


# BE THE CATALYST

Invest in the Faculty of Science and make the  
next world-changing discovery happen



“Donors can be the catalyst for transformative change. Greatness will bubble to the surface, but only if it has the right environment. In the Faculty of Science, we are marshalling our resources to create that environment.”

**JONATHAN SCHAEFFER**

DEAN, FACULTY OF SCIENCE  
UNIVERSITY OF ALBERTA

PROFESSOR, DEPARTMENT OF COMPUTING SCIENCE

## Inspire Innovation



Henry Marshall Tory didn't wait for discovery to happen by chance. A visionary, our first president knew the importance of preparing for discovery — seizing opportunities that would benefit people in the future. That's why he hired Robert Boyle in 1912 to head the Department of Physics. Though Boyle was a young scientist at the time, Tory saw potential for great things. That patience and planning paid off: Boyle's expertise in acoustics played a key role in the development of sonar, a technology still used for submarine navigation.

Today, the Faculty of Science continues to be an ambitious place of discovery research, home to people determined to make the world better. That's why we're engaged with international research projects and sought for our expertise. It's why our researchers work with partners locally and around the world — researchers like professor Douglas Gingrich, who uses the world's most powerful particle accelerator, the Large Hadron Collider, in Geneva, to search for black holes. It's why we prepare future scientists by adopting new ways to enrich the learning experience, such as massive open online courses (MOOCs) that reach hundreds of thousands of learners globally. It's why we build research centres like the Alberta Glycomics Centre that spawned GlycoNet, a new national research network based at UAlberta to develop new drugs and vaccines for conditions such as influenza, obesity and diabetes.



**Join us. With your investment,  
we'll be ready to make the next  
big discovery.**

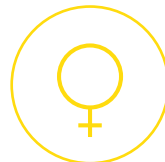
## SCIENCE MILESTONES AT UALBERTA

Over the course of a century, Faculty of Science researchers and alumni have made some major contributions to their fields. Here are just a few:



**1947**

Geology professor Charles Stelck's fossil research leads to his students' discovery of oil at Leduc No.1, resulting in the petroleum boom in Western Canada.



**1982**

Margaret-Ann Armour, '70 PhD, '13 DSc (Honorary), founds WISEST, a UAlberta-based organization that promotes diversity in the sciences.

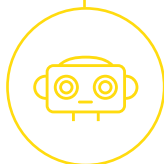
**1911**

Decima Eveline Robinson, '11 BSc, '12 MSc, becomes UAlberta's first female science graduate. Her legacy lives on in the Decima Robinson Support Centre, a space that assists 2,000 students a month on average.



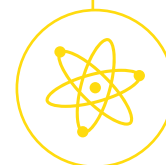
**1970**

Computing science professor Tony Marsland is hired, ushering in an era of artificial intelligence studies in the faculty.



**1990**

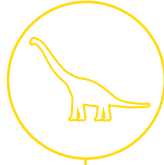
Richard E. Taylor, '50 BSc, '52 MSc, '91 DSc (Honorary), and two research team members win the Nobel Prize in physics, for research on deep inelastic scattering of electrons on protons and bound neutrons, leading to the development of the quark model in particle physics.





## 1993

Biological sciences professor Andrew Derocher, '87 MSc, '91 PhD, and adjunct professor Ian Stirling, '13 DSc (Honorary), co-author the first study describing the impact of climate change on polar bear populations.



## 2005

Professor Philip Currie, the world's best-known paleontologist, becomes the Canada Research Chair in Biological Sciences at UAlberta. He will mentor a generation of paleontologists, develop the field of dinosaur biomechanics and build a vibrant research lab and fossil collection.



## 2016

David Silver, '09 PhD, and former UAlberta post-doctoral fellow Aja Huang lead a Google DeepMind team to develop AlphaGo, a computer program that beats the world Go board game champion in a best-of-five challenge.

## 1999

Biological sciences professor David Schindler, '14 LLD (Honorary), receives the first Stockholm Water Prize. His 60-year career led to a ban on detergent phosphates, demonstrated evidence of global warming in the early 1970s, and proved that acid rain was killing fish in the 1970s and early 1980s.

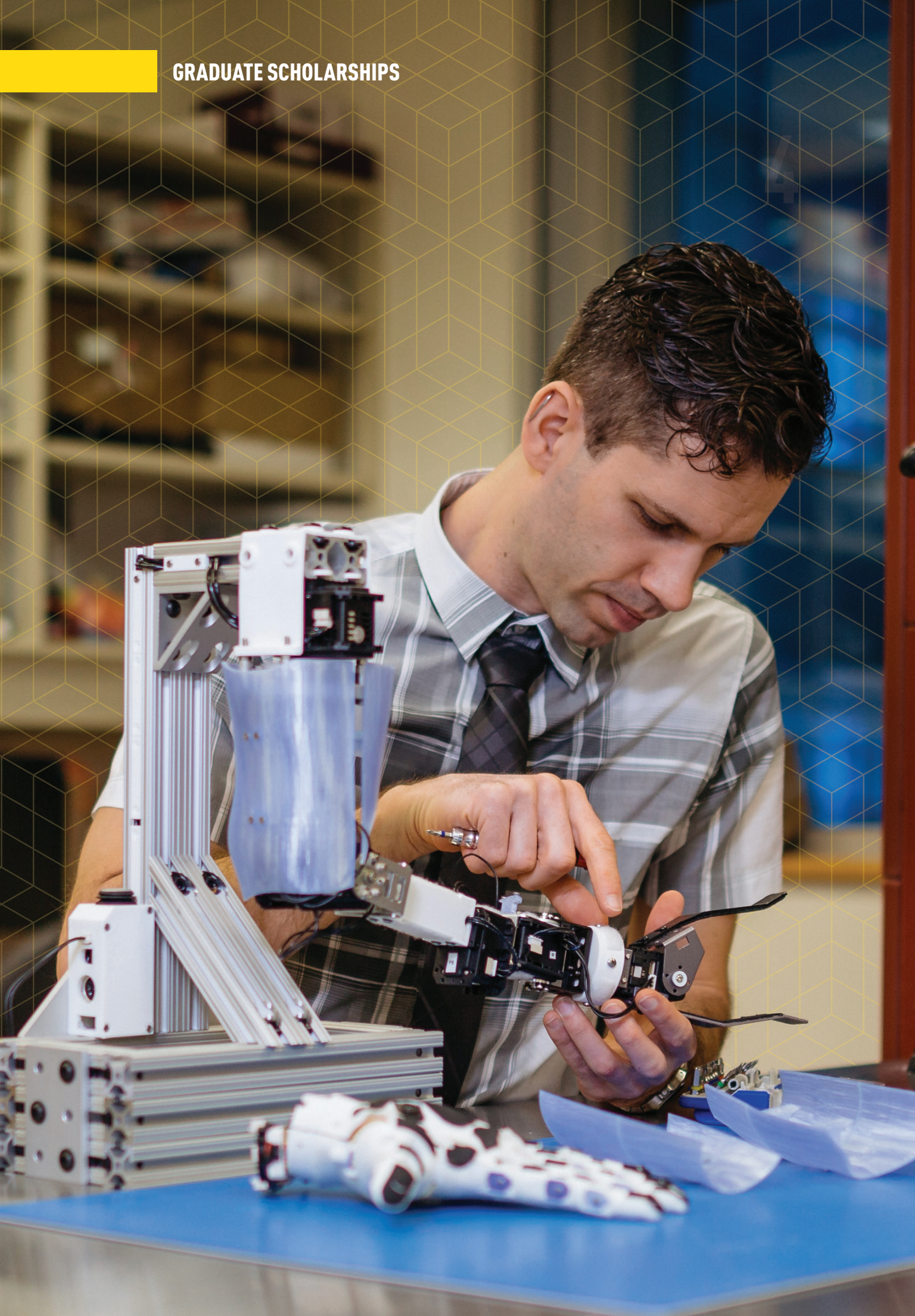


## 2014

Earth and atmospheric sciences professor Graham Pearson, Canada Excellence Research Chair in Arctic Resources, and his team discover the first sample of ringwoodite that contains water — confirming theories that vast volumes of water are trapped between Earth's upper and lower mantle.



GRADUATE SCHOLARSHIPS





## Grad Students Create Tomorrow's Technology

Craig Sherstan, '06 BSc(Eng), '15 MSc, grew up reading science fiction, dreaming of ways that science and technology could make the world better.



As a young man, Craig Sherstan travelled to Cambodia, where he used his software development skills to help a non-profit company that provided education and employment opportunities to those less fortunate. He sees his current work as a PhD student in computing science at the University of Alberta as another chance to help those in need.

Working in a robotics lab, Sherstan is part of a team designing prosthetic arms for amputees. Having found older models to be heavy, cumbersome and frustrating to use, the team is designing a new type of prosthetic to better serve amputees: an arm that thinks. This smart arm is designed to anticipate the user's needs — a robotic limb that can read facial expressions and monitor the user's body. Feeling thirsty? Your arm has already picked up that glass of water over there. Prefer to sip hot coffee or tea? No problem. The arm can sense the temperature of the object. And if the cup is wet, the hand can detect moisture and adjust its grip to avoid slipping.

The robotic arm is in the idea phase now, but today's research is tomorrow's technology. Graduate students like Sherstan are conducting some of that research. And thanks to a generous scholarship, he is able to spend more time in the lab, doing work that will benefit society.

"We have talented graduate students working under the direction of our senior faculty," says David Coltman, associate dean, research. "As any researcher will tell you, grad students are the lifeblood of our research programs."



**Graduate student scholarships goal:** By 2020, we aim to create 50 new major graduate scholarships to attract top-notch students.

## GRADUATE SCHOLARSHIPS

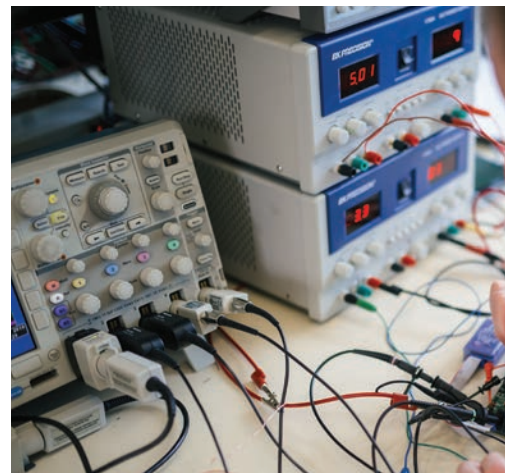
“Having the ability to get your head into your research without financial distractions allows you to do more. Also, it lures exceptional students who couldn't do research without financial support.”



“I do outreach with the JAMES circle — Junior Alberta Mathematics for Eager Students. I push advanced students further and further and help them become better at math, problem solving and critical thinking.”



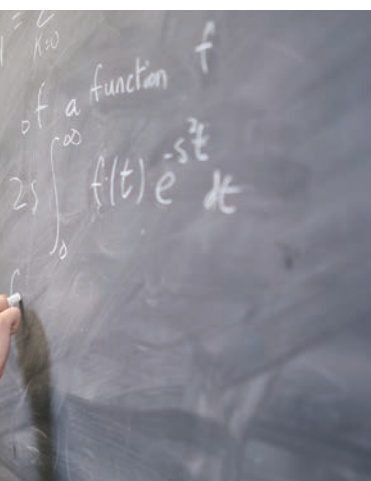
“With guidance from a professor, I built the instrument, took it to Norway, put it on the rocket and said 'go' on the day of the launch.”



“Grad students are the workhorses for this research. If you want results, you need graduate students.”







## Grad Student Research

A donation to graduate student scholarships supports the cutting-edge research happening in the Faculty of Science.



**GLACIERS** | Ashley Dubnick, '09 BSc, a PhD student in glaciology, studies how nutrients move from glaciers to ecosystems through meltwater, predicting the impact of melting glaciers. Scholarship support helped Dubnick research glaciers in Antarctica, Greenland and the Canadian Arctic.



**ENCRYPTION** | Ryan Morrill, '14 BSc, a master's student in mathematical and statistical sciences, studies generalizations of quadratic reciprocity, which comes from a branch of math called number theory. One of the many uses of number theory applies to how banks protect their clients through online security. Scholarship support gives Morrill time to volunteer with outreach programs in which he teaches children advanced mathematics, helping the next generation of math students.



**SPACE** | David Miles, '13 MSc, a PhD candidate in physics, studies how space weather impacts the Earth. His work requires a rocket to measure disturbances in space that affect our ability to use GPS on the ground. Funding from scholarships allowed Miles to travel to Norway, test his instrument and help decide when to launch the rocket.



**CANCER** | Cassandra Churchill, '15 PhD, analyzed the effectiveness of cancer drugs using computational methods to look at existing data. Her research could improve new drug development. Scholarship support gave Churchill extra time to devote to her research.

# Tomorrow's Promise

The SCI Fund is a new route to novel scientific ideas, methods and discoveries, positioning the Faculty of Science as a leader and an academic destination.


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The work UAlberta researchers carry out advances almost every field of human endeavour. At the Faculty of Science they make discoveries that solve the world's most perplexing challenges. And they are bold in laying the groundwork that will make tomorrow's discoveries possible.

Every day, they seize opportunities to improve the way they teach, research and engage with the community. To pursue these and other opportunities that will lead to significant discovery, the faculty has established the Science Creativity and Innovation Endowment Fund — the SCI Fund. It gives the ability to make large investments in lines of inquiry and research that might otherwise be unavailable. The SCI Fund is for donors who think long-term. It creates the conditions for breakthroughs significant enough to make a global impact.

The SCI Fund started with what amounts to an academic cautionary tale.

"In my first year as dean of the Faculty of Science, 2012, I had an opportunity to hire a team of four scientists," Jonathan Schaeffer says. "They were doing breakthrough



work in physics that could change the world.” But Schaeffer couldn’t marshal the million dollars a year it would take to lure the scientists to Alberta and fund their research laboratory needs. The experience spurred him and his leadership team to start planning the SCI Fund, the kind of endowed fund that has the depth to create transformative change.

It’s a new approach. First, the SCI Fund circumvents the pressure to spend all the money today. While a small portion supports key annual initiatives, the focus is to grow the fund. Second, the SCI Fund directs donations to a single fund to gain critical mass, requiring investors to think long-term.

Schaeffer and his team came up with a dollar amount reflecting what he calls “a big, hairy, audacious goal.”

“An endowment of \$200 million will fundamentally change the Faculty of Science,” he says.

The fund allows small donations to contribute to something big, and it lets large donations bring a robust, endowed SCI Fund closer to reality. “In my experience, lots of small wins often cannot match the impact of a large win,” Schaeffer says. “I would rather think big, and the SCI Fund makes big things possible. This money is to do big, transformative things.”

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**A \$200-million endowment will foster innovation and inspiration to change the faculty and the world. We aim to attract an additional \$25 million in donor support by 2020, setting the stage to advance big ideas in science, creativity and innovation.**



## Top-Flight Research

The SCI Fund will support the remarkable discoveries and great strides in research underway in the faculty.



**BRAIN MATTERS** | Psychology professor Clayton Dickson's research on memory permanence is helping us understand how the brain strengthens memories by actively rehearsing what it learns. Understanding how our brains solidify memories is essential for treating memory disorders such as Alzheimer's disease. It could also potentially help people with post-traumatic stress disorder get rid of distressing memories. Dickson's lab is one of only a handful worldwide that evaluate how spontaneous electrical activity, rather than cellular processes like protein synthesis, plays a role in memory and synaptic plasticity. Dickson is especially interested in how sleep might help enhance specific forms of memory.

WHAT THE  
SCI FUND  
WILL DO



Attract leading  
researchers and  
mentors



Accelerate projects that  
are on the verge of big  
discoveries



**THE CORE OF THE MATTER** | Glaciologist Martin Sharp's interest in the new field of glacial microbial ecosystems — life in and under ice — made UAlberta the obvious choice as the new laboratory home for a collection of ice cores being divested by Natural Resources Canada. The ice cores contain a frozen climate record stretching back 80,000 years. Sharp's team will study the ice cores and add more through new drilling. They'll also look at how pollutants from around the globe become trapped in glacial ice and how and when they make their way back into the environment. As these analyses use up the ice bit by bit, the team will build a digital archive of information about the cores so the data are available to researchers long after the cores themselves are gone.

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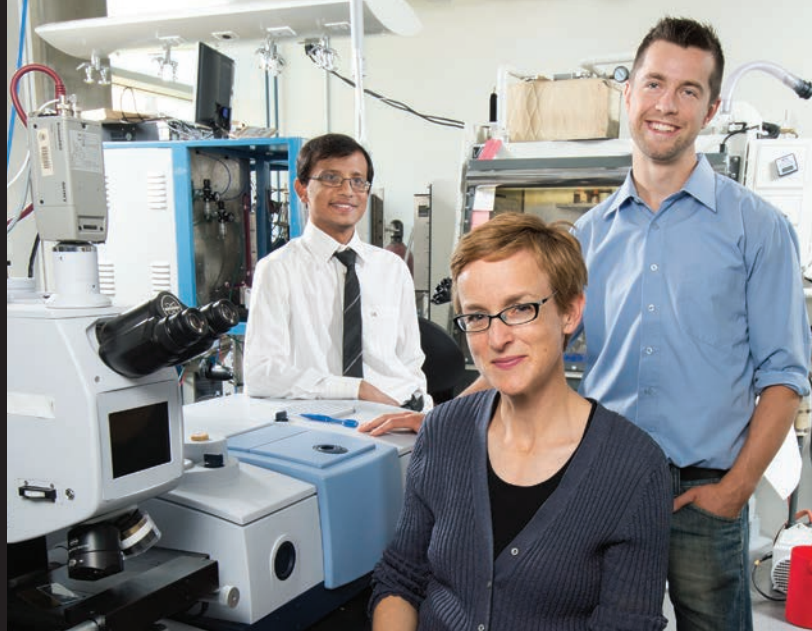
**BUILDING BLOCKS** | UAlberta's new Canada Research Chair in Astroparticle Physics is studying the universe's biggest mysteries. Darren Grant, a professor in the Department of Physics and the head of DeepCore, part of the IceCube Neutrino Observatory located in the Antarctic, aims to understand two of nature's most elusive fundamental building blocks — neutrinos and dark matter. Grant's work has played a role in discovering what we know about the neutrino, a subatomic foundational particle from which the universe is made.



Allow the faculty to act quickly and capitalize on narrow windows of opportunity



Conduct research that makes the world better



**THINK SMALL** | Jillian Buriak, chemistry professor and Canada Research Chair in Nanomaterials, and her team, including post-doctoral fellows Erik Luber, '06 BSc, '11 PhD, and Hosnay Mobarok, discovered that abundant phosphorus and zinc can be used in the creation of nanoparticle-based solar cells. Their work in nanotechnology, using only Earth-abundant elements, goes a long way toward making solar power more accessible in parts of the world that are far from traditional power grids, including the Canadian North. Nanoparticles could conceivably turn portable surfaces, even paint, into solar energy producers.

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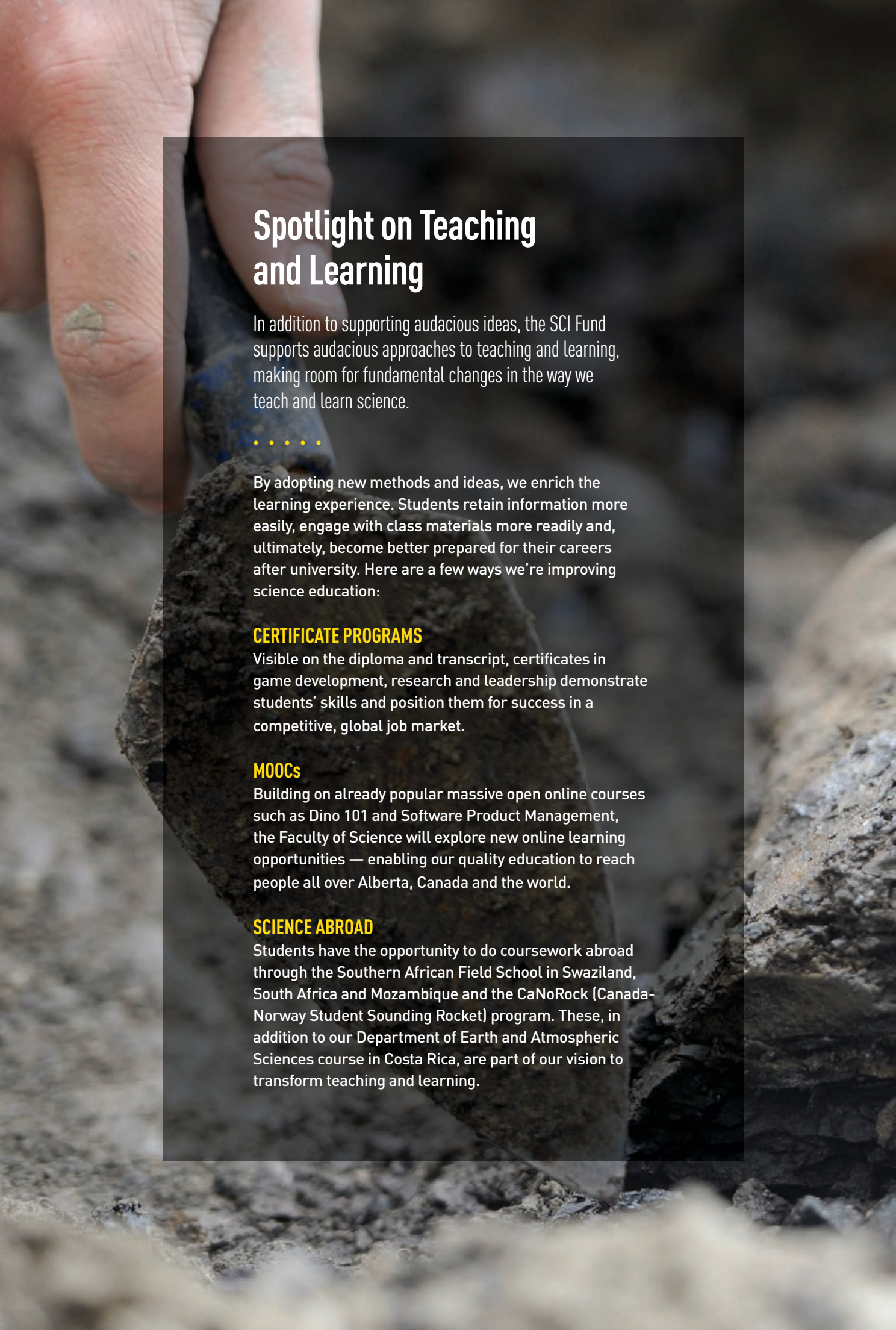
**NUMBERS GAME** | Mark Lewis combines his passion for math and biology to help answer questions about climate change, wildlife disease and animal movement patterns. As a mathematical biologist, Lewis applies numerical modelling to studies that range from polar bear habitats and sea ice to predicting the spread of biological invaders such as zebra mussels. Lewis joined UAlberta in 2001 as Canada Research Chair in Mathematical Biology. He is also a professor in the Department of Mathematics and Statistical Sciences and the Department of Biological Sciences.



Build infrastructure that allows the best research to happen in a timely manner



Introduce transformative change to teaching and learning



## Spotlight on Teaching and Learning

In addition to supporting audacious ideas, the SCI Fund supports audacious approaches to teaching and learning, making room for fundamental changes in the way we teach and learn science.



By adopting new methods and ideas, we enrich the learning experience. Students retain information more easily, engage with class materials more readily and, ultimately, become better prepared for their careers after university. Here are a few ways we're improving science education:

### **CERTIFICATE PROGRAMS**

Visible on the diploma and transcript, certificates in game development, research and leadership demonstrate students' skills and position them for success in a competitive, global job market.

### **MOOCs**

Building on already popular massive open online courses such as Dino 101 and Software Product Management, the Faculty of Science will explore new online learning opportunities — enabling our quality education to reach people all over Alberta, Canada and the world.

### **SCIENCE ABROAD**

Students have the opportunity to do coursework abroad through the Southern African Field School in Swaziland, South Africa and Mozambique and the CaNoRock (Canada-Norway Student Sounding Rocket) program. These, in addition to our Department of Earth and Atmospheric Sciences course in Costa Rica, are part of our vision to transform teaching and learning.

## FIELD SCHOOLS



**Travel far, learn much:** Field schools are a requirement for students in geosciences at UAlberta. They take students outside the classroom to important, diverse geological sites. Donor funds can ensure that students will continue to be able to travel to important provincial geological sites such as Drumheller, Jasper and Waterton Lakes National Park as well as sites abroad in places like Costa Rica.





## Field Schools Propel Theory Into Practice

Stéphane Poitras, '14 BSc, was walking alone along the shore of Bell Lake in the Northwest Territories when he discovered an unusual rock.



It was a chance discovery, made possible by participation in a geosciences field school, and one that would ultimately shape his career.

The field school was unlike any class Poitras had taken. His classroom was a remote part of the Canadian Shield, where he worked with state-of-the-art equipment to map and measure bedrock distributions, record field descriptions and collect structural data.

The rock was from a rare volcanic ash layer that formed nearly three billion years ago. Its discovery could prove key to determining the age of a volcanic eruption during that period. Poitras was inspired. He had discovered more than a thesis topic; he had embarked on his professional path. "Field school isn't only academic-life-changing," says Poitras. "It's character building."

Geosciences field schools produce graduates with field training experience, ready to enter the workplace. An endowment fund supporting geosciences field schools insulates students from budget fluctuations, ensuring continued participation.

Your donation prepares students for their future careers by giving them access to hands-on, practical learning. Field schools are an opportunity for students to challenge themselves, apply their classroom learning and make world-changing discoveries.



**Field schools:** Our goal is to establish by 2020 a \$5-million endowment to provide critical support in sustaining geosciences field schools.

**CHAIRS &  
PROFESSORSHIPS**





## Chairs and Professorships Create Momentum

An endowed research position at the Faculty of Science accrues value and builds momentum with time.



As with most research chairs, the R.U. Lemieux Chair in Carbohydrate Chemistry honours both its namesake, famed UAlberta chemist Ray Lemieux, and its current holder, Todd Lowary, '93 PhD. Lemieux was one of the founding fathers of carbohydrate chemistry, establishing UAlberta as the centre of expertise in the then-nascent field.

“It’s an honour and very gratifying to hold the chair,” says Lowary. “I grew up doing my PhD in the shadow of Lemieux.” Lowary served as the director of the Alberta Glycomics Centre from 2012 until 2015, when he accepted the Lemieux Chair. The position affords him time and resources to focus on his research in glycomics, the study of the role of carbohydrates in biological systems. Cells wear a carbohydrate “coat” that plays a role in how they interact with other cells. The carbohydrate coat also affects cells’ roles in immune response and inflammation.

Lowary’s work is leading to new avenues of drug development and diagnostics for a variety of illnesses and vaccines for infectious diseases.



**Research chairs and professorships:** We aim to establish by 2020 five new donor-supported research chairs and professorships, enabling us to recruit exceptional researchers and educators.

## On the Waterfront



Daniel Alessi, assistant professor in the Department of Earth and Atmospheric Sciences and Encana Chair in Water Resources, aims to improve the way industry uses water in unconventional energy recovery.

His five-year study looks at the chemistry and potential toxicity of water that returns to the surface following hydraulic fracturing, called “flowback” and “produced water.” The fracturing process requires chemically treated fresh water, which interacts with surrounding rock in the petroleum reservoir, often dramatically changing its chemistry.

“The largest part of the project looks at the chemistry, microbiology and toxicity of flowback waters,” says Alessi, who wants to investigate proper handling and treatment of flowback. His team also aims to develop numerical groundwater models to identify alternative water sources.

## Good Bone Structure



Top paleontologist and UAlberta professor Philip Currie’s name was cemented in bricks and mortar when his namesake museum opened in Wembley, Alta., in 2015. Now, thanks to an endowment established by the museum society, UAlberta will soon be home to the Philip J. Currie Professorship in Vertebrate Paleontology.

“This appointment in vertebrate paleontology is a bold experiment between the University of Alberta and a collective of stakeholders in Grande Prairie,” says Michael Caldwell, ’86 BPE, ’91 BSc, professor and chair of the Department of Biological Sciences.

The position is an example of the many ways an endowed professorship can develop UAlberta as a focal point of expertise, attracting top researchers and students. It brings the highest level of scholarship and science to the university and to the community.



# Endow Research

Endowed research professorships and chairs provide academics with the resources they need to transform fresh, bold ideas into solutions to pressing challenges. Here's how it works:



**DONORS GIVE** | A private person, foundation or corporate entity endows a research position at the Faculty of Science. The endowment demonstrates a commitment to community, giving back to causes the donor holds dear. It shows a commitment to long-term, basic research as the starting point of real-world innovation.

**SCIENTISTS CREATE** | Recruitment starts, to find or promote an expert to hold the academic position. This expert understands the complexity and problems surrounding their particular field and is prepared to work on solving those problems with the resources donors provide.

**RESEARCH TEAMS WORK** | When it is fully endowed, a research chair comes with the ability to hire a research team, advancing the science and creating new avenues of inquiry. The chair holder dedicates more time to research, while mentoring his or her team.

**STUDENTS LEARN** | A dedicated research position attracts great graduate students, who work alongside the experts in their field. This creates the best conditions for learning. More great students follow, redoubling the research results and following new paths.

**INDUSTRY BENEFITS** | Most students go on to work in industry and some in other academic institutions. They apply their expertise to the betterment of their fields and the communities in which they live and serve.

**WE BECOME BETTER** | The university becomes synonymous with expertise in the particular field in which the chair is endowed, helping to create and support local industries and enriching our community. Research from the endowed chair and the research team works to solve the difficult scientific challenges we face as a society.



## Your Investment Powers Discovery

You demonstrate your support of UAlberta's Faculty of Science in many ways. Now you can put the next big scientific advancement within reach with your gift. Catalyze innovation. By 2020 we aim for:

**\$25M**

IN ADDITIONAL GIFTS  
FOR THE SCI FUND  
ENDOWMENT

Your gift of any size toward this major endowment fund makes possible our "big, hairy, audacious" goals. Our long-term goal is a \$200-million fund.

**5 NEW**

DONOR-SUPPORTED  
RESEARCH CHAIRS AND  
PROFESSORSHIPS

Your deeply held scientific interests can come to life with an endowed chair or professorship.

**\$5M**

FOR FIELD SCHOOLS  
ENDOWMENT

You demonstrate your knowledge and appreciation of how science works when you send students to the field to put theory into practice.

**50 NEW**

MAJOR GRADUATE  
STUDENT  
SCHOLARSHIPS


Your endowed gift provides meaningful support for graduate students, turning ideas into actions and leading to scientific change.

“That’s the great thing about research. There is an elegance to it. It’s asking the right question in the right way. When it works, there’s a beauty that is indescribable.”

**DAVID TURPIN**

PRESIDENT AND VICE-CHANCELLOR,  
UNIVERSITY OF ALBERTA

PROFESSOR, DEPARTMENT OF BIOLOGICAL SCIENCES,  
FACULTY OF SCIENCE



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