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SCIENCE contours

FACULTY OF SCIENCE ALUMNI MAGAZINE

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Our recent Science Graduates

Realizing their big dreams

Celebrating the Impact of

Recent Graduates

The cover story for this issue of Science Contours features one of our more recent graduates Layla Neufeld – a caribou biologist working in Jasper National Park. The part she plays in protecting one of Canada's most iconic and threatened species gives all of us in the Faculty of Science a real sense of pride.

I had the great pleasure of meeting Layla – who studied as an undergraduate with polar expert David Hik - in November when she spoke at a luncheon we hosted for fall 2009 graduates.

Layla's words of wisdom about how she has come to be a caribou biologist reminded me once again of the real impact our alumni are having on the world. I learned about the very different working world our recent science graduates are entering, but was encouraged to hear that we are still doing a great job and keeping up with the times.

Layla's words, spoken to graduates barely a decade younger than herself, resonated with me as a dean, because it was confirmation that the programs, research and teaching we offer the next generation of scientists do equip people like Layla to make a difference.

This issue of Contours features a selection of stories about recent graduates like Layla who are making a difference in the world.

In November I also had the pleasure of honoring one of our more high profile alumni – Discovery Channel's Jay Ingram - with an honorary Doctorate of Science for his work in bringing science into the public domain.

That same evening Jay and his blues band The Mutations performed to a sell-out crowd at the Myer Horowitz Theatre. The title of his presentation was Darwin's Sexy Science – the evolution of human sexual behavior. It reminded me once again how much science underpins almost every aspect of our daily lives.

Please keep in touch with us; we are always interested in hearing what you are doing.
Happy 2010.

Gregory Taylor
Dean of Science

Science alumnus Jay Ingram talks with Science 100 students after his public lecture on the U of A Campus in November.

SCIENCE contours

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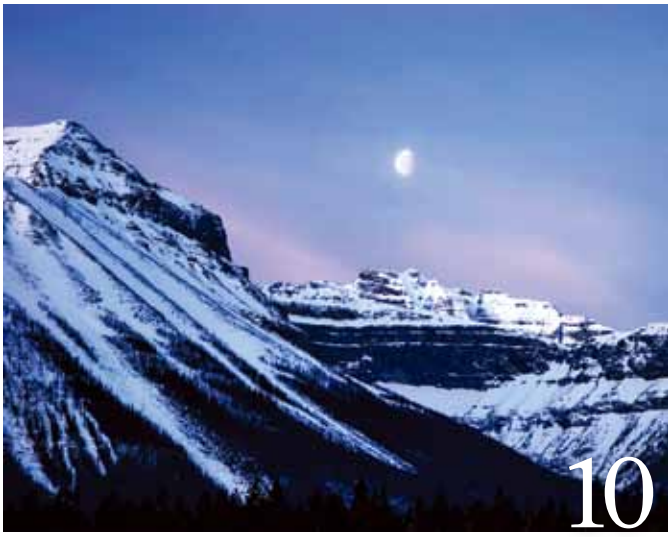


science bases

features

cover *story*


Mark Bradley

A Misplaced
Dinosaur Tooth
May Have Been Cannibalism

You don't have to be a palaeontologist to suppose that way back when dinosaurs roamed the Earth, chances were good meat eaters would have dined on one of their own.

Evidence from a southern Alberta dig site and some paleontological detective work by University of Alberta researcher Phil Bell has however, unearthed new clues about dinosaur cannibalism.

"Cannibalism is pretty widespread in today's ecosystems," said Bell. "Birds do it, crocodiles do it-it's not as uncommon as we think it is."

"Evidence of dinosaur cannibalism, however, is rare," said Bell, a palaeontology PhD candidate. "The only proven case of one meat-eater eating another of the same species was found in Madagascar in 2007."


Phil Bell
Dr Phil Currie

Bell worked with the jawbone of what appears to be a Gorgosaurus - found in Alberta's Dinosaur Provincial Park in 1996 - which had something embedded in it. It was in fact the tip of a tooth from another meat-eating dinosaur.

Bell says that tooth definitely shows that a fight had taken place. "Either the attacker fought and killed this dinosaur or it was already dead, and dinosaurs are not known for passing up a free meal."

Analysis of the wound and jaw bone showed researchers that the bite was applied with the same force as a two-tonne great white shark says Bell. "Sharks are a good analogy as their teeth frequently break off in an attack and become lodged in the victim."

"We're always looking for evidence of how these animals behaved and that can only come from extraordinary fossils. This is one of those."


Phil Bell on a dig site in Alberta

Personality Types May Contribute to Genetic Success of
Bighorn Sheep

U of A researcher David Coltman and his colleagues are trying to find out what makes a bighorn mountain sheep tick. They do that by trekking deep into the foothills of the Rocky Mountains to a place called Ram Mountain. They trap mountain sheep in a plywood box with walls five-metres high.

And they just don't watch the animal; they go into the box with it.

In addition to weighing and measuring the animal, the researchers gauge its personality by how much of a fight it puts up. Coltman and the research team are trying to figure out if personality type has anything to do with how long a mountain sheep lives or how many offspring it produces.

"Patient, less aggressive males bank on living long enough to become the dominant ram and produce lots of offspring," he said, adding the "bad boy" personalities of the bighorn mountain sheep world are the young rams that want it all, right now.

Coltman is co-author of a recent paper on animal personality research published in *The Journal of Evolutionary Biology*

The Ram Mountain trap and release study has been going on for close to 40 years so researchers have recorded lots of repeatable behaviour on individual mountain sheep and can see the same trends in their offspring.

Coltman says research into the personalities of wildlife is a growing field and one day the information could be of use to livestock producers and even pet owners. "Domestic breeders might want to focus on animals less prone to stress for the benefit of the animals and the people around them."

Infocus Imagery

University of Alberta Sets Alarm for

Incoming Space Storms

A team of researchers at the University of Alberta in Edmonton has broken new ground in outer space by pinpointing the impact epicentre of an Earthbound space storm as it crashes into the atmosphere and giving an advance warning that it's on the way.

The studies, using data from the NASA THEMIS mission, reveal that magnetic blast waves can be used to pinpoint and predict the location at the edge of space where space storms dissipate their energy. The technique can be considered as the seismology of space, the epicentre marking the location where the energy equivalent to 50 gigawatts of power, or the output of 10 of the world's largest power stations, is dumped into the atmosphere.

U of A Physicists Jonathan Rae and Ian Mann are leading the research team that has found the epicenter of impact. Using information from ground stations spread across northern Canada and five NASA THEMIS satellites the researchers look for the eye of the storm, hundreds of thousands of kilometres above the Earth.

"We see the benevolent side of space storms in form of the northern lights," said Mann. "When electrically charged particles speed towards Earth and buffet the atmosphere, the result is often a dancing shimmering light over the polar region."

The Earth is protected from the most damaging direct effects of radiation from these space storms by its atmosphere, but in space there is nowhere to hide. High-energy electrically charged particles released in space storms can disable spacecraft, interrupt radio communications and GPS navigation, and damage electric power grids.

Physics Professor Identifies

Youngest Neutron Star

University of Alberta physics professor Craig Heinke has solved a mystery that lies 11,000 light years beyond Earth and has puzzled astronomers for years.

When a supernova, an exploding star 20 times heavier than our sun, blasted apart, it left behind a small core, a 20 kilometre-wide remnant, which Heinke and a colleague identified as a neutron star. It's the youngest neutron star ever identified, and its atmosphere, a thin layer of carbon, is one of a kind.

"The death of a star is that violent," said Heinke. "It took centuries for the dust to settle and when it did, just 10 years ago, the star's mysterious core was revealed."

Data from a NASA satellite revealed that the neutron star had a temperature of roughly a million degrees Celsius; 3,000 times hotter than boiling water.

Heinke eventually concluded that the core is a neutron star and that its unusual carbon atmosphere is due to its young age. Up until now researchers have only had much older neutron stars to examine and none of them had a carbon atmosphere. Heinke says it was the carbon atmosphere that caused a lot of confusion for astronomers.

Heinke and his collaborator, Wynn Ho of Southampton University in the United Kingdom, had their results published in *Nature*.

Blake Johnson – BSc 1985

Water World

Making ends meet in a Kayak

Blake Johnson

Blake Johnson

There are no roadways when you're in a sea kayak, and Blake Johnson loves it.

"Sea kayaking is a great escape physically and mentally, because when you're out on the ocean you're not on anyone else's path, and you feel like you're on a journey of exploration and discovery," he says.

It is perhaps no coincidence, then, that Johnson has not followed a conventional path in his career.

After graduating with a BSc from the University of Alberta in the mid-'80s (but not before founding the U of A Entrepreneur's Club, which continues today), Johnson worked for Apple and then ran his own graphic design corporate communications company.

After more than a dozen years in those jobs, Johnson started Batstar Adventure Tours, which is based in Port Alberni, British Columbia and specializes in sea kayaking.

Batstar has won many awards and distinctions since Johnson created it in 1999, but a citation from National Geographic magazine in 2009 for being among the "best adventure travel companies on earth," stands out among them.

"The National Geographic designation] is a huge honour and very humbling," Johnson says. "It shows that we really take care and really know what we're doing—it's like having Martha Stewart tell you that you make the best muffins."

Johnson believes the personal touches that Batstar offers garnered the attention of National Geographic editors.

"Of course, people are going to expect great guides and great food and great wine and great equipment and all of that, but it's the intangibles that count. For example, if you're into photography, we'll plan the trip to give you a lot of opportunities for that," he says.

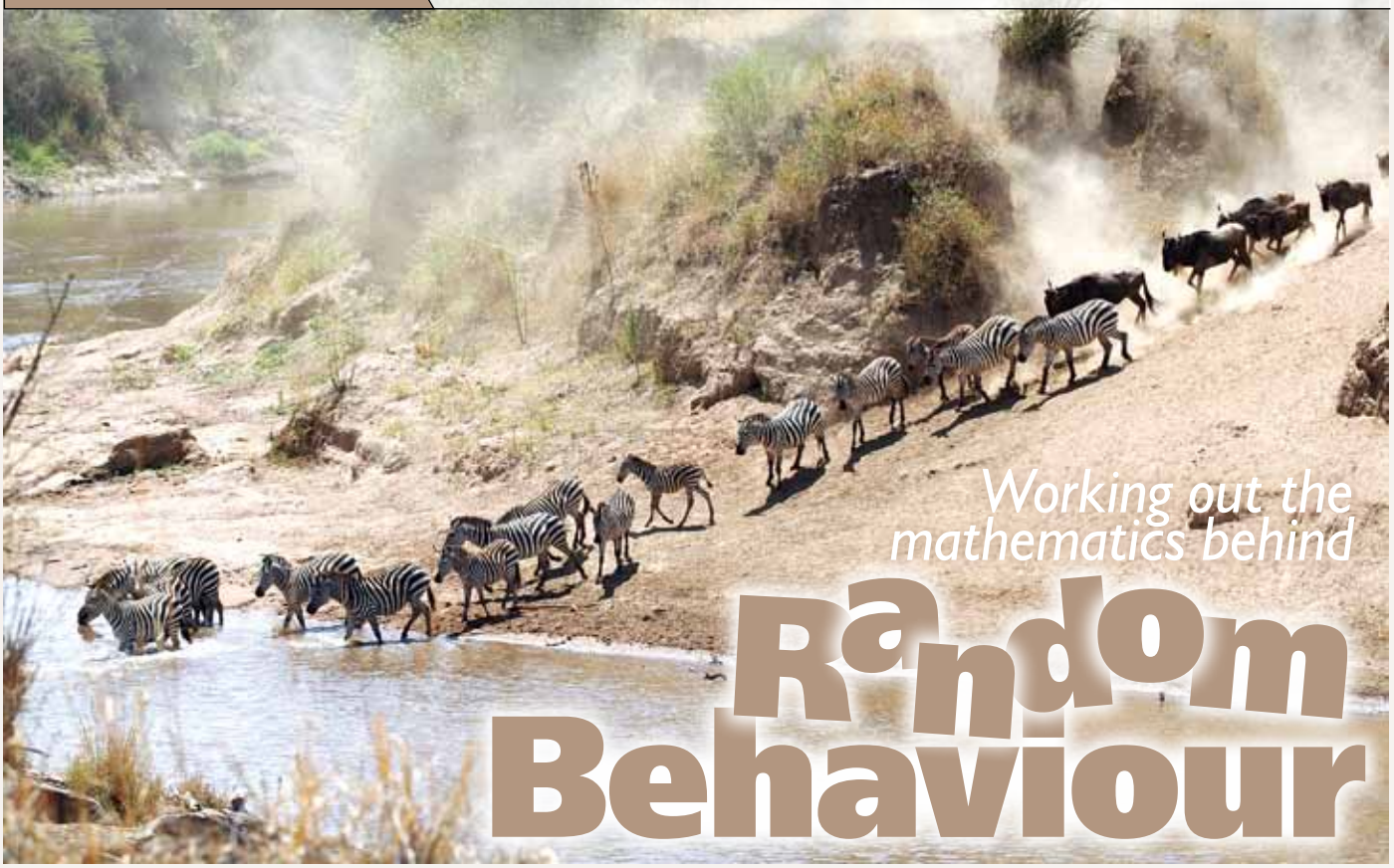
Johnson finds his work "extremely rewarding." It has allowed him to meet and befriend "amazing people from around the world" and provide them with life-transforming experiences. It has also given him some sweet vindication.

"I majored in geography and physics, and people would always tease me and say, 'What did your degree get you? You're working at Apple.' Or, 'You own a graphics design company,'" he says.

"But science teaches you discipline and how to learn, and it builds an appreciation for learning and discovery," he adds. "When I first started [kayak tour] guiding, I found myself immersed in the outdoor environment, and the core of my science education really came to life. Everywhere you looked it came into play—marine life, plant life, rocks, geography, astronomy, natural history—pretty much everything."

"So, yeah," he laughs. "No one teases me anymore."

Raluca Eftmie – PhD 2008



Working out the mathematics behind

Random Behaviour

Raluca Eftmie has never been to the Serengeti, but she has discovered things about the animals there that biologists in the field had never known.

Her special insights also extend beyond the African plains to answer questions about fish, birds and insects—even bacteria colonies—that have stumped experts who've spent their lives studying these organisms.

What's more, the Romanian native was able to make these breakthroughs while she was a PhD student at the University of Alberta.

The secret to her success, she believes, is that she has taken a new approach to answering old questions.

In her work related to animals, Eftmie used applied mathematical modeling to figure out how "self-organizing" groups of animals within species—especially those thought to be "leaderless"—move and behave.

Scientist have long believed certain animals exhibit seemingly random patterns when they move in packs, such as zigging, zagging and reversing course, and that these creatures were acting under the principle of attraction and repulsion; that is, their movements were dictated by a desire to remain a specific distance from each other—not too far and not too close.

However, Eftmie's modeling has shown the animals' movements are also related to subtle forms of communication within the group. As such, the sudden shifting of, say, a herd of gazelles or a school of fish, is partially random but is also in part due to communication mechanisms between individuals in the group, as they avoid predators and find food, for example.

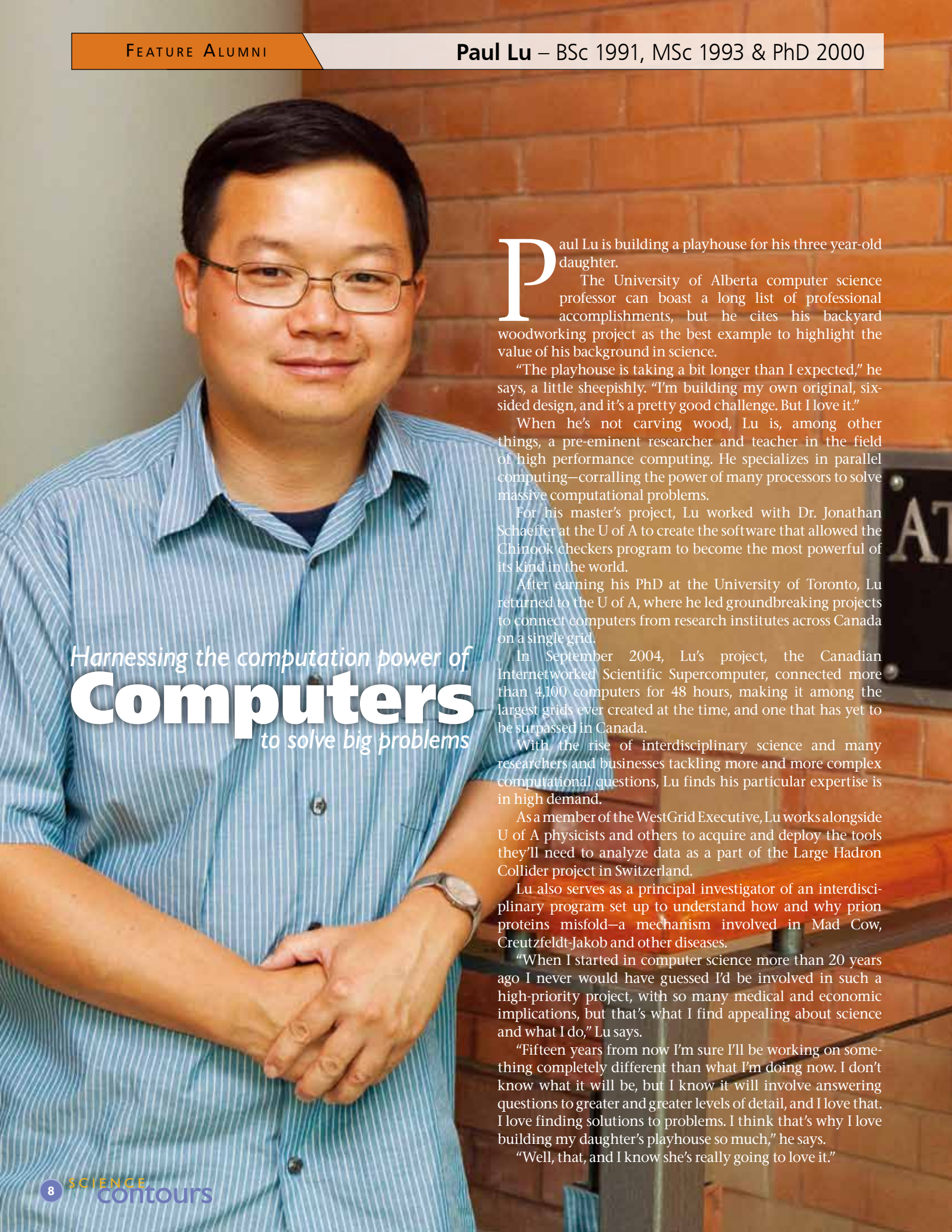
Eftmie's work earned her the 2008 Best Dissertation Award in the Canadian Applied and Industrial Mathematics Society Competition. She was humbled by the honour, but she hopes the work she's doing will become more commonplace in the future.

"Traditionally researchers have worked in their fields and discovered all they are able to discover, I think, but the new research involves interactions between different fields, and mathematics can act as a link for this. You can use mathematics to make sense of large amounts of data and answer questions that you couldn't before," she says.

These days, Eftmie is a post-doctoral fellow at McMaster University, where she is analyzing interactions between cancer and immune cells. The ultimate goal is to create a cancer vaccine to prevent and even cure the disease.

"I love applied mathematics because it gives me an opportunity to make a contribution," she says. "I think all of us want our lives to matter in some small way, and if I can add even just a tiny bit to the whole store of human knowledge, then, when I'm 80, I think I'll be satisfied that I didn't live in vain."

Paul Lu – BSc 1991, MSc 1993 & PhD 2000



Harnessing the computation power of

Computers

to solve big problems

Paul Lu is building a playhouse for his three year-old daughter.

The University of Alberta computer science professor can boast a long list of professional accomplishments, but he cites his backyard woodworking project as the best example to highlight the value of his background in science.

"The playhouse is taking a bit longer than I expected," he says, a little sheepishly. "I'm building my own original, six-sided design, and it's a pretty good challenge. But I love it."

When he's not carving wood, Lu is, among other things, a pre-eminent researcher and teacher in the field of high performance computing. He specializes in parallel computing—corralling the power of many processors to solve massive computational problems.

For his master's project, Lu worked with Dr. Jonathan Schaeffer at the U of A to create the software that allowed the Chinook checkers program to become the most powerful of its kind in the world.

After earning his PhD at the University of Toronto, Lu returned to the U of A, where he led groundbreaking projects to connect computers from research institutes across Canada on a single grid.

In September 2004, Lu's project, the Canadian Internetworked Scientific Supercomputer, connected more than 4,100 computers for 48 hours, making it among the largest grids ever created at the time, and one that has yet to be surpassed in Canada.

With the rise of interdisciplinary science and many researchers and businesses tackling more and more complex computational questions, Lu finds his particular expertise is in high demand.

As a member of the WestGrid Executive, Lu works alongside U of A physicists and others to acquire and deploy the tools they'll need to analyze data as a part of the Large Hadron Collider project in Switzerland.

Lu also serves as a principal investigator of an interdisciplinary program set up to understand how and why prion proteins misfold—a mechanism involved in Mad Cow, Creutzfeldt-Jakob and other diseases.

"When I started in computer science more than 20 years ago I never would have guessed I'd be involved in such a high-priority project, with so many medical and economic implications, but that's what I find appealing about science and what I do," Lu says.

"Fifteen years from now I'm sure I'll be working on something completely different than what I'm doing now. I don't know what it will be, but I know it will involve answering questions to greater and greater levels of detail, and I love that. I love finding solutions to problems. I think that's why I love building my daughter's playhouse so much," he says.

"Well, that, and I know she's really going to love it."

Rebecca Marsh – BA 1994, BSc 1997, PhD 2007

You don't need to be a male with wild hair to be a

Physicist

In her younger days, Rebeccah Marsh lived in the same apartment building as a "quiet loner with wild hair".

"He was a physicist," she explains. "He had been a graduate student of Stephen Hawking, and I had been thinking about studying physics—I loved it—but I couldn't picture what it would really be like to be a physicist. All I could see was this guy, who I couldn't relate to, and I was intimidated."

As Marsh puts it, there were many "twists and turns" in her life as she tried to figure out what she wanted to be when she grew up. At different stages she saw herself as a ballet dancer, an architect and a doctor.

But in her third-year as an undergraduate student at the University of Alberta, Marsh took advantage of an exchange program to study for a year at the Université de Bourgogne in France. The experience opened her mind to the possibilities of a career in physics.

"I realized I wasn't good at biology and chemistry—I wasn't good with memorization. But I was good at using numbers to solve problems, and I started to see how that can be applied in so many different and interesting ways that I hadn't realized before," she says.

As a master's student in physics, Marsh plied her skill with numbers to create a new way to date archaeological artifacts. As a doctoral student at the U of A, she worked with cancer researchers to develop a virtual liver that may be used in drug testing.

"Physics and math touch on everything. They are present in architecture, medicine, engineering and sports—pretty much everything", she says. "And physics helps you answer questions, which I also love."

Following her passion into physics has led Marsh to Vancouver, where she works as the program director for MITACS, a publicly-funded centre that links businesses and academic researchers for the benefit of society.

Current MITACS projects range broadly, including the development of a more efficient and cleaner combustible engine, models for fighting forest fires more safely and effectively, and a system to help banks create financial portfolios with reduced risks.

In her rare free time, Marsh volunteers for a program called Science AL!VE. One of her favorite things is to meet young, female students at science camps and let them see that you don't have to have "wild hair"—or be male—to be a physicist.

"I try to be myself and have fun," she says. "I tell them you can still enjoy shopping and reading and dancing and still be a physicist. The important thing is to ignore the stereotypes, and you'll see there's a lot more to science than you might expect."

Lucas Habib – MSc 2006

At home in the mountains

Lucas Habib is the first to admit he might be a bit overqualified for his job, but the perks of living and working in a prime location in the Canadian Rockies more than makes up for this right now.

Imagine waking up in the morning, strapping your saddle bags onto a horse and riding into the mountains of Jasper National Park on patrol for a few days. Imagine catching a quad ride to the top of Signal Mountain and spending the next few days checking in with hikers on the magnificent Skyline Trail.

These are things Habib does not need to imagine because he lives them as part of his job as a park warden – a profession that celebrated its 100th anniversary in 2009. Habib is part of a new generation of wardens to come into the parks system, graduates armed with degrees and a commitment to preserving and protecting what makes recreation in Canada's national parks a memorable and rewarding experience.

Habib says it is not always sunshine and fun because at some times of the year, enforcing the laws of the national parks can be more difficult. This is especially so in summer when campgrounds are filled with people decompressing from their busy lives with time in the mountains.

"The reality of being a warden is sometimes a lot less glamorous than the public probably appreciates and there are some real challenges," he said.

While studying with Stan Boutin and Erin Bayne at the U of A, Habib - originally from Ottawa – looked at the impact of increased background noise on birds. This topic piqued his imagination because it was a side effect of industrial oil and gas development that was not getting a lot of attention. With more than 3000 noisy compressor stations positioned around Alberta in prime bird habitat, Habib thought it was high time someone looked at the impact of this.

"My research examined a few ways in which chronic background noise may possibly affect boreal forest songbirds. Because birds communicate primarily through singing, it seems reasonable that they might be especially susceptible to negative effects of background noise. Most industrial noise is low-frequency, meaning it can travel great distances through the forest and could interfere with bird song," said Habib.

While Habib hopes to one day to make applied use of what he studied for his Master's thesis, right now he is happy to live in a warden cabin in the woods near Jasper.

"There are a lot of perks to this job that can't be compared to anything else out there and it really does not get any better than being able to call the mountains your back yard."

Layla Neufeld – BSc 2001, MSc 2006


Mark Bradley

Landing the dream job

Personality, passion, intelligence, and initiative are among the long list of fine ingredients that make Layla Neufeld a person people want to know.

This list is also good news for one of Canada's most iconic species - the caribou – which Neufeld is working hard to protect in her job as a biologist in Jasper National Park.

Anyone who meets this effervescent young woman can't help but be affected by the energy she exudes when she talks about her work and life in a small mountain town in the Canadian Rockies.

"Passion will only take you so far so my advice to students and graduates today is to get involved in what you want to be doing early on – in whatever way you can," said Neufeld.

Neufeld admits she is lucky to have landed her dream job working with Woodland caribou in Jasper so soon after completing her MSc. She also recognises, however, that a real passion for the environment and her connections and commitment to the scientific and conservation community have also played a big part in getting her where she is today.

A great day at the "office" for Neufeld might involve lacing up her hiking boots and taking off for a week, living in a tent, and tracking the movements and patterns of one of Canada's most endangered and iconic species. Another great day might mean jumping in a helicopter and flying over the mountains of one of Canada's most beautiful national parks looking for caribou.

A not so great day might require her to play detective at a caribou kill site or picking up animal scat to work out what exactly is going on in the back country when the biologists' eyes are turned to their computer screens instead of to the mountains.

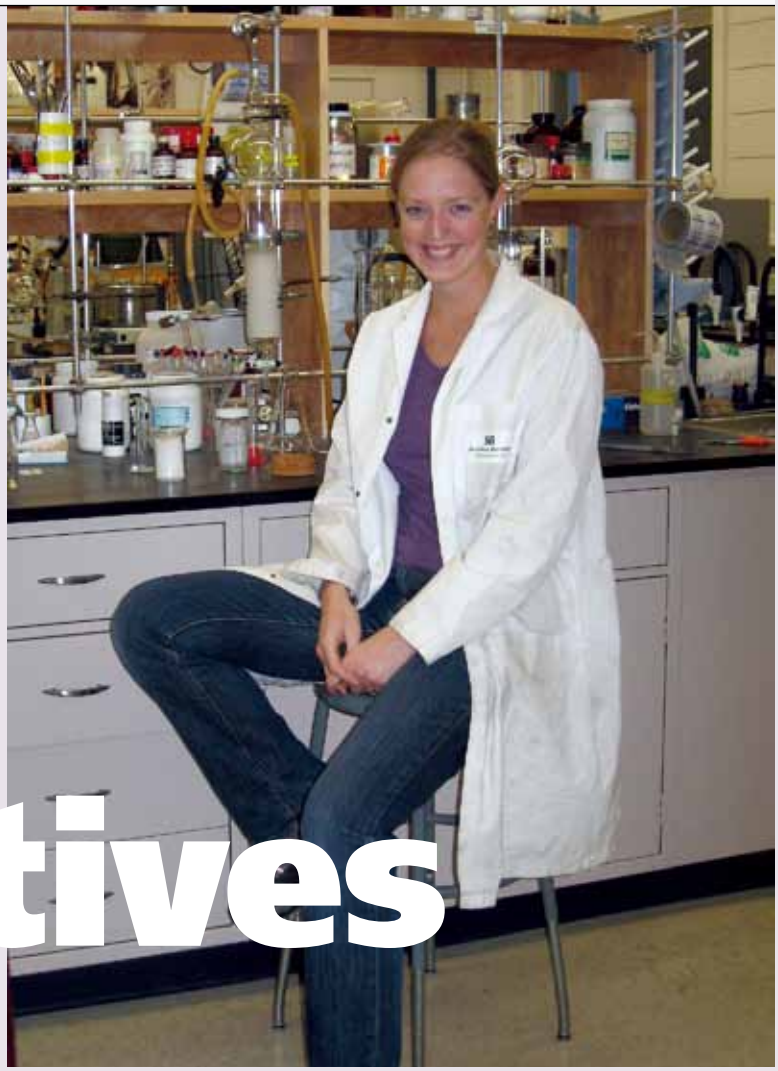
"The thing I really like working here is that even though I am young, I feel like my input is acknowledged," said Neufeld shortly after a tiring day discussing caribou recovery across a conference table with gathered experts. Her path to Jasper has been lined with "less-than-ideal" research jobs that eventually convinced her that this was what she really wanted to do. "You really do have to start with working with mice before you are able to move onto lions and tigers, but working with mice can be really fun too," she laughs.

"Like almost everyone else graduating, I suffered from the PUDDS (Post Undergraduate DegreeDepression Syndrome), working out what I wanted to do, but, I have to say that right now I really love my job and being able to live and work in the mountains is such a privilege," she said.

After two years living in town Neufeld now calls a remote warden's cabin home, the finishing touch to a perfect portrait of life and dedication to the mountains.

Mark Bradley

Tina Grant – PhD 2008



Nobody likes false positives

Current methods of cancer detection can lead to "false positives". It's a subject Tina Grant knows well.

In the medical world, a false positive describes when a doctor misdiagnoses a healthy person as diseased. But when Grant was a teenager, the term might have referred to her career aspirations.

"I was much more into arts than sciences in high school, and I thought I would focus on the arts for a career, but that changed dramatically," she says.

The transformation happened at university, where Grant took a chemistry class. Then she took another, and another, discovering that the more she took, the more she liked it.

"Chemistry, and especially organic chemistry, is like a puzzle. You're constantly trying to solve little problems that can lead to solving bigger problems, and that intrigues me," says Grant, who earned a PhD in organic chemistry from the University of Alberta in 2008.

Not yet 30 years-old, Grant has already pieced together solutions to some complex organic chemistry problems and published her findings in some of the most prestigious journals in her field.

Now a post-doctoral student, Grant is working with physiologists, oncologists and other chemists on a project at the Cross Cancer Institute in Edmonton to help doctors diagnose cancer, particularly breast cancer, with more accuracy.

Currently, doctors use Fludeoxyglucose (FDG) to detect cancerous tumors. The compound accumulates in cells that exhibit increased metabolism—a trademark of cancer cells—and doctors observe this phenomenon with Positron Emission Tomography (PET) imaging

However, sometimes FDG appears to accumulate in benign cells in PET scans, and this can lead to false positive—and even false negative—diagnoses. Such errors can be lethal, at worst, and emotionally draining, at best.

Grant's goal is to develop a synthetic fructose compound that will complement FDG and improve the accuracy of PET imaging to detect cancerous tumors.

"We believe a fructose-analog will be more selectively taken up by breast cancer tissue, and we'll avoid some of the issues inherent in FDG imaging," she says.

The group is on the verge of doing it's first testing on animals with the new fructose compound, and Grant is, of course, "really excited."

"When you're a chemist, often you stick to basic science, but if I can help someone with the knowledge I've gained over the years then that's what I'd prefer to do, and this project is leading me in that direction," she says. "I'm really hopeful that it will work out."

Nobody likes false positives.

Max Darrah – BSc 2001

Mountain Rescuer

It is not too difficult to work out why Max Darrah gets so animated when talks about the mountains. He lives in them, works in them and plays in them. What could be better?

On a perfect cloudless day surrounded by jagged peaks, Darrah admits he is pretty lucky to be in this position. Currently employed as a resource management and public safety specialist in Jasper National Park -a job that involves educating people how to stay out of trouble in the mountains - Darrah also works as the lifeline for people who eventually do get themselves into tricky situations.

Using the mountain skills he has gathered, learned and practiced over the years, Darrah can sometimes be found hanging out of helicopters, clipped into ropes dangling off cliffs or inching his way along knife-edge ridges, all in the name of getting people back onto safer ground after something goes wrong with their adventure.

In the two weeks before being interviewed, Darrah had been called out at least a dozen times to assist people in trouble – the most recent being a rescue on Mt Morrow which flanks the area near Jasper National Park's eastern boundary.

"I had actually climbed the route where the people were in trouble myself two weeks earlier and was therefore able to talk the people through part of the rescue and we were over the area within 25 minutes to help out," said Darrah.

While this job might seem a million miles from what he learned getting his BSc at the U of A, he believes nonetheless that his understanding of mountain ecology and the environment are cornerstones of working in a national park, whatever that role may be.

"I always wanted to work in the mountains, to work in the natural world," said Darrah.

"To get a job in the Parks Service it is definitely an advantage to have a degree so it makes good sense to have a solid understanding of the environment you are working in," said Darrah.

It has not always, however, been quite such an adrenaline-filled position that Darrah has occupied in the National Parks Service. He has done his time on the trail crews and the fire crew, both of which he says played an important role in improving his whole understanding of the management of conservation areas for public enjoyment.

To keep his skills sharp and tuned during off-season Darrah also works as a climbing guide, living, breathing and loving the environment he works and plays in.

Shulamit Gordon – MSc 1996

Life on Ice

Shulamit Gordon, science advisor for New Zealand's Antarctica program, is a study in contrasts.

She has always loved glaciers, but she did her undergraduate degree at Bristol University, which didn't have a glaciology program when she was there.

The London, England native loves that her work in Antarctica contributes to a greater knowledge of our world and how it's changing, and yet one of her favorite things about the southernmost continent is that it can make you feel like an "insignificant speck."

She sings in a choir and leads a jazz band, but she thrills to the "deafening" silence of a windless, Antarctic day.

Her favorite sport is hockey (which she discovered in the mid-'90s as a master's student at the University of Alberta), but she resides in a hemisphere where references to "icing" are almost exclusively cake-related.

Finally, Gordon coordinates several research projects happening in Antarctica, but she admits she doesn't always understand all of the science behind them.

But there is one element of Gordon's life that has remained steadfast and even: she loves science.

"People are always inquisitive, and science is one way of answering the questions that we come up with. The questions are always more and more challenging, but in my view, this is what has driven the technological advances that there have been over time," she says. "That's why science is important. The moment we stop asking those questions is the moment we stop caring about what is around us, and we stop challenging ourselves."

Gordon's current challenge is to provide support for some of New Zealand's science in Antarctica. She administers proposal reviews and scholarship programs, organizes conferences and manages scientific information. But her favorite duty is to help set up a base camp in Antarctica for scientists each summer.

"I've always wanted to facilitate science. I don't have to do the science, but I like taking the coordination work off of the scientists to let them do what they are best at," she says.

Her work has taken her to Antarctica more than a dozen times.

"There is no better ride to work than the one we take on the huge planes to Antarctica—and then getting off the plane and stepping out into that crisp cold is awesome," she says.

Among the many things she loves about Antarctica is the "stark contrast between the ice free land and the glaciers that flow on to it."

Indeed, contrasts can produce great things.

Keith Yerex – BSc 2002, MSc 2005

Saving humanity in a virtual world

Every day that Keith Yerex goes to work, he enters "a shattered world that is on the brink of utter annihilation."

He calls it his dream job

When he was a teenager, Yerex, like most kids that age, liked playing video games.

"I originally got interested in them from an artistic perspective," he says. "I've always been interested in game art—how they looked and how they were made."

After high school, Yerex studied computer science at the University of Alberta, receiving a BSc in 2002 and an MSc in 2005.

During his master's program, Yerex worked on a project called Open Real Time Strategy (ORTS), which provides a game engine for the purpose of studying Artificial Intelligence.

"My thesis was about capturing graphic models of real world objects using webcams. We would put an object on a turntable, focus a webcam on it and then spin it around to get a bunch of different views of it. From that we'd be able to construct a 3D model of it that we could insert into a virtual world, such as a video game," he explains.

After his master's degree, Yerex could have accepted an NSERC grant to pursue his PhD, but he was also offered a job with Edmonton-based Bioware, a leader in the production of fantasy video games, such as Baldur's Gate, for XBox, PlayStation and PC gaming systems.

"It worked out really well," he says. "I probably could have gotten a position programming game logic after my undergraduate degree, but, because of the experience I gained from doing my master's, I was hired for the job I've always wanted in graphics, so I took it while I had the chance."

For nearly four years, Yerex has been working on Dragon Age, a fantasy game that allows players to create their own characters and then try to save humanity from destruction at the hands of an evil warlord.

"Yes, it's my dream job, but that doesn't mean it's easy," says Yerex, who is not yet 30.

The job can include long hours, especially when deadlines are looming, such as the projected Dragon Age launch date in the fall of '09.

"We're just working some bugs out now, but, yeah, it's pretty exciting," he says, adding, "I'll be happy when it's out, and we can start on a new game."

One can only work in a world that is on the brink of annihilation for so long.

The connection between Physics *and* Cancer

Alberta Heritage Foundation for Medical Research

He probably doesn't know it, but, about 15 years ago, a high school teacher in Ontario made a significant contribution to the field of cancer research.

The calculus teacher showed an impressionable student, Alasdair Syme, the wonder and beauty of the world of physics, and Syme decided he never wanted to leave it.

"To be honest, I didn't always like science. When I thought about what I would study in university, I was leaning towards—actually I wasn't sure what it would have been, but it wasn't science," Syme says.

"It was all thanks to that one teacher I ended up in the sciences. He was one of those teachers who inspires you to learn. He actually made me look forward to his calculus class, and everything took off from there," Syme says.

Syme's path from that fateful high school classroom eventually took him to the University of Alberta, where, in 2004, he earned a PhD in medical physics.

Now he's an assistant professor in the U of A Department of Oncology and a medical physicist at the Cross Cancer Institute.

"I enjoy what I do because it involves a good mix of research, clinical work and teaching," he says.

On the research side, Syme uses Magnetic Resonance Imaging (MRI) to determine how tumors are responding to radiation treatment.

"We're looking for signals that can help us distinguish responders from non-responders, with the hope that we could one day tailor the treatment to the patient," he says.

Syme also uses Nuclear Magnetic Resonance (NMR) spectroscopy to analyze urine samples to try to find the metabolic signatures of certain forms of cancer.

"The analysis of metabolomic data is complicated by the fact there are so many possible combinations of metabolites that can produce a signal," he says. "But we think it might be possible to apply NMR urine analysis to detect certain disease types, such as bladder cancer."

"The main hope is that we will develop a cancer detection model that is non-invasive, cheap and reliable," he adds. "Of course, we also want to be able to detect cancer earlier, which almost invariably improves prognosis."

As for his teaching duties, Syme loves working with students and trying to inspire them to learn in the same way his calculus teacher inspired him many years ago.

"If I can do for them what he did for me, that would be great. That's what I strive for," he says.

Shannon Enns – BSc 1994

A gift becomes a lifeline

In March 1994, Shannon Enns was just a few months away from completing her BSc in psychology—but, she was also at the end of her financial rope. "I realized that I was going to run out of money," she recalls. Faced with the prospect of abandoning her studies and sacrificing years of hard work, a desperate Enns turned to the Students' Union for support.

In the nick of time, Enns was able to secure a grant, and save her degree. And, to this day, she remains profoundly grateful. "I really appreciated that I was able to get that help—just something to get me through the period of my exams."

Thankfully, fifteen years later, Enns is now in a position to help others. Through a personal contribution, plus matching funds from the provincial government, she has created a scholarship for a female student in the Faculty of Science who faces financial hardship.

Back in the 90s, her hard-won degree in hand, Enns hit the road for a post-grad motorcycle trip. She ended up in Vancouver, looking for work, but quickly realized that a BSc would not land her a job in psychology. Instead, she headed overseas, to teach English in Korea. After returning to Canada a couple of years later, she looked for a job teaching ESL in Vancouver, and has remained in the field ever since.

In short, the BSc Enns fought so hard for back in 1994 has never translated directly into a single day's employment. So, why, after all these years, does she still remain so loyal to her university and its Faculty of Science?

2009 Science students

Infocus Imagery

"Those were some of the best years of my life," Enns states simply. "Of course, some classes were harder to sit through than others, and there were days when I just wanted to quit altogether. But, really, I found the U of A to be a community. Getting to know the professors and some of the other students—that was just a super experience, and I maintain some of those connections still."

University also transformed her from a schoolgirl to an adult. "It was a huge part of growing up," she says. "Learning to plan my days, and to be self-motivated, because I had to be."

Enns is thrilled to think that her modest financial contribution might change a life, just as that 1994 grant changed hers. "I wish everybody could go to university."

Patrick Van Laake – PhD 2004

Global Worker *and* Carbon Banking Consultant

Patrick Van Laake works with locals on a research project in Paupa New Guinea

Supplied

Throw a dart at a map of the world and the chances are pretty high that where ever it lands, Patrick Van Laake has probably been there with his notebook, a laptop, a mosquito net, and his GPS.

As a researcher and lecturer based at the International Institute for Geo-Information Science and Earth Observation (ITC) in Enschede Holland, Van Laake has traveled to well over a dozen developing countries since starting work at this unique institute in 2004.

ITC – established by the Dutch government in the 1950s - has a specific objective to foster an international exchange of knowledge focusing on capacity building and institutional development in developing countries and emerging economies.

For Van Laake working at ITC is a perfect fit, marrying his Dutch ancestry with the opportunity to travel to developing countries and indulge in his passion for working with, and assisting people.

Van Laake began working at ITC shortly after completing his PhD at the U of A under the supervision of well-know earth and atmospheric sciences professor Arturo Sanchez-Azofeifa. The two first met in Costa Rica in the mid-1990s when Van Laake was working for the United Nation's Food and Agricultural Organisation (FAO) and Sanchez-Azofeifa was researching his PhD.

Interviewing Van Laake in 2009 in the ITC cafeteria surrounded by students from around the globe, he becomes very animated when talking about some of the incredible projects he is currently involved with.

"Considering the focus there is today on climate-related issues, it is wonderful to be working at the forefront of solutions and ideas that will benefit developing countries," said Van Laake.

Much of Van Laake's work to date relates to the assessment of ecosystem services, in particular those related to forested landscapes, and their application in climate change related fields, such as the Clean Development Mechanism of the Kyoto Protocol and the UN's Climate Change Adaptation program.

One project in particular that has got Van Laake into the field, is his work with Kyoto: Think Global, Act Local. This initiative looks at the possibilities and potential for Community Based Forest Management of existing natural forests to be included as an eligible carbon mitigation activity under international climate change agreements in the future.

The project has its own unique set of challenges, but that is precisely what Van Laake enjoys so much about his work.

"It really is my dream job to be traveling all over the world advising and working with locals to come up with ideas that make sense within their context and have the potential to make a real difference long-term," said Van Laake.

Chemistry's John Vederas on Becoming a Royal Fellow

In July 2009 U of A chemistry professor John Vederas and his family journeyed to London for a very special occasion.

Vederas joined the ranks of Isaac Newton, Ernest Rutherford, Steven Hawking and Charles Darwin when he was officially welcomed as a Fellow of the Royal Society -the world's oldest scientific academy in continuous existence founded in 1660.

Vederas was honored for his fundamental contributions to the fields of bioorganic and medicinal chemistry.

Each year just 44 people are awarded this honor. It is the highest accolade a scientist can get, short of a Nobel Prize. Vederas joined U of A scientists Werner Israel (Physics), Michael James (Biochemistry), the late Raymond Lemieux (Chemistry), Brian Sykes (Biochemistry), and David Schindler (Biological Sciences) on the list of Royal Fellows.

Science Contours caught up with Vederas in his colourful office shortly after the ceremony to find out more about the big day.

Q: How did you find out you about the honor?
A: I found out officially through a letter in the mail, although you don't suddenly find out you have won. It generally takes a few years to work through the process. I received a letter in May 2009 saying my name was on the list being put forward for selection and at that point you know there is a good chance that you will be named a Royal Fellow.

Q: What was your reaction when you found out for sure?
A: I felt deeply honored. For me it was also an acknowledgement of the work I have done with fellow researchers and students at the U of A. It is also a reflection on the university and a chance to recognise other U of A Royal Fellows.

Q: Where was the event held?
A: It was held in historic Carlton House in London. It's a magnificent building. The ceremony is in fact a three-day event that also requires the new Fellows to give a short seminar on their work. It was fascinating to hear the presentations made by some of the other Fellows - physicists, mathematicians, biologists - and recognise the great work being done by scientists.

Q: How many other Canadians were honored in 2009?
A: Typically just one Canadian is honored but this year three of us were honored including Michel Chretien, brother of our former Prime Minister Jean Chretien. It was interesting to hear about the work he is doing in neuroendocrinology.

Q: Was was a highlight of the ceremony?
A: Signing the parchment register that includes the names of Newton, Darwin, Hawking was definitely a highlight.

Q: Did you ever imagine that such a moment would happen for you?
A: I don't think this is something I would have imagined when I first started out, but as time went by and my research became more recognised, I began to realize that it could happen. You need to be patient in science I have learned.

John Vederas being formally admitted by Lord Martin Rees, President of the Royal Society - in the background Foreign Secretary and Vice President of the Royal Society, Oxford University Professor Lorna Casselton.

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