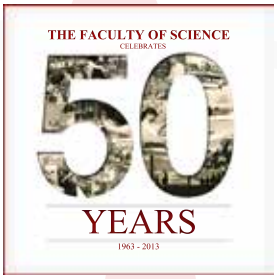
EUREKA!

NEWSLETTER OF THE FACULTY OF SCIENCE



Summer 2013 issue

Carleton University campus 1963

Faculty of Science celebrates 50 years

Carleton UNIVERSITY | Faculty of Science

carleton.ca/science

Letter from the Dean

Celebrating an anniversary presents us with an opportunity to look back and assess the past. As this is the year the Faculty of Science turns 50, we thought the time was ripe to explore Carleton's archives and see what life was like here years ago. A treasure trove of campus photographs showed the progression from an empty field bordered by the Canal, the Rideau River and Bronson Avenue in the late 1950s to the bustling campus of over 40 buildings it is today. In 1963, when the Faculty of Science was created, the 496 Science students (out of a student population of just over 2,200 students) took their science classes in one building – the Henry Marshall Tory Building for Science. The Steacie, Herzberg, Nesbitt and Life Sciences buildings were yet to come. We've shared some of our photographic finds on pages 10 and 11.

We also looked through back issues of the student newspaper, The Carleton (now called The Charlatan), and found some gems. Back in 1963, a pepperoni pizza from an establishment on Bank Street cost $1.50, and room and board in a double room in the newly built Lanark House residence (for men) and Renfrew House (for women) cost $675 per academic year. Varsity sport scores were heavily reported and mis-behaving students at the Panda game had to appear in front of the Judicial Committee of the Student Council. Ian and Sylvia Tyson *and* Ronnie Hawkins had been booked for that year's Winter Weekend festivities and invites to perform had also gone out to the Glenn Miller Band and the Tommy Dorsey Band. But the big issue in the fall of 1963 was over the safety of the road access to campus. Student protests had resulted in a proposed extension of Sunnyside Ave. with accompanying traffic lights at Bronson Ave. See the November 8, 1963 issue in our Stories section of **carleton.ca/science/science50**.

Other articles in these back issues made us proud to be part of the Faculty of Science. Mathematics student Ivan Fellegi had been awarded the University's first PhD in 1961. Dr. Fellegi went on to become Chief Statistician of Canada from 1985 to 2008 and has been an active member of the Carleton community for many years. Also in 1961, Carleton had its first Rhodes Scholar in Boudewijn Van Oort, a geology student. These firsts were just the beginning of a series of achievements by our faculty and students that followed, many of which we have profiled in past issues of *Eureka!* magazine.

In this issue of *Eureka!* we turned our attention to the departments and schools in the Faculty of Science and some of the people (students, staff and faculty) within them to tell us more about where we've been and where we are going. To further celebrate our 50th, we are organizing a series of events to be held this fall tied in to the return of Homecoming and football to Carleton (September 19-21), and you are cordially invited to join us. Hope to see you in September.

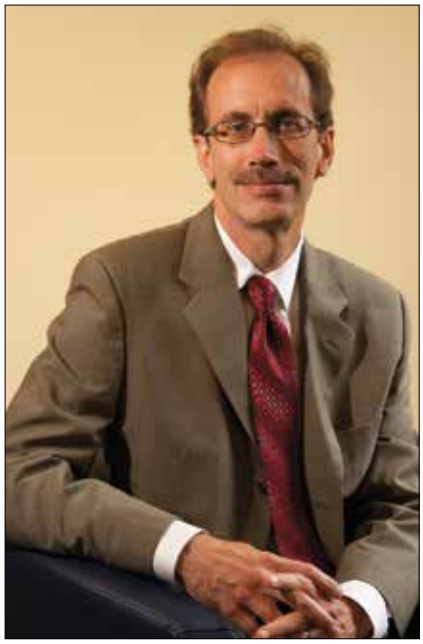


photo: Chris Strangemore

Malcolm Butler
Dean, Faculty of Science

EUREKA!
NEWSLETTER OF THE FACULTY OF SCIENCE

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On the cover

An aerial photograph of Carleton University's campus in 1963.

All historical photographs are from the Heritage Photograph Collection, Archives and Research Collections, Carleton University Library. Visit arc.library.carleton.ca

Your input is important!

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

carleton.ca/science

Ruth Lifeso, the Science Registrar

Over the 50 year history of the Faculty of Science, a series of deans have graced the Office of the Dean. Gentlemen such as H.H.J. Nesbitt, Joseph Wolfson, George Skippen, Jim Neelin, Les Copley, David Gardner, Peter Watson, Jean-Guy Godin, George Iwama and John Armitage have preceded the current dean. One staff member who worked alongside many of these deans was Ruth Lifeso, the science registrar from 1971 to 2000.

Lifeso was a high school teacher in Ottawa in 1971 when she spotted an ad saying Carleton was looking for a science registrar. "The job sounded interesting," says Lifeso today. "I had a science degree in Mathematics with a minor in geology and I liked working with students."

When Lifeso was hired, the Registrar's Office was a centralized entity located in the Administration Building (now Robertson Hall). As the science registrar, she was in charge of overseeing the academic progress of all science students once they were admitted to Carleton. This entailed advising students about program requirements and monitoring their academic progress to ensure they were on track to graduate.

A few years after she started, the Registrar's Office was decentralized and Lifeso and her staff moved into the Herzberg physics building just down the hall from the dean's office. Lifeso thought the move was a good one. "I was spending a lot of my time travelling to meetings with different departmental chairs and the dean about programs, university regulations, curriculum changes, and a host of other issues. It made a lot of sense to be situated in Herzberg as it housed several science departments, as well as the dean's office. Students could find us easier as well," says Lifeso.

Lisa Ralph, currently the university's associate registrar, began her career working under Lifeso and says of those early years. "We were like a small family in the science registrar's office and Ruth was our rock. She was an amazing teacher and had a great sense of humour. Customer service was first and foremost and students really benefitted from that."

As the years passed, Lifeso witnessed the steady increase in enrolment and the expansion of program offerings at Carleton. "There was a sense that we were moving from a small university to a much larger institution. This brought more layers of administration and more responsibilities."

One event that Lifeso's office geared up for every year was fall registration. Today, the registration system is online and each student is assigned a specific time early in the summer to register. Students can be anywhere with internet access to register. But for most of Lifeso's tenure as registrar, the process was a very manual one.

Up until the late 1980s, science students would arrive in the Tory building foyer the first week in September with their registration forms in hand. They then proceeded to a series of tables – one for each department – getting every course and accompanying lab or tutorial approved and logged in. If they were taking a course in another Faculty they had to make their way to that Faculty's registration area which was often across campus. Once all courses were approved, they then visited the science registrar's table for final confirmation that all was in order. The last stop was the gymnasium to pay their student fees. "The process may have been labour intensive," says Lifeso, "but it was a great way of meeting students right at the start of the school year and letting them know we were there to help them."

In the late 1990s, as the university continued to grow in size, Lifeso was seconded to work on a university-wide initiative to standardize across all faculties the student academic audit — a key component to tracking and ensuring a student's successful completion of their degree program —and to build it into Banner, the university's database system. Lifeso worked on this project, which is now an integral part of every student's record, for two years leading up to her retirement in 2000.

When she retired, the faculty recognized her contributions to the university by establishing the Ruth Lifeso Scholarship Fund which is awarded to an outstanding student in the Faculty of Science who has demonstrated both academic excellence and leadership in extra-curricular activities. "It was the end of an era," says Ralph, "when Ruth left. She really was a mentor to so many. And I know she continues to mentor and coach many of the students and staff she met here."

Mathematics and Statistics

By Kristy Strauss

Dr. Patrick Farrell, the current director of the School of Mathematics and Statistics, arrived on campus in 2000, just as the school was undergoing a major transformation. Two years earlier, it had changed its status from a department to a school, granting it more autonomy and recognizing its diverse nature. But the biggest change the school was addressing was the large number of faculty members who had recently retired or would soon be eligible to retire.

"It was a real eye-opener," says Farrell. "There was such a large number of retirements to deal with. The whole age profile, and whole look of the school, changed dramatically in a very short period of time. Many faculty had been teaching at the school for years. And I'm still dealing with this today, as two more recent retirees, Professors Cyril Garner and Mike Moore, had both been teaching at Carleton for over 40 years."

While the school filled vacant positions with new faculty, many of its established members were asked to stay on as Distinguished Research Professors (DRPs). The title recognizes a retired professor who is still very active in research and graduate student supervision. Faculty members must be nominated by their academic unit and the nomination must be approved through the Faculty and University promotion committees. A DRP serves for a five-year renewable term. The School of Mathematics and Statistics has an exceptional number of these professors who are still very active today. A complete list can be found on the School's website at **carleton.ca/math/faculty_staff.**

"The fact that so many of our retired faculty with highly significant accomplishments have maintained affiliation with the School has provided continuity and an incredible learning opportunity for our new colleagues," finishes Farrell. "Our DRPs possess experience and wisdom that is unmatched, and they are always willing to share."

PROFESSOR DON DAWSON

Professor Don Dawson started with the Department of Mathematics and Statistics in 1970, and was one of the first occupants of the 22-storey Dunton Tower – which was called the Arts Tower back then – and saw the campus's physical evolution from his seventh floor office.

"In the quad there was only the library, Tory and Paterson," he remembers. He also remembers the students' laid-back nature in the 1970s. "Now, campus life is a bit more high pressure," he says, adding that teaching styles have also evolved over time. "While mathematics is still the same, professors weren't expected to have such a polished style of lecture. In those days, there was chalk and a blackboard."

Dawson remains active on campus and off, recently attending conferences in Edmonton, Stockholm, Montreal and Banff, and this summer heading to UBC in Vancouver.

He's proud of his former students – many of whom he reunites with at conferences and some who now teach at Stanford, Berkeley and several universities across Canada.

"Our group has produced some internationally recognized mathematicians and statisticians," he says. "Some have really made something special out of their careers."

lrsp.carleton.ca

photo: Kristy Strauss

Professors Jon Rao and Miklós Csörgo seated outside the Herzberg building which houses the School of Mathematics and Statistics.

PROFESSOR MIKLÓS CSÖRGO

Almost every day – including weekends – Miklós Csörgo can be found in his Herzberg office. He still leaves post-it notes on his door for students who wish to make an appointment, or they can see him on the spot. "I used to have that policy, and I still have it," he says with a smile.

Csörgo started at Carleton in 1971, leaving his position at McGill University during the FLQ crisis. When he began at Carleton, he taught three classes each semester. He remembers the high-calibre staff he worked alongside – including his fellow professors Dawson and Rao. "We managed to put the school on the map in probability and statistics," Csörgo says. "At the same time, there were outstanding people in algebra."

He retired from Carleton on July 1, 1997, but remains active as a Distinguished Research Professor. Since retiring, Csörgo has overseen six PhD students, and continues to attend conferences around the world – including as a keynote speaker.
lrsp.carleton.ca

PROFESSOR MIZAN RAHMAN

When Professor Mizan Rahman started with the Department of Mathematics and Statistics in 1965, there were about 16 faculty members at the time. He was part of five new recruits, and had a special bond with them. "We were like family – except we had separate dwellings," he says of his former colleagues. "We would organize bowling nights together." Rahman particularly remembers being the test subject for new technology early in his career at Carleton. "When the so-called closed circuit television instruction was introduced, I guess I was the sacrificial lamb," he laughs. "Somehow, I managed. But I can't say I was a television star."

As a Distinguished Research Professor, Rahman still researches and publishes papers. He travels and writes regularly, and plans to go to India in November 2013. He values his role at Carleton, and still enjoys coming to campus five days a week. "I need to be around this campus. I need to go to the swimming pool," he says. "I'm a morning person. If you knock on my door at 7 a.m., I'm here."

PROFESSOR JON RAO

Professor Jon Rao came to Carleton in 1973, and had a joint appointment with Statistics Canada at the time. He consulted with the government department while teaching full time at Carleton – and still consults today, even after retiring from teaching in 2000. "Many of my former students are employed there, some at the director level," Rao says. "It's like a family when I go there."

Since becoming a Distinguished Research Professor, Rao says he hasn't slowed down. He still looks after PhD students, and has an NSERC grant – along with some of his fellow retirees in mathematics.

"I have such a schedule, you wouldn't believe," Rao says, adding he's spoken or has plans to speak at seminars this year in Brussels, Milan, Montreal, Bangkok and Bogota. He's particularly proud of how far the school has come over the years – including being named one of the top statistics schools in the world in the Canadian Journal of Statistics.
lrsp.carleton.ca

PROFESSOR JOHN DIXON

Professor John Dixon takes it a bit easier now that he's retired. The Distinguished Research Professor started at Carleton in 1968, and received his DRP title when he retired in 2002. Dixon continues to write, referee and review papers and attends seminars and colloquia.

Looking back, he says he particularly enjoyed teaching the various levels and classes. "I liked to teach something different every year," he says. "I had that opportunity in this department."

He also remembers the informality at Carleton when he arrived in 1968. "The president at the time, Davidson Dunton, would host a party on campus at the start of each school year."
people.math.carleton.ca/~jdixon/

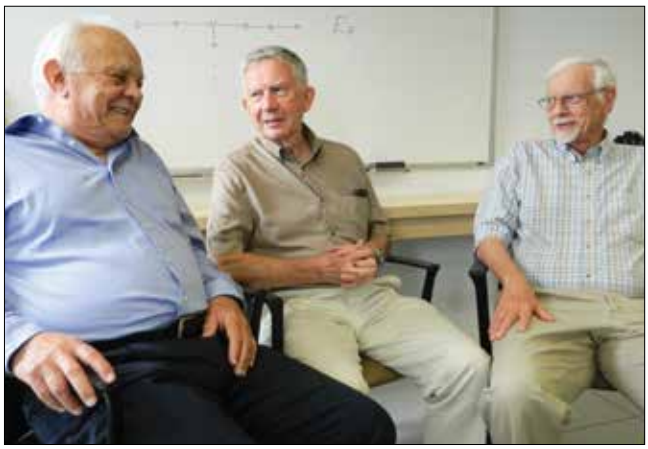


photo: Kristy Strauss

Professors (left to right) Vlastimil Dlab, John Dixon and Don Dawson were all appointed Distinguished Research Professors.

PROFESSOR VLASTIMIL DLAB

Vlastimil Dlab still remembers his job interview with Carleton, which took place in December of 1968. Since then, the Distinguished Research Professor has been instrumental in putting the School of Mathematics and Statistics on the map – as a professor and as chair of the Department of Mathematics and Statistics in its early days.

"It was a time when there were no committees, so chairmen were usually asked by the dean," Dlab says. "This was my case in 1971. I was asked to take over the department, so I built a modern department – which I think we succeeded at." While working as the chair, Dlab helped Carleton get involved in international conferences – which included establishing the first International Conferences on Representations of Algebras in 1974. "It's a well-established meeting that's held all over the world," says Dlab. "And it started right here at Carleton."

He became a Distinguished Research Professor upon retiring in 1998, and frequently travels to universities around the world to give lectures and collaborate on his research in Algebra.
people.math.carleton.ca/~vdlab

THE CENTRE FOR QUANTITATIVE ANALYSIS AND DECISION SUPPORT

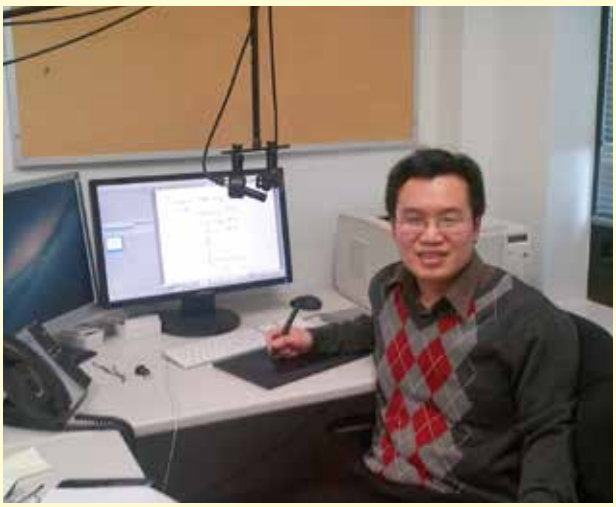

Patrick Boily

The Centre for Quantitative Analysis and Decision Support officially opened its doors in early 2013, and connects students and faculty with clients to help solve real-world problems. It also brings Carleton's School of Mathematics and Statistics out to the community.

Patrick Boily, the centre's manager, said it has already taken on various clients in the public and private sectors. "The centre provides opportunities for students to identify a problem that a group wants an answer to," Boily says. "We use math to help clients out, and it provides students with experience."

For example, the centre recently helped the United Way project fundraising numbers in certain regions of Canada that were hit particularly hard economically. With help from graduate students and select undergraduate students, Boily expects the centre to continue to grow. "As a university, clients can come to us and we'll help them solve their problems," he says.
carleton.ca/cqads

INNOVATION IN THE CLASSROOM


Kevin Cheung

Kevin Cheung, a professor in the School, is leading the way in how classes are taught online. He creates five- to ten-minute videos on his YouTube channel that allow students to go back and check certain points from a lecture.

Last fall, he was one of ten educators from Canada, the US, the UK, Ireland, New Zealand and Australia chosen to compete in YouTube's Next EDU Guru competition. The group was flown to YouTube's headquarters in San Bruno, California, and underwent a training session to learn more about making educational videos for YouTube. At the end of the session, one finalist was to be named winner of the Khan Academy Prize. That honour went to Professor Cheung.

Cheung has also created an app where students can ask questions as he delivers a lecture in real time. "I think on YouTube and social media there's a degree of anonymity, so it's easier for some people to post questions," he says.

Cheung believes there are a few teaching styles that professors could adapt in the future. They could teach the traditional way, teach entirely online, or use a combination of both styles, which he calls "the flipped classroom model." The model means professors would teach online, but also have in-class time for students to ask questions in person. "Online learning is really picking up speed."
people.math.carleton.ca/~kcheung

Biology

photo: Nanci Jolicoeur

Situated slightly away from the rest of the academic buildings, the H.H.J. Nesbitt Biology Building is easy to spot on campus because of its two attached greenhouses. But like all departments in the Faculty of Science, biology had to wait its turn to get its own building.

In 1959, when Carleton moved to its present day location on Colonel By Drive, only three buildings had been built: the Maxwell MacOdrum Library, the Norman Paterson Hall for the arts programs and the Henry Marshall Tory Building for Science. As the building's name implied, the Tory building, named after Carleton's founder and first president, was the central hub for all science programs. The biology department built its first campus greenhouse on the top floor. Today the building is used primarily for administrative offices.

In the mid-1960s, in response to the ever-growing student population, construction began on the E.W.R. Steacie building for chemistry and the Gerhard Herzberg physics building. Construction crews did not turn their attention to biology's needs until closer to the end of the decade. Smaller than the Nesbitt building is today, the original structure was called ELBA, short for the Environmental Laboratories Biology Annex. After an extensive renovation in the late 1990s, the building was renamed after H.H.J. (Bert) Nesbitt, one of the department's earliest and longest-serving faculty members.


photo: James Park

Dave Omond

When Dave Omond was hired as a biology technician in the early 1970s, the only science programs still housed in the Tory building were biology and earth sciences. "Biology was in several places then – Tory, Steacie and ELBA. I went back and forth between the buildings, but was based primarily in Tory." Omond's duties included running experiments for faculty and graduate students, preparing the teaching labs, working in the biology stores, repairing equipment and driving students and faculty in the 'biology' bus to field work sites.

Omond remembers how the atmosphere among the faculty and staff developed over time. "When I first started, the department was run with a very strict hand, but when Gray Merriam became chair in the late 1970s it became less formal. Staff and faculty worked better together and still do." Omond retired in May 2012 but still stays in touch with his colleagues on campus.

One of Omond's long-time colleagues is Ed Bruggink, the Nesbitt building supervisor and greenhouse manager who started working at Carleton in 1981. Bruggink was instrumental in getting the first butterfly show off the ground in 1998. "It's a big part of my job, getting ready for the show," says Bruggink. "We bring in close to 1,400 butterflies representing 41 different species worldwide. The butterflies arrive in 5 different shipments and we have to be very organized, preparing the greenhouses, handling the butterflies and coordinating the school tours." But Bruggink says all the work is worth it. "Every year, 10,000 to 12,000 people go through the 10 days of the show. Families come back year after year and the kids absolutely love it."


Ed Bruggink

The greenhouses have also appeared in a film recalls Bruggink. In 2002, local filmmaker and Carleton film studies graduate Katie Tallo shot some scenes there for her first feature film. "It was fun filming the scene there," says Tallo.

"A touch humid, but perfect for what we needed, which was a florist's greenhouse.

The plot involved a suspected killer stealing her sister's flowers for a shrine she is creating for her dead friend. It's a raunchy girls-gone-bad drama about four friends who get caught in a killing spree, some are victims and one is revealed to be the killer in the end. It starred Adam Beach (Arctic Air), Jessica Paré (Mad Men), Emily Hampshire (Snowcake), Sarain Boyland (Bon Cop, Bad Cop) and Stephanie Von Pfetten (Cracked)." One can catch a glimpse of the greenhouse in the director's demo reel at **www.katietallo.com**.

"There is a good atmosphere among the people who work in this building," says Bruggink. "I think we are a bit closer because we feel we are a little away from everyone else. And we often don't mind that," finishes Bruggink with a laugh.

Chemistry

By Susan Hickman

When Maria DeRosa walked into the chemistry department of her alma mater as a professor, rather than as a student, the first thing she noticed was the smell. No, not chemicals, but the scent of familiarity, the scent of being home.

DeRosa first set foot on Carleton's campus in 1995, where she completed her Bachelor of Science degree and went on to graduate school, earning a PhD in inorganic chemistry in 2003.

She then moved to California to pursue a post-doctoral fellowship in DNA chemistry at the California Institute of Technology, never leaving behind her dream of one day returning to Canada.

What she didn't expect was that her Canadian homecoming would involve Carleton's chemistry department, and that it would all fall into place so easily.

"I wasn't applying for jobs at the time," recalls DeRosa. "But while I was doing my post-doc, the chemistry chair [Gerald Buchanan at the time] told me about an ad for a faculty position as a professor in bio-inorganic, which was unique enough that it seemed built for me." DeRosa successfully landed the post in 2005.

"When I came in for my interview, I was surprised by how much had actually changed in the department in such a short period of time. There were new hires, such as professors Sean Barry and Anatoli Ianoul, a new nanotechnology stream, and a new sense of pride in the department.

"I was worried it might be awkward working with faculty members as an equal rather than as a student. But those worries quickly dissipated."

As a professor, DeRosa now sees the department as a whole, much more than she did as an undergraduate.

Professor Maria DeRosa is photographed in her lab for a recruitment publication.

"Ours is a mid-size department," she explains, "one that is big enough that we have access to great facilities with experts in a number of areas, but small enough that we know our students' classes are not overwhelmingly big. It really feels like a community."

Professor and departmental chair, Robert Burk, began his career at Carleton as a student.

Robert Burk, the chair of the department since 2006, has himself been walking the corridors of the Steacie building since 1975, when he began his studies in chemistry, obtaining first an undergraduate degree and then a master's and a doctorate in inorganic analytical chemistry. Like DeRosa, he experienced his teachers become colleagues.

As head of the department, Burk has had the challenge of overseeing the major renewal of the Steacie building, but he is first and foremost a teacher, lecturing in the same rooms where he once sat as a student and supervising some of the same laboratory experiments he once did himself, earning some impressive awards for his teaching efforts along the way.

Having studied or worked with seven of the former department chairs, Burk speaks of the continuity within the department that focuses on the rigorous training of undergraduate students in all fields of chemistry, just as it always has done.

"We take a holistic approach with our students, teaching them to think as scientists, so they have a sound knowledge of all levels of chemistry. It's a hard-wired program that results in well-rounded graduates."

Chemical education at Carleton is pretty much as it always has been, even if the undergraduate program has doubled and new programs in food science and nutrition and nanoscience (joint with electrical engineering) and nanochemistry have been added.

Former chair (1979 to 1988) Don Wiles, a nuclear chemist and one of the longest-serving members of the chemistry department, having arrived at Carleton in 1959 in the wake of the department's move to the new campus, agrees with Burk's assessment of the department's holistic approach.

"The philosophy of Jim Holmes (who first became chair in 1957) was to cover all of chemistry, rather than focusing on a few experts in one field. This built the philosophy of the department."

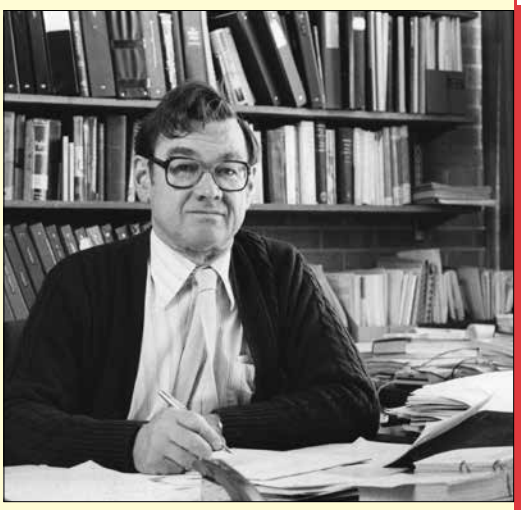
He reminisces about some of the famous graduates such as Dr. Peter Grünberg, who worked in professor Arnold Koningstein's chemistry lab as a post-doctoral fellow from 1969 to 1972, and went on to win a Nobel Prize for Physics in 2007. Other faculty members have been highly cited for their research, winning such prizes as the Gerhard Herzberg Award from the Spectroscopy Society of Canada, and the Royal Society and the Killam fellowships.

"Many chemistry students will remember Karl Diedrich," says Wiles. "He worked as the storekeeper in the chemistry department from 1961 through the mid-1990s. He knew everything about the department and nearly everything about the university," recalls Wiles. "He ran the department and was the only one who didn't know that."

Wiles notes how Diedrich could identify any chemical by its smell and would work into the wee hours of the morning to help students with their research, particularly the third-year organic students who were required to identify an unknown substance. "Many students owe their degrees to Karl," Wiles believes. "He did many things beyond any job description."

Before the Steacie building opened in 1965, chemistry students studied in laboratories on the fourth floor of the Tory Building, including a makeshift one in Wiles's office.

Carleton's chemistry department was perhaps fated to grow into a flourishing one, given its unique location in the research-centred capital.



Former chair Don Wiles is still active in the department, documenting its history.

The department was further strengthened with the introduction of the NSERC Canada Research program in 2000, and within the last decade, the Canadian Foundation for Innovation has provided strong support for infrastructure, including research laboratories for the new appointments.

The Chemistry program, as current master's student Christopher Mattice will attest, is lab-intensive. From their first year, students are practicing hands-on chemistry. In fact, eighteen hundred students go through Carleton's lab-based first-year chemistry course every year. Mattice was one of them, beginning his biochemistry studies in 2008.

"I'm really happy with the choice I made," says Mattice, who graduated this June with an undergraduate degree in biochemistry and a perfect GPA, one of an unprecedented six Carleton students who accomplished this feat this year.

"I have done research in all the chemistry labs, all the way through, so I have plenty of hands-on experience" says Mattice. "And the labs are amazing," he continues. "They're very organized. It's a very cohesive unit."

Mattice is also impressed with the newer faculty, such as DeRosa, who are bringing with them their novel research (DNA aptamers in DeRosa's case). "The chemistry department is evolving as we merge with newer fields and branch off into more obscure areas," according to Mattice. "I feel I am part of something special."

In June 2013, Marilyn Stock, who held the position of Departmental Administrator in the Chemistry department for many years, retired from Carleton. "It's almost impossible to think of our office without her," says Burk. "A lot of students and faculty have passed through these doors and Marilyn was a huge help to a lot of them."

Carleton's Evolution

1960
Tory building under construction

1960
Aerial view of campus

1963
Tory science building

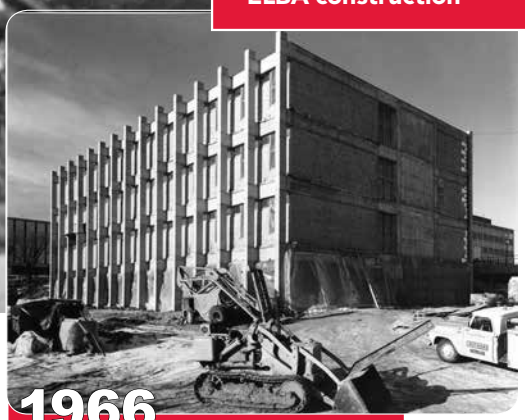
1964
Steacie building model

1965
Steacie build

1988
Life Sciences building construction site

1979
Installing the telescope on top of the Herzberg building

1968
ELBA construction



1966
Herzberg building construction

1965
Herzberg building construction

ling construction

Physics

By Susan Hickman

photo: Luther Caverly

Professor Rowan Thomson, who is also a Canada Research Chair in Radiotherapy Physics, studied at Carleton before joining its faculty ranks.

Carleton's physicists have always been at the forefront of innovative research, recognized globally for their intensive work in two important areas – particle physics and medical physics. Concentrating in these areas has been one of the physics department's strengths.

The departments's involvement with the large collaborative ATLAS experiment, now led by Professor Manuella Vincter, after former leader Gerald Oakham took on the post of departmental chair this summer, has also been well known. The department's supporting theoretical particle physicists work in tandem with the experimental group in addressing such fundamental issues as understanding the origin of mass and what makes up the universe.

The Carleton ATLAS team developed, constructed and tested detector modules for the forward calorimeters, which gathered data between 2008 and 2012 as part of the ATLAS experiment at the Large Hadron Collider (LHC) particle accelerator at the European Organization for Nuclear Research (CERN) laboratory in Switzerland, contributing to the discovery of the Higgs particle in the summer of 2012. Data-taking will resume next year with an upgraded accelerator.

Earlier this year, the Enriched Xenon Observatory (EXO) collaboration group at Carleton contributed key elements to the world's leading measurement of the extremely rare double beta decay of Xenon-136. EXO is probing new physics, attempting to determine if the elusive neutrino is its own anti-particle and to make a definitive measurement of the neutrino's tiny mass.

The Carleton EXO group, led by physicists David Sinclair and Kevin Graham, is spearheading aspects of development of a new, large-scale Xenon-136 detector, which could be ideally located in the Sudbury Neutrino Observatory (SNO) deep-underground laboratory.

The department also recently unveiled its cosmic ray inspection and passive tomography (CRIPT) system, a large detector that will use high-energy cosmic ray muons to scan containers for radioactive material, to detect magma flows under volcanoes and to monitor nuclear waste tanks. The three-year CRIPT project, led by physicist John Armitage, was funded by a federal grant from Defence Research and Development Canada's Centre for Security Science.

The medical physics group, which carries on its research on campus, as well as at local hospitals and other external medical facilities, is able to network proactively with the community through the Ottawa Medical Physics Institute located at Carleton. Its doctorate program was the first in the province to be formally accredited by the Commission on the Accreditation of Medical Physics Educational Programs.

photo: James Park

Professor Pat Kalyniak (left), a former chair of the physics department, and Professor Heather Logan (right), are both theoretical physicists.

"Our reputation is maintained by the hard work of the people who are part of the department," says former department chair and theoretical particle physicist Pat Kalyniak. "Our strength has been that we chose to focus on particle physics and medical physics and we have been able to make an impact in those areas."

What has also become significant in the last few years is the changing face of the department, as more and more women enter the significantly male-dominated field. By January 2014, when the newest faculty member joins the department, six of the 17 faculty members will be female.

Kalyniak declares it is unusual that there are so many women in the Physics Department today. Nearly three decades ago when she first set foot on campus, Kalyniak had come through a field taught exclusively by men.

"It wasn't a conscious effort to beef up the number of women," Kalyniak explains. "It wasn't planned. We hire the best people and some of them just happen to be female."

And, even if unknowingly, Kalyniak has influenced other women to follow their passion for physics, including faculty member Rowan Thomson, who earned her BSc degree in 2003 at Carleton and is now a Canada Research Chair in Radiotherapy Physics.

After coming back to Carleton in 2007 on a post-doctoral fellowship, Thompson has helped develop BrachyDose, a fast and accurate dose calculation algorithm for radiotherapy cancer treatments. The research chair funding will allow her to focus on refining radiotherapy treatments in targeting tumors.

Thomson admits that as an undergraduate student, her only female physics professor was Kalyniak. Now, as a professor herself, it is her turn to pass on her passion to young women as well as young men in the faculty.

"I think it's important to provide role models to young people. You are bound to get the best breakthroughs if you draw on the largest population and that includes women. Men and women may have different skill sets and different approaches."

Manuella Vincter, who has held a Canada Research Chair in experimental particle physics for the last nine years, was the first female professor to be hired at the University of Alberta's physics department, a much bigger department than that of Carleton's.

"That was 15 or 20 years ago, when young people didn't have the same access or exposure to women role models in our field," says Vincter. "I had a couple of physics professors who were really excited about what they did and I became curious about their passion."

As part of the ATLAS team, Vincter now spends her summers at CERN with several physics students. She finds the collegiality of Carleton's physics department "remarkable," not only among the faculty, but also the students, who "hang out" together both on campus and at CERN.

"All the students bring a unique gift to the field of research," she notes. "Some bring an incredible amount of enthusiasm. Some bring rigor. They all bring their own talents."

Kalyniak's work as well as that of other theoretical particle physicists at Carleton also attracted Californian Heather Logan to Ottawa eight years ago.

"I knew there was a group here doing what I do," says Logan, who studies the details of theoretical models to work out their predictions for what can be seen and measured in experiments, thus allowing the testing of the models. "It's important to have multiple people doing similar things – the environment for graduate students is much better and we can pool our resources to hire a post-doc. It's critical mass."

Logan's initial interest in astronomy and cosmology drew her into her field of study, which she calls "phenomenology."

"When I was an undergraduate, there were a lot of popular books on quantum physics and dark matter. I was interested in that kind of interface between astrophysics and particle physics and wound up on the particle physics side."

Logan, who presents at international conferences, is currently focusing on properties of the Higgs particle, which was discovered last year.

"This quest could potentially shed light on a wide array of possible solutions to the problem of mass: everything from new forces of nature, to supersymmetry, to extra dimensions of space."

Logan believes in the strength of Carleton's physics department today.

"We have a world-class research program and the largest phenomenology group in Canada. We really have the potential to flower," says Logan.

Earth Sciences

By Kristy Strauss

Carleton's earth sciences program reaches out to all corners of the globe – from active volcanoes in Italy, to soft and hard rocks in Hawaii. But students in the program do not just study these areas from a classroom. For decades, their education has gone beyond classroom walls and into the field—a vital component of the program. Students travel all over the world studying the Earth, trying to understand its formation over billions of years, and assessing what will become of its future.

"Because of field work, we're more of a family," says Tim Patterson, an earth sciences professor who's been teaching in the department for 25 years. "There's nothing like sitting around a camp fire, and getting to know people beyond the classroom."

Ken Hooper, now 90 and a retired professor in the department, has fond memories of the program and Carleton. He arrived at the school in 1958 and retired in 1988. Over his 30 years of teaching, he says he has seen both the department and the university campus change.

When he started, Carleton was preparing to vacate its former location on First Avenue and move to its present site. "Carleton was primarily a liberal arts college at the time," he says, "The sciences were taught but Carleton was best known for its journalism program. There was only one room for geologists, so there were four of us faculty members in one office," he remembers, adding that Carleton only had about 900 students at the time. "I didn't really fully appreciate the smallness until we got bigger."

He smiles as he remembers taking students on the second-year field course to Cobalt, Ontario, where students study the lakes and rocks surrounding active mines. Hooper recalls one exceptionally hot day jumping into nearby Lake Temiskaming where the waves were so huge due to tempestuous southerly winds that it felt like he was jumping into the ocean.

The Cobalt trip is where students got their first taste of field work. As they continue through the program, they travel further afield. This past spring, Professor Patterson took a group of third-year students to the American southwest, where they visited a meteor crater and hiked the Grand Canyon.

In 2011, Professor Claudia Schroder-Adams led a group of undergraduate and graduate earth sciences students to Antarctica, where they studied the continent's history and evolution of its ecosystems.

Professor Keith Bell, another retired faculty member, remembers taking students to Italy to study active volcanoes. "When you're in the field, you are not simply professor and students. You're all roughing it. You get to know the students well, and vice-versa."

Earth sciences professor Brian Cousens says he has had fabulous experiences with his students while on field courses, and that the trips transform relationships between professors and their students.

"I think the advantage of spending large chunks of time with students is you really get to know them, and they get to know you," Cousens says. "When you're in a van with someone for five hours, you find out their idiosyncrasies and quirks. You can't get that out of a lecture-based or lab-based class."

No matter where undergraduate

Photo left: Fourth-year and graduate level earth sciences students hiked in to Cajon del Maipo at the edge of the Andes mountains near Santiago, Chile, in the spring of 2012. The group observed vertically tilted sedimentary beds and the abundant fossils in the area.

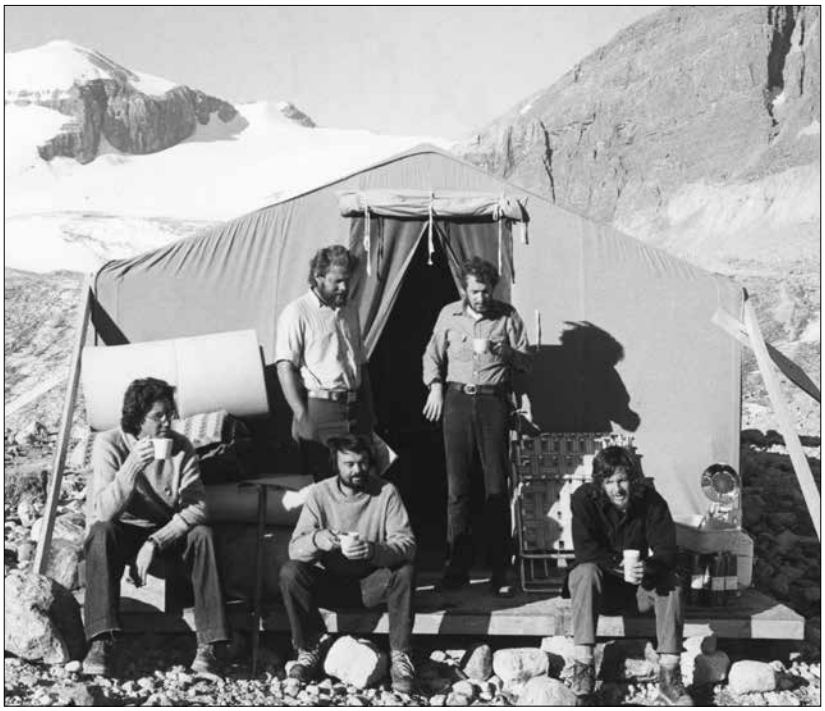
Geology student chiseling rock on a 1974 field trip.

students are studying, Cousens adds Earth Sciences students are helped at Carleton by a strong endowment program and scholarships.

"For undergraduates who go on field courses, they get $1,100 back," Cousens explains, adding that funds are also used to award scholarships for students who maintain a high grade point average. "The endowments are critical, and extremely valuable."

While there is currently no specific endowment fund available for graduate students in earth sciences, three donors came forward to cover a large part of the expenses for the Antarctica field trip. "Unless they could fundraise, no one could afford to go," says Cousens.

Allowing students to go on these field courses is crucial in helping them get jobs afterwards, adds Professor Bell. He says the real-world work experience on field courses makes earth sciences students among the highest employed after graduation. "Undergraduate students at Carleton, after their second field season, had more experience than I did after my seven years studying in England," Bell says.



This black and white image captures geology students at their campsite while visiting Peyto Glacier in Banff National Park in 1974.

Professor Claudia Schroder-Adams led a student group to Antarctica in the winter of 2011 and plans to return with another student group in December of 2013. In 2009, she led a group that visited this slate mine below in Switzerland as part of a field trip to Germany and Switzerland.

Patterson says the types of jobs available for earth sciences students are often highly paid in the mining and petroleum exploration industry, and they are also able to get summer work while in school. "Earth sciences is the only discipline where you can come out with a four-year degree, and be hired as a professional geologist," he says. "You can come out and go straight to work as a professional. That's something unique."

As the earth sciences program at Carleton is a tight-knit community, so is the professional world of geologists. Every year, the Prospectors and Developers Association of Canada (PDAC), which represents the interests of the mineral exploration and development industry in Canada, has its annual conference bringing together more than 30,000 professionals and students. Bell says the conference gives students a great chance to connect with industry professionals and network. "Students go down to get jobs, and they can tap into different mining companies," he says.

Patterson adds that students have unique networking opportunities at this event that students in other fields might not have access to. "You'll have the CEO of the company talking to students," he says. "They're networking at a high level."

The department continues to grow, and today, Patterson says, enrolment is at its highest.

Cousens adds that students used to transfer to earth sciences in their second year, but more are enrolling in their first year at Carleton. He says that he started noticing a spike in interest in earth sciences when it became a topic of news headlines.

"The year enrolment really jumped was after the 2004 tsunami in Indonesia. It was in the news for months, and that had an impact on people," Cousens says. "And since then there was the earthquake in Japan, and Hurricane Katrina. These are geological problems." He adds that while Hurricane Katrina was pushed by a weather system, he believes it showed potential students the importance of learning earth sciences.

"New Orleans will never be above sea level again, and the next hurricane will flood New Orleans again," Cousens says. "It's a geological problem, and there's no solution. These events have been in the news a long time, and I think it captured students' interest."

From Professor Hooper's early days of the four-person faculty in the Department of geology, to the ever-growing department of earth sciences today, Patterson believes it will just keep getting stronger.

"We are very proud of what we do, and I think we have a bright future ahead of us," he says.

Computer Science

By Kristy Strauss

From its initial days in the early 1980s, Carleton's School of Computer Science has graduated students who are well prepared for the working world.

Jason Flick, who graduated with a computer science degree from Carleton in 1996, is now president and CEO of Flick Software Inc., a leading provider of software products and services for the mobile and wireless communications industry. A true entrepreneur, he's also president and co-founder of You I Labs Inc., combining art and science to help companies build the best devices and apps.

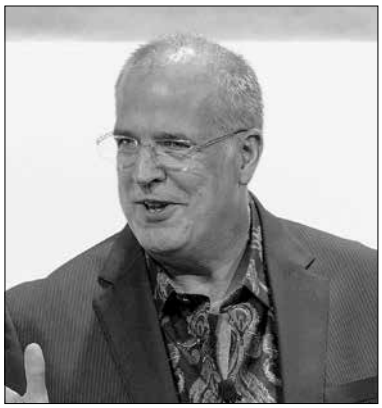
"At Carleton, I got lots of practical and abstract experience in the industry," says Flick. He worked in various software roles while earning his degree, and after graduating, built his career in management and director roles with companies such as TouchLink/TouchNet, Eftia, and Canadian Health Systems Inc.

But Flick says his experience at Carleton encouraged him to also start his own businesses. "Carleton gave me confidence," he says. "Starting your own company always takes longer than you think. It's been more difficult, but more rewarding, than I could have imagined."

Derek Burney Jr., another Carleton computer science alumnus, has also used his degree to serve in senior executive roles at companies such as Corel and Microsoft. He's currently Microsoft's corporate vice-president for strategic relations in the Applications and Services Group.

Burney was in his mid-20s when he started his degree at Carleton. He was older than most of his fellow students, so decided to take Carleton's co-op program and work while studying computer science. He graduated in 1993, and says his co-op experience helped him land a computer programmer job at Corel. Seven years later, he was CEO.

Jason Flick



Derek Burney Jr.

"I do credit the co-op experience tremendously with the fact that I was able to join the workforce, and be productive immediately," Burney says, adding that he was Corel's CEO for three to four years before he moved to Microsoft in senior executive roles.

John Pugh, a former professor and director of the School of Computer Science, says the school always had the tradition of graduating students right into the working world. He says many Carleton computer science students got hired on to work at the company he co-founded, The Object People Inc., a multi-national company and provider of computing, e-commerce and web solutions that was eventually bought by Oracle.

Now owner and CEO of the Ottawa Fury Soccer Club, Pugh says Carleton's computer science students were especially in demand across Ottawa in the early days.

"Our students were particularly attractive to many companies," he says. "These companies wouldn't have been successful without the students from Carleton who knew the latest technologies."

Computer science professor Dwight Deugo, also Assistant Dean of Science (Recruitment and Retention), says the school has grown since its early days to offer a variety of streams and courses, including computer game development, robotics, mobile computing and software engineering.

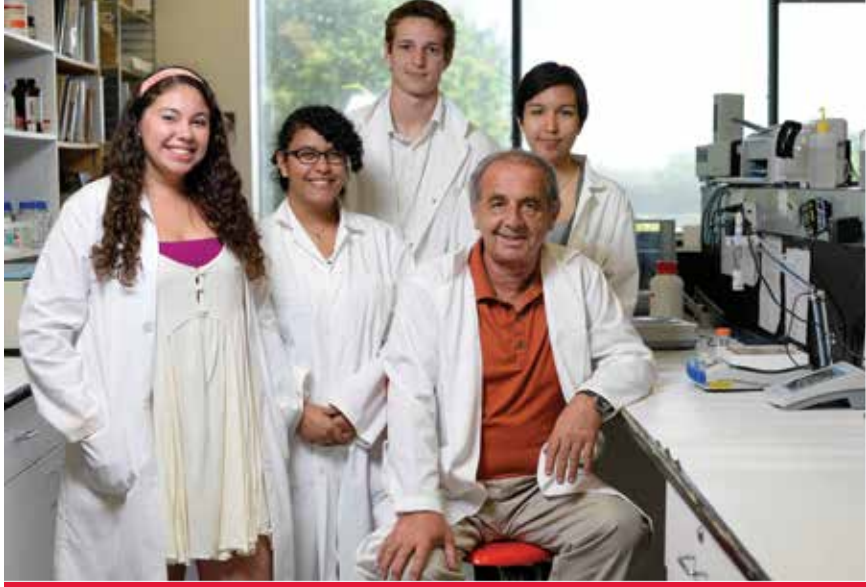
"We do a really good job in giving students a wide range of capabilities," says Deugo, who received his computer science education at Carleton. "That's something they can use to advertise to potential employers."

Professor Prosenjit Bose, Associate Dean of Research and Graduate Studies, has been teaching computer science at the university for 16 years and says computer science students have a great chance of finding work after school. "Demand is so fierce and we have graduate students being offered incredible jobs," Bose says. "I had two students who went to work for Google."

He adds that Carleton's computer science students also have the added benefit of being in a city where they have their choice of co-op placements in the high-tech industry.

Bose often runs into alumni around the city, who always tell him about their positive experiences at Carleton and how their computer science degree has helped them in their careers.

"Every single one of my graduate students that has finished has an amazing job," Bose says. "I have students that come back and tell me how they've been doing. It's really nice to hear, and makes me feel like I have the best job in the world."



Neuroscience students with professor Hymie Anisman (seated).

Dean's Summer Research Internships

By Kristy Strauss

Most first-year students wrap up their studies for the summer and head off in different directions. But some Faculty of Science students stay behind, thanks to the Dean's Summer Research Internships (DSRIs) that provide these students with the opportunity to work closely with a professor during the summer break.

"It's difficult for a first-year student to find a job in their field of study because a lot of employers are looking for those with previous experience, or want to wait until students have completed second year at least," explains Dwight Deugo, Assistant Dean of Science (Recruitment and Retention). "DSRIs are a great way of giving students that first experience."

First-year computer science student Michael Lutaaya is working with professor Sonia Chiasson.

In January each year, letters are sent to the top first-year science, computer science and mathematics students who have a grade point average of 10.0 or higher (80 per cent or higher) inviting them to apply for an internship. Deugo says students who are interested must then fill out an application stating why they want to do research, and which professors they would like to work with and why. Faculty representatives from the various science units review each application and determine who gets chosen.

Deugo says it's a fairly competitive process. Approximately 100 students receive a letter, and about half will apply; out of those students, roughly 15 get chosen. "You can tell a lot of the time if the student is interested or passionate about what they're trying to do or accomplish for the summer," says Deugo. "And, you can tell when the student has already had a conversation with the professor who's supporting them."

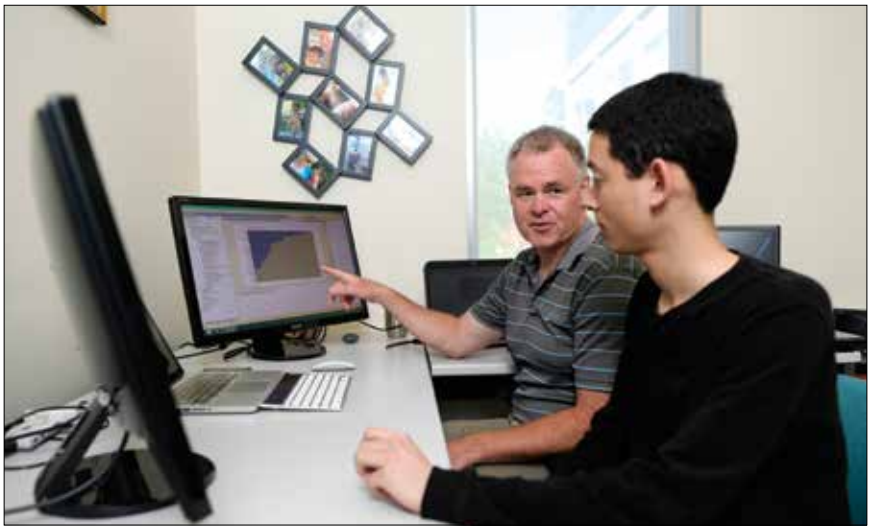
Deugo, who is also a Computer Science professor, is overseeing a student just out of his first year in the program. Zachary Chai is helping Deugo study the popularity of different computer languages and web-based charting packages. For example, they are working collaboratively on a website that shows a comparison of how often one computer language is required for a job over another. The results show up as numbers, and a bar graph.

Chai, who's an international student, says he's grateful for the experience. He decided to apply for the internship because he felt it was a good opportunity to get experience in his field. "It's definitely more hands-on," Chai says. "I get to build a website, while working on great techniques. With programming, there are new technologies all the time, so I stay very up-to-date. It's a great experience."

Sonia Chiasson, a Canada Research Chair who is an assistant professor in the School of Computer Science, is working with student Michael Lutaaya on her research into human oriented computer security. She works with students from all levels – from PhD to first-year DSRIs – and says students from each level bring unique skill sets, including the DSRI student she has hired for the summer. "Michael has been wonderful. He's technically skilled, creative, able to work independently, and enthusiastic about research," she says. "I am hopeful that his work, combined with an earlier part of the project, will result in an academic publication."

Lutaaya applied for the internship because he wanted to get hands-on experience with programming. He's particularly interested in computer security, and has been working on a game that helps people remember their passwords as part of his summer work. "In order for a password to be hard to guess, it has to be complex," he explains.

photo: All photos James Park



Professor Dwight Deugo (left) discusses his research with student Zachary Chai.

"But complex passwords can also be more difficult to remember." He adds that if it wasn't for the internship, it would have been difficult to find hands-on experience. "With this internship, I'm able to apply what I learned in the classroom, put it to use and develop something concrete," Lutaaya says.

Biochemistry students have also had a chance to work directly in the lab this summer thanks to the DSRI program. Kyle Fournier and Jason Moggridge have been busy working with professor Kenneth Storey in his lab. "The DSRI program is brilliant," says Storey. "As a first-year program, it's needed and it's necessary."

Storey is working with Fournier and Moggridge in developing a way to determine if proteins have been irreparably damaged in stored tissue samples using a technology being patented by the Storey lab. Storey says the technology has great potential in the health care and agricultural industries, particularly considering the hundreds of thousands of frozen tissues, blood and plant samples that are stored in biobanks around the world. "The question is: how good are the samples? Are they suitable for further testing or are they too old and damaged?" says Storey. "We developed a technique that will, going forward, have a health care consequence as well as help the biobanking industry."

Moggridge applied for the internship because he wanted to see what happened in a lab where research was being conducted. "It's been exciting doing real research in a lab. There's a sense of real discovery happening," he says. "It's been fun and social, but we've also been learning things that we wouldn't normally learn until later in our degree."

Shelby Levine, a neuroscience student, agrees that the hands-on learning experience offered through the DSRI program is invaluable. Levine works under the guidance of professor Hymie Anisman, who is also supervising three other students this summer. Levine is looking at the effects of estrogen and pre-natal stress on mice in Anisman's lab. "It's a very different experience than in the classroom," she says. "You're not just talking about the brain – you're looking at the brain, and really seeing what happens. It's very cool."

Anisman, who is supervising the most DSRI students this year, says it's important to him that they get real experience in the lab at a young age. He says he particularly notices how motivated students are in their first year. "These are very good, smart and motivated kids," Anisman says. "Their work is always great."

It costs just over $4,600 to fund each DSRI student – who usually puts in 35 hours a week, for 12 weeks. Funds primarily come from the Dean of Science's budget, with the overseeing professor contributing a portion. Some years, additional internships have been handed out due to an increase in alumni donations.

Ryan Davies, of the Department of University Advancement, says a new fundraising website will be used to help bring in more donations for these internships. The website, called Future Funder (**futurefunder.carleton.ca**), was launched in February 2013 and allows people to donate to specific university initiatives that are near and dear to them – entirely online.

Davies says the Dean's Summer Research Internship is scheduled to be featured on the website in August to tie into the Faculty of Science's 50th anniversary celebrations, and hopes this will allow more first-year science students to gain this research opportunity.

"I think internships really represent the shared experience of everyone who goes through science," he says. "It's about being hands-on and collaborative and gaining real-world experience. As a scientist you can really make a difference in the world, in neighbourhoods, and in communities – and these types of internships are often a source of real inspiration for students."

Biochemistry professor Ken Storey (centre) and Dean's Summer Research Internship students Jason Moggridge (left) and Kyle Fournier (right).

Carleton University Campus 2013

The Faculty of Science celebrates 50 years in 2013! As part of the Homecoming celebrations scheduled for September 19 to 22, 2013, the Faculty of Science will be hosting a series of events on campus geared to our Science alumni, faculty, staff and students. Come and join us and reconnect with the Carleton community!

Friday, September 20

Discovery Lecture
The Faculty of Science is pleased to host renowned scientist and Carleton Science alumnus Lawrence Krauss.

A reception will follow the lecture. Kailash Mital Theatre in Southam Hall, 7 pm

Saturday, September 21

Chemistry Outdoor Magic Show
Southam Hall Amphitheatre, 5 pm

Science Alumni BBQ
Tim Hortons, River building, 6 pm

Institute of Environmental Science 20th Anniversary celebrations
Baker's, University Centre, 7 pm

Visit **carleton.ca/science/science50/events** for all the details and to register.

Discovery Lecture

The Faculty of Science is pleased that renowned theoretical physicist and cosmologist Lawrence Krauss is able to return to his undergraduate studies alma mater to give the 2013 Discovery Lecture. Dr. Krauss graduated from Carleton in 1977 with a degree in Mathematics and Physics. He went on to complete a doctorate in physics at the Massachusetts Institute of Technology. He currently is a faculty member at Arizona State University.

He is the author of several popular science books including *The Physics of Star Trek*, *Hiding in the Mirror* and *A Universe from Nothing*.

In April 2013, his documentary film called "The Unbelievers" had its world premiere at the Hot Docs Film Festival in Toronto.

http://krauss.faculty.asu.edu/

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