SCIENCE
contours
FACULTY OF SCIENCE ALUMNI MAGAZINE
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COLD AMBITION
Taking Antarctic exploration to unimagined depths

LIFE IN THE BIG CITY
Studying wildlife in an un-wild setting

NINT'S EGYPTIAN DIAMOND
PhD student crosses the world for a nano opportunity

Around the world with Science

message from associate dean

It is with great pleasure that I introduce this new issue of Science Contours, which focuses on our international outreach and activities. It is not hard to imagine that today we are a very diverse, dynamic, and international Faculty.

We are active in international recruitment, and this activity is reflected in a growing international student body at both the undergraduate and graduate level. Last year alone, international students made up 10% of our undergraduate student body and 46% of our graduate student body. Our efforts have resulted in a diverse student population, attracting scholars from 45 countries from places as far away as Nigeria, the Philippines, China, Korea, Hong Kong and as close as Mexico, the United States, Brazil and Colombia.

Our Faculty is also proud to have achieved global diversity in terms of our researchers and faculty members, as well as the field locations where their advanced research takes place. Our researchers have been recognized worldwide for their cutting edge work, with field sites that range from the deep Amazon Jungle to the Arctic and Antarctic regions.

Our goal is also to support undergraduate, graduate and faculty work via a wide variety of international agreements with top universities around the world, as well as with internationally recognized institutions such as Germany's Helmholtz Institution. Signing the U of A's Helmholtz Alberta Initiative in 2009 was one of our more proud and strategic achievements. Comprehensive agreements now being developed will also provide access to important emerging areas of great interest to our Faculty, specifically in China and Brazil, which are becoming priority countries for student and faculty exchange, as well as sites for research initiatives.

This issue of Science Contours includes a series of interesting and relevant profiles on alumni, student and faculty. For example, Dr. Andrew Bush (EAS) discusses the difficulties and realities of conducting research overseas. Alumni Cecilia Reyes and Rafael Avila-Flores describe their studies in the Philippines and Mexico, respectively.

On behalf of all us at the Faculty of Science, I would like to extend a warm invitation to all readers to explore our unique international micro-cosmos, and to celebrate the success of our undergraduate/graduate students, faculty and alumni in the international arena.

Arturo Sanchez-Azofeifa
Associate Dean, International and Graduate Affairs

SCIENCE contours

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A BREAK FROM THE FLOCK

The old proverb, "Birds of a feather flock together," might be in need of a rewrite, according to University of Alberta findings about chickadees. Researchers have divided chickadees into two personality types and their results could determine if they do, indeed, flock together.

Lead researcher Lauren Guillette says the first step in their research involved looking at how the song birds check out new territory.

"We characterized our chickadees as fast explorers or slow explorers," said Guillette, and the chickadees were then released into a large room lined with artificial trees. Researchers recorded how many trees, if any, the birds visited. Fast explorers flew to more trees, while slow explorers either stayed at the room entrance or visited only a couple of trees.

Guillette, a PhD provisional candidate in psychology, says fast explorers are bold and go straight for what they want, while slow explorers are shy and take their time.

"Bold animals are generally more aggressive in pursuit of food or a mate," said Guillette. "But a shy or cautious animal might be harder target for predators and might have a longer life span."

Outside the laboratory in the real world of chickadees, Guillette says a slow explorer's adaptability advantage shows itself when there's a change in its environment. That change could be the food supply, which could be affected by something as simple as the temporary absence of a homeowner who routinely filled a backyard bird feeder.

The researchers are cautious about linking bold and shy chickadees to human characteristics, but study co-author and U of A psychology researcher Chris Sturdy says there could be similarities. "If you wanted to anthropomorphize the research, the bold ones would be the charge straight ahead, go get 'em type of person."

WINNING STUDENTS

Tara Whitten, a PhD candidate in neuroscience, capped off a six-event week at the Commonwealth Games in Delhi, India with four medals – a gold in the 29-kilometre time trial, and three bronze medals at the velodrome in the team sprint (with Calgary's Monique Sullivan), the points race and the individual pursuit. Whitten went into the games as a double world champion, having won the points race and the Omnium at the track world's last March.

Undergraduate science student Paula Findlay took the triathlon world by storm, winning her first World Cup victory in Monterrey, Mexico in April. She then went on to make her first statement that she was ready to contend with the top athletes in the world after finishing fourth at the prestigious Hy-Vee Elite Cup in Des Moines, Iowa in June. Two weeks later, the bronze medallist from the 2009 Under-23 World Championships then moved on to win a Pan-American Cup race in Coteau-du-Lac, Quebec before writing the history books as the first Canadian to win back-to-back on the World Championship Series with victories on the 2012 Olympic course in London and then again on in Austria.

Tara Whitten

Reuters

Paula Findlay

CCIS LECTURE THEATRES OPEN TO STUDENTS

Almost 500 students piled into lecture hall 1-430, Sept. 8, 2010, for Peter Lee's Psychology 104 course – the first lecture in the U of A's newest facility, the Centennial Centre for Interdisciplinary Science.

The first of its kind in Canada – and one of just a handful around the world – CCIS represents an interdisciplinary approach to scientific discovery that will facilitate a cross-fertilization of ideas and techniques as never before. Established scientists will interact with a new generation of world-class researchers and outstanding students, sharing sophisticated tools and state-of-the-art facilities. From innovative teaching to cutting edge research, the benefits will be huge – for researchers, for the community and above all, for students.

DUCK VERDICT BOOSTS U OF A RESEARCH

News out of Fort McMurray that more ducks landed on an oilsands tailings pond reconfirmed a University of Alberta researcher's hunch that weather changes may be linked to the fatal incidents.

Biologist Colleen Cassady St. Clair is already deeply involved in the issue of ducks and tailings ponds going back to the initial Syncrude tragedy in 2008. Part of the $3-million penalty Syncrude must pay for the 1,600 ducks killed two years ago will go towards St. Clair's U of A research into bird migration and the effectiveness of bird landing deterrents.

St. Clair says the report that an unknown number of ducks landed on another Syncrude tailings pond might have something in common with the 2008 incident.

"Immediately it came to my mind that both incidents followed a rapid change in the weather," said St. Clair. "In 2008, and again this week, the ducks were migrating, and there was a dramatic cold snap that was followed by a corresponding change in barometric pressure. This has never been studied in relation to duck landings in the oilsands."

St. Clair says analysis of weather changes and the probability of ducks landing en masse was already on her list of things to do with the $1.3 million the court ordered Syncrude to pay towards her research.

OILSANDS RELEASING MORE TOXINS INTO THE WATER, SAYS RESEARCHER

University of Alberta ecologist David Schindler and several colleagues completed new research, concluding that Alberta's oilsands industry is releasing more pollutants into the Athabasca River, its tributaries and its watershed than previously estimated.

"This study counters industry and government claims that the pollutants are from natural seepage of bitumen," said Schindler.

Schindler and the research team analyzed 13 elements in river water and snow pack along the Athabasca and its delta. The pollutants found include mercury, arsenic, lead and cadmium. The researchers say the releases are a clear violation of the federal fisheries act and provincial guidelines for protection of aquatic life.

Schindler says some of the metals interact with organic pollutants, making them more toxic. The combined impact of the toxins on the river is not fully understood. This study focused on toxic elements in the Athabasca, above and below the oilsands upgraders and included analysis of airborne pollutants in the snowpack. Last year the research team reported on organic pollutants from oilsands development and found carcinogens similar to those released by the recent British Petroleum spill in the Gulf of Mexico and the 1989 Exxon Valdez tanker spill in Alaska.

As a result of the findings, both provincial and federal governments have struck a panel of scientists to review the state of the downstream watershed in the oilsands.

Worth the effort

by Scott Rollans

Overseas research can be extremely rewarding, but every project comes with its own challenges. When your research takes you to one of the planet's most remote and politically volatile regions, those challenges can be downright intimidating.

Just ask U of A climate researcher Andy Bush. He's studying glacial movement in the Karakoram—the Western Himalayan region that takes in parts of Pakistan, India and the Hindu Kush. "It's a beautiful part of the world," says Bush, "but people die there all the time."

Bush and his team had hoped to revisit the glaciers near K2, the world's second-highest peak. Their previous access point, Pakistan, was ruled out when the Taliban beheaded a Polish geologist there in February 2009. "Science is fun, but it's not worth dying for," Bush observes sombrely.

The team next planned to access K2 from the Chinese side. "We were all approved through the Academy of Sciences over there, and were looking at the governmental permissions," explains Bush. "And then we got our quote for how much they were going to charge us. It was $350 US, per person, per day. For each individual, that would have been $20,000. That's almost an entire grant!

"You know the porters are probably going to get five dollars a day, if that. So we were getting ripped off."

With China crossed off the list, the group looked at Nepal. Third time lucky, right? "We had the outfitters, and it was much more reasonable—about $1,700 per person for the whole trip," says Bush. "Unfortunately, the United States issued a travel advisory about a week before we were scheduled to leave." In short, none of the project's American students would be allowed to take part. "There goes half our team, with half the equipment. If you don't have the equipment over there, then there's no point. So we cancelled with four days to go."

If the team ever does manage to get past the bureaucracy and security threats, and makes it to K2, then they'll have to grapple with

Dr. Andy Bush at K2

some extreme physical challenges. "At times, you're hiking 12, 14 hours a day at high altitude," says Bush. "I train for months—running, rowing, and lots of exercise.

"The best part, though, is the month before you go, when you eat everything you want because you know you're going to lose it all. I put on ten pounds before my first trip to Pakistan, and by the end of it I had lost 25 pounds."

Unfortunately, then, this year's Nepal disappointment left Bush with more to deal with than just paperwork. "I put on all this weight, and then all of a sudden we weren't going," he laughs. "I had to lose it the old-fashioned way!"

Despite the setbacks and frustrations, Bush is determined to eventually get back to the Karakoram. A specialist in regional climate modelling (he's been with the U of A for over 13 years), he's after the kind of data you can only get on the ground. "It's such a remote and difficult place to get to, that there aren't very many scientific measurements made," he explains. "So the glaciers there have really not been systematically studied. NASA has satellites that are viewing them from space, but a lot of them are covered with debris—boulders, rocks—so you can't tell where the boundary of the glacier is. So monitoring it requires some level of ground trooping—GPSing the margins of the ice sheet."

> "In the central and eastern Himalayas, everything is melting."

With better data, Bush hopes to help unravel a crucial mystery. "We've found that about half the glaciers in the Karakoram are either holding their own, or even growing. And that's unique in the Himalayas. I've been doing work with numerical climate simulations to find out why that's the case. There are a lot of atmospheric factors converging on that particular spot that help the glaciers."

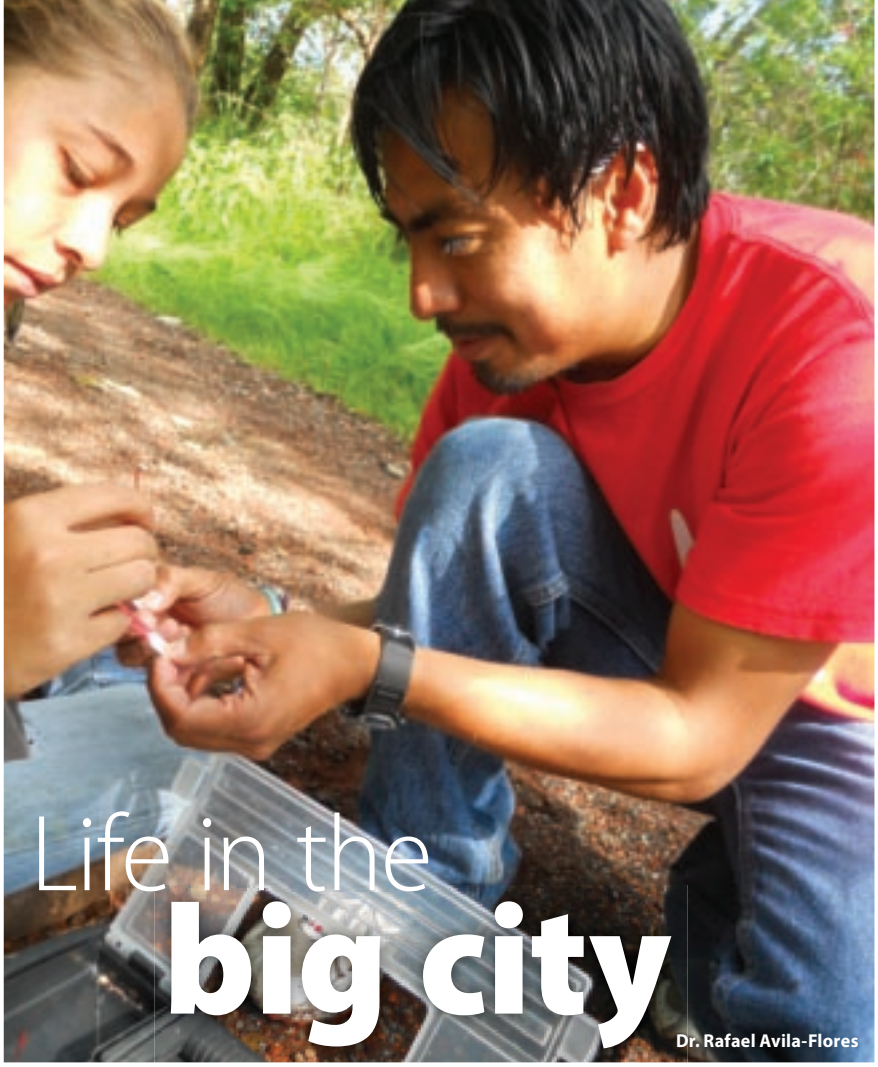
Elsewhere in the region, the glaciers are suffering a familiar fate, says Bush. "In the central and eastern Himalayas, everything is melting."

Next summer Bush hopes to once again pack his bags-and pack on the pounds-to head for the Himalayas.

"We're planning for northern Pakistan again, the Hunza valley and all of its glaciers," he says.

"You have to pick the region judiciously, so that it's safe for everybody. No place there is physically safe. You've got avalanches, you've got rock slides, crevasses, and hazardous treks. But, politically, you don't want to have to deal with human aggression on top of all the natural hazards you're facing."

Clearly, this scientist is up for the challenge.



Life in the big city

Dr. Rafael Avila-Flores

by Scott Rollans

Picture the life of a U of A-trained wildlife ecologist, and you might imagine an intrepid outdoorsman in plaid flannel, tramping through the boreal forest in search of the elusive woodland caribou.

Rafael Avila-Flores, on the other hand, focuses his studies on much smaller, less glamourous mammals: bats. And he does so in Mexico City, one of the most heavily urbanized environments on the planet.

"For me, Mexico City is like one large laboratory," explains Avila-Flores, who is completing a postdoctoral fellowship at UNAM's *Instituto de Ecología*. "It has extremes of all the processes that we applied ecologists are interested in. We can find extreme levels of fragmentation; Mexico City has only about four square metres of green area per inhabitant. Also, these fragments are highly disturbed."

By studying wildlife in such an un-wild setting, Avila-Flores hopes to broaden our understanding of the impact humans are having on other species. We know that urbanization decreases species richness, and decreases the abundance of most species, except for some species that are opportunistic and can exploit that environment successfully.

"I want to know how mammals respond to these changes, and how different species respond differently to urbanization, depending on their attributes."

A couple of bat species are doing particularly well in Mexico City, says Avila-Flores, in part because of their ability to exploit man-made environments. "They like crevices, so they can exploit almost any building." Also, because these bats can fly for long distances and have the ability of long-range echolocation, a fragmented habitat poses less of a problem. "They can reach almost any place in the city to forage."

Although his research doesn't take him to the remote wilderness, Avila-Flores says that the study of urban bats can add its own challenges to a busy academic's lifestyle. For one thing, these critters are nocturnal. "I have to combine my office work—reading, writing, teaching, that kind of things—with sampling bats at night," he says. "It can be difficult, especially the day after monitoring bats. You get tired—like I am right now."

Avila-Flores has just finished a day at the office, and has the prospect of a long evening ahead of him. First he has to reach his location, which on Mexico City's crowded streets can take an hour or longer. "I usually work from about half an hour before dusk until four or five hours after dusk," he explains. "So, this time of year that's probably until 11:00 or midnight.

"I have to catch the bats, and collect samples of blood, saliva, feces, and ectoparasites. All these samples together will tell us what kinds of pathogens are in the bats. Then I have to come back to my place and process my samples. That's probably another one or two hours."

Still, he's not complaining. "These days tend to be kind of intense, but it's fine," he smiles. In particular, Avila-Flores is looking at the relationship between the level of urbanization with the prevalence of some diseases, in particular rabies. "If we want to interest the public in bat conservation, we also have to provide them with solid scientific information about the real risks of sharing the space with these animals," he points out.

In addition to his study of disease patterns in Mexico City's bats, Avila-Flores is exploring the environmental factors associated with attacks by vampire bats on cattle in rural Mexico. He's also overseeing two students with small mammal projects of their own—an epidemiological study of prairie dogs, and a study of ectoparasites in Mexico City squirrels.

The projects mark a homecoming for Avila-Flores, who spent the last several years studying in Canada—completing his Master's at York before heading west to Edmonton for his PhD. Like many population ecologists, he was drawn to the U of A by the prospect of working with Stan Boutin. "He is able to see things that other people cannot see," marvels Avila-Flores. "I learned a lot."

> "If we want to interest the public in bat conservation, we also have to provide them with solid scientific information about the real risks of sharing the space with these animals."

For Avila-Flores, the U of A proved the perfect training ground for studying wildlife—even in the most unlikely of settings.

Bug love brings Filipina PhD student to the U of A

by Caitlin Crawshaw

Cecilia Reyes is the first to admit that her passion for insects can seem a little quirky. But, there's just something about their chitinous exoskeletons, three part-bodies and three pairs of joined legs that Reyes can't get enough of.

"I don't know what's wrong with me!" she laughs.

Whatever the reason for her fascination, Reyes comes by it honestly. Raised on a farm in the Philippines, she grew up around critters of all kinds and took a keen interest in bugs. So, when she stumbled upon an entomology class as an undergraduate student in the mid-1970s, she was intrigued. "I thought, 'This should be fun because I know them already,'" says Reyes.

At the time it was just a lark: Reyes figured she'd pursue a traditionally female-dominated profession like teaching or nursing, as women were expected to. "I wasn't thinking about the complications, and the money that would come with (being an entomologist). I was naïve – I just thought, 'Why not?' "

But after just one course, Reyes was smitten with the study of bugs – much to her family's chagrin. "My family couldn't relate," she laughs.

Dr. Cecilia Reyes

Their concerns did nothing to deter Reyes, who embraced her undergraduate and master's studies with vigor. She loved fieldwork especially, hunting for bugs like a kid in a candy store. "At the time it was like, 'Wow! I'm a discoverer!" (In fact, to date, Reyes has identified and named more than 35 new species).

Reyes "first love" was thrips, a species of tiny insects that feed on both animal and plant matter. Many varieties are considered to be pests since they can decimate crops. In the Philippines, the tiny bugs can cause major problems for rice farmers.

When it came time to choose a PhD program, Reyes looked around for a supervisor with an interest in thrips, eventually tracking down a researcher at McGill University. But just months after arriving, she discovered he didn't have funding for her to pursue her work.

Reyes admits she could have switched to a new bug – but she just couldn't bring herself to do it. "My heart was already with the thrips! And, I felt I could contribute to my country, since no one was working on it (in the Philippines)," she says.

Fortunately, she was referred to the U of A's Dr. Bruce Hemming, who happily took her on as a student. So, with her specimens in tow, Reyes arrived at the U of A campus in the fall of 1985. "It was very friendly," she recalls. Even though she was the only female student in entomology, she soon developed a rapport with her male colleagues, drinking beers with them at the Power Plant after class. "They were buddies," she says.

But while the people were warm, Edmonton winters were anything but. Reyes bundled up in so many layers she could hardly walk. "I loved HUB mall," she laughs. "I just stayed in HUB mall and usually didn't need to go out. I just needed to connect to the buildings."

In 1990, Reyes finished her PhD and began a long career as an entomology researcher, professor and administrator. These days, she's a professor of biology and works as a director at Emilio Aguinaldo College in Manila. Whenever she can, she urges students to consider going abroad.

"I tell them, 'I can only teach you this much. Go out of the country, learn, come back and tell me more,' " she says. "Books are a great resource, but they're no substitute for travel."

Field camp at Lake Ellsworth

Cold ambition

by Scott Rollans

It's not exactly a typical boyhood dream.

"When I was asked what I wanted to do when I was at school, I said I wanted to be a glaciologist," says John Woodward, on the phone from his home in Newcastle upon Tyne, England. "I think they thought I was slightly mad."

"We have a rich polar history in the U.K., with Scott, and Shackleton, and Franklin," Woodward explains. "I'd read a lot of the books about polar exploration when I was in my teens. It just had always fascinated me, to study the changing climates of the polar regions."

In 1994, Woodward was able to realize that ambition, through a University of Alberta connection. "I was lucky enough to be invited to come across to Alberta on a scholarship to do a Masters with [U of A glaciologist] Martin Sharp."

Before long, Woodward found himself aboard a Polar Continental Shelf Program airplane, winging his way to Canada's high Arctic. "That was my first significant experience of glaciological field work," he recalls. "We worked up on John Evans Glacier, which is on the east coast of Ellesmere Island. We conducted two field seasons there—a very long summer season and then a spring season."

If Woodward harboured any lingering doubts about his career choice, those two trips dispelled them for good. "It was an incredible experience, to fly up for the summer onto the glaciers, and to be left in a little camp on a Canadian Arctic island. It's another world up there."

Since returning to the U.K., where he now teaches at Northumbria University, Woodward has been able to continue his love affair with ice and snow. His projects have taken him to Svalbard (in the Norwegian Arctic), Greenland, and Iceland. Recently, however, his focus has switched to the polar opposite—literally.

> "Ellsworth has been cut off from the rest of the planet since it formed . . .

Woodward is part of a group of international researchers studying a series of lakes that lie hidden far beneath Antarctica's massive ice sheet. "The sub-glacial lake I'm studying with collaborators from the U.K. is called Lake Ellsworth," says Woodward. "Ellsworth is three and a half kilometres beneath the ice sheet."

Dr. John Woodward

Woodward and his colleagues have already mapped the lake, which is approximately two kilometres wide, 15 kilometres long, and 150 metres deep. In the Antarctic summer of 2012–2013, the British plan to drill into it.

"The idea is to look for life in these lake environments, and to find out what that life might be like," Woodward explains. "Ellsworth has been cut off from the rest of the planet since it formed, either as the Antarctic ice sheet advanced over that area, or since it formed at the bed of the ice sheet—in which case it could be millions of years old. Anything living in there might have evolved very differently than life at the surface."

In short, Woodward is now part of an effort to take Antarctic exploration to unimagined depths. Shackleton himself would be chuffed.

Laura Mazzino

Auntie Laura's space journey

by Scott Rollans

Every stage of Laura Mazzino's life so far has brought her one step closer to her ultimate goal: a career in space physics.

When the goal is so lofty, and the road to it is formidably long, it's important to make the most of the trip. And Mazzino does. "I love my life," she declares emphatically. "I'm grateful for every day. I do what I love, every day."

Mazzino was first smitten with astrophysics as a small girl in Argentina, when the PBS series *Cosmos* flickered its way onto the small black and white TV in her grandma's house, which she shared with her mother and siblings. "I was eight or nine, and didn't even know what astrophysics was," she recalls. "I just knew I wanted to do what Carl Sagan was doing."

Mazzino knew she couldn't very well launch her space career from Argentina, and her family couldn't possibly finance an education in the U.S., so she took a job as an elementary school teacher to raise funds. Then, "I packed my bags when I was 27, and left."

She completed her B.Sc. at University of Michigan, and headed to University of Louisiana for her Master's, to work with scientists who had NASA connections. She had to keep working full-time to cover expenses (which were much higher than she anticipated), but she didn't see this as a hardship. "Every time I went to a class, I felt lucky. I knew that many Argentineans would do anything to be in my position."

> "I just knew I wanted to do what Carl Sagan was doing."

In 2007, Mazzino accepted a position as a research assistant at Belgium's Center for Space Radiation. The job allowed her to spend time with her family, who had emigrated to Europe after Argentina's economic crisis. It also broadened her contacts. At one international conference, she met two professors from the U of A's Department of Physics. After Googling the school ("It looked great!"), she decided to head to Edmonton for her PhD.

Here, she's studying the complex interaction between radiation in the solar wind and the waves in the Earth's magnetic shield. Or, as she puts it, "My thesis is how the sun plays music with the Earth's magnetic field—which is very poetic!

"I'm hoping that my nephews are going to take their kids for vacation in space. They're going to tune into Auntie Laura's Space Weather Channel to see if it's good to go or not."

She's also up to her ears in the local astrophysics community—whether it's launching a weather balloon to the ionosphere at a Space Camp for elementary-aged kids, or helping coordinate a team to build a "cubesat," a miniscule satellite, as part of a Canada-wide competition.

For Mazzino, "reaching for the stars" is more than a cliché.

Great minds
think differently

by Scott Rollans

Bricks and mortar are all well and good, but the best universities are built on great minds.

That philosophy, backed by concerted and successful effort, is boosting the U of A's profile nationally and internationally. This article profiles three outstanding researchers (among many), from different countries and diverse backgrounds, who have put down new academic roots in Edmonton.

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Dr. Natasha Ivanova

AT HOME AMONGST THE STARS

As you might guess from her job title—Canada Research Chair in Astronomy and Astrophysics—Natasha Ivanova has chosen an otherworldly career path. A specialist in stellar interactions, and in particular common envelope events (when two stars are so close that they exchange material, and may eventually smash together), she spends her days crunching reams of data, building theories to help her model some way-out-there phenomena.

But, though her head may be thousands of light years away, her feet remain firmly on the ground. Like many of us, she credits her job satisfaction to the people she sees and works with every day.

The U of A's collegial atmosphere is what attracted Ivanova to Edmonton in the first place. In 2009, after completing postdoctoral fellowships at the University of Toronto and Northwestern University, she found herself interviewing for jobs at several prestigious academic institutions. When she visited the U of A, though, she knew she wanted to stay. "I really liked this place," she says simply. "The atmosphere here was very relaxed and friendly. It was the least stressful environment that I visited."

Ivanova arrived on campus in May 2009, giving her months to brace for her first Edmonton winter, a prospect she dreaded—a surprising attitude for someone with a Russian surname. "That's what everybody says," she smiles. "But, I'm from St. Petersburg. It has a rather mild climate, because it's close to the sea." Fortunately, she observes, "Last winter was not as cold as I could have feared."

Ivanova has always been comfortable working in an international context. "When you work in science, you don't see much of the country," she explains. "You go from lab to lab. So, it depends on the people in the lab."

Ivanova really hit her stride at the U of T 's Canadian Institute for Theoretical Astrophysics after earning a D.Phil. in Astrophysics at Oxford and completing her first postdoctoral fellowship at Northwestern University in Illinois,. "It was a very nice, very free environment," she recalls. "There were about six professors, and forty postdocs. We called it the Postdoc Republic."

Next spring, Ivanova hopes to build a similar energy at a five-day gathering in Beijing—the 2011 Common Envelope Workshop. The event, which she's organizing, will bring together about 20 astrophysicists to brainstorm theoretical solutions to specific problems in the field. "No PowerPoint presentations, just brains and debates," she promises.

That spirit of fun is no accident. Ivanova believes that she does her best work when surrounded by active, friendly minds who share her interests—a relaxed environment like the one she has found here at the U of A.

As she puts it, "I cannot do science if I'm stressed by something else."

NATURE THROUGH NUMBERS

High school students think of mathematics and biology as two separate subjects. But, for researchers like Hao Wang, the two are completely intertwined.

Wang came to the U of A in 2009, to join the Centre for Mathematical Biology, which was founded by Mark Lewis to foster interdisciplinary research. The CMB's reputation and excellent research atmosphere were strong draws for Wang.

When Wang arrived, he was a newcomer surrounded by prestigious academics—but he quickly felt at home. "Even during my interview, I felt welcomed by all the colleagues who talked with me." Since then, he has felt endlessly grateful for the U of A's supportive atmosphere. "Mark Lewis and Thomas Hillen help me so much with my grant applications and student recruitment," he says. "Without their help, it would have been impossible for me to develop my research group in one year."

Wang says that he wouldn't be able to list all the people he'd like to thank, but he can't resist adding at least one more name. "My departmental chair, Arturo Pianzola, has been very supportive in my research and group development. I can ask him for help with almost anything—annual report, or grant application, or even if I need a room for my group meeting."

Mathematical biology, as the name suggests, uses math to further our understanding of the natural world. Wang and his colleagues model natural systems and analyze massive amounts of data, looking for answers that scientists have difficulty finding through observations alone.

Wang's research interests include the emerging field of ecological stoichiometry—the balance of energy and multiple key elements, and their relationship with organisms and ecosystems. Wang does his best to explain: "Through history, only energy flow was considered in food webs and trophic cascades." But, clearly more than energy is at play. "Carbon supplies energy to cells," he says. "But, if we just eat carbon, that's not enough. For example, nitrogen is essential to build proteins, and phosphorus is an essential component of nucleic acids. The scarcity of any of these elements can severely restrict organism and population growth."

Along with Mark Lewis, Caroline Bampfylde and MSc student Nicholas Piazza, Wang is also working on a project—supported by MITACS and Alberta Environment—to assess the risks of oil sands pollution on biodiversity. "We've already developed a model to use the provincial government's data," says Wang, "and we will connect this modelling work to fish biodiversity as our next step." In short, it's a huge project with massive implications. "We believe our results can potentially help the government make wise strategies to balance oil sands development with the need to maintain the ecosystem."

After growing up in China and studying in the U.S., Wang is ready to settle in for a long-term, stable career—and it looks like he may have found his place.

"The students are excellent here. I enjoy teaching them, and working with them. And it's a great faculty—great people, great spirit, and great research."

Dr. Hao Wang

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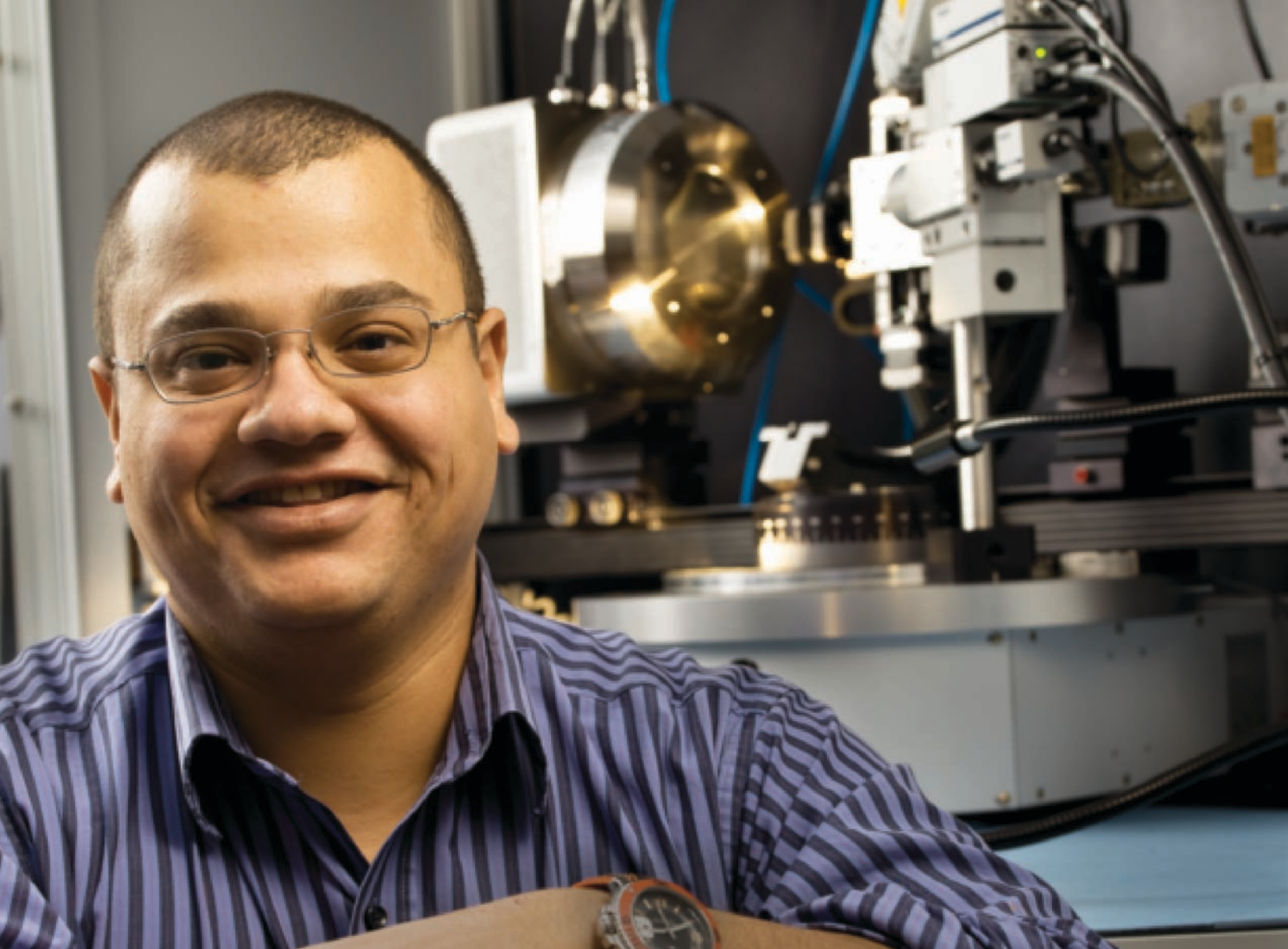

NINT's Egyptian diamond

by Scott Rollans

You never get a second chance to make a first impression. Luckily, when Sayed Nagy stumbled across the U of A website in 2005, he liked what he saw.

Nagy had just completed his Master's at the University of Cairo (finishing first in a class of 300), and was surfing the Web for a university with a strong nanotechnology program, in order to pursue a PhD. "I saw that a new scientist had come to the University of Alberta, with a prestigious background and an exciting research field," he says.

That scientist was Jillian Buriak, Senior Research Officer at the National Institute for Nanotechnology (NINT). Buriak recalls when the soft-spoken Egyptian appeared in her life—seemingly out of nowhere. "He just said, 'I'd really like to join your group.' I needed an electrochemist, so I said, 'Okay, great.'

"I didn't realize what a diamond I had there. Oh, my goodness. Had I known, I would have been all over him. I would have recruited him so heavily."

Within days, Buriak began to recognize her good fortune. "Sayed was asking some pretty fundamental questions about what we do, and making connections to much larger problems. He was thinking in a much more advanced way than most early graduate students.

"He's brilliant, and I will not say that about a lot of people."

Nagy's PhD work focuses on the interface between semiconductors and the metal wires that lead into them. Years ago, people attached wires to circuits using a soldering iron. These days, that "soldering iron" needs to be mind-bogglingly precise. "Feature sizes on chips are now in the area of 50 nanometres—the width of 150 atoms," Buriak observes. "So those interfaces have to be almost perfect."

To aid his work, Nagy immersed himself in the group that runs NINT's electron microscopy lab, gradually absorbing a free education in the field. That expertise, combined with NINT's amazing resources, has boosted his efficiency immeasurably, he says. "I have a friend at the University of Calgary, who sends in his samples every two or three weeks and then waits for the results. But I can prepare my samples in the morning, and then go downstairs at 10 p.m. and get my results."

Nagy plans to complete his PhD this term, and then pursue post-doctoral work with Richard McCreery. Eventually, he'll return to teach at the University of Cairo, passing along his enthusiasm and expertise to the next generation.

And he remains grateful for the website visit that brought him to Edmonton. "Whatever you want to fabricate, you have the equipment and the techniques to do it. Everything you can dream of is available at the University of Alberta."

LIFE ON THE ROAD

Faculty of Science recruiter Shennella Fraser travels to Asia, North America and South America in search of great students. In November 2010 – while on a trip to China – Fraser took time out to answer a few questions.

Q: On average, how long do you spend out of the country in a regular school year?
A: On average I spend one month out of the country. This will probably increase as we grow our international student base.

Q: Where would you like to go that you haven't already, and why?
A: I'd love to recruit in Japan and a few areas in Africa. Mexico is another region where there are many strong students.

Q: Where have you traveled to recruit students?
A: I mostly travel to Asia and focus on several cities in China. I've also recruited in Hong Kong and Brazil.

Q: What do you wish you could forget from your first international recruiting trip?
A: My first international school visit was in China and I was so nervous and excited. Fortunately the schools I visited had great students who were so much fun, they helped me cope significantly.

Q: Do you have students who you first met overseas that remember you when they get to the U of A?
A: I do get to see some of the students that I recruit internationally but I wish I could meet more! Those who contact me regularly like to drop in and visit every now and then which is nice.

Q: What is the most common misconception students have about the U of A, or Edmonton?
A: Many international students equate admission averages to the quality of the institution. Fortunately our rankings, achievements and established relationships help show we are a great school to consider. Our biggest hurdle is location. Many students have never heard of Edmonton, and if they have they have misconceptions about the weather!

Q: How has social media changed the way international recruitment is done?
A: Surprisingly, I've found that social media has had a bigger impact on the North American market. Many students I've visited in Asia do not have reliable access to the internet and Facebook isn't available in China, so social media isn't as effective in those regions.

A METEORIC OPPORTUNITY ON THE NATIONAL MALL

U of A meteorite specialist Chris Herd moved to Washington with his wife and two children in August to take up a prestigious one-year senior fellowship at the Smithsonian Institution's National Museum of Natural History. Herd says he pinches himself every morning as a reminder he really is working at one of the top places to study Martian meteorites and biggest museums and research institutions in the world. Science Contours caught up with him before the American Thanksgiving weekend.

Q: How did this come about – you going to the Smithsonian?
A: For my sabbatical I was looking for opportunities that would enable me to expand on projects I am already working on related to Martian meteorites. I knew there was an Alberta-Smithsonian relationship, so applied to the Senior Fellowship Program and found out in April I was successful.

Q: What are you doing there? What are you working on?
A: My research looks at specific occurrences of a special mineral within Martian meteorites that will enable new ways to date these ancient rocks. Being at the Smithsonian gives me access to an unprecedented collection of meteorites and I hope to be able to use the new equipment we have at the U of A's CCIM upon my return to do the dating.

Q: What do you like most about working at the Smithsonian?
A: Working here is a phenomenal experience and it blows me away every morning walking through the staff doors to think I get to spend my days in an internationally acclaimed institution like this. I really hope to take a lot from my experience here including seeing how the Smithsonian meteorite collection is managed and what I can learn that will benefit the curation of the meteorite collection at the U of A.

Biology sparks chemistry

by Scott Rollans

International study brings the opportunity to meet and collaborate with colleagues from distant parts of the globe—to exchange ideas and to form new bonds. And, in extreme cases, to fall in love, get married, and have children.

At first glance, Dave and Cecilia Latham would have seemed an unlikely pair. He grew up in New Zealand, and she in Argentina, so they had the entire continent of Antarctica separating them. But when, in 2004 they found themselves in closer proximity—sharing a tiny office, in fact—the differences in their backgrounds quickly melted away.

In 2002, Dave was searching the web for the right place to pursue his PhD. "I'm a keen hunter, and have always been very, very interested in large mammals," he explains. "I looked at various universities all over the world, and I actually almost took up a position in South Africa."

When funding fell through for that, though, Dave was equally excited to head to Edmonton to work with renowned biologist Stan Boutin. "I knew Stan worked on those types of species, and management-related questions. He was the next person to get back to me, so it was as easy as that."

About a year later, Cecilia Arienti was in Argentina, similarly scouring the Internet for a Master's program. "I was looking into going to either Canada or England," she explains. "I wanted to experience how the biological world worked outside of my country."

> "Dave went on holidays with his dad, and when he came back, he came back with a ring."

Cecilia had signed up on an email list for ecologists, and a U of A BioSci department advertisement for a Masters of Science position caught her eye. "This was with Stan Boutin and Steve Cumming, from the Renewable Resources department," she says. "I applied, and was accepted, and the funding was there." In short order, she had her bags packed for Edmonton. "Things happened very fast."

Soon after arriving, Cecilia found herself in the middle of Stan Boutin's Christmas party. Not surprisingly, she felt a bit disoriented. "I had studied English for a long time, but I had never been in an English-speaking country," she recalls. To make matters worse, it seemed as if one of the other guests wasn't even speaking English.

Latham family - Dave, Cecilia, Conall and husky Jezebel

"Dave has a very strong accent," she laughs.

Dave picks up the story. "When I first spoke to Cecilia, she couldn't understand a word I said. It carried on like that for a while, but I persevered." The effort became even crucial when they discovered they'd be in an office together. "Stan's lab was pretty big at that time, and his office space was a little bit cramped," Dave says. "So we were both put in a little wee poky room a couple of floors below his lab.

"We were in there pretty much by ourselves most of the time. So it was kind of fate setting us up there, I think. In about three weeks, we realized we were pretty keen on each other, and started dating."

They also found ways to support each other in their academic work, even though their fields of study didn't appear to overlap. Cecilia was analyzing forest fire data dating back to the 1930s—crunching numbers on a computer, essentially—while Dave spent much of his time in the field.

"My work was very isolated," Cecilia explains. "But Dave always tried to take me out in the field with him. That gave me a chance to see what my analyses were telling me. I could see why black spruce might be more fire-prone than other forested stands, for example. On the other hand, after I learned all these analytical techniques, I could teach Dave how to analyze his data. So we complemented each other in that sense."

Academic romances inevitably end up at a crossroads, however. When Cecilia finished her degree in 2007, Dave faced an impending decision. "I asked him, 'Should I stay, or should I go?' Dave went on holidays with his dad, and when he came back, he came back with a ring."

And the rest is history? "The rest was just born!" laughs Cecilia.

In late September the Lathams, who now live in New Zealand, celebrated the birth of their son Conall. He's apparently part of a minor BioSci baby boom, Cecilia says. "There are two other couples—the guys did their PhDs at the same time as Dave, and their wives did their Masters kind of at the same time as I did. So we were all very good friends. And they all recently had their first babies as well."

Clearly, international studies and biology can be a potent combination.

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A GEM OF AN OPPORTUNITY

Dr. Graham Pearson

Since moving to Edmonton from the U.K. in October, Graham Pearson has had some trouble getting used to the weather—and not for the reasons you'd think. "I'm sure most people would say the biggest challenge is adjusting to the cold," he says. "But, actually, my wife and I are having more trouble adjusting to the amount of sunshine here. As you probably know, England's not a sunny country. It's not second nature to grab your sunglasses every time you go out!"

Along with the boost to his vitamin D levels, Pearson believes the move will push his research to the next level. Already recognized as one of the world's leading experts in diamond studies, Pearson is the new Canada Excellence Research Chair in Arctic Studies. Although, on this day, he still hasn't had the chance to unpack his files, he's clearly energized by his new academic surroundings. "There's already a world-class group here that does research on diamonds, and the rocks that host diamonds. If you're going to make progress, then you need an excellent bunch of colleagues around you, to trade ideas to make sure you've got it right, and to feed off."

As a CERC recipient specializing in such an economically vital field, Pearson will have the resources to craft his ideal physical work environment as well. "It's an opportunity to build a totally new lab, with enough funding to buy the very best, state-of-the-art equipment. And to complement what's here, because they've already got tremendous labs at the U of A. This will be something that's unique in Canada—actually, unique pretty much anywhere—for doing the sort of research that I do."

Pearson and his colleagues will be studying the deep continental roots beneath the Canadian Arctic, using rock samples collected from volcanic diatremes—vents left behind by underground explosions. By analysing these samples, they hope to build a better understanding of how diamonds form.

Of course, that kind of knowledge has obvious practical implications, Pearson observes. "You're developing technologies and methods that may help companies decide where to look next for diamonds, or whether a given deposit might be economic, without having to spend millions to take bulk samples."

Pearson also hopes to build upon his method of pinpointing a diamond's geographic origin. "Diamonds are 99.9 percent carbon, but there are tiny amounts of impurities," he explains. "These trace impurities appear to be at different relative concentrations in different areas." By analysing those elemental signatures, along with other factors like shapes and size distributions, scientists could tell whether a batch of diamonds came from Canada's Arctic, for example, or from a sub-Saharan war zone.

"That helps Canada, by helping to assure Canada's brand name," says Pearson. "There's a lot of interest in that from a company level, and from the RCMP. And there's an obvious application to the Kimberly Process, the multi-government-funded initiative to combat conflict diamonds. So, that's a very nice spin-off to our pure research."

Clearly, diamonds are a CERC's best friend.

Science students round out their education with global travel

Study Abroad program lets undergrads pay U of A tuition at international schools


Cathy at Pamukkale, Turkey


Wiew of the Cappacdocia, Turkey

by Caitlin Crawshaw

For most of her degree, biology major Meagan Saunders kept her nose to the grindstone, prioritizing academics over extra-curricular activities.

But everything changed when she signed up for the study abroad program, with hopes of studying in Norway, a country whose wilderness opportunities matched Saunders' "outdoorsy" inclinations.

The U of A's Faculty of Science routinely sends students to 27 different universities in 10 countries around the World. Thanks to partnerships between the institutions, students pay U of A tuition fees and can earn credits towards their degree programs.

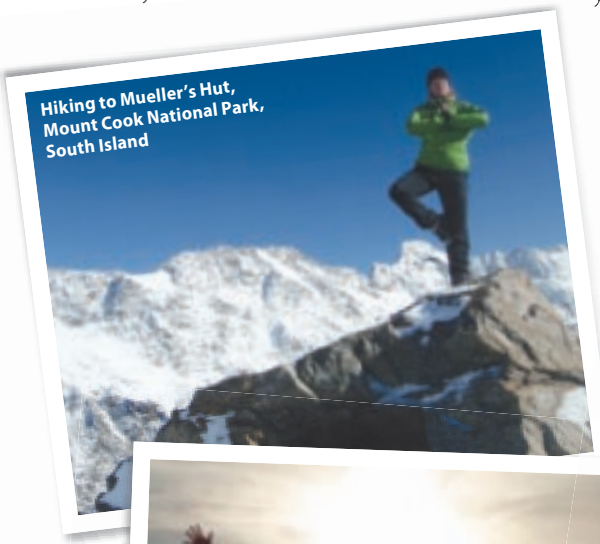
In August 2009, Saunders hopped on a plane for the University of Bergen and spent the next year exploring, both personally and academically.

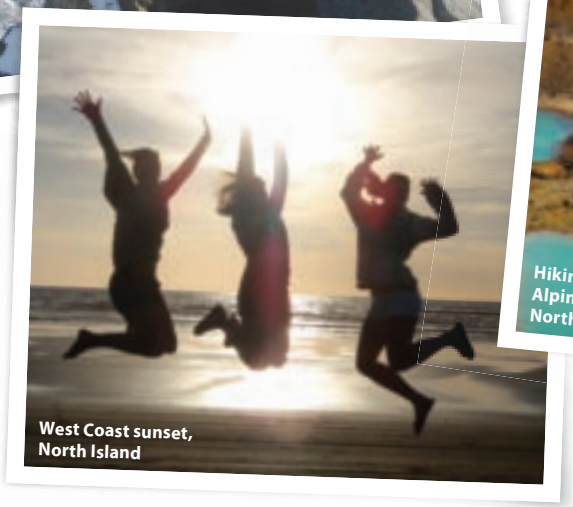
During the week, she studied Norwegian language and culture – drawing on some Norwegian classes she'd taken at the U of A prior to her arrival – and took a winter ecology class. "We went to the place where they filmed the ice planet Hoth in Star Wars," she says. "The University of Bergen had really great field programs."

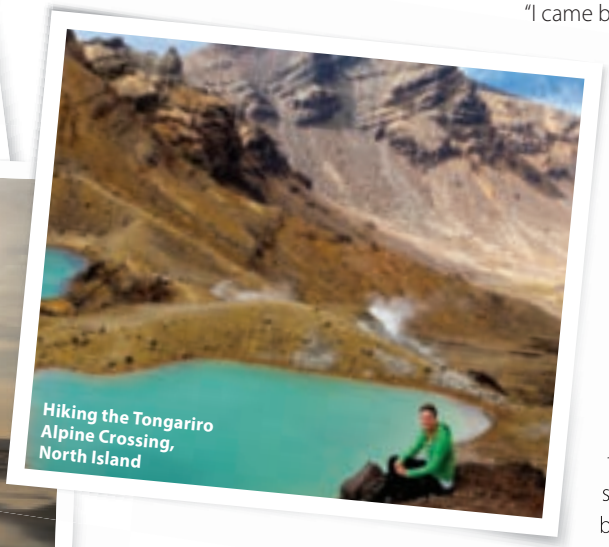
On her time off, Saunders hiked through the Norwegian wilderness and travelled the country. When the school year ended, she spent the summer traveling through Europe with family and friends.

This spirit of adventure followed her home. "I came back and ended up doing much more. I joined more clubs, went on more trips," she says. Having developed strong Norweigan language skills overseas, she changed her minor to Norwegian.

Like Saunders, Cathy Danilec chose to travel towards the end of her degree. Towards the end of her third year, she realized she wouldn't be able to finish her degree in four years if she didn't take an extra course in the summer. "I figured


Hiking to Mueller's Hut, Mount Cook National Park, South Island


West Coast sunset, North Island


Hiking the Tongariro Alpine Crossing, North Island

Hagia Sofia in Istanbul, Turkey

that if I had to do school over the summer, I might as well do it outside of Edmonton," she says.

Danilec ended up at Middle Eastern Tech University, in Ankara, Turkey – about as far from Edmonton as a student can get. "I wanted to go to a country that would be totally different from what I knew," she says.

While Turkey was more westernized than she expected, Danilec was struck by the differences between Middle Eastern Tech University and the U of A. The Turkish campus was so large that an inter-campus bus system was needed to help students get from class to class, and many students would hitchhike.

Figuring out how to navigate a foreign land on her own offered the chance to learn more about herself, says Danilec. "You're placed in these situations where you have no idea what's going on, and you have to learn about things and figure out how to go places. It was a good confidence boost."

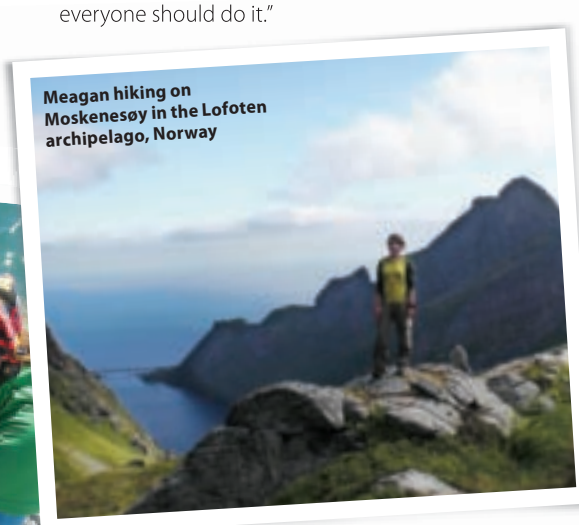
Like many study abroad students, Alyssa Chappell's friends recommended the opportunity to her. Chappell applied and, in 2008, headed to New Zealand to study at the University of Otago in Dunedin.

Having travelled internationally as a tourist, Chappell relished the opportunity to be immersed in the culture. During the semester, she took Maori culture and language classes, and spent her weekends traveling around.

Like her friends, Chappell is quick to recommend the program. "It's really quite easy to apply. You just have to investigate where you want to live," she says. "I think everyone should do it."

> The U of A's Faculty of Science routinely sends students to 27 different universities in 10 countries around the World.

Fresh caught herring, Sotra, Norway



Meagan hiking on Moskenesøy in the Lofoten archipelago, Norway

Sotra Island near Bergen, Norway

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