balloon-borne observatory"
- Josiah Sinclair "Measuring the time atoms spend in the excited state due to a photon they don't absorb"
- Prof. R.J Dwayne Miller "From Basic Science to Star Trek Surgery: Achieving the Fundamental (Single Cell) Limits to Minimally Invasive Surgery and Biodiagnostics"
- Dr. Patrick E. Sheese "17 years of monitoring the atmosphere with the ACE-FTS satellite instrument"
- Prof. Nikolina Ilic "The ATLAS Detector and Recent Physics Results"
- Mikhail Schee "Internal Waves in the Arctic Ocean"

Continued on next page.

Adjustments were made over the summer to find the right methodology. Security was increased and the advertising changed after an unfortunate "Zoom bombing" occurred when a malicious party took over control of the seminar to stream disruptive content. The committee took measures to prevent these kinds of incidents in the future, with great support from the Department of Physics and technical staff. At the end of the summer, the online Summer Colloquium experience provided valuable feedback to the Department on how to host future virtual colloquia.

Paving the way isn't always easy, but the learning process can be quite rewarding, especially when working in a great team of organizers, speakers, and staff. The committee would particularly like to thank all of the speakers who kindly volunteered and presented their intriguing research at the 2020 virtual Physics Summer Colloquium.

Physibility

Diversity, Accessibility, and Equity: Physibility is a group that was started by graduate students: Liz Cunningham and Laura Saunders

Liz Cunningham

Laura Saunders

We started Physibility in September 2019 because we saw a need for space in the Department that would allow grad students to have discussions around diversity, accessibility, and equity. A graduate degree can be isolating if you don't feel like you belong in your department, so we aim to remove barriers that cause people to feel this way in physics and to support them in the meantime.

To support grad students who might be feeling isolated, we host a number of social events that are explicitly welcoming to traditionally underrepresented members of the physics community; everything from ice cream socials to craft nights. Our ultimate goal is to remove the need to differentiate between safer, more equitable events and regular events. This will require a lot of education and conversation among people who already feel comfortable and welcome in physics and is something that's going to take a while.

Some steps we've taken to start conversations of equity in the Department include inviting Dr. MacKenzie Warren to give a workshop pointing out barriers that might be invisible to the majority of the physicists and starting a bi-weekly podcast club. Dr. Warren's talk was well-attended and began an important conversation among all levels of the department on what we all could do to make our department more accessible. The podcast club is a recurring event which meets twice a month to discuss media related to equity, diversity, and inclusivity. This club has helped to bring similar issues as those Dr. Warren discussed into the minds of our colleagues and start folks thinking about how current events and inequities in the larger world impact us as physicists. We have been encouraged to see so many people interested in our work and hope to continue to build a more inclusive community in our department.

Student Union Updates

Physics Graduate Students Association (PGSA)

One of the primary functions of the PGSA—its raison d'être, even—is to bring graduate students together. Physically together. Whether it be to the lounge to talk shop or discuss the news of the day over coffee, or to the pub to recount tales of life in and out of the department, the PGSA's duty to its members has always been to create the space to foster in-person discussion and the space to socialize.

When COVID-19 struck, we, like so many other groups, moved as many of our events as we could online. Coffee Hour, once a staple of the day-to-day social activities in the Department, is now hosted weekly on Zoom. The Physics Formal, normally held at Hart House in recent years, and our largest event, was hosted virtually as well in late May. Keeping true to form, the evening was a great success, complete with trivia and an endearing show of commitment to the theme with everyone logging in from home clad in their most dapper formal wear. We thank everyone who has attended our virtual events for their enthusiasm to keep the physics community connected in this difficult time.

Writing this piece in September, in-person events and social outings already feel like quaint archaisms, like vinyl records and cathode-ray tube televisions. Our hope is that we may return to normal soon and see you all back in the department, but for now, we look forward to keeping in touch online. With Halloween approaching, perhaps we will even see some evidence of "spooky socializing at a distance" this October.

All the best for the coming year,
Joey Carter, PGSA Vice-President Internal (on behalf of the 2019-2020 PGSA)

Physics Undergraduate Student Union (PhySU)

The undergraduate Physics Student Union (PhySU) extends a warm welcome to all new and returning faculty and students as we begin a new semester! Our executive team has been working diligently to prepare for the hybrid fall semester and has shifted many of our events and initiatives to purely online modes of delivery. Over the summer, we launched a Discord server that functions as a virtual "lounge" space for physics students while the PhySU lounge is closed. The server allows students from various years and disciplines to connect with one another, ask questions about the department, and participate in social events such as game nights. In addition, PhySU has been preparing to assist students in acclimating to their online courses by compiling a set of resources, including an online course notes repository, to set students up to succeed academically. We have a number of academic events planned for the semester and are particularly looking forward to our student-led programming workshops.

Rosalie Cormier, President, PhySU (on behalf of the 2019-2020 PhySU)

Physics News

2019-2020 Van Kranendonk Teaching Award Recipients

The Van Krandendonk Awards are given annually to four graduate students to recognize their outstanding contribution to the teaching of undergraduate physics. The graduate student teaching assistants are nominated by undergraduate physics students.

Read the full story here:

https://www.physics.utoronto.ca/news-and-events/news/physics-news/2019-2020-van-kranendonk-teaching-award-recipients/

Musical Renditions of Milky Way Observations

On September 22, 2020, NASA's Chandra X-ray Center released musical renditions, or sonifications of the Milky Way that were created by U of T Physics' Matt Russo and a colleague.

Read the full story here:

https://www.physics.utoronto.ca/news-and-events/news/physics-news/musical-renditions-milky-way-observations/

“**Adventures in Research” with Professor Josh Milstein**

Professor Josh Milstein featured on View to the U: An eye on UTM Research

Read the full story here:

https://www.physics.utoronto.ca/news-and-events/news/physics-news/adventures-in-research-with-professor-josh-milstein/

Professor Arun Paramekanti elected Fellow of the American Physical Society

Department of Physics Professor Arun Paramekanti has been elected Fellow of the American Physical Society (APS) by the APS Council of Representatives at its September meeting upon the recommendation of the APS Division of Condensed Matter Physics (DCMP).

Read the full story here:

https://www.physics.utoronto.ca/news-and-events/news/physics-news/department-physics-professor-arun-paramekanti-elected-fellow-american-physical-society/

From the Big Bang to the Milky Way Galaxy: Planck scientific collaboration comes to an end

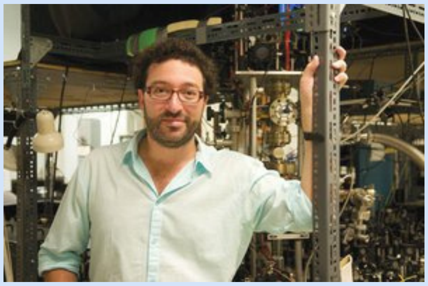
One of the largest collaborations in science has officially come to an end with the release of its final scientific papers this summer.

Read the full story here:
https://www.physics.utoronto.ca/news-and-events/news/physics-news/big-bang-milky-way-galaxy-planck-scientific-collaboration-comes-end/

U of T Physics Faculty Among Experts to Recieve Funding for Research Infrastructure

Thirty-three research projects at the University of Toronto, spanning fields from artificial intelligence and smart manufacturing to cancer detection and neurodegeneration, are set to benefit from more than $9.5 million in federal funding that will support research infrastructure needs and expenses. Among them are U of T Physics faculty, Miriam Diamond and Nikolina Ilic.

Read the full story here:
https://www.physics.utoronto.ca/news-and-events/news/physics-news/u-t-physics-faculty-among-experts-recieve-funding-research-infrastructure/



Aephraim Steinberg, co-director of CIFAR's Quantum Information Science Program, led a team that timed atoms' mysterious quantum behaviour.

How long does it take to do the apparently impossible? Knowing might unlock better quantum computers and a deeper understanding of physics.

Read the full story here:
https://www.physics.utoronto.ca/news-and-events/news/physics-news/aephraim-steinberg-co-director-of-cifars-quantum-information-science-program-led-a-team-that-timed-atoms-mysterious-quantum-behaviour/

Physics News

From Mars exploration to Earth conservation: alumni mentor Julius Lindsay helps physics students navigate career options

When asked how he developed an interest in physics, Faculty of Arts & Science alumnus Julius Lindsay laughs. “I was — am— a big Star Trek and Star Wars nerd,” he says. “I’ve always been interested in math and science, but Grade 8 was a watershed year for me.”

Read the full story here:
https://www.physics.utoronto.ca/news-and-events/news/physics-news/from-mars-exploration-to-earth-conservation-alumni-mentor-julius-lindsay-helps-physics-students-navigate-career-options/

Loudon-Hines Gold Medal and Scholarship in Physics

The Loudon-Hines Gold Medal and Scholarship in Physics was established in 2018 through the generosity of two anonymous donors. The 2019-2020 recipient is: Celina Pasiecznik.

Read the full story here:
https://www.physics.utoronto.ca/news-and-events/news/physics-news/loudon-hines-gold-medal-and-scholarship-in-physics/

Why isn’t there nothing in the universe? Physicists are one step closer to an answer

In a paper published in the journal Nature earlier this year, a team of physicists reported the best evidence yet for an asymmetry between neutrinos and anti-neutrinos that could explain our matter-dominated universe.

Read the full story here:
https://www.physics.utoronto.ca/news-and-events/news/physics-news/why-isnt-there-nothing-in-the-universe-physicists-are-one-step-closer-to-an-answer/

Announcing the Natalia Krasnopolskaia Memorial Summer Undergraduate Research Fellowship

The Physics Summer Undergraduate Research Fellowship (SURF) program has been renamed as the "Natalia Krasnopolskaia Memorial Summer Undergraduate Research Fellowship" to honour Lecturer Natalia Krasnopolskaia (July 16, 1955 - January 30, 2020).

The University of Toronto Physics Summer Undergraduate Research Fellowships provide entry-level summer research experience to first and second year students. They involve undergraduate lab development and research with faculty within the Department of Physics. Approximately six fellowships are available each year to full-time physics students.

From 2011 to 2017, Natalia Krasnopolskaia supervised 19 students in the SURF program and these students helped to develop experiments for the Advanced Labs and Second Year Labs. Several of these projects led to posters at the Canadian Undergraduate Physics Conference. Naming the Summer Undergraduate Research Fellowships after Natalia is a fitting way to honour and remember her.

Natalia started working in the Physics Department in September 2002, and became a Lecturer in 2007. Over the years, she taught many first year physics courses, as well as PHY291H1S "Quantum Mechanics I" for Engineering Sciences and PHY385 "Introduction to Optics".

Natalia was an instructor for the Advanced Physics Laboratories for many years, and also served as the course Coordinator several times. This is a demanding position that involves one-on-one student mentorship, as well as maintaining and updating over 35 different experiments in condensed matter physics, optics, and high energy physics.

Natalia's colleagues remember her "hard work, outstanding organization, enthusiasm for physics and caring attitude". One student commented, "Dr. Krasnopolskaia's efforts to make herself available to the students during lab hours has been invaluable in my learning and understanding of the experiments and associated theory.

"The Natalia Krasnopolskaia Memorial Summer Undergraduate Research Fellowship is a tribute to the memory of an instructor who was well-loved by both colleagues and students. She is greatly missed. Donations will be used to expand and strengthen these student fellowships.

To contribute to this fellowship, please visit:
https://donate.utoronto.ca/give/show/49

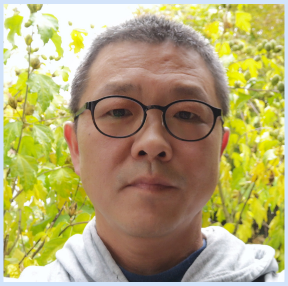
Employee Anniversaries

Celebrating 20 years
Larry Avramidis

Larry Avramidis is a member of the Physics Learning Research Services group (PLRS). A familiar face to undergraduate students, Teaching Assistants and Teaching Faculty, Larry's primary responsibility for a number of years was the 2nd year labs. Larry now shares responsibility for the 3rd and 4th year labs.

His current role requires creativity, innovation and resourcefulness and Larry easily rises up to the challenge. His pleasant manner, ability to adapt to new situations and eagerness to help have made him an indispensable part of the teaching labs.
By: David Rogerson

Celebrating 20 years
Shuqing Li



Shuqing Li is part of the Physics Electronics Resource Center (PERC) which supports research in the Physics Department and at U of T. Shuqing has an Engineering degree and while expert in a wide range of electronics he is particularly skilled in analog design. In a field that requires creativity and innovation, Shuqing works in a patient and thorough manner.

He works closely with faculty and students to produce an optimal design meeting and often exceeding their requirements. Shuqing enjoys spending time working with PERC clients resolving technical issues, providing advice, helping them to understand circuitry or just pointing them in the right direction.

Shuqing is a valued member of the Physics Department and his work enhances both the Department of Physics' and U of T's reputation as research leaders.
By: David Rogerson

Celebrated 25 years (in 2019)
Phil Scolieri

Phil is Supervisor of the Physics Learning Research Services group who's mandate is to support Lecture Demonstrations and Teaching Labs apparatus. His primary responsibility is supporting 3rd & 4th year labs. Desktop computing and electronics are essential elements of Lab work and Phil's training and expertise in these areas have proven to be an invaluable resource to the department. He is continually learning and broadening his skills and becoming an even more valuable asset to faculty and students.

Continued on next page.

Phil also takes an active role in Departmental Health & Safety as co-chair of the Joint Health & Safety committee and as a certified member. His dedication, enthusiasm and willingness to help others continues to be very much appreciated. Thank you Phil for your 26 years in Physics! We look forward to your continuing contributions to the Department, enhancing teaching and enriching the student experience in Physics and at U of T.
By: David Rogerson

Celebrating 30 years
April Seeley
April Seeley is the friendly face that meets and greets any visitors who come to MP129 who have not found their way to the 3rd floor reception and her official role is the First Year Administrative Assistant at the Department of Physics. This means that she is the course administrative assistant mostly for PHY131H1, PHY132H1, PHY151H1, PHY152H1, PHY100H1,PHY205H1, PHY202H1. She helps with other Undergraduate Courses when requested by instructors. She also advises undergraduate students on first year physics courses, backing up the Undergraduate Coordinator.

April is the Learning Management System Administrator (for Undergraduate courses only) and is the Accommodated Testing Services (ATS) representative (formerly test and exam services) in the Physics Department.

She organizes and compiles reports for any TAs who would like to have an evaluation from their students in the course they have taught (not to be confused with the UofT course evaluations).

Her duties also include:
- Copying any undergraduate course material if needed by instructors
- Doing prerequisite, co requisite and exclusion checks for all physics undergraduate courses
- Dealing with the private tutors list which consists mostly of graduate students for undergraduate and high school students in the GTA
- Is the exam invigilator for any student whose high school does not register for the CAP High School Prize Exam

On top of all that, April also organizes the fabulous Departmental Holiday Party every year in December!
By: Sheela Manek

.

Employee Anniversaries

Celebrating 20 years

Gregory Wu

Greg Wu is the longest serving member of *modern* Physics Computing Services. He arrived in the summer of 2000, a year prior to Galina Velikova, and 2.5 years before my arrival and that of Julian Comanean. Greg's principal and crucial role over these 20 years has always been support for research computing. Among the many important roles that he fills in PCS, Greg is the principal contact for the specification and quotation of computing and storage hardware for research groups.

Greg's work also includes:

- installation, configuration and management of Linux workstations and servers
- Installation and configuration of complex and frequently idiosyncratic domain-specific research software
- Troubleshooting of network and hardware problems
- Management of several hundred Terabytes of primary and backup storage
- The full range of general user support

Major projects that Greg has tackled include: over a decade as the principal system administrator of the (now retired) Big Mac computing cluster; a nearly invisible migration of Physics computing infrastructure within our data centre; and the development and management of the Physics perimeter firewall. Greg is a highly valued and trusted member of Physics Computing Services and we look forward to working with him for many more years. Congratulations on this milestone.

By: Steven Butterworth

Arrivals and Departures

Arrival

Zhan Su

Professor Zhu is our new faculty member in Earth, Atmospheric and Planetary Physics. His research is in ocean fluid dynamics, including large-scale ocean circulation, ocean turbulence, and ocean-ice-atmosphere interaction, as well as the resulting effects on the climate.

Read more in the faculty profile: https://www.physics.utoronto.ca/newsletter/interactions-fall-2020/faculty-profile/

Departure

Teresa Baptista

It is said in Greek mythology Atlas holds up the sky. But the undergraduate physics sky at Toronto is, in fact, held up by Teresa Baptista. When I arrived in 1986, she was in the same office, doing the same incredible job she was still doing decades later when I was Undergrad Chair. Her penchant for filing paper is legendary; and she can find things too. Teresa is an administrator in the same sense that Clark Kent is a reporter. Every so often, she turns into a superhero and saves the life of some hapless undergraduate (or Undergraduate Chair). Then she reverts to her usual mild mannered self and nobody is the wiser. She makes the system run in the face of incredible odds, against the relentless Kremlin-esque UofT bureaucracy. We shall never see another like her.

"This reaction from Stephen Morris to the news of Teresa Baptista's retirement likely reflects the feelings of every present and past Physics Undergraduate Associate Chair.Teresa came to the Department of Physics as a Secretary 1976. She was promoted to Main Office Supervisor in 1979, back when that office handled much more of the Departmental administration. Over the years, she took responsibility for many tasks associated with the Undergraduate program, and in 1995 she became Administrative Assistant to the Undergraduate Chair. It was quickly realized that "Assistant" was far too weak a description, and in 1999 she was appointed Physics Undergraduate Coordinator.

Teresa's vast knowledge and experience made all the difference to both students and faculty, and her patience is legendary. Nothing ever fazed her: new University procedures that make no sense and don’t work, desperate students panicked over poor grades, angry professors looking for someone to blame. Teresa calmly handled them all, providing – as needed - a listening ear, good advice, or a solution. When anyone showed up frantic with some issue, a few minutes of discussion with Teresa would typically help them on the road to an answer, or if not, at least provide a soothing perspective.

It was usual to see Teresa working well into the evening at busy times, long after all other administrative staff had more sensibly gone home. She dealt with the myriad details that keep our undergraduate program running smoothly, but which are usually invisible to students and instructors. She provided the information needed as we constantly work to improve our courses and programs. She helped Undergraduate Associate Chairs avoid repeating past mistakes, and ameliorated the problems caused by new ones. Teresa is a wonderful people person, and the constant stream of students in her office knew that she would do her best to answer their questions, solve their bureaucratic problems, and help them succeed.

Continued on next page.

Over the years, Teresa has had to learn and adapt to many changes and would take the initiative when needed. For example, when faced with University's abysmal course scheduling, she unilaterally decided to develop a course database for all Physics programs in order to work through course conflicts more systematically. She mentored younger staff, hiring April Seeley in 1990 and creating an Undergraduate administrative team that is the envy of other Departments.

Teresa was largely responsible for the smooth administration of our undergraduate program, including scheduling of classes, tutorials and labs; tracking and assistance with fulfillment of degree requirement by students enrolled in the many programs we offer; organization of TA contracts and payroll; supervision of support staff working in the Physics Undergraduate program; consultation with other units on undergraduate related matters; and counseling of current and prospective undergraduate students. She had to handle mountains of "back office" administrative support, while simultaneously providing front-line support to students, TAs, Instructors, and staff.

She always supported and educated new Undergraduate Chairs, offering them consistently thoughtful and sound advice. Her memory of all the Department's and University's complicated decision making history was critical in helping them to avoid many mistakes and to build on the work of previous UG Chairs. Every good "bright idea" we've had to improve our programs was only successful because of Teresa's ability to implement the necessary administrative details and to handle myriad unanticipated issues. Sometimes, of course, she also had to gently and kindly explain to the UG Chair why the proposed idea was not going to work.Calm, competent, and unfailingly and genuinely cheerful – we are all going to miss her.

By: David Bailey, with input from Peter Krieger, Paul Kushner, Stephen Morris, Henry van Driel, Tony Key, and April Seeley.

Left: Trinity College
(credit University of Toronto)

Departure

Pierre Savaria

Pierre Savaria was the course coordinator for PHY138-Y Physics for the Life Sciences in the early 2000s when its enrollment peaked at 1200 students. Pierre adeptly managed those thousands of students, four professors, a practicals coordinator and 60 TAs for this course, keeping it running smoothly for more than 10 years, including when it transitioned to the semestered PHY131+132 which continues today.

He was incredibly well-organized, and was known to solve problems before the students even noticed. Beginning in 2009, the duties of the Associate Chair of Undergraduate Studies in Physics were split, creating a new position which involved all the hiring, assigning and managing of the Teaching Assistants. Pierre filled this role of TA Coordinator for 11 years. As such he put his supreme people-management skills to great use as he matched our graduate students with teaching positions where they would be most effective, and counseled hundreds of TAs as they progressed through grad school with us. Pierre's office door was almost always open, including evenings and weekends, and he became an indispensable resource for the department and our students.

By: Jason Harlow

Departure

David Rogerson

David Rogerson is retiring at the end of December 2020.David started at the Department of Physics on March 23, 1998 as an Engineering Technologist in the Physics Electronics Resource Centre (PERC).

After three years he became supervisor of PERC. After managing PERC for 12 years, David became the manager of the Physics Learning and Resource Services (PLRS) which includes graphics and the machine shop.

In his 22 years at Physics, David sat on a number of committees, including the Joint Health Safety Committee. He taught non-credit course to graduate students, including courses on safety. Also, during his time, David oversaw the purchase and installation of new equipment in Technical services and implemented the Student Workshop area in PERC. David was also responsible for all the crane inspections in physics.

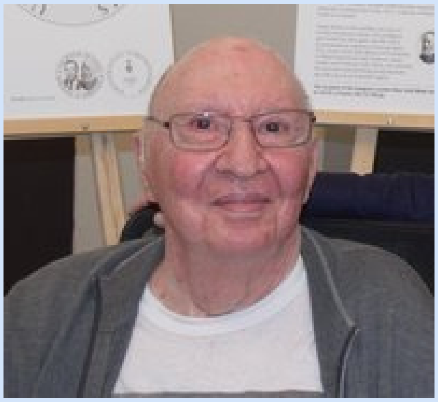
When asked what he will miss about the Department of Physics, David say " I will miss working with the students, teaching and assisting them with their research work".

David's retirement plans include catching up on projects at home, some back country canoeing and camping. He will continue to develop his woodworking skills and plans to do volunteer work in his community. He also hopes to do some travel once the restrictions have eased. Congratulations Dave!

By: Sheela Manek

In Memoriam 2020

Colin O. Hines



Atmospheric physicist and mathematician Colin O. Hines passed away on August 30, 2020 at the age of 93.

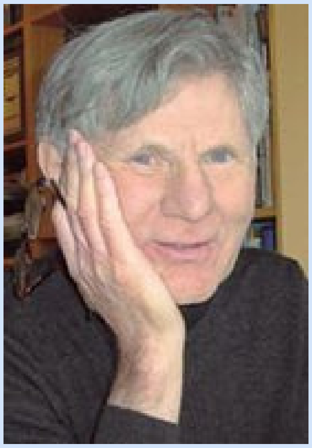
Read more here:
https://www.physics.utoronto.ca/people/memoriam/colin-o-hines/

Rashmi C. Desai

Professor of Condensed Matter Physics (Theoretical) Rashmi C. Desai passed away on June 1, 2020.

Read more here:
https://www.physics.utoronto.ca/people/memoriam/rashmi-c-desai/

David Rowe



Theoretical nuclear physicist Professor David Rowe passed away on May 8, 2020

Read more here:
https://www.physics.utoronto.ca/people/memoriam/david-rowe/

McLennan Physical Labs (Credit: University of Toronto)

Contact Us

Interactions is edited by Sheela Manek

Department of Physics
University of Toronto
60 St. George Street.
Toronto ON M5S 1A7
Canada

Phone:
416-978-3307
Email:
newsletter@physics.utoronto.ca

@PhysicsUofT **@uoftphysics**