



Photo: Diana Nethercott

## UVic oceanographer leads new radioactivity monitoring network

— By Valerie Shore

Ever since the 2011 tsunami and nuclear disaster in Japan, there's been widespread concern along the west coast of North America about the potential danger of low-level radioactivity crossing the Pacific Ocean.

What are the levels of radioactive elements in our coastal waters? Do they pose a health risk to us? How will they affect marine ecosystems and the food chain?

We're about to find out.

University of Victoria chemical oceanographer Jay Cullen is leading the formation of a new marine radioactivity monitoring network that will engage scientists in Canada and the US, health experts, non-governmental organizations—and citizen scientists along the British Columbia coast.

The Integrated Fukushima Ocean Radionuclide Monitoring Network (InFORM) is being funded by \$630,000 over three years by the Marine Environmental Observation Prediction and Response Network (MEOPAR).

Research partners in the network include world-class expertise at the Woods Hole Oceanographic Institution in Massachusetts, Health Canada, the University of Ottawa, UBC and Fisheries and Oceans Canada (DFO).

"There's great public demand for information about the impact of the Fukushima disaster on the marine ecosystem and on the health of British Columbians," says Cullen. "Our

goal is to provide the public with the best information possible about risks to the environment and their health."

The 2011 earthquake and tsunami led to meltdowns in three of six nuclear reactors at the Fukushima-Daiichi nuclear power plant on Japan's east coast. Significant levels of radioactive elements, or radionuclides, were released into the ocean and are slowly drifting across the Pacific toward North America.

Of particular interest are Cesium 134 and 137, two radioactive isotopes that are produced during fission reactions in a nuclear reactor or in nuclear explosions. They're unstable and give off energy as they decay to more stable forms, which is how they cause damage when they get into living tissue. They also serve as tracers of other radioactive isotopes released during the Fukushima disaster.

"In the next few years we need to know what the concentrations are and what kind of risks they pose," says Cullen. "And we won't know that unless we monitor the situation properly."

The network will involve NGOs such as the Clayoquot Biosphere Trust, the Georgia Strait Alliance, the Raincoast Education Society and the Living Oceans Society, which will help with public outreach, information transfer, and recruitment and training of citizen scientists.

The plan is to set up 10 to 15 community sites along the BC coast where volunteer citizen scientists will collect water and seafood samples monthly or bimonthly for analysis.

"End-user involvement is a key pillar of this network," says Cullen. "By engaging directly with the public, we're inviting those with a stake and interest in marine environmental risk assessment to get involved."

Sample collection has already begun—this summer samples were collected from the Coast Guard icebreaker Sir Wilfrid Laurier as it sailed from Victoria to the Arctic Ocean. And this month, more samples will be collected along a series of stations from Victoria to about 1,500 km off the BC coast.

Cullen says results will be disseminated online and through community town hall meetings up and down the coast. He's currently setting up an InFORM website, and results will also be posted on the ourradioactiveocean.org website hosted by Woods Hole.

Long-term, the project will do much more than monitor levels of radiation, stresses Cullen.

"It will provide much needed information on the circulation of the North Pacific," he says. "Ocean mixing and transport are fundamentally important to understanding fisheries productivity and how the ocean will absorb human-produced greenhouse gases."



Welcome to the fall 2014 edition of Science Matters.

It's easy to brag about our inspiring students, alumni and world-class faculty, but this time I'm going to let the numbers speak for me.

Four UVic faculty members including Andrew Weaver (Earth and Ocean Sciences) and Pauline van den Driessche (Mathematics and Statistics) have been recognized in the 2014 list of Highly Cited Researchers compiled by Thomson Reuters. These researchers have published work of exceptional value to their field, appearing in the top one per cent of most-cited scientific papers in the literature. Among Canadian universities, UVic is fifth on the Thomson Reuters list, with more faculty members among the most-cited researchers than any other Canadian comprehensive university. Most universities have one or two researchers on this list. The fact that UVic has four speaks to the calibre of talent that we attract.

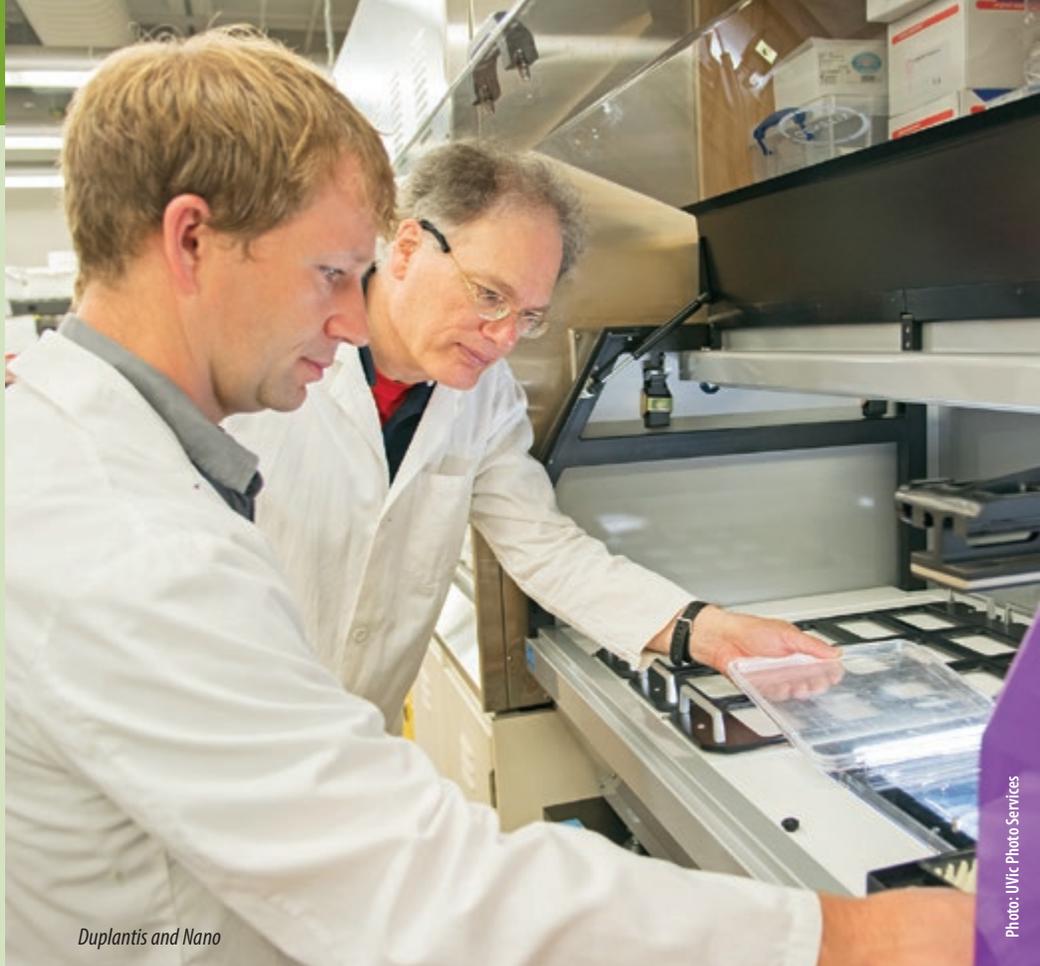
The 2014 Leiden Rankings placed UVic first in internationally co-authored research among Canadian universities. UVic placed fourth overall in Canada in terms of scientific impact, and is the top-ranked university without a medical school. UVic placed second in math, third in earth and environmental sciences, fifth in natural sciences and sixth in cognitive sciences. Among the 750 universities ranked worldwide, UVic placed 183rd for overall scientific impact.

I'm also pleased to announce our fifth Schulich Leader Scholarship winner, Joshua Stimpson. Two of these scholarships are given out at UVic each year and, of the six winners we've had at UVic, five have been science students. The award, part of one of the biggest scholarship programs in Canada, is renewable over 4 years at \$15,000 per year. You can read more about Joshua and the Schulich Scholarship program on page 4.

On a sad note, we acknowledge here Physics Professor Alan Astbury who passed away unexpectedly in July after a brief illness. As you can read on page 3, his contributions to particle physics and to the UVic were immense.

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

Rob Lipson



*Duplantis and Nano*

Photo: UVic Photo Services

## “Frosty genes” technology awarded US patent

The most effective vaccines against disease are those that expose our immune systems to live pathogens. But how do we do that without causing the very disease we're trying to avoid?

Two UVic researchers may have found a way of using bacteria from the frigid waters of the Arctic. The innovative technology they've developed over the last decade has just been awarded a US patent.

The technology—developed by former graduate student Barry Duplantis and UVic microbiologist Francis Nano—substitutes cold-loving genes from Arctic bacteria for the genes of warmth-loving, disease-carrying bacteria.

The strategy is to create a strain of bacteria that can replicate in a person or animal's skin, but not penetrate into deeper, warmer tissue to cause infection. In this way, the body is safely exposed to the pathogen, providing future immunity from the disease.

“One of the strange things about cold-water bacteria is that they can only grow in cold water,” says Nano, whose team has since identified a number of genes and proteins from Arctic bacteria that make them sensitive to warm temperatures.

“We look for temperature inactivation relevant to human body temperatures, but most often we're looking for proteins that are inactivated at 37 C.”

The new technology can be applied to vaccines for almost any disease caused by a bacterium, such as tuberculosis, drug-resistant staph infections and even plague. Nano and his team are currently working with a number of bacteria, including Salmonella, which causes one of the most common food-borne illnesses in the world.

The newly patented technology is at the heart of a spinoff company headed by Duplantis. He formed DuVax Vaccines and Reagents Inc. in 2011 to further develop and market the technology to pharmaceutical companies in human and animal health.

In addition to the US patent, the technology is patented in a number of other countries including Canada, he adds. “Without a solid intellectual property position it would be impossible for a small start-up biotechnology company like this to get off the ground.”



## Ocean Networks Canada research and technology on display in the Arctic

On Aug. 23, Prime Minister Stephen Harper and Lauren Harper were with UVic President Jamie Cassels and Ocean Networks Canada's President Kate Moran to view the latest instrumentation that showcases ONC's technology and science applied in the Arctic at Cambridge Bay, Nunavut.

President Cassels talked with the Prime Minister about ONC, as well as the joint venture between UVic's history department and the Nunavut Department of Education to develop a new web-based "Great Canadian Mystery" on the Franklin Expedition.

He also spoke to northern officials about the potential to work together in the future to benefit northern communities and peoples in the tradition of the university's ground-breaking Akitsiraq partnership.

Installed in 2012, ONC's community-based, cabled seafloor observatory is the first location in Canada's Arctic for year-round, continuous undersea monitoring of the northern environment. Its instruments – including an underwater camera, ice profiler and sensors that measure temperature, depth and salinity – provide science-based support for greater understanding and protection of fragile arctic marine ecosystems. Data streaming from the instruments supports cutting-edge research and science-based decision making which will enable local students, teachers and community members to steward their own environment.

Kim Juniper, BC Leadership Chair in Marine Ecosystems and Global Change at UVic and coordinator of the scientific program at the Cambridge Bay Observatory, has been working with researchers from ArcticNet, a network of centres of excellence based at Laval University in Quebec City. "We've had an exciting two years building and operating the first real-time ocean observatory in the Arctic Ocean," says Juniper. "We're thrilled with the recognition we received this summer with the visit by Prime Minister Harper."

ONC, a UVic initiative, operates world-leading observatories for the advancement of science and the benefit of Canada. Made up of NEPTUNE in the northeast Pacific and VENUS in the Salish Sea, ONC is changing the way oceans are studied by providing data collected by hundreds of instruments and delivering it free through an Internet portal. Scientists and citizens alike can observe the underwater natural environment in real time from anywhere in the world and study a wide range of phenomena, including earthquakes, tsunamis, climate change, ambient noise and Arctic change.

*L to R: Kate Moran, Jamie Cassels, Prime Minister Stephen Harper, Lauren Harper.*



## DR. SARA ELLISON WINS THE ROYAL SOCIETY OF CANADA'S RUTHERFORD MEMORIAL MEDAL

Sara Ellison has been awarded the 2014 Rutherford Memorial Medal in Physics by the Royal Society of Canada. This prestigious award is given annually to an individual for outstanding research contributions in physics.

Ellison joined the University of Victoria in 2003 after completing her Ph.D. at Cambridge and a fellowship at the European Southern Observatory in Chile. Choosing UVic was an easy decision for Sara. She was offered a faculty position with a Canada Research Chair (CRC), and combined with UVic's strength in her field of astronomy, the choice was clear. She began her UVic career as an assistant professor in the Department of Physics and Astronomy, and this year was promoted to full professor,

the first female professor in physics—along with fellow astronomer Kim Venn who was also promoted this year—in the history of the department.

Ellison's most recent research has focused on how galaxies are transformed when they merge with another galaxy. Although space is vast, galaxy mergers are not uncommon, and they can trigger dramatic bursts of star formation, and funnel gas towards the central supermassive black hole, causing it to dramatically "light up". In complementary work, Ellison uses some of the world's largest optical telescopes, such as the Very Large Telescope in Chile, and the Hubble Space Telescope to probe gas in galaxy halos to better understand their evolution.

## IN MEMORIAM OF ALAN ASTBURY — A SCHOLAR AND A GENTLEMAN

*By Bob Kowalewski*

Dr. Alan Astbury, Professor Emeritus of Physics at the University of Victoria, died on July 21 following a brief illness. Alan, a leading figure in Canadian science, served as Director of TRIUMF, Canada's national laboratory for particle and nuclear physics, from 1994-2001.

His distinguished career began in the U.K. Born in Crewe, he obtained his Ph.D. at Liverpool and, following postdoctoral work at Berkeley, was a scientist at the Rutherford Laboratory from 1963-1983. He served as co-spokesperson of the UA1 collaboration at CERN, whose discovery of the W and Z bosons confirmed the unification of the electromagnetic and weak forces and led to a Nobel Prize. Alan came to Victoria in 1983 as the R.M. Pearce Chair of Physics, and established a strong particle physics group through experiments at SLAC and CERN. He was Director of the Canadian Institute of Particle Physics from 1991-1995. As Director of TRIUMF, he secured increased federal investment in the lab, built the ISAC facility and provided substantial Canadian contributions to the LHC accelerator and the ATLAS detector.

Following his retirement, Alan served as President of the International Union of Pure and Applied Physics (IUPAP) from 2005-2008.

He was elected as a Fellow of the Royal Society of Canada and of the British Royal Society, was awarded the Rutherford Medal of the Institute of Physics, the Lifetime Achievement medal from the Canadian Association of Physicists, and the BC Science Council Career Achievement Award. Alan held honorary degrees from the Universities of Liverpool and Victoria and from Simon Fraser University.

Alan animated the lives of his friends and colleagues with his energy, integrity, commitment and humour – he will be sorely missed. He is survived by his wife, Kathy and two daughters, Elizabeth and Gillian.



# ALUMNI IN ACADEMIA:

**Roderick Edwards** (PhD '94) obtained a M.Sc. degree in applied mathematics from Heriot-Watt University in 1990 and a Ph.D. degree from UVic in 1994. He was a postdoctoral fellow in the département de kinanthropologie at Université du Québec à Montréal from 1995 to 1998, after which he returned to the University of Victoria, where he is now a professor and Chair in the Department of Mathematics and Statistics. His research has involved the analysis of network dynamics arising in biology, including neuronal, genetic, and disease networks, as well as analysis of physiological time series and applications of mathematics in other areas such as applied linguistics.



Roderick Edwards

**Laurel Schafer** (PhD '99) obtained her BSc from the University of Guelph, and her PhD from UVic in 1999. As an Associate Professor at UBC, her research group specializes in organometallic catalysis for organic synthesis including reaction kinetics and mechanistic investigations. In 2013 she received funding for an Industrial Collaborative Research and Training Experience (CREATE) Program. Through this program young scientists receive interdisciplinary training with areas of expertise ranging from chemistry, chemical and biological engineering to pharmaceutical sciences.



## The Science of Sleep

Cornell University's Dr. James Maas educated and entertained a sold out audience in the Farquhar auditorium on October 2nd. The world-renowned sleep expert drove home the effect of sleep deprivation on the brain, body and overall health. The Faculty of Science is very thankful to Vifor Pharma for their continued support in sponsoring the Distinguished Speakers Series, which allows outstanding individuals like Dr. Maas to come to campus for the benefit of the entire Victoria community.

## Schulich Leader Winner

Joshua Stimpson is one of two recent high school graduates selected to receive this year's prestigious Schulich Leader Scholarship, one of the largest scholarship programs in Canada.

Created in 2011 by entrepreneur and philanthropist Seymour Schulich, the scholarships are awarded annually to 40 students in Canada pursuing undergraduate studies in STEM subjects: Science, Technology, Engineering and Mathematics. The scholarship for Engineering is \$80,000 and \$60,000 for the other areas of study.

Nominees must demonstrate two of the following attributes: academic excellence, outstanding community, business or entrepreneurial leadership, and financial need. The scholarships are for four years.

Stimpson, who comes from the remote rural community of Beaverdell in the southern BC Interior, applied to UVic with an impressive entrance average of 95.25% and received numerous awards for his accomplishments. He was involved in a variety of school sports, was a senior member of the Spirit Club, and involved in fundraising for his grad class activities. He assisted with community events and helped seniors with physical chores. He also undertook much of the physical work as well as other responsibilities at home as his father, a single parent, suffers from debilitating physical disabilities as the result of a work-related injury. Stimpson has demonstrated a resilience that will serve him well in his studies.

"I was shocked and thrilled when I found out I had received this scholarship. I am very grateful to the University of Victoria and Schulich Foundation for the award," said Stimpson.

Stimpson says that the financial assistance takes the pressure off trying to find and juggle a part-time job with his studies. "This scholarship will make a tremendous difference."

As one referee wrote, Stimpson "is exceptionally strong academically, motivated, excited to learn, and possesses a work ethic and desire to excel that is extraordinary . . . He has come to know that his own inner strength and personal goals have helped him in times of adversity and will continue to support him in the future."

UVic has welcomed six Schulich Leaders since becoming part of the program, five of whom have been in the Faculty of Science.

## 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](http://www.uvic.ca/givingtouvic) or by contacting the Development Coordinator, at 250-472-4210 or [devtcoor@uvic.ca](mailto:devtcoor@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](http://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](mailto:jsloan@uvic.ca).



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