EUREKA!

NEWSLETTER OF THE FACULTY OF SCIENCE

FALL 2014

The Peanut Allergy Project:

Critical research aiming to discover the truth behind the rise in peanut allergies

Research, faculty, student and community news, brought to you by the Faculty of Science.

Carleton UNIVERSITY | Faculty of Science

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Message from the Dean

Carleton University was founded as a university with deep roots in the community. We are proud of that legacy, our continued commitment to the community, and of the role the Faculty of Science has played since it was created 51 years ago.

Science can connect to our communities in many different ways. Fundamental research helps us understand and appreciate the world and universe around us. Research in areas that touch on our health and well-being impact our quality of life and our ability to enjoy our natural surroundings. Citizen scientists are important partners to the university as we work to minimize our impact on the natural environment and to understand the complex ways we interact with the planet. The mathematical and computational sciences help us make sense of an ever-more complicated world and strive to simplify our interactions with technology.

It is important to emphasize that commitment to community is shared by everyone – faculty, staff, and students. We have students leading activities in "Let's Talk Science" and people from every corner of the Faculty working in and supporting other activities that partner with teachers to support our community schools. This includes bringing students on campus to experience science first-hand in the laboratory.

Our science cafés and public lectures are another way we connect to our local community. It is vital that universities be part of the communities where they live, sharing our excitement about our discoveries but also hearing the thoughts and questions of our neighbours.

This issue of Eureka speaks to some of the ways the Faculty of Science at Carleton connects to the community. It is a small sample of our many activities, each as impactful and exciting as those you will read about here.

Malcolm Butler
Dean, Faculty of Science

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Newsletter Mission Statement
EUREKA! is published for the alumni, faculty, staff, friends and partners of the Faculty of Science. The newsletter is intended to communicate the faculty's goals, strategic direction and activities in order to connect alumni to each other and the university. It is published in collaboration with the department of university advancement.

The department of university advancement protects your personal information. It is used by the university to inform you about programming, events and offers from our affinity partners, to communicate Carleton news, and for fundraising purposes. To update your name or address or stop mail, please contact advancement services at 1-800-461-8972.

Please send your feedback, letter to the editor or story ideas to cuscience@carleton.ca.

On the cover: Rozlyn Boutin, BSc. Honours student in Biology with a concentration in health science. Rozlyn is currently working on the Peanut Allergy Project led by professors Mark Forbes and Shawn Hayley. Read about their research on pages 8-9.

Photo by Luther Caverly

CHECK OUT EUREKA ONLINE TODAY!

carleton.ca/science

Innovative Research Focuses on Preventing the Negative Impact of Concussions

By Kristy Strauss

Matthew Holahan's son was just six years old when he started playing hockey, a sport which led the father and Carleton University neuroscience professor to start thinking about concussions.

"It was a big concern when my wife and I started sending our son to hockey," said Holahan, whose wife is a neuropsychologist at the children's hospital of eastern Ontario (CHEO). "I started getting interested in concussions based on discussions with her, and I thought I should try and study it."

For the past three years, Holahan has turned his academic attention to researching concussions, focusing on their long-term effects as well as prevention methods. Holahan specifically looks at concussion effects on younger demographics such as children and young adults.

"I'm involved with the kids' hockey team, and being a university professor, I work with university-aged students all the time," Holahan explains. "I've seen a lot of athletes who come to class who have had a concussion over the weekend."

His research started by looking at the effects of concussions in young children, which can include trouble performing in school, difficulty focusing, and other behavioural effects.

Then Holahan started collaborating with neuropsychologists at CHEO in order to learn more about memory deficits in children who have sustained concussions, going on to model these memory deficits in rats.

Holahan also worked with neurosurgeons at CHEO to research preventative measures and the best ways to keep children safe. While collaborating with CHEO, Holahan organized a mini conference on campus which hosted a panel of four experts on pediatric concussions. It was at this meeting that Holahan stumbled across his next opportunity for collaboration – working with Carleton's athletics department.

"One of the people who attended [the symposium] was Dr. Taryn Taylor, the sports medicine physician, so she and I started talking about concussions in athletes," said Holahan.

Photo by Luther Caverly

Matthew Holohan, Neuroscience

After learning more about concussion rates among athletes at Carleton, the professor quickly discovered that the women's rugby team had the highest concussion rates on campus.

"Women's rugby was the worst, every player had had a concussion," he says. "That ripples out to their school work. They're here to attend university and complete their degrees. Sports are very important, but it shouldn't interfere with their schooling".

But these issues didn't just affect the rugby team. Holahan says he found that many athletes suffering concussions were female – a finding that prompted him to begin developing hypotheses to find out why.

"One hypothesis is that, for men's hockey, when boys are growing up they start contact," he says. "They're taught how to take a hit and how to tighten up and be prepared for a hit."

Holahan believes these findings could also be due to the fact that males tend to have stronger neck muscles physiologically than females.

Females often suffer from concussions after their necks twist rapidly, he says, which can be almost worse than a head-on impact.

Photo by Luther Caverly

One way to reduce this is to strengthen the necks of female players with exercises as part of their physical training, said Holahan.

The neuroscience professor will be collaborating with the athletics department for the next year or so, focusing on the women's hockey team and possibly rugby team, working with trainers to help female athletes strengthen and prevent injury.

Holahan will be comparing concussion rates at the end of the year to see if numbers have been reduced.

"We're going to do this for these students, strengthen their necks, and see if that will have prevented concussions," he says. "From there, we can talk to Queen's University or the University of Ottawa and see what their concussion rates are, and see if the numbers reduce [after using this exercise]. If they do, we can come up with a strategy for all universities to have neck strengthening protocol, and maybe implement it across Canada."

Holahan believes that research into concussions, as important as it is, is an area that's overlooked.

"There is a lot of push for kids to be in sports, and the consequences increase in contact sports," he says. "Some people think that a lot of society's problems are based on kids who have had concussions, it starts to cause problems in other areas of their life and leads to bigger problems."

He adds that young people are particularly sensitive to concussions since brain development is still occurring. If damage occurs during this critical period, it can lead to lasting effects.

"Treatment is obviously important, but what seems to be more important, is that coaches and trainers who are working with younger kids recognize the signs of concussions," Holahan says. "And, it's important to look at how we can prevent more head injuries and brain injuries"

The bottom line of all Holahan's research? To prevent concussions by raising awareness of their impact.

Navigating the New World of Human Computer Interactions

Photo by Luther Caverly

By Kristy Strauss

They're teaching users how hackers attack and developing computer password systems that are easier to remember - Carleton computer science professor Sonia Chiasson and her team of research students are making users more secure online.

"With more and more of our world being online, cyber security is incredibly important," said Chiasson, who is also Canada's research chair on human oriented computer security.

Chiasson began looking at the way people approach the design of usable computer systems while she was completing a master's degree at the University of Saskatchewan, working on a project involving designing interfaces for children.

"It was a really cool way of combining the more human side of things with computer science," said Chiasson.

Chiasson then brought her research to Carleton, where she completed her PhD thesis before going on to become a professor. She currently leads a team of researchers in combining human-computer interaction with computer security, an area of research that Carleton is the international leader in.

"Internationally, there are fewer than 10 labs who are really focusing on this type of research, and we have so much," she says.

Chiasson adds that the research happening in her lab is a collaboration across many disciplines, and includes students from subjects such as graphic design and psychology.

While several students are completing degrees in computer science, Chiasson adds that she also has several students completing interdisciplinary master's degrees in human computer interaction (HCI).

"Some of our students come from traditional computer science backgrounds and engineering. But also having students with psychology and graphic design backgrounds makes for a really nice mix, and different perspectives," said the professor.

For example, one of Chiasson's students with a psychology background was interested in studying older adults, deciding to look into their views on online threats. This research was then used in Chiasson's lab to learn how to design better interfaces for all ages, and to increase online security.

"(Older adults) are getting so many conflicting messages, such as don't click on any pop-ups," said Chiasson. "As a result, they're not doing any updates to their computer either, so when they don't click a pop-up that says please update Java or your browser, they actually end up more insecure."

Other HCI students have developed a series of online interactive comics aiming to raise awareness about computer security while teaching users how to stay vigilant against potential threats. These comics, entitled "Secure Comics" are intended to improve people's understanding of computer security through visualizations. To view: www.versipass.com/edusec/.

"The idea was to use infographics, visual design, and humour to teach people about different security threats, with the idea that if they had a better understanding of why we're asking them to be more secure, they're more likely to comply," said Chiasson.

Computer science students in the lab are also looking at alternatives to CAPTCHAs , the little boxes users see on-screen that determine if a user is human by asking them to input a series of numbers and letters.

"CAPTCHAs are getting more and more difficult," she says. "They are

Sonia Chiasson, Computer Science
Photo by Luther Caverly

annoying on a regular computer, and if you're trying to do them on your smartphone, it's even worse. You have a small screen, and then the keyboard pops up and hides the CAPTCHA, and then it does autocorrect."

Another student in Chiasson's lab is looking at alternatives to CAPTCHA's for cellphones, such as using sensors instead of codes to determine if the user is human.

Overall Chiasson says a lot of the research happening in her lab deals with user authentication, and alternatives to traditional text-based passwords.

"Everybody hates passwords, and doesn't want to have to remember them. We're trying to find alternatives that are not as taxing."

For example, humans have a much better ability of remembering pictures instead of texts. Taking this into account, she and her students are developing new authentication schemes where people remember images instead of the traditional text password, or alternatively, using images to trigger memory of what the text-based password is.

As Carleton continues to be a leader in cyber security research, Chiasson says the university will host the Symposium on Usable Privacy and Security (SOUPS) conference in July 2015, which focuses on this type of research.

This will be the first time the conference will ever be held in Canada, Chiasson adds. In addition to this conference, the research done by the professor will continue to grow into the community thanks to a four-year $1.6 Million research grant from the Networks of Centres of Excellence of Canada.

The grant will be used to create the SERENE network, which is a joint project with the Université de Montréal that will get academic research on cyber security out to Canadian government agencies, companies and non-profit organizations.

As part of the grant, researchers will also receive feedback from users within these organizations so they can solve important problems that arise. Chiasson adds, "It's about opening the dialogue on cyber security and sharing knowledge."

Chemistry PhD Student David Mandia Rewarded for His Incredible Research

Carleton is known for its collaborative initiatives. One such project is called the Multimodal Optical Sensors, Applications, Interfaces, and Controls (MOSAIC) project, funded by NSERC and led by Electronics Professor Jacques Albert.

MOSAIC is a fibre optic sensing technology combined with nanoscience in the Department of Chemistry to build better sensors that will have important biomedical and environmental research applications.

David Mandia, PhD student in the Department of Chemistry, was looking for this kind of research to focus on during his PhD. The opportunity to work with renowned professors like Albert and Chemistry Professor Sean Barry led to his decision to chose to study at Carleton.

Barry's CFI-funded Lab adapted optical fiber-based devices, developed by the MOSAIC team, to create extremely thin and optically-interesting metallic films on metals.

The Barry lab specializes in thin gold films by vapour deposition methods. Ultimately, this research is leading to the development of robust, versatile and tiny sensors that can have many applications for electronics, solar applications, or microelectronics.

Notes Mandia: "We envision that these sensors can be used for many applications, which include the detection of harmful gases such as hydrogen sulfide or small molecules such as cancer proteins. Since we are dealing with the interaction of light with matter on the atomic scale, extremely good sensitivities are easily achieved."

"This particular research has garnered a lot of interest already and the Barry Lab has collaborated with colleagues in Canada, the U.S. and Europe on a regular basis," says Mandia. "What's even more encouraging is the inception of what will be a world-class facility in surface science, called the Facility for Nanoscience, Surfaces and Sensor Interfaces (FANSSI), introduced just this spring at Carleton."

Mandia's research has now won him a $3,000 Optics and Photonics Education Scholarship from SPIE, the international society for optics and photonics.

SPIE is the international society for optics and photonics, a not-for-profit organization founded in 1955 to advance light-based technologies. The Society serves nearly 256,000 constituents from approximately 155 countries, offering conferences, continuing education, books, journals, and a digital library in support of interdisciplinary information exchange, professional networking and patent precedent.

Mandia plans on using his SPIE funds to offset the cost of attending SPIE Photonics West 2015 and other conferences in the near future.

Training Future Toxicologists in Responsible Assessment

By Susan Hickman

The first product on the market that used quantum dots was a series of flat panel televisions released last year. And now these dots, which are tiny engineered nanocrystals made of semiconductor material, are becoming increasingly common, being used in solar cells, transistors, white-light emitting devices (LEDs), diode lasers, and in medical imaging applications.

"They are very heavily used in industry for converting light into energy," notes William Willmore, Carleton University biochemist who also studies toxicology. "But are they toxic? Should we be concerned?"

In collaboration with Dr. Azam Tayabali at Health Canada, Willmore's team have found that quantum dots usually end up in the mitochondria, or the cellular power plants, where they can damage important components (Nguyen KC et al. Toxicology 306 (2013) 114– 123).

"They generate a lot of radicals. They also mess up electron transport in the mitochondria, which generates more radical species. If quantum dots are in a high enough concentration, the cell will die by a natural process known as apoptosis."

William Willmore, Biochemistry

Although the precise mechanisms of quantum dot toxicity are unclear, Willmore says there is a serious gap between the science of toxicology and the policy required to assess its risk.

To address this concern, Willmore and a team of eight other principals from universities across Canada are designing new courses to train future toxicologists, who will then be able to influence policy.

Under a $1.65 million NSERC grant, researchers are beginning to target areas of toxicology that need addressing. Laurie Chan, the Canada research chair of toxicology at the University of Ottawa, initiated the proposal for the collaborative research and training experience grant (CREATE). The project, entitled Research in Environmental, Analytical Chemistry and Toxicology (REACT), also involves Carleton adjunct chemistry professor Robert Letcher, a research group leader of Environmental and Analytical Chemistry and Ecotoxicology of Contaminant Stressors in Wildlife and Ecosystems for Environment Canada, and adjunct biology professor Carole Yauk, who works as a research scientist in the Environmental Health Centre's Lead Genomics laboratory.

This team of toxicology experts are also using the grant to develop a multi-disciplinary training ground that will benefit over 140 qualified personnel, as they will be able to promote public policy based on scientific research.

As chemicals are used more extensively, ecological consequences are also a growing concern, such as the health of ecosystems in the Arctic, especially for indigenous peoples in the North.

"Contaminants are consistently showing up in higher levels in the blood of individuals in the far north," said Willmore. "They are transported there by wind, rain and ocean currents: methylmercury and other heavy metals from industry as well as polychlorinated biphenyls (PCBs)."

Willmore, whose laboratory studies the results of treating cells with toxicants and other mixtures that generate oxidative stress, says we need to know what levels of toxicity are a concern. Unfortunately few studies have been conducted on the most harmful chemicals, he says.

Under the NSERC grant, academic toxicology training programs will be designed to meet the real needs of the work force.

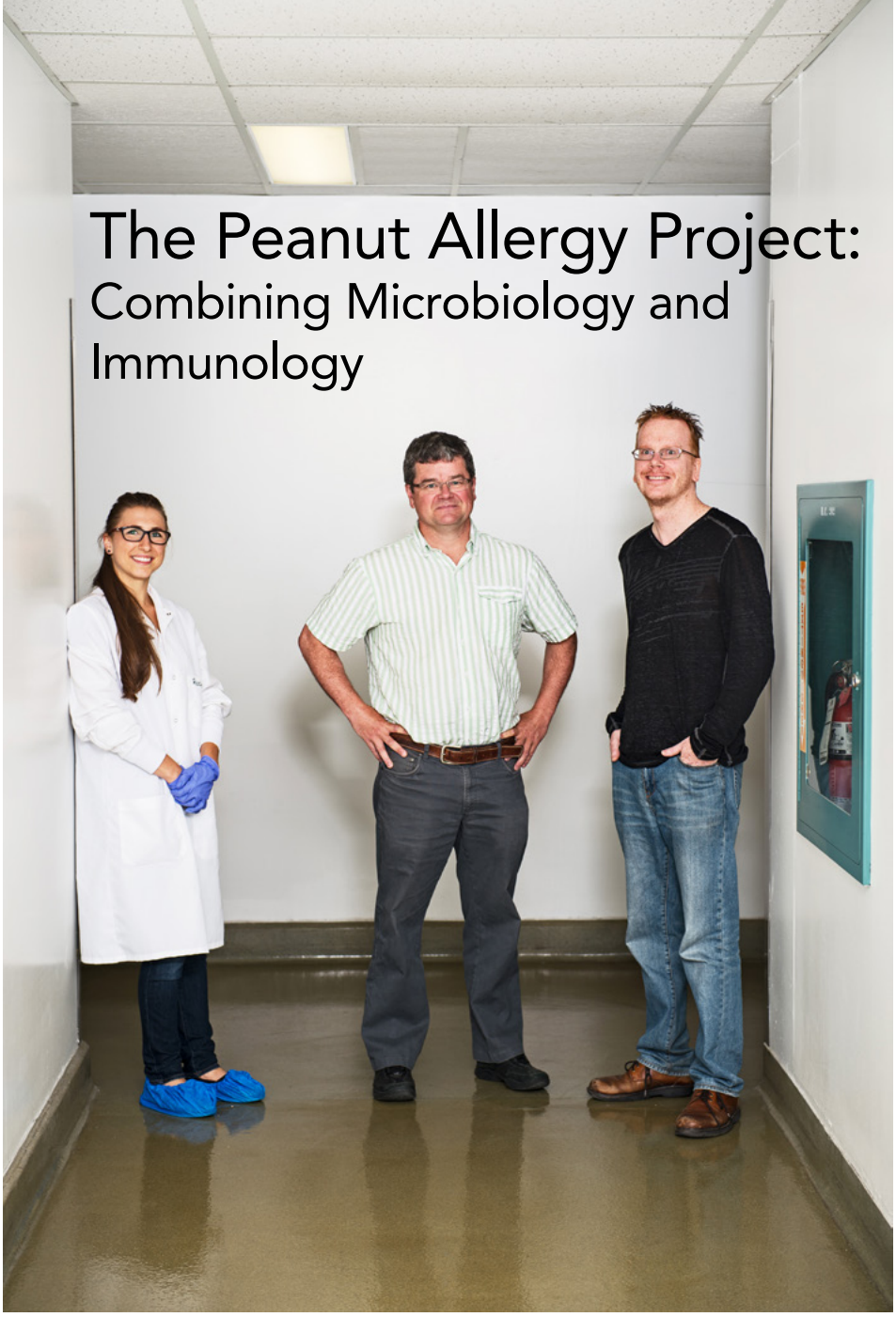
"There is a disconnect between the subjects taught in academia and the skill sets required for employment in the private sector and in government. We are developing courses that introduce toxicology students to the new technologies and how they can be used to build risk assessment for a lot of toxicants."

One course being developed is a certificate program on regulatory leadership, which will be offered jointly by Carleton University and the University of Ottawa. Courses in advanced exposure and effect characterization will examine environmental samples as well as human blood to determine the risk posed to humans. State of the art toxicity assessment methods will be taught, as well as how they will be used to develop regulations and economic proposals. The certificate program is tentatively set to begin this Fall.

Roger Keefe, senior advisor for Imperial Oil Products and Chemicals Division, points to the students who will become well grounded in the processes affecting pollutants.

"The REACT partnership network is unique in toxicology and environmental sciences," says Keefe, "and industry sees value in the mentoring in professional and practical skills, developing a broad global perspective and building advanced technical skills. Graduates," he notes, "should be job-ready."

The Peanut Allergy Project:
Combining Microbiology and Immunology



Biology student Rozlyn Boutin with professors Mark Forbes and Shawn Hayley.
Photo by Luther Caverly

By Susan Hickman

Often inspiration springs out of everyday life. Inspiration for a painting, or an idea for a novel can spring out of something mundane, and cause you to think twice about something you wouldn't ordinarily think twice about. Such was the case with Mark Forbes and Shawn Hayley's research project.

It all started when Forbes' two year old son came down with pneumonia. As is routine, the youngster was prescribed a course of antibiotics by the family doctor, which he soon finished. Curiously, after he finished the medication, the child began developing a rash whenever he ate oranges.

Forbes, who is also an ecological parasitologist, wondered if there might be a link between food allergies and the use of antibiotics. In Forbes' work as a parasitologist, he mainly focuses on how changing environments affect parasite-host ecology and evolution – so his son's reaction following the antibiotic treatment was not a thought that he immediately engaged with. After all, it could have been just a coincidence; It did seem like a stretch to link antibiotic use to a food allergy.

Nevertheless, Forbes' curiosity drove him to the office of Shawn Hayley, a researcher in Carleton's neuroscience department.

Hayley, who is also the graduate chair of the faculty, studies the effects of interactions between the brain and the immune system and how protein messengers inform the brain of infectious or inflammatory events.

Upon hearing Forbes' idea, Hayley thought the connection might have merit – and so the two teamed up to investigate the matter further.

The student helping with the project, Rozlyn Boutin, sifted through literature on the topic, and uncovered some studies that found links between antibiotic use and respiratory allergies. Unfortunately there was little published on possible links between food allergies and antibiotic use, and experiments using humans are not possible.

One article found suggested that the increasing use of antibiotics might be responsible for the rising rates of asthma and allergies, because the body's natural balance of gut microbes were being upset.

A researcher by the name of Gary Huffnagle at the University of Michigan, was the first to provide evidence from experiments done on mice that interfering with the gut flora could actually provoke an allergic response. He speculated that our gut bacteria are somehow involved in training the immune system to ignore harmless molecules that end up in the human stomach – but how this occurs was still a mystery.

"We started working on the issue as an extra project a couple of years ago," Hayley recalls. "But we had problems with the model and results were inconclusive, and it just slipped off our radar."

But then coincidentally a few years later, fourth-year biology student Boutin approached Forbes, looking for a project for her honour's thesis. "I list projects on my web page," says

Forbes. "Students come in and talk. The Peanut Allergy Project interested (Boutin) and she talked to me about the possibility of doing it."

Forbes, who is also associate vice-president of research at Carleton, was looking for a project Boutin could work on, on campus grounds. Her lab experience and previous knowledge of how to work with rodent models made her a perfect fit.

"I'm interested in Darwinian medicine (to understand why people get sick rather than how they get sick), how evolution and medicine are related," Boutin explains. Boutin, who is currently concentrating her degree in health science, plans to go on to study medicine and eventually become a clinician scientist where she can make a difference behind the scenes.

"I became interested in this link between antibiotics and allergies and the idea that we are being over-sheltered immunologically," Boutin says. This interest sprung out of literature the biology student had read, which found early hypothesis that the increase in hygiene standards in Western society correlated to higher incidences of asthma, food allergies, and eczema, and more.

"It's early in life that you develop your immune responses," notes Boutin. "That's when you learn to recognize harmful versus harmless and recognize self from non-self."

Hayley notes, "(Boutin) has researched the history of allergy research with a fine-toothed comb. The problem is still out there ready to be challenged. We want to know what's driving the increase in allergies, specifically peanut allergies. Is it the toxins in the environment? Or is it a situation like an increase in antibiotics that is changing the micro flora in the gut?"

Boutin began her experiment this summer, and will conduct her study over a four-month period. She plans to give antibiotics to baby mice, and then study their behavior to determine if they are more susceptible to developing an allergy.

Forbes and Hayley's "peanut project" differs from other studies in that will set the stage for exploring a particular mechanistic cause. The best outcome is that the antibiotic-treated mice become highly vulnerable and actually develop an allergic response, says Hayley. Then the specific factors in the body that triggered the reactions can be determined.

But there is the possibility that a secondary effect of using antibiotics could confuse the intestinal system, Forbes points out. "Antibiotics should cause changes in gut flora. We suspect this will happen. One of our collaborators, (assistant biology professor) Alex Wong, has the expertise to study the ways that antibiotics cause these changes in the gut and we can study those changes relative to physiological outcomes to determine if there is a link." If a link is found in the mouse models, Forbes and Hayley want to define the types of antibiotics that are causing the linkage.

"We would expand the scope of the project," says Forbes. "We would have to try different allergies, tree nuts for example. We would need more critical research."

On this subject, the pair have approached Ryan Davies, the advancement communications director at Carleton, to raise money through the school's FutureFunder platform, which funds various initiatives for students and faculty around campus.

"We hope to take it to the next stages if we find something," Forbes says. "After four months, we will know if there is a link. It could take another four months to translate the results and some time to determine the mechanism, but it has the potential of being hugely exciting."

"It would be one of the first documented association between antibiotic use and food allergies in an experimental setting, and if we don't find anything, it won't be time wasted. A student will have been trained to take multiple approaches to a research problem."

This is such a timely problem, adds Hayley. "Given the large number of kids and even adults who are developing allergies, it is important to tackle the mechanism and add this data to the research community."

No matter what the outcome of the experiment is, the data could possibly inform other areas of immunology as well, says Hayley. For example, it could be co-morbid with other diseases such as Crohn's disease, or others that have an inflammatory component.

With the possibility of such an important contribution to the research community, we will be keeping an eye out for Forbes' and Hayley's results.

Did You Know?

You can lend your support to the Peanut Project and other Carleton science research projects through FutureFunder?

Visit futurefunder.ca

Susan Aitken, Health Sciences

Introducing the Department of Health Sciences

We are delighted to introduce the recently established Department of Health Sciences, officially opening its doors to the first incoming class of Bachelor of Health Sciences students in the Fall of 2014.

Our purpose is to provide high quality, interdisciplinary education in health to our students at both the undergraduate and graduate level. Our programs address a growing need in the public health field to hire employees who can apply their knowledge in the workplace on a variety of issues.

The Bachelor of Health Sciences is a unique undergraduate program that pulls together Carleton's extensive academic and research expertise in health. The BHSc program has been designed from an 'outcomes' perspective, starting with questions of what knowledge and skills alumni require to be competitive in a broad range of health careers. It is designed to not only provide knowledge in a student's area of interest, but to present this information in the context of the broadly interdisciplinary field of health.

The BHSc program considers the biomedical sciences in the broader context of the influences of society, government, environment and technology. It emphasizes training and skills development necessary for alumni to be highly marketable in their career pursuits as well as to be successful in further education for a range of research and professional careers.

Our students pursuing Master's and graduate diplomas in Health: Sciences, technology and Policy have also joined the Department of Health Sciences, bringing along a teaching force that includes the expertise of over 50 faculty members from 23 departments. A factor making our MSc in health so distinctive is our broad interdisciplinary approach, credited for being the first graduate program at Carleton to involve all five academic faculties.

Another unique feature of our graduate programs is the capstone research project that students will pursue in their second year. This project is team-based and will be completed in collaboration with government, corporate or community health partners.

We look forward to training Canada's future leaders in this field and providing them with the skills and knowledge they will need to tackle pressing problems facing the health sector.

Dr. Susan Aitken, Chair, Department of Health Sciences

Carleton is Canada's Data Science Hub for Research and Learning

The era of data collection has arrived. Private industry, academia, government, not-for-profits and high-tech organizations are all interested in your data – but why? Who could this benefit and how?

Technology has evolved to give more possibility to the acquisition and analysis of large data sets, leading to a new frontier of data science.

More than 130 researchers are working on projects involving big data at Carleton University, which is uniquely positioned to be a leader in data science. Current projects cover topics such as DNA and molecular modeling data; bridge and infrastructure management; cloud computing; information retrieval and web information access; natural language processing; artificial intelligence; and database and information integration.

Carleton's new collaborative master's in Data Science is geared at high-tech professionals and graduate students who are interested in understanding how to analyze and use 'big data' sets collected by governments, industry, NGOs etc. These data are being used for purposes such as generating personal recommendations for online shopping, improving the efficiency of health care delivery or predicting national security threats.

Students can earn a degree in one of six academic disciplines at Carleton, graduating with a specialization in Data Science or a concentration in Business Analytics in the MBA. Collaborating programs include: Biology, Business, Computer Science, Economics, Electrical and Computer Engineering (including Biomedical Engineering) and Geography.

Physics Professor Manuella Vincter Awarded Killam Research Fellowship

Manuella Vincter, Physics

Manuella Vincter, professor of particle physics at Carleton University currently working on the ATLAS project, has received one of just a handful of Killiam Research Fellowships given out each year to researchers across a number of disciplines.

Fellowships are awarded to full professors at Canadian universities and research institutes, who have an outstanding reputation in their area of research. The fellowship provides two years of funding valued at $70,000 a year.

"I am so pleased to see this recognition by the Canada Council for the Arts for a Canadian contribution to the ATLAS physics experiment," said Vincter. "The ATLAS collaboration consists of nearly 3,000 scientists and students from around the world and receiving this award provides tangible support for this paradigm of large-scale international collaborative efforts to solve the big questions in science."

"On a personal level, I am absolutely thrilled to hear about receiving this fellowship. This sustained support for my research program over a two-year period means that I can immerse myself into solving the more involved issues related to the operation of the ATLAS experiment in this era of precision physics measurements with this new particle, the Higgs boson, whose existence helps elucidate how all matter acquires mass."

Some of the most exciting potential contributions of ATLAS to the understanding of the universe may well be through discoveries of new unimagined physics. Though the production mechanisms and subsequent decays of these processes may well be exotic, they will fundamentally contain the particles known to exist and interact as predicted by the Standard Model

Therefore, these discoveries of new physics will be impossible to interpret without a clear and precise knowledge of the physics that "should be there." This is how ATLAS was able to discover the Higgs boson in 2012. We look forward to hearing more about Manuella's research!

John ApSimon Receives Founders Award after 52 Years at Carleton

John ApSimon has retired after more than 50 years at Carleton and has been recognized for his countless contributions as a popular educator, top administrator and innovative fundraiser.

The Founders Award is Carleton's highest non-academic honour. It is given to people who have made significant contributions to the university's progress.

In ApSimon's 52 years at the university, there was no shortage of those. After receiving his BA and PhD from the University of Liverpool, in the U.K., ApSimon began working at Carleton as a chemistry professor in 1962.

He has held numerous positions both academically and admistratively throughout his time at Carleton, including chair of the Department of Chemistry, dean of Graduate Studies, vice-president (Research), and vice-president (Academic) – to name a few. ApSimon was the director of corporate relations at Carleton from 2011 until his retirement.

More recently, the 79-year-old has been heavily involved in fundraising and making Carleton the hub for Big Data, an emerging field of integrated data study, management and application.

"I think the best part is having been part of the success of Carleton University, without looking back at individual things. Carleton is a lovely institution, a great institution, and I'm proud to have been part of its development."

A longer version of this story originally appeared in Carleton Now and was written by Dario Balca.

Students explore the Great White South

After passing through the coldest waters and highest waves on Earth, walking with chinstrap penguins and sailing up close to a 60-metre high iceberg, Carleton students have returned home telling their tales of adventure.

Earth Sciences Professor Claudia Schröder-Adams led 13 students on a journey to Antarctica in late December of 2013 with the help of the Students on Ice FutureFunder campaign.

The students were on a scientific journey aboard the MV Ushuaia, exploring the southernmost tip of Argentina to the South Shetland Islands and the Antarctic Peninsula.

In addition to general exploration, students had a curriculum consisting of the continent's geological history, climate and ecosystems.

They endured the long journey through the moody Drake Passage separating Antarctica from South America. They worried over the durability of the ship when a chunk of ice broke a propeller. They closely studied glaciers by zodiac and saw an impressive number of whales, seals, penguins and majestic albatrosses with enormous wingspans.

To see an amazing first hand video account of their experience, we invite you to check out the Carleton University YouTube page - 'Carleton University Students On Ice 2014', at: goo.gl/xV3C1f

A longer version of this story originally appeared in Carleton News and was written by Susan Hickman.

Support for Science Success

By Lindsay Brennan

As it enters its seventh year of helping students succeed in the sciences, the Science Student Success Centre (SSSC) is doing better than ever in its new location in Herzberg Laboratories.

Featuring multiple TV's and projectors, a wall entirely made out of whiteboard, and the largest team of peer mentors in the history of the centre, the SSSC is set to help more students than ever this school year.

The mentors, who are high-achieving and often more experienced third and fourth year students, offer support and guidance to students as needed. The centre also recruits first-year representatives to help promote centre activities and encourage use of the science support resources.

In addition to one-on-one mentoring sessions, the centre also offers workshops and presentations on a wide variety of topics: everything from how to write a chemistry lab report, to how to apply to medical school.

"We offer workshops on how to get involved in research at Carleton, how to find an honours thesis supervisor, the different scholarships that are available, and so on," said Lily Visanuvimol, science student success centre administrator.

To help students learn about research, the centre also hosts a "Lab Tour Week" where students are able to tour various science labs on campus. During these tours, professors give students a brief overview of the research they are working on, and let students know how they can get involved.

Visanuvimol says feedback from students on the centre has been extremely positive. "On average we see over 200 students a year," said Visanuvimol. "These are students who want to excel in their academic careers and get a sense of community within the faculty of science."

In addition to helping students who are struggling to succeed, the SSSC also focuses on students who are high achievers and want to get more out of their university experience. These students have the opportunity to add a mentor position to their resume and gain valuable leadership skills.

"The centre was opened through one of the associate professors here, Dr. Susan Bertram," said Visanuvimol. "Her vision for the centre was to give students a sense of community within the Faculty of Science, and to help students who are struggling in their science courses."

The centre is intended to keep students engaged, to show them where to get help, and to support them in achieving their academic goals. The motto for the upcoming school year? To help students excel!

Arthur Mehta, Mathematics Alum, Wins President's Medal

Arthur Mehta, one of the newest alumni of the Mathematics and Statistics department, received the President's Medal at convocation this past spring. Awarded annually to the student with the highest standing in a degree program of studies, the President's award is one of the highest academic honours at Carleton.

For 25-year-old Mehta, the President's Medal is the "cherry on top" of turning his life around after high school, years he calls his "academic failure."

Enrolling at Carleton in 2009, initially in the economics program, was an important change of direction in Mehta's life and, he says, "I tried to keep my grades up, so I would have the best shot at winning (the medal)."

"The difficulty of pure mathematics is an attractive feature," admits Mehta. "There's a lot of beautiful structure and deep symmetry in mathematics that you don't see anywhere else in life. Nothing compares to it – not the most beautiful music or art. Some of the symmetries and structure in mathematics are just one level above all of those."

Mehta believes that if young people learned more about pure mathematics in high school, there would be a higher interest in it.

Now that he's hooked on pure mathematics, Mehta wants to pursue the academic route, earn a doctorate degree and become a mathematician.

"It's a pretty competitive field, but it's definitely something I keep in mind. Every day, I wake up and try to do something to make sure that goal happens."

During the summer of 2014, Mehta was active in research with his supervisor, mathematics professor Matthew Kennedy, in preparation for his master's thesis which examines quantum function theory.

The original story about Arthur Mehta appeared in Carleton Now and was written by Susan Hickman.

Discovering Climate Change in "Ice Out" Records

by Elizabeth Howell

It was when Tim Patterson was waiting to board the plane home from a work trip that he made the discovery. In an effort to kill time, the Carleton geologist had Googled his hometown of Harvey, N.B, a search that led him to a citizen science project that would later contribute significantly to his own research on climate change.

On the website for the Oromocto Lake association Patterson had found detailed records of "ice-out", also known as the springtime ice-break up, for the lake. As it turned out, most of these records had been collected by one person, a man by the name of Clayton Piercy.

Although in his 80's, Piercy was still an active ice-out observer, even going so far as to collect records from others stretching back decades before his birth.

"There were a lot of farms strung out along the lake," said Patterson. "In the early days people might be milking the cows, look out the window and note that the ice had just gone out. They would write the date down on whatever was handy. So Clayton and other people looked at cellarways and barn doors and created a record stretching back to 1876."

The work done by Piercy improves on current records of the area's spring temperatures, which only date back to the 1890's.

After discovering Piercy and the lake, Patterson got to work before even boarding his plane, sending the data to Dr. Graeme Swindles, associate professor of earth system dynamics at Leeds University in the UK.

By the time Patterson's plane landed in Canada, Swindles had done a preliminary time-series analysis of the data and found evidence of there being several climate phenomena at work. One phenomena found was the El Niño Southern Oscillation, which cycles between unusually warm and cold waters in the tropical eastern Pacific.

These cycles impact global climates such as where the lake is located, New Brunswick, in the process.

Piercy and others helped Patterson track down citizen scientist ice-out records from two other lakes in New Brunswick, Lake Skiff and Lake Utopia.

The Carleton geologist then compared the unpublished data from these three lakes to previously published ice-out dates from Maine and New Hampshire.

This data comparison revealed a high correlation between spring instrumental records and the ice-out dates for lakes.

"We knew we were on to something as a review of the literature revealed that although lake records have been examined to determine trends, no one had ever carried out time series analysis," said Patterson.

Researchers found that on average, the lakes' ice broke up 13.2 days earlier than when the Little Ice Age drew to a close in the 1870's. After this point, ice-out dates were observed to occur progressively earlier until a climate-cooling period from 1940 to 1970 pushed dates later again.

The ice-out dates occurred the earliest in the year, after the 1970's, which reflects significant warming in the 20th and 21st centuries.

The research done by Patterson has been submitted to the 'Climate Dynamics' journal.

Dean's Summer Research Internships Double Thanks to Community Support

By Lindsay Brennan

For many first-year students, the Dean's Summer Research Internships (DSRI's) offered by the Faculty of Science are a welcome way to spend hot summer months.

Working alongside professors and graduate students carrying out controlled experiments, analyzing data, and discussing results is an invaluable experience that many apply for, but not everyone receives.

However, students were rejoicing this summer as the number of DSRI's awarded were doubled, thanks to a successful fundraising campaign run by the platform, Future Funder.

Future Funder is a new fundraising website launched in February 2013 that allows donors to choose specific university initiatives that are important to them, and complete transactions entirely online.

Every donation was matched dollar for dollar by the Dean of Science, bringing the total amount raised for DSRI's to over $25,000, seeing 30 students awarded these much sought-after awards.

Dr. Susan Bertram, associate professor of biology at Carleton, says that the internships give students an opportunity they might not have had otherwise.

"Students who obtain DSRI's have phenomenal grades but haven't had the opportunity to do much hands-on research. This gives the students a taste for actual research, what goes on behind the scenes," said Bertram. "Now when they read a publication, they have a personal understanding of what it takes to conduct a research project of that scale."

Bertram, who is supervising two DSRI students this summer, says the internships are a fantastic experience for first-year students as they progress in their degrees.

"By the time they move into their fourth-year honours projects and are looking for a lab to join, they can talk to the professors and let them know how much actual research experience they have. They have a much greater understanding of what is involved in doing a research project."

Bringing the School of Mathematics and Statistics out in the Community

By Kristy Strauss

The Centre for Quantitative Analysis and Decision Support (CQADS) at Carleton University has been flourishing in its collaborations with community organizations ever since it opened over a year ago.

"We've had a lot of success," said Patrick Boily, the manager and senior consultant of the centre.

CQADS brings Carleton's School of Mathematics and Statistics out into the community by connecting university students and faculty with clients to solve real-world issues.

Partnering with clients in the public and private sectors, the centre also gives Carleton students a chance to gain experience in their field.

Boily says the centre has been so successful that it has renewed its third contract with the United Way, where it helps the organization project fundraising numbers for different regions of Canada.

"We're looking at determining what the trends would be, and using this information to help them change their policies and their fundraising approaches based on the data," he says. "We provide an analysis over time, where we can help them get a better idea as to what the fundraising picture is in this country."

Boily adds that the centre's data enables the United Way to compare their fundraising efforts with those of their competitors.

"We've managed to help them, at the very least, see their activities in a different light," said Boily. "We've offered them different ways to look at data they have, and useful ways as well."

He adds that CQADS has also recently collaborated with the Canadian Air Transport Security Authority (CATSA), which is an organization that protects the public by efficiently screening all air travellers and their baggage at Canadian airports.

"They have some queries about the number of arriving passengers at airports, and the rate at which they're being screened."

Students and faculty at the centre analyzed data to help their new client understand the growth in the number of air travellers, average wait times experienced at airports, as well as the impact of screening resources.

"Obviously, the more screening resources you have, the quicker people can go through," said Boily, adding that the centre used math and statistics to help CATSA model the relationship between screening resources and wait times at Canadian airports.

The CQADS's success is just beginning, says Boily, and there are many other collaborations it is currently working on.

For more information on CQADS, visit its website at: http://www.carleton.ca/math/cqads/

Homecoming is back.

Save the dates: October 16-19, 2014

The Faculty of Science hopes you will join us at the Science Mixer, Alumni Dinner and Chemistry Magic Show! The Department of Earth Sciences will also be celebrating its 60th anniversary with extra activities, *hope to see you there!*

alumni.carleton.ca/throwback/events

Science Café

Free and open to the public, the bi-weekly Science Café in Ottawa is your chance to explore the world of science.

Join Carleton faculty and graduate students as they discuss their research and relevant issues facing our society.

For the schedule of upcoming topics, visit sciencecafe.carleton.ca

Annual Lectures

Gerhard Herzberg Lecture
by *Dr. Gerald Ross*
Wednesday, November, 12, 2014
at 7:00 p.m.
Kalaish Mitel Theatre

Discovery Lecture
hosted by
the School of Computer Science
February, 04, 2014
at 7:00 p.m.
Kalaish Mitel Theatre

Butterfly Show

Annual Biology Butterfly Show
Saturday, October 4, 2014 to
Monday, October 13, 2014
Nesbitt Biology Building, 9:00 a.m. to 4:00 p.m.
Admission is free, donations are welcome.

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Publication Mail Agreement
No. 40063314
ISSN 0226-5389

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