



Biochemist wins national research fellowship



Boraston and PhD student Melissa Cid in the lab.

NSERC

Finding molecular ways to thwart microbial infections and generate biofuels will be uppermost in the mind of biochemist Dr. Alisdair Boraston for the next two years. Boraston is one of six Canadian scientists who were awarded a prestigious 2012 E.W.R. Steacie Memorial Fellowship by the Natural Sciences and Engineering Research Council of Canada.

The award goes to outstanding and highly promising university faculty who are earning a strong international reputation for original research. The award provides a research grant of up to \$250,000 over two years and frees recipients from teaching and administrative duties during that period.

While microbial pathogens and biofuels may seem unrelated, there's a common thread that unites them—carbohydrates. These are vital biomolecules found in most living things that store energy, transmit information and provide structure. Well-known examples are sugars, starch and cellulose.

Boraston, who is also the Canada Research Chair in Molecular Interactions, is one of the world's leading experts on how

carbohydrates and proteins interact in such processes as bacterial infection and the generation of bioethanol for fuels.

"Proteins and enzymes bind to carbohydrates and, in many cases, degrade or modify them," explains Boraston. "By finding out how these processes take place, we can manipulate these processes to discourage [as in bacterial infections] or encourage [as in the production of biofuels] the breakdown of carbohydrates for our benefit."

As a Steacie fellow, Boraston will continue his ground-breaking work on *Streptococcus pneumoniae*, a bacterium that is gaining superbug status and ranks as one of the world's leading causes of death from infectious disease. He'll also investigate how marine microbes break down seaweed cell walls, with an eye on potential applications to biofuel production.

"The research process is a highly creative one that requires freedom of time and freedom to think," says Boraston, who starts the two-year award on July 1. "I'm really excited about being able to devote all of my time and attention to thinking about science again."

IN THIS ISSUE

- 2 Dean's message
- 2 Fishy business
- 3 Cosmic dark core challenges scientific theories
- 3 Inaugural AXYS lecture
- 4 Alumni profile: Mark Lewis
- 4 Wiretapping for whales
- 4 Global adventurer: Julie Angus

DEAN'S MESSAGE



Welcome to this issue of Science Matters. Once again, we're proud to bring you stories of the success of our students, faculty and alumni. UVic Science continues to engage, discover and lead.

Whether it's been a few months or a few years since you've graduated, you'll always be a part of the UVic family. Be sure to check out

the faculty's new website (uvic.ca/science). It's designed to help you stay connected with UVic Science. To make connections with fellow alumni, go to the "Alumni" tab to learn how to network online or for information about events.

2012 marks two important milestones for Science and UVic. This year, the Bamfield Marine Sciences Centre will celebrate its 40th anniversary. UVic, as a partner of the Western Canadian Marine Biological Society, has run this world-class marine lab for teaching and research since 1972. It's grown a lot in 40 years—this year the centre is offering 13 summer field courses and a fall semester in marine sciences. Learning through hands-on experience in a unique coastal and marine ecosystem continues to attract students.

From September 2012 to June 2013, UVic will celebrate its 50th anniversary and you're invited to join us in recognizing this significant point in our history. UVic is gearing up for a whole host of celebrations and I encourage Science alumni to participate as we engage with our past and look to the future. The anniversary website (uvic.ca/anniversary) is your first stop for information about the many celebrations planned at UVic and how you can get involved. Be sure to mark your calendars for UVic's inaugural Homecoming weekend, Sept. 28–30, and plan to come back to campus. I look forward to seeing you here.

Rob Lipson

Fishy business

Biologists leading the way to healthier oceans

UVic's campus is located only minutes away from the ocean. But how many of us ponder the impact of our actions for fish and other ocean creatures? Several of our biology researchers are well-positioned to point the way towards healthier marine ecology.

As the newly appointed Liber Ero Chair in Fisheries Research, Dr. Francis Juanes' work in conservation is expected to have a lasting impact on the sustainability and viability of fish stocks. Dick and Val Bradshaw established the endowed chair in the context of climate change, human impact on marine ecosystems and declining fish populations. The Bradshaws, who are based in Vancouver, have shown deep philanthropic leadership by funding similarly named endowed chairs at McGill and Simon Fraser universities. Together, this Liber Ero network should lead to synergistic advances in our understanding of these critically important ecosystems for the benefit of British Columbia and Canada.

Dr. Julia Baum's work explores the impact of fishing on the life of predatory species, such as sharks. She investigates the role of these predators on coral reefs, and how the impacts of overfishing and climate change alter these species and systems. In February, Baum received a prestigious 2012 Sloan Fellowship which honours scientists whose potential and achievements identify them as rising stars. This is the first year the Alfred P. Sloan Foundation has included ocean sciences.

Dr. Kim Juniper holds the Leading Edge Endowment Fund (LEEF) BC Leadership Chair in Marine Ecosystems and Global Change. Juniper's research contributes to an improved BC—both environmentally and economically. His observations form part of a larger picture of how an ocean-climate system affects fish and their habitats. He focuses on how human-induced climate change is influencing ocean systems to give an improved understanding of fisheries' yields. One of Juniper's collaborators is biologist Dr. John Dower who specializes in how variability in marine environments affects fish populations.

These researchers form a core of excellence in fish biology research and are key players in helping ensure our oceans remain healthy for the future. *by Roxane Kelly*



VJ Tummich

50 years of Great Chemistry

Homecoming 2012—September 28–30

UVic's inaugural Homecoming designed specifically for alumni will take place this coming September. The Chemistry department will celebrate 50 years as one of the original departments of UVic Science by hosting a reunion weekend. It's sure to be a special opportunity for alumni to connect with each other, remember their UVic days and learn from outstanding teachers and researchers in a casual setting.

Chemistry's 50th anniversary reunion will include a mini-conference with alumni speakers and a departmental open house for the public including displays, hands-on activities, and the infamous Chemistry Show—originally created by Dr. Zonk (aka professor emeritus Reg Mitchell) and now presented by professors Alexandre Brolo, Scott McIndoe and Matt Moffitt.

Also planned are a variety of receptions and get-togethers for chemistry alumni and friends throughout the weekend. To register for the chemistry reunion, or for more information, email chem50yr@uvic.ca

For details on other Homecoming events, go to alumni.uvic.ca/homecoming. Plan to be a part of it!



Cosmic dark core challenges scientific theories

Roughly 2.4 billion light years from Earth, a massive clump of dark matter is pressing scientists to examine how they understand galaxies. An international team has detected what they are describing as a “dark core”—a large clump of dark matter that appears to have collided and stuck together, even as the galaxies the dark matter was attached to continued to move on.

“It challenges conventional understanding of dark matter and how dark matter should behave,” says UVic astrophysicist Arif Babul, the team’s senior theorist. “According to our current theory, galaxies and dark matter are expected to stay together, even through a collision. But that’s not what’s happening in Abell 520.”

Using data from NASA’s Hubble Space Telescope, the team looked at Abell 520—a collection of several galaxy clusters that are colliding into one another at high speed—to confirm the presence of the baffling gigantic clump of dark matter at its very heart.

The dark core was first discovered in 2007 by UVic astrophysicists. The discovery was so bizarre that most astronomers (including many in the discovery team) wished the result away, hoping it was a false signal, likely due to the limitations of using a ground-based telescope. That prompted Babul and his US collaborators to turn to Hubble, expecting to learn their initial discovery was incorrect. However, that only strengthened their original findings.

Babul said the dark matter clump has recently been detected by other ground-based telescopes, leaving him confident that it does exist. The next task will be attempting to determine whether the phenomenon can be explained using existing theories about dark matter, or whether those theories need to be rewritten to explain how the dark core formed.



NASA, ESA, CHT, CIO, M. J. Lee and A. Mahdavi

Composite image of Abell 520, a “high speed cosmic pile-up” of multiple massive clusters of galaxies. The “dark core” appears blue-green.

If the current theories are wrong, Babul says it could change everything from how scientists explain the formation of galaxies—a process that depends entirely on the existence of dark matter—to where gamma rays come from. “It’s exciting because dark matter is not easy to get a handle on. If this is really telling us something unique about dark matter, then it’s a breakthrough.”

Making a mark

Faculty milestones & achievements

New chairs boost health research talent in the Faculty of Science

Four science researchers recently secured Canada Research Chairs awarded to UVic by the federal government—medicinal chemist Fraser Hof and neuroscientist Gautam Awatramani last October and organic chemist Jeremy Wulff and biochemist Martin Boulanger this March.

As the Canada Research Chair in Supramolecular and Medicinal Chemistry, Hof studies how molecules bind together. He’s on the trail of a molecule that, when accidentally activated in men, can lead to an aggressive form of prostate cancer. His goal is to discover a way to neutralize this species.

Awatramani is a neuroscientist who is seeking ways to combat degenerative eye disorders. As the Canada Research Chair in Synaptic Physiology, Awatramani uses advanced technologies to understand how nerve cells within the retina of the eye communicate with each other.

Boulanger (BSc 1997 Biochemistry) studies structural interactions between proteins, especially in parasitic diseases such as malaria and toxoplasmosis. He’s been named the Canada Research Chair in Molecular Interactions and Structural Biology.

As the Canada Research Chair in Bioactive Small Molecule Synthesis, Wulff (BSc 1999 Chemistry) builds complex molecular structures and assesses their potential for new drugs in the treatment of diseases such as cancer, influenza and HIV/AIDS.

Now in its 12th year, the Canada Research Chairs program helps Canadian universities to strengthen their position as global leaders in research and development, bringing greater economic opportunities for Canadians. UVic now has 38 filled Canada Research Chairs, with 15 of the chair holders in the Faculty of Science.

CBC’s Bob McDonald presents inaugural AXYS Lecture

The Faculty of Science welcomed Bob McDonald to campus March 14 as the AXYS Group Distinguished Speaker Series’ inaugural lecturer. Nearly 1000 people attended the free public lecture by the well-known host of CBC Radio’s *Quirks and Quarks*.

“His uncanny ability to make complex things understandable and to draw clear concise explanations from his many guests is a credit to his skill as an educator and communicator,” says Science Dean Rob Lipson. “The AXYS Group has shown tremendous leadership and generosity to their community by funding this lectureship.”



Reflecting on the topic *Science as I’ve Seen It*, McDonald described how his career has given him the opportunity to make knowledge more engaging and accessible to the public. As a new resident of Victoria, McDonald noted in his talk the important scientific contributions of UVic Science including our work in particle physics and the search for dark matter, as well as our studies in climate science and using the Ocean Networks Canada Observatories: NEPTUNE and VENUS. *by Roxane Kelly*

For more details, ring.uvic.ca/news/bob-mcdonald

Wiretapping for whales

If Amalis Riera sometimes hears a symphony of squeals, whistles and clicks in her sleep, it wouldn't be surprising.

The earth and ocean sciences graduate student has spent hundreds of hours in front of a computer, headphones on, listening intently for the telltale voices of killer whales. What she's found out could have important conservation implications for these charismatic emblems of the BC coast.

The waters off Vancouver Island are one of the best places in the world to see killer whales, or orcas. Resident killer whales are a special conservation concern, facing threats such as reduced food availability, marine pollution and noise disturbance. Which is why Riera set out to shed light on a lingering mystery—where do BC's resident killer whales go when we're not seeing them, especially in winter?

The study site was Swiftsure Bank at the mouth of the Strait of Juan de Fuca, an area rich in marine life. For a year, a hydrophone suspended 10 metres over the ocean floor eavesdropped on passing whales. Riera trained herself to recognize their calls to determine which pod she was hearing. She also devised a system to separate one whale encounter from another, and to assess whether the whales were just passing by or spending quality time there, presumably to feed or socialize.

The results so far? Swiftsure Bank is a hotspot for killer whales—all year round. The new information is significant for endangered southern orca pods, since identification of critical habitats—the areas and resources vital for their survival—is part of the recovery plan under Canada's Species at Risk Act. See full story at communications.uvic.ca/edge/riera.html



Alumni profile

Mark Lewis, PhD

Canada Research Chair,
Mathematical Biology,
University of Alberta



Mark Lewis was a twenty-something UVic ecology student when a professor made a simple suggestion that would change the course of his life: enroll in some math classes. Facing “big questions” of population dynamics and causes of extinction, Lewis turned to equations and computer programming. Course work evolved into a double major, then an Oxford PhD, finally a Canada Research Chair in 2001 at the University of Alberta in the blossoming interdisciplinary field of mathematical biology.

Mark Lewis (BSc 1987 — Biology and Math/Computer Science) received this year's Faculty of Science Distinguished Alumni Award during Alumni Week at an awards ceremony February 8.

Mark has become not only a leader in the Canadian research community, but an important player in complex and controversial ecological issues—such as climate change and resource management—that affect Canadian and global societies. As an academic and a researcher, Lewis has been phenomenally successful. His work has been recognized with a number of significant awards, including the Canadian Applied and Industrial Mathematics Society Research Prize in 2009 and the CRM-Fields-PIMS Prize for Exceptional Research in Mathematics in 2011, Canada's top mathematics award. Lewis is the youngest recipient of this prize to date.

“I had many great teachers at UVic, but there are some who made quite an impression: I learned the beauty and complexity of ecology from Edwin Hagmeier. I experienced the power of statistical reasoning from Bill Reid's classes. Industrial math projects with Reinhard Illner taught me how math is a lens for the physical world around us. These teachers helped me transform from an unfocused youth to a scientist,” says Lewis.

“My relationship with UVic is enduring. Pauline van den Driessche has been a mentor for more than 25 years, since I was an undergrad researcher with her. We still continue to collaborate, whether on mathematical equations or on educational initiatives. She remains an inspiration to me for what it means to be a good scientist.”

Since being recognized by UVic, Lewis was named one of seven Canadian researchers awarded the 2012 Killam research fellowship granted by the Canadian Council for the Arts. The fellowship frees Lewis for two years from teaching and committee work to focus on research.

Global adventures

Alumna Julie (Wafaei) Angus and her husband Colin presented a free public lecture February 9 during Alumni Week 2012 describing lessons learned from their extreme adventures around the globe. From circling the world by human power to rowing across the Atlantic Ocean, their adventures highlight environmental issues and what we can do to make a difference.



With “Leaders in our Community” as this year's theme for Alumni Week, the Angus duo fit the bill. Through captivating images, these adventurers, best-selling authors and award-winning documentary film producers inspired an audience of nearly 300 with their riveting tales from the road.

In 2006, Julie and Colin completed the first human-powered circumnavigation of the globe, earning them the title National Geographic Adventurers of the Year (2007). Their 2011 National Geographic sponsored expedition, Olive Odyssey, saw them travel 3,500 km by small boat with their infant son from Spain to the Middle East. They retraced the trading routes of early seafaring merchants to explore the lands sculpted by the olive tree and uncovered how the olive first came to those shores.

Alumnus wins national teaching award

Dr. Charles Lucy, chemistry professor with the University of Alberta, is among 10 Canadian scholars honoured with a 2012 3M National Teaching Fellowship. The award recognizes exceptional achievements and contributions by teacher-scholars across Canada. Lucy (BSc 1983 Chemistry) credits UVic and his undergrad co-op work terms as contributors to his career and teaching success. For a full profile go to oncampus.macleans.ca/education/2012/03/09/forming-bonds-between-chemistry-and-careers/



University
of Victoria

FACULTY OF SCIENCE
PO Box 1700 STN CSC
Victoria, BC V8W 2Y2
www.science.uvic.ca
email: sciealum@uvic.ca

ScienceMatters 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.

Design | UVic Graphic Services