Interactions

Message from the Chair

Welcome to the Spring 2018 issue of Interactions, the Department of Physics newsletter. We are coming to the end of another academic year, awaiting only the end of final exams, and the arrival of warm weather. (As an undergraduate in this Department, I remember these did not quite coincide: warm weather would always arrive a few days before my last final exam, making studying even more of a challenge than usual.) I too am coming to an end – of my five-year term as Chair, and this is my last Newsletter Introduction. I will perhaps write elsewhere about the ups and downs (mostly ups) of my time as Chair, but I wish to use this opportunity to thank Sheela Manek who, with unfailing enthusiasm and energy, has been responsible for production and writing of these Newsletters, not to mention all of our other outreach and alumni events, websites, etc.

In this edition, we have a profile of new faculty member David Curtin the latest addition to our Theoretical High Energy Physics group. We also have features on grad student Greg Gomes who is an experimental Biological Physicist doing pioneering work on single-molecule spectroscopy, on undergrad Tess King, alumnus Curt Jaimungal who is putting his physics problem solving skills to work in the film industry, and Emeritus Professor Derek Paul It is interesting that Professor Paul mentions that he enjoyed teaching in the undergraduate labs, because one of my most terrifying student experiences was being soundly trounced in an Advanced Lab oral exam by Professor Paul and Professor Manchester. I suppose it's a good thing that someone enjoyed it.

Pages 11 to 13 report on Department news, and please look at Pages 2 and 14, where we list some upcoming events. You will have opportunities to visit us at the Welsh Lectures (May 3rd), Science Rendezvous (May 12th), and Alumni Reunion (June 2nd). Please come and visit the Department! We hope to see you soon.

Yours Sincerely,

Stephen Julian

Undergraduate Wing Renovations

New undergraduate lounge

Improvements to the undergraduate labs and teaching technologist space in our north wing were 99% completed in late 2017.

On the second floor we expanded and improved the main lab room for our second and third year Physics Practicals course.

On the first floor we completed the fourth and fifth new Practicals rooms designed for collaborative hands-on work for our first-year students (the first three were completed in 2009-2012). The new room for engineers is the most versatile of our five new Practicals rooms, with furniture that can be rearranged, and a retractable dividing wall in the middle. In the winter semester 2018, this room is being used for hands-on activities in "Physics of Everyday Life" and "Physics of the Changing Environment".

Continued on next page.

Undergraduate Wing Renovations continued…..

Practical Room

Breakout space

The five new Practicals rooms surround a colourful central space which is divided into an undergraduate lounge and new office and workshop space for our Learning Services Technologists.

Included in the undergraduate lounge space are a separated breakout room for group study sessions, a physics help centre which can be booked by teaching assistants and a 14-foot wide screen that can showcase research in the department.

Invitations

Kids Passport U of T

Saturday, June 2, 2018
9:30am-12:00pm

The popular children's event is back!

You and your children can travel to a variety of faculties and departments, learning exciting facts from professors and grad students. Drop in for a morning of discovery with the kids. Especially suited to 4-12 year-olds and their grown-ups.

At Physics:
- Come visit us to see how sharing energy makes objects dance together.
- Explore magnetic levitation and take home the world's simplest electric motor.
- All this plus our usual favorites – don't miss it!

Questions? Email: *alumni@physics.utoronto.ca* *or visit* springreunion.utoronto.ca *for more information.*

Alumni Reunion - *(formally called Spring Reunion)*

Saturday, June 2, 2018
12:00-3:00pm

Department of Physics
McLennan Physical Labs
60 St George Street
MP 111 (Grad Lounge)

Come see the brand new undergraduate teaching wing, hear about current research and reunite with some of your professors and classmates at the wine and cheese!

Are there Professors from the Department of Physics that you have memories of and would like to meet again? Please email alumni@physics.utoronto.ca and we will see if that Professor can attend the reunion.

To register and for more information on U of T Alumni Reunion, visit: springreunion.utoronto.ca

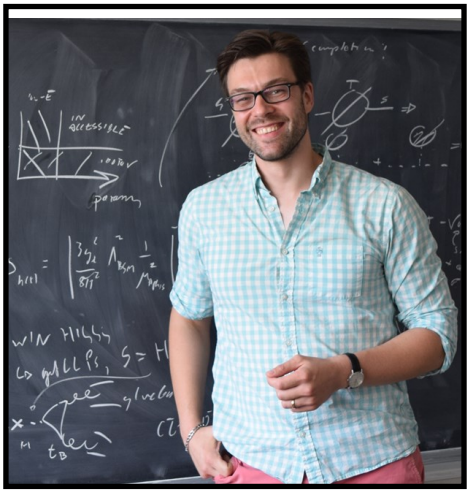
Questions? Email alumni@physics.utoronto.ca

U of T ALUMNI REUNION

Faculty Profile - Davd Curtin

David Curtin

Assistant Professor
Theoretical High Energy Physics



David Curtin

Welcome to the Department of Physics and to Toronto Dr. Curtin! Your chosen area of physics is theoretical high energy physics. Why?

Thank you. High energy physics studies the most fundamental interactions which ultimately make up everything else we observe. Probing these basic building blocks of the universe is tremendously exciting, pushing the envelope of our mathematical and theoretical understanding as well as our experimental capabilities. We've reached the stage where probing the highest energies requires gigantic experimental facilities, colliding protons at energies 7,000 x higher than their rest energy to probe size scales orders of magnitude smaller than an atomic nucleus. What's not to love? I'm a theorist, but as someone working on phenomenology, my research connects closely with experiments, as well as cosmological observations, so there's always something interesting new to think about.

You did your PhD at Cornell University, can you tell our readers a little bit about your thesis topic "Model Building and Collider Physics above the Weak Scale"?

It's kind of a broad title, because my thesis contains several chapters which basically represent the papers I've written during my PhD. These papers span model building of theories with additional warped spatial dimensions (Higgsless-Randall-Sundrum models, somewhat fallen out of fashion since the discovery of the Higgs boson I'm afraid) and supersymmetric theories, as well as investigations of collider signals at the Large Hadron Collider (LHC) via numerical simulations.

The common thread connecting these topics is that they are motivated by the Hierarchy Problem, which is the problem of stabilizing the weak scale of nature (basically the mass of the Higgs, W and Z bosons, ~ 100 GeV) against enormous and incalculable quantum corrections at the Planck Scale of Gravity (~10^{19} GeV), which strongly suggests the presence of new physics beyond the Standard model at energy scales of 100 - 1000 GeV.

Beyond this common motivation the chapters are very different and self-contained, which is indicative of the diversity of investigations needed to do particle phenomenology today. To me, that's what makes it exciting.

Your research interests include Higgs Physics. Why do you think the world was so captivated by the Higgs Boson?

The discovery of the Higgs boson is an incredible story. It begins at the dawn of the modern era of particle physics, when the Standard Model was theoretically formulated in the 1960s. Higgs and others showed that the vacuum expectation value of a scalar field could spontaneously break a gauge symmetry and make the corresponding force carriers massive, and Glashow, Salam and Weinberg wrote down the theory of unified electroweak interactions as the gauge group SU(2) x U(1). The Higgs boson was needed to explain the weakness of the weak nuclear force by making the W and Z bosons tremendously heavy (~100 GeV) compared to the energy scales of protons (mass ~ 1 GeV) and experiments at the time. The predictions of spontaneously broken electroweak theory were put to the test over the coming decades, and it passed with flying colors, but the Higgs mass was an unknown parameter within the theory, and the Higgs boson itself proved elusive.

We tried to find the Higgs with the Large Electron-Positron collider (LEP, collision energy ~ 200 GeV) at CERN in the 1990s. No dice. We looked at Fermilab's Tevatron proton-proton collider in the 90s and 2000s (collision energy ~ 2,000 GeV), and while it found the top quark, again, no Higgs. Finally, the Large Hadron Collider started smashing protons in 2008, with an initial collision energy of ~7,000 GeV (now running at 13,000 GeV). It's a final push towards the Higgs — if the LHC doesn't find it, it simply has to find something else, because otherwise the basic equations of the Standard Model start breaking down at these tremendous energies. Thousands of scientists and engineers from all over the world devote their lives to build and operate this gigantic machine that costs 10 billion dollars and consumes as much electrical power as a small city. Years are spent gathering and analyzing data, and in 2012 we finally crossed the threshold. The Higgs discovery was confirmed, separately, by both major detectors operating at the LHC. More than 40 years of theory, several scientific megaprojects, and tens of billions of dollars later, a prediction from the 1960s that lays the groundwork for our understanding of the subatomic world and everything that relies on it, is triumphantly confirmed.

Continued on next page….

Continued from page 3.

I think the public recognizes and appreciates the obvious passion and dedication of scientists spending their lives pursuing difficult questions, even if the complexity of the subject matter makes details opaque to a layperson. Apart from everything else, I think the sheer scale of the effort to find the Higgs plays an important role in how strongly the story resonated with many people.

You are a founding member of Exotic Higgs Decay working group, what does this group do?

This informal group formed in 2012, the year the Higgs was discovered, and included about a dozen theorists as members. The Higgs is actually a very powerful probe of possible new physics. Almost any particles that might exist can easily couple to it (in quantum mechanics speak, it's impossible to forbid these couplings via symmetries, so you'd just generically expect them to always be there), and the Higgs is so delicate that even small new couplings could be detected, for example via exotic decays of the Higgs boson into these new particles. We wanted to lay out the space of theoretically motivated possibilities for these types of decays, which represent a tremendous discovery opportunity for the LHC but require a dedicated experimental search program. The time was certainly right for such a message. We broke down more complete theories into simpler components and suggested experimental search strategies for each part. Our 200 page survey paper, published in 2013, made a big impact and still guides experimental searches at the LHC to this day.

In organizational terms, our continuing efforts have been absorbed by one of the big working groups at CERN, the "LHC Higgs Cross Section Working Group", which means our recommendations became something closer to official policy. So ultimately our little working group was very successful and achieved all its goals.

You are also a founding member of the MATHUSLA collaboration, can you tell our readers about this project?

I have been interested in the physics of Long-Lived Particles (LLPs) for several years now. By LLP we mean any hypothetical new particles that are not part of the Standard Model, which is produced at colliders and decays some macroscopic distance, from microns to kilometers, away from the production point. Neutral LLPs are invisible until they decay, in which case you suddenly see a flash of energetic particles that seem to come out of nowhere. It's a spectacular signature, but because the LHC main detectors were not designed for it from the outset, they are easily missed unless you specifically look for them and bring specialized reconstruction and search techniques to bear on the data.

I've been studying LLP signatures for a while and encouraged my experimental friends to look for them, but I was vexed by an apparent blind spot of the LHC: LLPs with very large lifetimes, so large that they just escape from the detectors without being noticed. This is a very generic possibility, and our blindness to them is especially frustrating when you consider that we might already be making lots of these particles in LHC collisions!

I organized a workshop at the University of Maryland, when I was still a postdoc there, to talk about various hidden sector theories, including LLP signatures. I had some kooky ideas about looking for LLPs with ultra-long lifetimes using particle detectors on balloons above CERN, which I knew could not work but presented as a joke to get people thinking. It's incredibly hard, because there's just no way to be clever about it: these particles decay whenever they want, and you have to be right there when it happens, to detect them. You can't make them decay, you can't trap them, you can't detect them by scattering them off something.

Two experimental colleagues, Henry Lubatti from ATLAS (University of Washington) and John Paul Chou from CMS (Rutgers), became interested, and we realized that a dedicated external detector was the answer. This eventually evolved into the MATHUSLA (MAssive Timing Hodoscope for Ultra-Stable neutraL pArticles) idea published in 2016, which is essentially a gigantic empty barn above CERN with some simple particle detectors in the roof. Its large size, and the fact that it is shielded from the conventional particle chaos produced by the LHC, makes it extremely sensitive to LLPs, and allows us to extend the range of lifetimes we can detect by a factor of 1000! Despite its size, the project should be affordable, since the detector is so simple.

That was a bit less than two years ago. Our experimental collaboration now includes dozens of members, and my experimental colleagues took data with a small-scale test demonstrator detector (5x5x10 meters) at CERN in November. We also have about 100 theorists working together on a white paper to support the detector and explain the physics case for its construction. The response from the scientific community, and the amount of progress in less than two years, has been pretty incredible.

A lot more progress is expected this year, and we hope to secure funding towards construction of the full scale detector in the coming few years. This includes soliciting contributions from private donors or organizations who would like to make an outsize impact on basic science. It's a very exciting time.

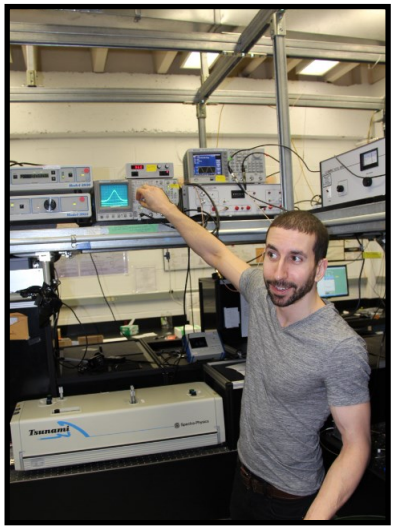
What are your research plans for the University Of Toronto Department Of Physics?

I'm excited to build up my research group here. There's a lot of theoretical work to be done to understand LLP signatures and our MATHUSLA detector. I've also been busy thinking about the connection between LHC signals and cosmological signals in surveys of large scale structure or the cosmic microwave background, and the theories that can produce both or either. Another area I'm very interested in is the behavior of the Higgs boson in the early universe, which involves understanding the physics of the Higgs field at tremendously high temperatures shortly after the Big Bang. This can predict stochastic gravitational wave signatures we could observe with future space-based detectors like LISA, and play a vital role in explaining the mystery of why our universe contains more matter than antimatter. There's a lot to do in phenomenology, and the intersection with high energy experiments, cosmology, and even astrophysics means you can always learn something new.

Graduate Student Profile

Gregory Gomes

PhD
Biological Physics



Greg Gomes mode-locking a laser, a process that creates ultrashort (femtosecond) pulses of light to be used in time-resolved spectroscopy.

Gregory Gomes joined the UofT Physics department in 2012 after completing an undergraduate degree in Engineering Physics at McMaster University. As an undergraduate student, he did summer research internships in labs studying solar cells, biophotonics, and non-linear optics. His initial interest in biology was from a biomedical engineering perspective, mainly focused on diagnosis and imaging.

However, after reading Erwin Schrödinger's book "What is Life?" he wanted to find a way to use his practical experience with lasers, spectroscopy, and microscopes to study the question that Schrödinger poses: "How can the events in space and time which take place within the spatial boundary of a living organism be accounted for by physics and chemistry?"

In Biological Physics within the UofT Physics department, Greg is able to use the approaches and methods of physics/engineering to study biological systems. His current research is in single molecule biophysics with Professsor Claudiu Gradinaru at the University of Toronto Mississauga campus. He uses custom-built microscopes to study fluorescently labeled protein molecules, one at a time. Why would one wish to perform such single-molecule experiments which require measurements of tiny signals, in environments of tremendous noise? Why not take the average signal by measuring a large number of the biomolecule of interest at once; thereby improving the signal to noise?

Consider this analogy: Michael Phelps joins the physics department as the 12th Biological Physics professor. With his 28 Olympic medals, the Biological Physics faculty now have an average of approximately 2.3 Olympic medals per faculty (OMPF) – a much higher OMPF than the Quantum Optics or Condensed Matter faculty! The error here is in the assumption that the group average is an adequate representation of any given single molecule (or in this case faculty).

In many biological systems, there is a prevalence of molecular heterogeneity. Biological molecules, to perform their biological functions, usually exist in different states at different times (for example, open or closed states, bound or unbound). By studying biological processes at the single molecule level, the entire distribution of an observable can be quantified. States of a biological molecule related to disease should (hopefully!!!) be rare, and so single molecule biophysics is uniquely poised to study these states.

When Greg is not working on his research, he is at a local rock climbing gym (Boulderz in the Junction). In particular, he enjoys "bouldering", a discipline of climbing in which the heights do not require the use of rope, and the "problems" or routes are shorter and more intense. Bouldering problems place an emphasis on explosive strength, or technical/problem solving abilities. Climbing is a great hobby for physicists; climbing is gracefully moving from one position of static equilibrium (no net torque, no net force) to another position of static equilibrium.

Undergraduate Student Profile

Tess King

Physics and
Physical Geography
Major

Tess King

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

I have always been fascinated in how physicists approach the world and problems that are presented to them. There is the old joke of how a physicist would approximate a cow as a perfect sphere of uniform density, and even though that is a joke it does capture how physicists like to take complex systems and approximate them to be as simple as possible. That is how I like to approach my problems, which may be why I was drawn to physics.

What do you enjoy most about the physics program?

The enthusiasm that my peers have for the subject. It may be a sort of masochistic joy, but I really do love just grinding our problem sets with all my peers and combining all of our brain power to solve physics problems.

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

I illustrate for the Varsity, captain the Innis intramural Frisbee team, sang in the Innis Choir, was a member of the IGEM policy and practices team (a student club dedicated to synthetic biology), and do calligraphy.

What are your research interests?

Atmospheric physics.

What is your favorite course and why?

My favorite course has to be, probably PHY151. It wasn't particularly challenging or eye opening, but the year I took it, the course was taught by Professor Sabine Stanley and she has been the single greatest professor I have ever encountered in university. The first day of class I introduced myself to her after class and she remembered my name for the entire semester. She has an uncanny skill of effortlessly being able to put knowledge directly into her student's brains. Even though she now teaches at Johns Hopkins I still keep in touch with her because she was just such a great professor.

What are your future plans?

Get a job somehow, make money, and avoid living under a bridge.

Where do you see yourself in 10 years?

Hopefully successful somewhere warm, because I hate living in cold places, and not under a bridge.

Tell me something interesting about yourself.

One of my 10th grade class rooms had the walls painted with lots of different pictures by past students, except for one corner that for some reason was left completely blank. It was against the school's policy at the time to paint any walls, but I was leaving that school in the next year, so over the exams period at the end of the year in June, myself and 2 friends snuck into the room and painted a mural on the blank corner without getting caught. The mural is still there today.

Alumni Profile

Curt Jaimungal

BSc
Physics & Mathematics
0T3

Curt Jaimungal

Curt Jaimungal graduated with a specialist in Mathematics and Physics in 2013.

He studied physics because he loves puzzles and sees the "Theory Of Everything" as the ultimate puzzle.

"When you ask "why" enough, then any question comes down to physics. For example, why is the economy the way it is? Because society is like that. Why is society like that? Because people value things in a certain way. Why are people like that? Because of their psychology. Why is psychology like that? Because neurology. Which is because of the biology. Which is because of the chemistry. Which is because of the physics!" he says.

Now, however, he's doing something which seems completely unrelated; filmmaking and entrepreneurship.

Last year he released what UofT's The Newspaper called "the most Toronto film on Earth" - a 90 minute anti-romantic comedy called "I'm Okay" which deals with themes of depression and mental health. He is now using his physics puzzle-solving skills to solve the big issue of mental health with artists.

In 2016 Curt founded indiefilmTO, a startup which teaches entrepreneurship to artists by focusing on the startup methodology - with a heavy dose of psychology since as Curt says "80% of someone's success is their psychology. How do you perform when you don't feel like performing? How do you stay fulfilled when you achieve, because how many times have you reached a goal you thought you'd be thrilled about but instead thought "...is this all there is?""

He's now working on his next feature which will explore similar themes, as well as continuing to inspire artists across Toronto with his in-your-face brand of entrepreneurship and psychology.

"It would never have been possible without physics and math. It teaches you to look at what works, what doesn't, and how can you solve a problem. Artists and business execs are missing that analytical mindset. Life is full of problems. But problems make you grow. Problems strengthen you. The problem that most people have these days is that they think they shouldn't have any. What you want is better quality problems. And physics made me feel like I can solve any problem."

The Impact of Philanthropy on Physics Students

The Hymie and Roslyn Mida Student Award in Theoretical Physics

This generous prize is awarded annually to third- or fourth-year undergraduate students. Since it was established in 2013, the scholarship has supported 21 students. On January 23, 2018, some recent recipients met with Dr. Hymie Mida and department chair Stephen Julian over afternoon coffee. The students shared news of their research, and told Dr. Mida what the scholarship meant to them.

"Your donation goes beyond financial support. It means that my academic pursuits and passions are supported and worthwhile. It is a vote of confidence in the path that I am taking and the accomplishments that I have achieved. On behalf of all the students you have supported and those you will empower in the future, I would like to express my deepest and most heartfelt gratitude. Thank you."

– recipient Darren Pereira

Left to Right:
Haider Abidi, Hymie Mida, Darren Pereira,
Stephen Julian and Anqi Mu

A Lasting Legacy

When Fraser Code was an undergraduate at Victoria College in the 1960s, his father put pressure on him to study engineering. But young Fraser had long before fallen in love with Physics. And when he won several scholarships, he gained the freedom to choose his own academic path. That path led him to Harvard University for graduate school, and then back to U of T, where he was a faculty member at UTM and the Department of Physics (St. George) for 32 years.

Professor Emeritus Code retired in 2003. Last year, he and his wife, Jennifer, made a gift to U of T, to endow an annual award for the best PhD dissertation and oral defense in the Department of Chemical and Physical Sciences (CPS) at UTM.

We asked him why they decided to establish this award, and why now.

Fraser and Jennifer Code (Photo Credit: Blake Eligh)

"As a student I won a lot of scholarships and awards. It gave me freedom –

I was able to pursue my personal interests, and to work on my dissertation without having to take on jobs as a TA.

Why a dissertation award? I remember seeing it listed on an international scholar's CV that he had won a PhD prize. This is something that made his CV notable, and made him a more attractive candidate. I thought we'd like to offer the same opportunity and edge for someone at CPS.

Opening the door for somebody is important. The goal is to encourage everyone's interest in science, and to help someone feel good about the struggles of their PhD work.

What can you do in your age of retirement? You can think about how you'd like to spend your time and resources, and how you'd like to be remembered. When you put your plans together, you think about what impact you can make in the future – but we also thought it was appropriate to give back while we are alive. What I thought of was, let's give a scholarship – and let's do it now so we can meet these young scholars. Jennifer and I both agreed it was a great idea, and it's been a great pleasure for both of us.

What makes a good university is investment in its students. What we really wanted was to make a contribution to the university that would catalyze that kind of student reward and recognition—that's the idea behind this award."

UTM Chemistry & Physical Sciences student, Samer Doughan, received the first PhD Thesis Award in November 2017 for his thesis in Analytical Chemistry.

Support Physics –
Helping a tradition of teaching, research excellence and innovation

We welcome the continued interest of our alumni, faculty, staff and friends. Your gifts to the Department of Physics provide vital funding to support top students, educators, researchers, facilities and academic programs.

Departmental Priorities?

A donation to the Departmental Trust–provides the Chair with valuable resources to respond to priorities as they arise. In addition, the department aims to build a strong portfolio of undergraduate and graduate scholarships for our bright students.

How much should I give?

Give what you can, and what feels right. Donations of any size make a difference, and help inspire others to join in with their own gift. Your one-time gift can be directed to the project of your choice. You may decide to give monthly—just $20 a month translates to $240 over the year. Or you may wish to consider establishing a named fund now or through a bequest to honour someone special.

How do I give?

It's easy. Just click here and follow the links. You can select credit card payment or payroll deduction.

If you wish to make your donation by mail, please send the pledge form to:

Arts & Science Advancement
100 St. George St., #2036
Toronto, Ontario, Canada
M5S 3G3

Do I get a tax receipt?

Yes, a charitable tax receipt will be provided for your donation. Payroll donations will be reflected on your T4.

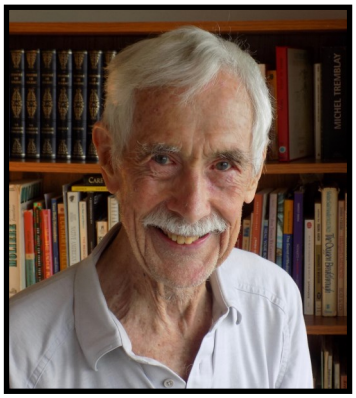
Can I speak with someone about a donation?

If you have any questions about making a donation to Physics or elsewhere in the Faculty of Arts & Science, please contact Heather McLean, Senior Development Officer at heather.mclean@utoronto.ca or 416.978.1844.

Emeritus Update

Derek Paul

Professor Emeritus



Retired professors can carry on their physics research following retirement, or change fields, or devote their lives to other things. Derek Paul is one who devoted much time to a variety of human concerns and published in at least six other fields. His recent book, A Leap to an Ecological Economy, was issued by Archway Publishing in December of 2017. See Professor Paul's website: www.derekleverpaul.ca for more information on this book.

Topics of his writing outside of physics have included: peace research, foreign policy, climate change, getting a male-female balance in parliaments, a New Paradigm for the 21st century, a superordinate principle and poverty elimination.

He says that physics is an excellent background for all other fields, because physicists tend to look at fundamentals and thus look for root causes.

During his 31+ years in the Physics Department, Professor Paul taught in both physics and engineering at all levels. In physics he taught all subjects except earth sciences and condensed matter.

He says that his best experiences teaching were generally in the labs. He was in charge of first and second years (1970-73) and did many three-year stints in the advanced labs (3rd and 4th years). These latter were the best of all teaching assignments.

In terms of research, Professor Paul and his graduate students mainly worked on positron interactions with ordinary atoms and molecules, and produced at the physics department, c.1972, the first beam of low-energy (few eV range) positrons outside of the USA.

Professor Paul retired in June 1995, moved to Montreal in 2016 and is keeping busy by collaborating with Coalition Climate Montreal, a coalition of city groups working toward a greenhouse gas emissions-free Montreal.

He spends his scant leisure time painting in oils and in creative writing. His first portrait (below) was completed in January; it is of Harriet Brooks, nuclear physicist, born 1877. She was the first woman to complete a Master's degree at McGill (1903), and the first person to suggest that when an atom disintegrates radioactively, it is changing atomic species. The fact was later proved by Ernest Rutherford, her graduate supervisor.

This painting of Harriet Brooks by Derek Paul was inspired by a black and white photo of her at her graduation in 1898 when she received her bachelor's degree.

We would love to hear from more emeritus faculty. Tell us what you are doing now by emailing: newsletter@physics.utoronto.ca

News

Sajeev John Appointed an Officer of the Order of Canada

Professor Sajeev John has been appointed an Officer of the Order of Canada, "For his revolutionary contributions to optical sciences, notably for his role in the development of new structures capable of harnessing the flow of light."

Officers of the Order of Canada are recognized for "National Service or Achievement" in any sphere of activity, and Professor John is one of only 35 such appointments in the December 2017 list.

Details of the awards.

The full list of appointees.

Amar Vutha - Recipient of the 2018 Sloan Fellowship

The Sloan Research Fellowships seek to stimulate fundamental research by early-career scientists and scholars of outstanding promise. These two-year fellowships are awarded yearly to 126 researchers in recognition of distinguished performance and a unique potential to make substantial contributions to their field. The 2018 Sloan Research Fellows will receive fellowships in the amount of $65,000.

Professor Amar Vutha is a recipient in the physics category.

When Professor Vutha was asked about what this fellowship means to him, he said:

"It is nice to know that my research is appreciated by my colleagues. It is also great to find support for doing fundamental physics, without having to justify why it is useful"

Full list of 2018 fellows can be found here:
https://sloan.org/fellowships/2018-fellows

Unseen Toronto: Hidden Technologies filmed at the Department of Physics!

Last year, the television series Unseen Toronto paid a visit to the Department of Physics and filmed the episode "Unseen Toronto: Hidden Technology". The episode aired in September 2017 and can be viewed here:
https://vimeopro.com/brull/unseentoronto-physics

Host Derek Flack was accompanied by Professor Stephen Morris on a tour of the Department. Viewers got a glimpse of the Department's research facilities including Stephen Morris' icicle machine and Aephraim Steinberg's laser lab. Kimberly Strong showed University of Toronto Atmospheric Laboratory (TAO) and Space Instrument Characterization Facility (SICF). Stephen Morris showed viewers the vacuum tank for the van de Graaf accelerator used by Isotrace for mass spectrometry. They ended the day by visiting Barth Netterfield in the High Bay and were able to see the Stratospheric Balloon Payload Integration Facility.

Heroic calculation: Prof. Peltier on using new supercomputer to shed light on how oceans behave

To break in Canada's newest, most powerful research supercomputer, the University of Toronto's Richard Peltier is running a "heroic calculation" – one that is expected to shed new light on how the world's oceans physically function.

It's unknown how long it will take the more than $18-million machine known as Niagara to crunch the millions of gigabytes in real-time data streaming to it now from the ocean bottom of the Pacific.

"It's never been done before," said Peltier, a globally renowned climate change expert. "It could be days or even a week depending on the spatial resolution we decide to work at."

Niagara is a massive network of 60,000 cores – the equivalent of roughly 60,000 powerful desktop computers – that can be tasked to work together simultaneously on a single, humungous problem.

This type of setup, known as a large parallel system, is the only one in Canada and is housed in a secure, non-descript location in Vaughan, Ont. It's open to all Canadian university researchers and is part of a national network of research computing infrastructure.

Read the full article on the UofT News page.

Author: Jennifer Robinson

November 2017 Graduates

Back Row: Melissa Ratzlaff, Jennifer Sears, Di Tian, Paul J. Godin, Ian Jardine, Ciarán Hickey, Zachary Vernon, Stephen Foster, Sean Trim, Derek Inman

Front Row: Sylvia Swiecicki, Jennifer Yu, Kevin Marshall, Christopher Luciuk

physCAP recap - Mentorship Program

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

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

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

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

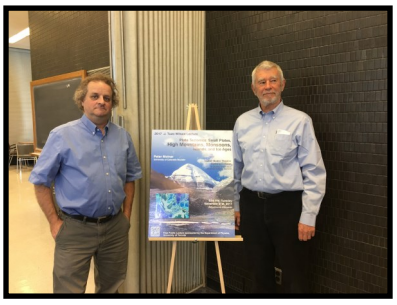
Past Events

Start of Term Party - September 6, 2017

The annual start of term party was held on September 6 right after the Physics Jamboree. The event was attended by faculty, staff and students and was a great way to welcome our new graduate students.

Tuzo Wilson Lecture - November 21, 2017

The 2017 Tuzo Wilson Lecture took place on November 21 at the Isabel Bader Theatre.
The speaker was Peter Molnar of the University of Colorado at Boulder. His talk was titled Plate Tectonics Meets Climate: the Tibetan Plateau and the Indian Monsoon.



Tuzo Wilson Professor Stephen Morris and Speaker Peter Molnar

Left: Peter Molnar speaking the Isabel Bader theatre

physCAP Career Event - Conversations on Careers - February 15, 2018

Left to right - Paul Kushner, Farah Henley, Vijay Venkataraman. Stephen Steel and Andrea

Professor Paul Kushner hosted the physCAP Conversations on Careers this past year. 3rd and 4th students had the opportunity to engage with physics alumni from industry who are using their Physics degrees in diverse ways.

The speakers were

Farah Henley - HBSC Physics and Astrophysics - finance

Stephen Steel - PhD Experimental Physics, MSc Experimental Physics, BSc Physics - programming

Andrea Vargas - MSc Medical Biophysics , HBSC Physics - medical technology

Vijay Venkataraman - PhD Physics - data science

Interested in being a speaker at one of our events? Contact mentorship@physics.utoronto.ca

Upcoming Events

Case Studies: A History of Physics Innovation - April to late Summer 2018

In conjunction with the University of Toronto Scientific Instruments Collection, the University of Toronto Physics Department and the Faculty of Information, this exhibition presents four instruments and processes, developed at the department that illustrate the university's impact on physics research and the scientists behind the inventions.

The exhibition will be on display in the McLennan foyer, all are welcome to drop and see it.

Welsh Lectures - Thursday, May 3, 2018

The Welsh Lectures are an annual highlight in the life of the Department of Physics. They are held in honour of Harry L. Welsh, a former Chair in the Department of Physics. The Welsh lectures began in 1975 to honour his 65th birthday.

2018 Speakers
Prof. Seamus Davis (Cornell University)

Prof. Ana Maria Rey (University of Colorado)

Public Talks
Thursday, May 3, 2018
1:30pm
Earth Sciences Building - ES 1050
5 Bancroft Avenue

Science Rendezvous - Saturday, May 12, 2018

Science Rendezvous is Canada's largest Science Festival and is free for everyone. With over 300 events across 30 cities and 1000s of mind-blowing exhibits, the Department of Physics will be joining in the fun again!

Guests can expect to see demonstrations like: Sound Waves & Pendulum Waves, Bernoulli Tricks, Singing Wine Glasses, 1m tall dominos, Cosmic rays, Classic Van de Graaff generator, the Superconducting Train and more.

Please visit the Science Rendezvous website for more information or contact outreach@physics.utoronto.ca for more information!

Date: Saturday, May 12, 2018
Time: 11am-5pm
Location: 60 St. George Street

Doors Open Toronto presented by Great Gulf - Saturday, May 26 and Sunday, May 27, 2018

One weekend every year Doors Open Toronto provides an opportunity to explore some of the most architecturally, historically, culturally and socially significant buildings across the city, many of which are not usually open to the public.

The event also features walking tours, a speaker series, music series and other special programs. All activities are free, but some require advance registration.

This year McLennan Physical Laboratories is participating for the first time and you are invited.

Guests will see the lecture hall where Good Will Hunting was filmed as well as newly renovated teaching facilities. Visit the roof to see the massive telescopes and weather permitting, the telescopes will be open to view the sun. Visit the 15th floor balcony that has a panoramic view of downtown.. Plus, a variety physics demos for children and parents.

Date: Saturday, May 26 amd Sunday May 27, 2018
Time: 10am-5pm
Location: 60 St. George Street

Science Unlimited Summer Camp - August 13-17, 2018

50 high school students will be participating in a week of workshops from the Departments of Astronomy and Astrophysics, Chemistry, Computer Science, Earth Sciences, Math, Physics and the School of the Environment. More information on this fantastic week can be found here: https://sites.physics.utoronto.ca/summercamp

People

New Faculty

David Curtin - Assistant Professor

Employee Changes

Physics Departmental Assistant - Elizabeth Glover

Graduate Office Assistant—Beata Kuszewska

Retirements

Research Laboratory Technician - Alan Stummer

Employee Anniversaries

20 Years

Dave Rogerson - Manager Physics Learning and Research Services

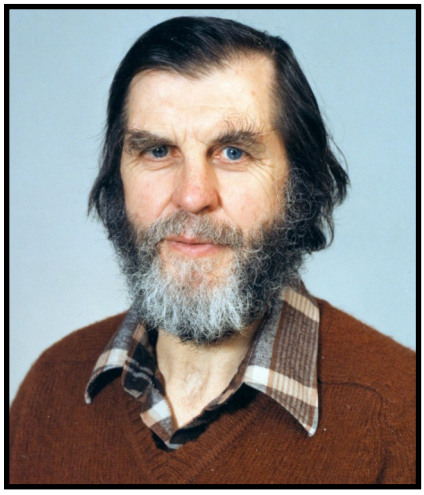
15 Years

Julian Comanean - Information Systems Specialist

10 Years

Sheela Manek - Facilities and Special Projects Coordinator

In Memory

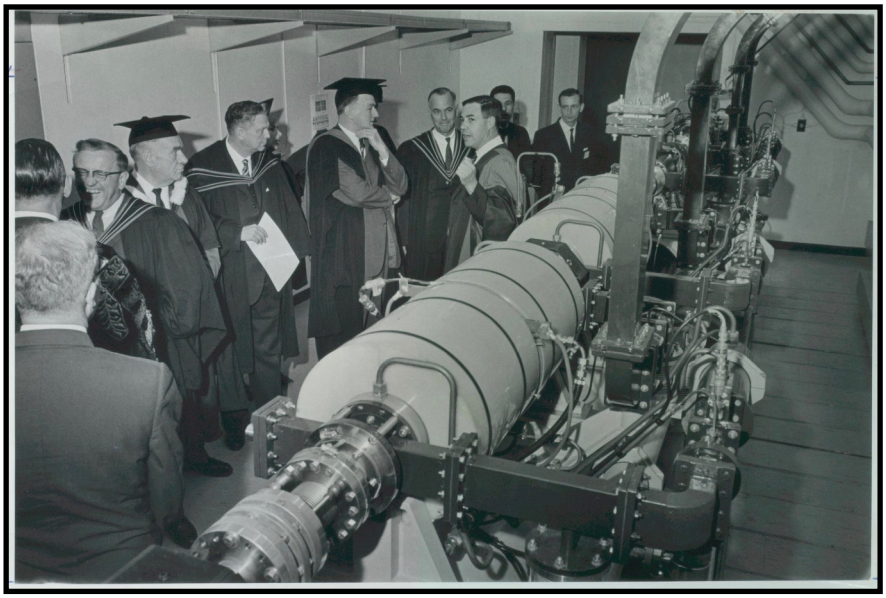


James D. Prentice (1930-2018)
Professor Emeritus -
High Energy Particle Physics

Michael Walker (1937-2017)
Professor Emeritus -
Condensed Matter Physics

Robert Smidrovskis (1958-2017)
Senior Learning Services Specialist -
Advanced Teaching Labs

Physics Flashback



This is the main machine room of the Linac machine circa 1966.

Professor Ken McNeil (standing in front of the machine) was the driving force behind the Linac Lab and is explaining the new machine to other physicists!

Can you identify others in the picture? If so, please email newsletter@physics.utoronto.ca

Letters to the Editor

Fall 2017 Issue of Interactions

As I recall, the official opening day of the new McLennan Labs was bright and sunny. I was a Ph.D. student in Robin Armstrong's magnetic resonance group. Along with scores of my fellow physics grad students we formed a section of the large outdoor audience for the formal proceedings. Faculty members wore academic gowns, many being the red and black of the U of T Ph.D. robe. I don't remember any of the speeches, but I do remember some awkwardness with the fitting the ceremonial key in the door of the building.

Robin's group actually moved into the labs in the basement prior to the official opening. I remember having to carry Dewar containers of liquid nitrogen from the cryogenics facility in the old McLennan lab to our new space, as the new building was not yet completely fitted for low temperature experiments.

I spent my career at a small college outside of Philadelphia. During the late 1980's I began my involvement in chaotic dynamics with colleagues at other institutions, including Wilfred Laurier U, Waterloo U, and Haverford College. In 2000, Raj Roy, well known in nonlinear physics, formerly of Georgia Tech and then at U of Maryland, invited me to drive to Maryland to give an 'informal' lunchtime talk to what I thought would be just him and his grad students. No problem.

Imagine the increase in my stress level when I saw the room fill up with many of the leaders in nonlinear physics, Jim Yorke, Ed Ott, and many others. This was the full Applied Dynamics Group at the University of Maryland. I would have prepared quite differently and more thoroughly for this group. Luckily I was first and, still in a state of mild shock, I stumbled through my talk on the chaos of synchronized pendulums – archetypical nonlinear systems. After my talk someone handed me a slice of pizza.

To my further surprise, the other speaker was Stephen Morris from U of T. Unlike me, he seemed right at home with this high powered group and gave an interesting talk involving nonlinear interactions in long tubes, if memory serves. For Stephen, the composition of the audience was no problem. I, on the other hand, could barely get down the pizza. The drive back to Philadelphia was a bit of a blur. At any rate, that is my Stephen Morris story. Clearly, he continues to do great things.

Gregory L. Baker, Ph.D., 7T0

In 1966 I came first to Toronto as a NSERC postdoc to join the High Energy Group recently started by Jim Prentice and Dick Steenberg (who, very sadly, died soon after). We were located in the Sandford Fleming building where I was given a huge gloomy office in the basement, not too far from John Moffat's. Harry Welsh was departmental Chair, and, on my arrival, I was allowed to meet the great man. I left after two years to work at the National Accelerator Lab (now Fermilab) and when I returned two years later, to take up my Assistant Professorship, the department had moved to the Mclennan Physics Building, a great improvement. In those days, only tenured faculty were invited to attend faculty meetings, and a lab assistant would scrupulously clean the blackboards between each lecture. Both aspects of this well established hierarchy suited me well.

Tony Key, Professor Emeritus

Helium!

We brought the last of the helium over in a huge weather balloon. It was stored in a small room opposite my new office. It nearly filled the room to the door. I used to go in there and put my head against it to listen to the erie echos- literally on a different wavelength. I got quite addicted to this and was sorry when in a couple of weeks Bert Owen took it away to pump it into the new system.

Malcolm Graham, Professor Emeritus

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Physics UofT **@uoftphysics**

Physics Funny

What did one quantum physicist say when he wanted to fight another quantum physicist?

Answer: Let me atom!