



Of the 60 men and women worldwide that can put 'National Geographic photographer' on their business cards, Paul Nicklen is the only Canadian.

Northern exposures Photographer brings conservation into focus

"What I love most, the number one reason I love my job as a photographer is that I love wildlife," says Paul Nicklen (BSc 1990 Biology). His passion for his profession goes beyond that of your average animal lover. On assignment with National Geographic, he captures breathtaking images of Arctic and Antarctic animals including polar bears, leopard seals, penguins and narwhals. More importantly, in addition to the animals themselves, he captures a threatened landscape that is changing with frightening speed. He often goes to extreme lengths and braves personal discomfort to photograph this climate and its inhabitants—before they're gone forever.

"I have been to every level of Antarctica. I have been to the top of the ice shelf, I have been deep under the ice, I've been attacked by leopard seals." When Nicklen is on assignment, he immerses himself completely within his environment. "When I go to Antarctica, I live on the sea ice, I'm surrounded by the elements, I'm getting hammered by blizzards, I'm experiencing extreme cold, and then not only am I doing that, I'm diving under the ice, or I'm in a helicopter, or I'm in an airplane."

"When I think of an area, habitat, ecosystem that I want to photograph, or even a species, I'm going to see it from 1000ft high to 200ft deep and everywhere in-between." As a UVic alumnus, Nicklen's academic background in biology serves him well when approaching his subject matter from an ecological standpoint. "That's how I like to think about a habitat, an ecosystem that I can truly cover from every possible angle. That's what excites me about what I do."

Growing up in Canada's north gives Nicklen a deeply rooted love of the Arctic, and a passion for its conservation. "I've been very fortunate to live in some of the most beautiful spots in the world. I grew up in Baffin Island, in the Northwest Territories, lived in the Yukon, lived in the mountains on 20 acres of solitude, bears around me, moose in our yard. A place to think, re-group. Recollect my thoughts, dream of the next stories that I'm going to tell on assignment."

Nicklen's talent has vaulted him into the top-level of wildlife photographers, receiving some of the industry's highest awards. As an active member of the International League of Conservation Photographers, his commitment to environmental stewardship has earned the respect of those concerned over the disappearing sea ice resulting from global warming. This October, Nicklen was one of five recipients of UVic's Celebration of Excellence Award for his work in bringing attention to these endangered environments.

Despite his love of the Arctic, Nicklen has moved back to Vancouver Island. "I was missing the ocean. The ocean has always been a big part of me. For the next 30 years of my life, I'm going to dedicate my time, effort and energy to the ocean. So in order to immerse myself in that environment, I decided to move back to BC. I'm very lucky to have a property on the ocean, in Nanoose Bay." With Nicklen already slated to return to the UVic campus for as a presenter in the Faculty of Science's Distinguished Lecture Series next spring (see page 3 for details), we're excited to have him back on Vancouver Island.

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This issue of Science Matters celebrates a very special time in the history of the University of Victoria—our 50th Anniversary. As we celebrate the many achievements of the Faculty of Science, I would like to take this opportunity to congratulate several of our outstanding alumni and students on their recent successes.

Paul Nicklen (*see cover story*), the only Canadian photographer on assignment for National Geographic, received the University of Victoria's 50th Anniversary Celebration of Excellence Award for his global and local community impact in bringing attention to endangered northern environments. This summer, Rachele Viinberg (BSc Biology 2005) took home the Olympic silver medal in women's eight rowing, while Tim Rees, a postdoctoral research fellow at UVic's School of Earth and Ocean Sciences who is legally blind, represented Canada in the Paralympic judo competition.

I continue to be proud, indeed, awed by the range of world-class research being conducted in the Faculty of Science. The University of Victoria placed first in Canada (and 11th in the world) among universities under 50 years of age in the *Times Higher Education's* 100-under-50 rankings. This recognition of UVic as a research-intensive university can be attributed in large part to the activities in the Faculty of Science and to our commitment to offer meaningful experiential learning opportunities to both our undergraduate and graduate students.

Regardless of how long it's been since you attended UVic, you will always be a part of our alumni community. I encourage you to join us in our 50th Anniversary celebrations happening throughout the 2012-2013 academic year as we explore our history, honour a half century of achievement, and look ahead to building on our successes and tradition of excellence.

Rob Lipson



An artists rendering of the elusive Higgs boson "God" particle.

UVic's Higgs detectives

On July 4, the triumphant cheering from physicists and armchair cosmologists was thunderous in response to the announcement of the latest results in the search for the elusive Higgs boson. And a large group of UVic researchers who have had significant involvement in the experiments had good reason to join in the celebrations.

The Higgs boson only lives for a fraction of a second. Particle physicists have tracked traces of the decay of a new particle, and now data has shown a statistically significant 99.99994 per cent certainty. In lay terms, this means only one experiment in two million would see a signal this strong in a universe without this new particle, which is likely to be a Higgs—the particle responsible for the mass of all things.

UVic has been in the loop since the very beginning. The Large Hadron Collider, buried deep underground, is a giant ring built by the European Laboratory for Particle Physics (CERN) to accelerate protons into head-on collisions. ATLAS is one of two large detectors recording the subatomic debris, and in 1992, the UVic group brought Canadian researchers to the project.

"Now we have a new piece of information about the fabric of the universe," says UVic physicist Michel Lefebvre, founding spokesperson of ATLAS-Canada. "This is not the end of the story. It's only the beginning." The current results, unveiled July 4 at a seminar held at CERN, were webcast live to institutions around the world, confirming the telltale signs first seen in December 2011.

"It has been described as reaching land at the end of a long voyage of discovery," says Rob McPherson, ATLAS-Canada spokesperson and UVic adjunct professor. "Last winter, there was a smudge on the horizon and now, land is sighted, all paddles are in the water and the wind is blowing in the right direction to reach shore."

The UVic-ATLAS team—having benefited greatly from early work by UVic particle physicists Alan Astbury and Richard Keeler—now includes Justin Albert, Robert Kowalewski, Randall Sobie and Isabel Trigger as well as more than 25 students, associates, technicians, computer experts, engineers and scientists. The team is responsible for maintaining detector components, poring over thousands of gigabytes of data, and developing strategies and software to be ready for such new discoveries. The ATLAS data centre is housed at TRIUMF in Vancouver, the national laboratory founded by UVic, UBC and SFU in the 1960s.



Dr. Alexandre Brolo examines the effect of liquid nitrogen on a balloon during "That Chemistry Show" for alumni during Homecoming.



Homecoming Weekend!

On September 28-29, UVic celebrated its 50th Anniversary with a community festival and the inaugural Alumni Homecoming. The jam-packed schedule of events included Vikes athletic games, a KidZone, live music, open house tours, alumni presentations, a reunion dinner, retro dance party and more!

Established in 1963, UVic has grown to become a leading research-intensive institution with alumni making a difference around the world. Join UVic's 50th Anniversary celebrations! Events, activities and projects are running year long from September 2012 to June 2013 - www.uvic.ca/anniversary.



Payette floating in zero gravity aboard space shuttle Endeavour.

UVic audiences delighted by top lecturers

On August 27, Canadian astronaut Julie Payette presented an intimate picture of daily life aboard the International Space Station to an audience of nearly 1000 in a free public lecture entitled "The Earth from Above: An Astronaut's Perspective." Awarded an honorary Science degree from UVic in 2002, Payette is co-chair of the 50th anniversary's honorary cabinet, a group whose membership reflects UVic's core values. "When you go to space, you find a perspective that you don't have when you live on the planet," said Payette.

Attendees of Dr. Sherwin Nuland's October 10th presentation learned the steps to take to remain healthy in their later years. A physician, professor and medical historian, Nuland is most known for his best-selling books *The Art of Aging and How We Die*. Growing old, he explained in his lecture sponsored by Vifor Pharma, is not a disease but an art—and for those who practice it well, it can bring extraordinary rewards.

Research profile

Boualem Khouider, Mathematics and Statistics

Modeling a changing climate

Anyone that has ever dressed for sun, but then been caught in a downpour knows too well that weather forecasts aren't always accurate. Meteorologists use current conditions and past patterns to project what they think will happen in the days and weeks to come. Mathematician Boualem Khouider is using numeric formulas to create a more dependable simulation for weather occurring globally for the months and years ahead—data necessary to understand the causes and effects of climate change.



"I use mathematics to create better ways of predicting a complex system with variable behaviour." Khouider focuses his attention on the tropics, researching the relationship between ocean currents, atmospheric circulation, temperature and other components to understand how these forces produce weather. By using observed measurements to detect seemingly random changes, he can formulate equations that more accurately reflect these subtle variations.

"The climate models that are used right now miss a lot in regards to clouds and waves that mostly occur in the tropics. They are very inaccurate and don't match the observations." Khouider explains that a disparity between predicted weather and observed weather in the tropics has far-reaching consequences for other regions because ocean and atmospheric currents impact global systems. "If we don't know what's going to happen in the tropics, we cannot predict consistently what will happen in Canada—now or in the future."

Khouider's equations are incorporated into large-scale computer simulations by government labs in Canada and the United States as well as in universities around the world. "These big climate models are so complex that no one person can actually claim that one model can do it all. It's teamwork, contributions from all different people, that will make the difference."

Upcoming Lecture

This spring, join alumnus Paul Nicklen as he returns to the UVic campus for a special free presentation based on his assignments in the Arctic and his March 2011 TED Talk "Tales of



Ice-bound Wonderlands." His stunning images will illustrate his passion for the polar regions and will move you to ask what personal changes you can incorporate into your life to make a difference. Registration information will be announced soon—check www.events.uvic.ca for ticketing details regarding the AXYS Group Distinguished Lecture Series.

Researchers receive green light for eco-friendly product

A new eco-friendly technology developed at UVic has been licensed by GreenCentre Canada with the support of UVic Industry Partnerships (IP). This new product provides an alternative to toxic solutions currently being used in marine and other environments to control moss, mold and mildew.

This special class of anti-fouling additives was created by organic chemist Dr. Thomas Fyles (BSc Chemistry 1974) in collaboration with Bob Rowe of Rhocraft R&D. The pair brought the innovation to UVic IP, the university's industry liaison office, to patent the technology and to get support for some of the initial product testing.

"The technology was initially slated to be used in marine coatings. It rapidly breaks down in sea water and does not accumulate in marine organisms making it an environmentally friendly alternative to other commercially available biocides," says Fyles. "When the active agent is no longer on the surface doing its job, it falls apart into non-toxic compounds."

This new green technology is the first of what UVic IP hopes is a long line of innovations to evolve from the partnership between UVic and GreenCentre Canada. As part of the Canada Centre of Excellence for Commercialization and Research, GreenCentre Canada is also a member of the Ontario Network of Excellence established in 2009 to advance green chemistry innovations at Canadian universities.


Hoffman receives Order of Canada

Earth & Ocean Sciences adjunct, Paul Hoffman was named an officer of the Order of Canada on June 29 for advancing the field of geology, notably through his landmark research on the Precambrian period of Earth's history. Hoffman is credited with proving the "snowball earth" theory, which in lay terms means that more than 650-million years ago the earth was one giant snowball of ice.

Established in 1967 by Her Majesty Queen Elizabeth II, the Order of Canada is the centrepiece of Canada's honours system and recognizes a lifetime of outstanding achievement, dedication to the community and service to the nation. Recipients' contributions are varied, yet they have all enriched the lives of others and made a difference to this country.

Student profile

Michelle Tonkin, Biochemistry and Microbiology Top student gets boost from award funding



Graduate student Michelle Tonkin's work to identify how parasites invade host cells and cause devastating diseases such as malaria could one day lead to saving millions of lives every year. Tonkin says, "It is both challenging and exhilarating to be working on the cutting edge of this research area. Hard-earned results that make a significant contribution to the field are definitely motivating!"

Her hard work hasn't gone unnoticed. She was recently published in the world's leading research journal *Science* in collaboration with a group in France. The paper was chosen as the top biochemistry entry in the issue. Her research to develop a detailed understanding of the steps of invasion will provide a solid foundation for the engineering of broadly neutralizing treatments and vaccines.


Tonkin has achieved numerous scholarships and prestigious awards and plans on pursuing a post doctoral fellowship once she has earned her degree. She was awarded the top prize out of more than 250 of the top five per cent of health research graduate students across Canada. Topping this impressive competition, she received the Lindau Award and Gold Award of Excellence at the Canadian Student Health Research Forum in Winnipeg (2011).

"Receiving scholarships has been a huge advantage in that I've been able to fully focus on my research in the lab and move forward. It's been really advantageous in that way." UVic graduate students are competitive for top-tier research scholarships, but Tonkin received the Alexander Graham Bell Canada Graduate Scholarship - CGSD3 for her doctoral level research as well as the prestigious Julie Payette NSERC Research Scholarship. Most recently, she was awarded a PEO Scholar Award for 2012-2013.

Tonkin is quick to thank her PhD supervisor Dr. Martin Boulanger and says, "Scientific research often feels like a roller coaster. Having a reliable supervisor and a project in which you are personally invested is key to a successful graduate program." When not in the lab, Michelle can be found touring the landscape on her motorbike.

Alumni profile

Daryll Harrison BSc Chemistry 1982, PhD Chemistry 1987



Daryll Harrison's time as a UVic student may have provided a strong foundation of academic knowledge, but it also reinforced his values of creative thinking and continuous learning, problem solving and time management. "I had to learn how to balance time between what I needed to do and what I wanted to do." While this lesson is true of most students, it's these skills that serve him well outside of the classroom.

As Vice President of Technology for NOVA Chemicals, Harrison manages a team "responsible for the development and commercialization of technologies that improve the financial, 'Responsible Care' (the chemical industry's commitment to sustainability) and environmental performance of NOVA's business, while serving our customers." As an active board member with GreenCentre Canada, he imparts an insider's view on the challenges and opportunities facing sustainability for his industry, and encourages the design of ethical products.

After completing his PhD in 1987, Harrison moved to Alberta to join NOVA Chemicals as a scientist. He misses Victoria's ready access to sailing, fabulous climate and craft beer, but has grown to appreciate all that Calgary and surrounding areas have to offer, especially the mountains for backpacking and skiing.

Harrison recalls many fond memories of his student days, citing "the Chemistry Co-op program, the positive impact of the dedicated UVic staff on myself and colleagues, the challenge of finishing my dissertation, and how I was fortunate not to have more lab safety incidents than I did" as highlights. When asked if he has any advice for current students he replied, "Plan for success, never give up on the goals that are most important to you, and build strong relationships—these are the things that matter the most."

Subatomic views: World's most advanced microscope arrives at UVic



UVic researchers isolate an individual protein-loaded polymer microsphere designed for encapsulated release of proteins as a novel device of drug delivery. The image shown is 200 nanometers, while the STEHM will give access to the atomic scale of picometers.

The University of Victoria is now home to the most powerful microscope ever built. On May 22, the 7-tonne, 4.5-metre tall Scanning Transmission Electron Holography Microscope (STEMM) arrived on campus in 22 pieces. The STEHM is a one-of-a-kind machine built for UVic in Japan by Hitachi High Technologies Canada and is the highest-resolution microscope in the world.

Unlike conventional microscopes, which use light to peer at specimens, the STEHM uses an electron beam and holography techniques to observe the inside of materials and their surfaces to an expected resolution smaller than the size of an atom. The STEHM will see materials beyond the nanoscale to the picoscale. A nanometer is one-billionth of a metre, while a picometre is one-trillionth of a metre. Atoms are typically between 62 and 520 picometres in diameter.

"This machine will be used for thousands of different types of research by scientists from around the world, who are already lining up to use it," says Rodney Herring, a professor of mechanical engineering and director of UVic's Advanced Microscopy Facility. "This microscope will open up a hidden world and gives UVic a research capability that no other institution has."

Engineers, physicists, chemists, biologists and medical researchers will use the STEHM to better understand subatomic structures relevant to areas such as medical and environmental diagnostics, communications, computers, alternative energy and manufacturing. The STEHM is expected to be operational by this fall.

Giving to UVic Science

The generous support of donors helps fund student scholarships, equipment, and research. To explore how your gift can make a difference, contact Ms. Jody Kitts, Development officer at 250-853-3245 or kittsj@uvic.ca.



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