University of Victoria
Science

ScienceMatters

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MATHEMATICS & STATISTICS:
changing health care, biology research and the world of sports

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What do big data, stroke research, frogs and NBA salaries have in common? Dr. Mary Lesperance.

Being a statistician means analyzing data and developing complex models for use in an unlimited number of areas. To Dr. Lesperance, that means her job is always interesting. "We live in a data society. Everyone is collecting data on us, and we need statistical tools to get meaning out of that data. That's what I do."

Health care has made great advances in collecting, sharing and analyzing patient data. The information derived from this data can save lives, and a group of researchers, including Dr. Lesperance, are working on a project to do just that. The project, led by Dr. Andrew Penn, a stroke neurologist, is called "Reducing stroke burden with hospital-ready biomarker test for rapid TIA triage." It is the outcome of a four-year $9.6 million contract awarded to Island Health by Genome BC. If transient ischemic attacks (TIA's), or mini-strokes, are caught in time, drugs can be administered to prevent major or fatal strokes. The challenge is to distinguish between a TIA and other medical issues that mimic the symptoms of a TIA, such as a migraine. Dr. Lesperance is creating a model to quickly differentiate true TIA symptoms from similar clinical presentations. She, and research assistant Linghong Liu, are collaborating with Island Health analysts to examine historical data from the Victoria General Hospital, and working with Dr. Francis Lau in Health Information Sciences to incorporate these clinical data into a decision support tool that will be used in the Emergency Department setting for rapid triage of TIA patients. The next piece of the puzzle comes from Dr. Christoph Borchers, the Don and Eleanor Rix B.C. Leadership Chair in Biomedical and Environmental Proteomics, who will use mass spectrometry at the UVic-Genome BC Proteomics Centre to establish the biomarkers of TIAs. The creation of an effective diagnoses model based on these data sets has the potential to reduce stroke fatality and the burden of stroke significantly.

Dr. Lesperance has also been working with local physicians to help patients plan palliative care. She created a model to predict end-of-life based on numerous risk and disease factors, a practical tool that can make planning for patients and families more predictable.

Health care is only one area where Dr. Lesperance wields her mighty statistical sword. She's also been working with UVic molecular biologist Dr. Caren Helbing, whose research looks at the effect that common local water contamination has on bullfrogs and their metamorphosis. These "contaminant soups," which often contain common household effluents, can change a frog's hormone production and affect a tadpole's natural growth cycle.

Dr. Lesperance also creates theoretical models, which she recently used in a project with PhD student Rabih Saab to predict an NBA team's likelihood of making it into the playoffs based on players' ages and salaries. Theoretical model development, as Dr. Lesperance explains, "is the ground-work that has applications anywhere and everywhere." They used a mixture model in their analysis, which is essentially a model that employs as few assumptions as possible to come up with a more accurate picture of the data.

MATH BY THE NUMBERS

Students who took a Math & Stats course in the 2013/14 year: 3,400

Number of current graduate students: 55

Number of current faculty members: 29

Mathematics & Statistics Alumni: 1,276

The potential applications for Dr. Lesperance's expertise are limited only to the amount of time she has in a day. She is clearly passionate and excited about the work she does. "Being a statistician and mathematician gives you the opportunity to use your skills in lots of different environments," explains Dr. Lesperance. "And you get to make a difference."

Dr. Lesperance is the Founding Director of the Statistical Consulting Centre, which offers statistical advice and services to researchers both at the university and beyond. She has served on the Canadian Institutes of Health Research, the Michael Smith Foundation and NSERC grant selection committees, has been involved with the Statistical Society of Canada in numerous capacities, including Treasurer of the Biostatistics Section, Board member and Program Chair for the large joint meeting with the Institute of Mathematical Statistics and the Western North American Region of the International Biometric Society.

DEAN'S MESSAGE

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Welcome to the spring 2014 edition of *Science Matters*.

I'm always inspired by the stories we are able to share with you about the outstanding accomplishments of our faculty, staff, students and alumni in scholarship, research and professional pursuits.

The Rhodes Scholarship, one of most prestigious awards available to students, was recently awarded to Dylan Collins, a fourth-year Biochemistry & Microbiology student. The scholarship will allow him to pursue a PhD at the Nuffield School of Population Health at Oxford. Congratulations Dylan!

The Faculty of Science was delighted to have hosted Dr. George Whitesides from Harvard University while he was on campus in November to receive an honorary doctorate from UVic. His contributions to the field of chemistry have been monumental, in that his work has led to the creation of new areas of research, which have been taken up by numerous others around the world.

Dr. Rossi Marx, a senior lab instructor in the Department of Biology, recently received the President's Distinguished Service Award for Service Excellence. This was a much-deserved award for Dr. Marx, who inspires her students and always goes far above and beyond for them, her unit and the Faculty.

I know how grateful our students, staff and faculty are for your continued and sustained support. Your role in the life of the Faculty of Science is critical. I therefore encourage you to keep in touch and to be involved with the Faculty of Science and the university. We welcome your feedback, and hope to see you on campus throughout the year.

Rob Lipson

Dr. Diana Varela on the Carlini research base in Antarctica

Chasing phytoplankton algae in the Antarctic

Standing on the edge of the Antarctic sea on the Carlini Base, Argentina's main scientific research station in Antarctica, Dr. Diana Varela checks how phytoplankton algae grow in testing tanks. With the low rumble of a moving glacier in the background, researchers from around the globe, like Dr. Varela, are working at the base, studying life in the Antarctic.

Dr. Varela, Associate Professor in the Department of Biology and the School of Earth and Ocean Sciences (SEOS) at UVic, was in the Antarctic in December and January, researching the effects of climate change on coastal planktonic communities in Antarctic marine waters. She was accompanied by Dr. Irene Schloss, Dr. Marcelo Hernando and PhD student Natalia Visintini. The results of their Antarctic research will be compared with similar research in coastal Arctic waters over the next two years.

Dr. Varela's algal experiments were set up in 12 tanks (or microcosms) in total, with three tanks for each treatment. In order to simulate the changing climate of the Antarctic, her group modified the temperature and salinity of the tanks to see how these parameters affected phytoplankton growth. The ultimate goal is to see if these environmental changes are affecting the physiology and ecology of marine phytoplankton—the base of marine food webs. This work is critical as seawater temperatures are rising, and salinity is lower along coastal Antarctic areas due to melting ice runoff.

During her month at the base, Dr. Varela's colleagues observed episodic high biomass fluctuations of planktonic algae. However, this didn't seem to affect the krill that feed on the algae. What is still uncertain is why these puzzling events were happening.

The experience of conducting research in Antarctica is one Dr. Varela won't soon forget. The last leg of the journey south to Antarctica was a two-and-a-half hour flight over the Drake Passage on board an old Hercules military plane owned by the Argentinian Air Force. Despite the lack of comfort, there was a palpable excitement among the group of researchers. "It was really exciting to touch down on the continent," remembers Dr. Varela. "It brings back that lost sense of excitement. It's a rare opportunity to go to such a mythical place."

During her stay, an old sailing research vessel—the ex-Atlantis I—arrived at the base. It was the first research vessel Varela had been on in the 1980's while working on her honours thesis. "Getting back on that ship was one of the highlights of the trip," says Dr. Varela. The vessel, originally built in 1939, was purchased from the American Woods Hold Oceanographic Institution by the Argentinian government, and has since been rebuilt as a research vessel and renamed twice.

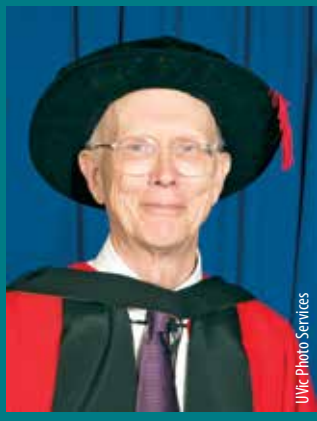
The research trip was a joint project with the Argentinean research agency, and sponsored by the Argentinean Antarctic Institute. It was also partly funded by Dr. Varela's NSERC Discovery grant.

World-renowned Chemist receives honorary degree from UVic

In November 2013, Dr. George Whitesides was awarded an Honorary Doctor of Science (DSc) at UVic's fall convocation ceremony. Dr. Whitesides, the Woodford L. and Ann A. Flowers University Professor at Harvard University, though primarily a chemist, has generated a wealth of original ideas and results across science, engineering and medicine—which have led to new and active fields of research. His work in organic chemistry—especially in the area of molecular self-assembly at the nanoscopic level—has led to breakthrough applications in electronics, photonics, molecular biology, and medicine.

He has made key contributions to technologies that are central in academic and industrial chemistry. His work in the interface between man-made materials and human cells has led to new medicines and his co-founding of the biopharmaceutical company, Theravance.

One of the world's most prolific chemists, he has had a major impact on the work of other scientists. His research journal articles have been cited close to 92,000 times. Another metric, the "Hirsch or H-index" is an integer n which corresponds to the number of papers in which a scientist has been cited at least n-times in the literature. It is often taken as a measure of impact. Dr. Whiteside's H-index of ~ 150 places him **ahead of any other living chemist in the world**. Much of his current focus is related to medical diagnostic tools suited for use in the developing world. Among his many honours, Dr. Whitesides has received the US National Medal of Science, the Robert A. Welch Foundation Award, and the Kyoto Prize.



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Dr. George Whitesides

DYLAN COLLINS
ON TO OXFORD ON A RHODES SCHOLARSHIP

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Dylan Collins is British Columbia's winner of one of the world's oldest and most prestigious student scholarships for 2014. Collins, a 21-year-old biochemistry student from UVic, will head to Britain's University of Oxford next fall as a Rhodes scholar. The award, which supports outstanding all-round students from all over the world, is worth more than $100,000 and covers travel, living and study expenses at Oxford.

"We're extremely proud of Dylan and his achievement," says UVic President Jamie Cassels. "He's an outstanding student who has pushed himself in the classroom, the lab, the community and the workplace to get a well-rounded perspective and hands-on experience in his chosen field of study. His determination to make a difference in the world is remarkable."

Collins will graduate from UVic in June 2014 with an honours BSc in biochemistry.

This winter, Collins completed his honours thesis in a BC Cancer Agency lab on a project that involves the chemical modification of genes or gene-associated proteins. "This field has huge implications for diseases such as cancer," he says.

He has also been working with UVic's Centre for Aboriginal Health Research (CAHR) and a Haida Gwaii community on a project that explores barriers to harm reduction among Aboriginal people who use illicit drugs. "This experience has been key to my success as an undergraduate and with the Rhodes Scholarship, because it has given me a local and global perspective," he says.

At Oxford, Collins will pursue a PhD (a DPhil in the UK) through the Nuffield School of Population Health. "I'm committed to exploring the interactions between substance use, social determinants, and the broader context of poverty, colonization, culture and trauma."

Up to 11 Rhodes Scholarships are awarded in Canada each year, including one from BC. The scholarships require outstanding scholastic achievement, strong qualities of leadership and character, and a commitment to public service.

UVic has produced seven Rhodes winners in the last 12 years, including one last year (2013).

Rossi Marx: recipient of President's Distinguished Service Award for Excellence in Service

Described as "inspiring" by colleagues and students alike, Senior Laboratory Instructor and Neurobiologist Dr. Rossi Marx has provided personalized, hands-on learning opportunities for more than 5,000 undergraduate biology students since 2007. She is a major contributor to more than nine biology courses, spanning all years of the undergraduate curriculum, and has primary responsibility for the aquatic animals used in a variety of laboratories.

"She makes biological science accessible and appealing to diverse audiences within and beyond the university. Her students love learning from her," says Kerry Delaney, Chair of the Department of Biology. Her innovative initiatives to improve the learning environment and the care and management of aquatic animal species help to integrate lecture-based material with experiential, laboratory-based learning.

Marx is also a skilled mentor for new lab instructors and graduate students and a passionate contributor to community outreach activities including Science Venture and Let's Talk Science. Marx is also the Chair of the Vancouver Island Regional Science Fair, a position she has held since 2006.

Marx's students speak of the impact of her dedication and enthusiasm, as well as her emphasis on critical thinking and excellence. "She made countless efforts to make the time for all of her students," says former student Fawn Yastremski. "Dr. Marx inspired me to view life in an entirely different way."

With undergraduate degrees in mathematics and biology from Germany, an MSc in neurobiology from the University of Saskatchewan, and a PhD in neurobiology from UVic, Marx is no stranger to going the extra mile for the love of teaching and learning.

"Throughout my career, I always had to fight to be allowed to get my education," says Marx. "As a pupil in high school, I was told by a teacher that girls did not need to know science, since they were going to get married. Just before graduating from high school, my father was diagnosed with leukemia, and he died a few months later when I was in my first term of university. I was told that I couldn't and shouldn't stay in university. But look at me now: I am a continent away, not only in science, but teaching it. I really try to encourage students, and it has been wonderfully rewarding."

Marx's lab abounds with glowing tanks and undulating, gelatinous beings. She studies jellyfish, and her enthusiasm for the creatures is infectious. For Marx, jellyfish are exciting because their ancestors were the first animals to have a full nervous system. "Evolutionarily speaking, the group goes back almost a billion years," says Marx. "How humbling is that? How interesting is that?" Making connections—from invertebrates to humans, between instructors and students—at the end of the day, that's what it's all about.


Dr. Rossi Marx
UVic Photo Services

Dr. Qimin You
2014 Faculty of Science Distinguished Alumni Award

Dr. Qimin You was awarded the 2014 Faculty of Science Distinguished Alumni Award at a ceremony on February 5, 2014, as part of UVic's Alumni Week. The event was held at The Hotel Grand Pacific on Victoria's inner harbour and honoured 14 alumni, one from each Faculty.

During the Cultural Revolution it was very difficult for students to leave China and study abroad. Qimin You, an extremely talented student who went straight from elementary school into medical school, overcame great odds to come to UVic to complete his PhD in biochemistry under the supervision of Professor Paul Romaniuk. After leaving UVic, You first did a postdoctoral fellowship at the University of Pennsylvania School Of Medicine working on transgenic technology, followed by a number of years developing novel nucleic acid-based technologies with US biotechnology companies. This work led to several patents. In 2005 he returned to China to start Ustar Biotechnologies, a company focused specifically on developing simple, inexpensive diagnostic tests for use in developing countries. Ustar holds 15 global patents for innovative molecular technologies.

Dr. You's contributions to the improvement of global health care have been well recognized. In particular, Ustar's isothermal nucleic acid amplification system for tuberculosis (TB) diagnosis was selected and recommended by the World Health Organization (WHO) as an innovative technology that addresses global health concerns. This recognition was a singular achievement as Ustar's TB test was one of only eight commercialized technologies recognized by the WHO for their potential to address health problems and improve quality of life in low and middle-income countries.

Dr. You's major contribution to the global community is embodied in his commitment to focus his scientific efforts, and the commercial efforts of his company, on the improvement of health care in the developing world through the provision of safe, reliable, accurate and low-cost diagnostic tests that can be used at the point-of-care by relatively untrained personnel. This business model is designed to allow for the widest possible dissemination of state-of-the-art diagnostic testing in the developing world, which will have a major impact on health care where improvement is most needed.

UVic hosts undergraduate chemistry conference

The 28th annual Western Canadian Undergraduate Chemistry Conference (WCUCC) will be held at UVic this spring from May 1st-3rd, 2014. This year the conference theme is ***Fuelling Creative Energy***, and will feature keynote speaker Stephen Campbell, Principal Scientist at the Automotive Fuel Cell Cooperation, as well as Dr. Dennis Hore (University of Victoria), Dr. Darren Johnson (University of Oregon), and Dr. David Vocadlo (Simon Fraser University).

Student organizers (R-L) Brent Godau (Head of Finance), Kira Kirk (Chair), and Steven Nowicki (Head of Sponsorship).

The conference promotes research in chemistry at the undergraduate level, and is organized entirely by undergraduate chemistry students. It will bring together peers from Western Canada to network in a conference-style setting, uniting some of Western Canada's most knowledgeable and resourceful students with current industry leaders. For many students, conferences such as WCUCC are a capstone event in their university experience.

Organizers expect close to 100 students from across Western Canada as well as Washington and Oregon. The student organizing committee is hard at work, planning and fundraising for the event. If you'd like to offer your support, please contact the Department of Chemistry at rpulez@uvic.ca.

Alumni in the News

Paul Nicklen (BSc '90) has published Bear: Spirit of the Wild. Nicklen is an award-winning photographer for National Geographic, the only Canadian photographer to have that honour. Nicklen's work to protect the Arctic by highlighting the warming Canadian North and its effect on wildlife has been widely praised. His latest book is another demonstration of his commitment to a land he calls home.

Dr. Tom Rimmer (BSc '89) received BC's 2013 Family Physician of the Year award for providing exemplary care to underserviced communities. The Duncan physician is a co-founding Board Member of the Cowichan Valley Division of Family Practice Society whose mandate is to bring primary care to the Cowichan Valley, and is the physician lead of the Mental Health Module with the Vancouver Island Health Authority.

Dr. John Deniseger (BSc '81) received the Premier's Innovation and Excellence Legacy Award for his dedication to environmental protection. Deniseger's unprecedented collaborative work with government agencies, First Nations, community groups, academia and the private sector have made an enormous impact, and shows his passion and dedication to making a difference in our province.

Co-op Student of the Year: Ross Prager

Ross Prager

Microbiology honours student Ross Prager is UVic's Co-op Student of the Year for the Optional and Professional Co-op Programs. We asked Ross what attracted him to the co-op program and to describe his co-op experience. "I first became interested in the Biochemistry and Microbiology (BCMB) co-op program with the hope that through science related work experience I could narrow down possible career options. Having now completed 3 co-op terms: a volunteer work term with St. John Ambulance Victoria, a work term in Dr. Leigh Anne Swayne's cellular and molecular neuroscience lab, and a work term as a paramedic with the British Columbia Ambulance Service, I know that co-op has truly enriched my undergraduate experience, and has allowed me to explore several different career options. Throughout this process, the BCMB co-op coordinator Dr. Rozanne Poulson has been incredibly supportive and integral to my positive co-op experience. She has helped me apply for jobs, funding, and develop my resume. I wholeheartedly recommend that anyone completing a biochemistry or microbiology undergraduate degree should consider co-op, as I am sure it will be as positive an experience for them, as it has been for me."

MAGNETIC NORTH

The workshop "Magnetic North IV: Controlling magnetism and its excitations" will be held at the University of Victoria in Victoria, British Columbia, Canada over a three day period (May 23rd – 25th, 2014). The workshop is intended to cover topical work on multiferroic materials, spin-torque and domain wall motion, and voltage control of magnetism. The list of invited speakers includes some of the most prominent researchers in the area of magnetism throughout the world. For more information: www.magneticnorth.mun.ca/MagNorthIV/.

Science Honours Fest

The third annual Science Honours Fest was held on February 28th, 2014. First place in the research poster competition went to Ross Prager in Biochemistry and Microbiology, who received the inaugural Boehm Family Award for Excellence in Science, made possible by a generous gift from Dr. Fritz Boehm. As noted in the adjacent article, Ross also won the 2013 Optional and Professional Co-op Student of the Year award. Carolyn Tsao from Mathematics and Statistics placed second, while third place went to Kayla McLean from Physics and Astronomy. Honourable mentions were also given to the best poster from each department.

Poster presentations were judged by a diverse panel representing all of the departments and schools in the Faculty of Science, led by Dr. Patrick von Aderkas from the Department of Biology. The event, organized by Dr. Kathryn Gillis, Associate Dean of Science, was a rousing success and we look forward to seeing the amazing research done by our Honours students next year.

(L-R) Kayla McLean, Ross Prager, Dr. Rob Lipson, Dr. Kathryn Gillis, and Carolyn Tsao.

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Giving Back

Our alumni make a difference by volunteering at events, speaking to classes, hiring co-op students or supporting scholarships. To help change the lives of our current students, you can make a donation today at www.uvic.ca/givingtouvic or by contacting Chrystal Phan, Development Coordinator, at 250-472-4210 or cmphan@uvic.ca.

Planning a reunion?

The UVic Alumni Association can help by promoting your event to classmates, arranging speakers or providing door prizes. Network and keep involved by exploring the list of groups and upcoming events to find something that's right for you. www.alumni.uvic.ca/events/reunions.php

Alumni Newsletter

Science Matters is published twice yearly by the Faculty of Science to communicate the faculty's goals, strategic direction and activities in order to connect alumni with each other and the university. Send your story ideas and feedback to Julie Sloan at jsloan@uvic.ca.

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