GRADUATE AND POSTDOCTORAL STUDIES



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SASKATOON SASKATCHEWAN CANADA



EduCanada A world of possibilities Un monde de possibilités



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Message from the dean

he College of Graduate and Postdoctoral Studies was established in 1946, and our strong network of faculty and staff members works hard to attract the very best graduate students and support them from admission to convocation. Our team is highly committed to providing world-class student experiences, with a focus on 3 priorities:

- Collaboration with partners internal and external to the university;
- Opportunities for international experiences; and
- Program quality and innovation.

We constantly seek innovation and creativity in program structure and delivery. This means expanding and enhancing mechanisms which facilitate student mobility. A number of exciting initiatives continue to move us forward to those ends. As a member of Canada's U15, the 15 most research-intensive universities in the country, we continue to explore research partnerships with communities, governments and research collaborators that are critical to our meeting and exceeding societal, health and economic needs. The University of Saskatchewan is responding to some of the world's greatest challenges including threats to the environment, food and water security, and human and animal health.

The College of Graduate and Postdoctoral Studies remains committed to new and enhanced graduate programs, stemming from areas of research excellence and supporting growth in areas of local and global importance. Register in a graduate program at the University of Saskatchewan and make a difference.





TREVER CROWE UNIVERSITY OF SASKATCHEWAN COLLEGE OF GRADUATE AND POSTDOCTORAL STUDIES DEAN





Today's agriculture cares for the environment to sustainably produce bioproducts like food, fuel, fibre and pharmaceuticals. Its concerns are universal and individual, rooted in tradition and driven by innovation. It happens everywhere—in rural fields, urban landscapes, laboratories, wetlands and boardrooms.

Our mission is to help feed the world through transformative innovations in agriculture and food production that will promote economic, social and environmental wellbeing, and will empower developing countries to achieve local food security.





Getting to the Root of the Problem

With climate change and farmers' growing concern over drought, research on the lentil plant roots may offer practical solutions.

AGRICULTURE AND BIORESOURCES

anada is the world's largest producer of lentils, with the majority of lentil farms located in Saskatchewan. However, the short, dry growing season of the prairies makes plant growth a critical issue to the producers. Unlike wild lentils grown in warmer regions such as Syria, Iran, and Iraq, Saskatchewan lentil plants are prone to drought.

Plant Sciences M.Sc. student, Eliza Mohsenzadeh Rabani explains that "According to global climate models, we will have shorter and warmer winters in the future. And summers will be longer and warmer. So, limited water resources will pose a threat to agriculture, especially to Saskatchewan lentils."

Working with professor Albert Vandenberg, her supervisor and NSERC Industrial Research Chair, Rabani experiments on the effects of drought on the roots of different wild lentil genotypes. By raising the plants in controlled growth chambers and examining their root development and distribution, she aims to identify which genotypes of drought tolerant lentils can survive in Saskatchewan.

"If we can identify which of those wild genotypes will grow here, and cross them with Saskatchewan genotypes, we'll be able to solve the problem of lentil production even if most water resources run dry," Rabani says.

ADAPTED FROM RABANI'S 3MT PRESENTATION



Fungicide Application? It's Effective If You Do It Smart

Gursahib Singh studies the best timing and the efficiency of fungicide application in durum wheat, an important Saskatchewan crop.

AGRICULTURE AND BIORESOURCES he findings of this research could minimize the amount of infected durum wheat harvested in Canada" reports Singh, who is a Ph.D. candidate in Plant Sciences. Singh's research is supervised by professor Randy Kutcher, in the College of Agriculture and Bioresources.

Fusarium graminearum, a pervasive plant pathogen in North America, causes Fusarium head blight (FHB) in durum. "Highly FHB resistant durum wheat varieties do not exist," Singh says, "so, I am working toward an efficient disease management plan that uses fungicide application."

In this pioneering research, Singh considers that the effect of fungicide application timing on disease severity is different in durum wheat than bread wheat and also varies from region to region. He adds that "by comparing the effect of various fungicide application timings on FHB severity and mycotoxin accumulation, I can hopefully determine the most appropriate fungicide application timing for durum in Saskatchewan."

The effectiveness of fungicide treatment is also important. Triazole, a single group of fungicides, is the dominant group that has been deemed effective in managing FHB. Triazoles have been in use for about two decades in high FHB risk areas of southeast Saskatchewan and Manitoba. "Overuse of triazoles can result in fungicide insensitivity," Singh clarifies. "In Canada, there have not been reports of *F. graminearum* insensitivity to fungicides so far, but increasing use of triazoles carries the risk of fungicide resistance. There is a need to investigate the regional population of fungus for resistance and cross-resistance (resistance to multiple fungicide groups) to triazole products currently used across western Canada." Singh hopes that his research will help eliminate FHB in durum wheat and the consequential health risk posed to humans and animals.

STORY AND PHOTO BY ZAHRA GHOREISHI

COLLEGE OF AGRICULTURE AND BIORESOURCES

The College of Agriculture and Bioresources is a leader in education and research because we believe in the power of partnership—with the government, private enterprise, producer groups, research centres and industry associations promoting innovation through applied science and business development.

We are an interdisciplinary, applied-science college recognized by industry for the quality of its graduates with expertise in four key areas:

- Plants and Animals
- Food, Feed and Bioproducts
- Soil, Environment and Ecology
- Agribusiness and Applied Economics
 An average of \$30 MILLION

per year in research funding



85+ faculty



260+ graduate students

DIVERSIFYING CHICKPEA GENETICS FOR BETTER CROP PERFORMANCE



Bunyamin Tar'an and Donna Lindsay, researchers at the Crop Development Centre (CDC), are part of an international project to increase the genetic diversity of chickpeas by providing plant breeders with thousands of seed progeny from wild plants. "The scale and depth of this study makes it unique," says Tar'an, Agri-Food Innovation Chair at the CDC. "This research generated close to 10,000 progeny from crossing samples of wild chickpeas grown in southeastern Turkey and crossing them with cultivated lineages." Forty-nine faculty and students work on this research project which has generated over 650 diverse seed lines that are available for the CDC's chickpea genetic improvement program.

ADAPTED FROM STORY BY SARATH PEIRIS, RESEARCH PROFILE AND IMPACT

Frogs and Food Security?

Methods to study frog's DNA help researchers to understand adaptation and reproductive mechanisms in plants.

FOOD SECURITY

lobal Institute for Food Security post-doctoral researcher Andrés Posso-Terranova and Biology professor, José Andrés have studied mutated genes of Colombian dart frogs. They found evidence that a single gene called MC1R controls the black colour on the skin of these poisonous frogs.

The researchers photographed hundreds of frogs in the Colombian Chocó province. Back at the U of S, they used modern DNA technology

to screen more than 15,000 genes that could be associated with the frogs' colouration. The surprising discovery was that unrelated species of frogs in the north and the south of Chocó province show mutations of the MC1R gene in the same DNA region. This explains why the frogs share similar black patterns even when they live hundreds of miles apart.

"These mutations associated with black colour show the footprints of natural selection," Posso-Terranova says. "It confirms that dark patterns are beneficial for frogs' survival, so it has been passed down through generations."

Although frogs and plants belong to two different groups of living organisms, they share essential features at the molecular level. So, the same methods of studying their DNA can be used to understand the mechanisms behind plant adaptation and survival in nature, including disease resistance, adaptation to climatic change, and reproductive traits.

Under supervision of GIFS professor Dr. Tim Sharbel, Posso-Terranova is currently studying natural populations of plants with high levels of genetic diversity for important economic traits. The goal is to identify beneficial genetic variants for their use in plant breeding programs that aim to increase crop performance.

Dr. Sharbel and Posso-Terranova hope that their work at GIFS will contribute to more efficient planting practices with increased crop productivity. Poison frog's research was funded by NSERC and a Colciencias grant from the Colombian government, and findings are published in the international journal, Evolution.

STORY BY GIFS AND FEDERICA GIANNELLI, RESEARCH PROFILE AND IMPACT PHOTO BY JOSÉ ANDRÉS

GLOBAL INSTITUTE FOR FOOD SECURITY

With 9.6 billion people expected to be living on earth by 2050, food security is one of mankind's greatest challenges. Within the next 30 years, agricultural productivity must improve by almost 70 per cent. The amount of arable land cannot increase—the only solution is through ingenuity and innovation.

The Global Institute for Food Security is a University-based research institute dedicated to achieving global food security. Over 110 researchers, graduate students and postdoctoral

- Seed and developmental biology: Investigating how to improve the value of
- Root-soil-microbial interactions: Improving crop yields by better understanding how roots interact with the soil.
- Accelerating plant breeding through high-performance computing.



\$52 MILLION initial investment by PotashCorp

\$37.2 MILLION over 7 years: funding awarded



\$20 MILLION in research funding in the area

Image of Research



CAMPO Zayda Morales, Ph.D. Student in Food and Bioproduct Sciences



Tiny crawlers could help producers stuck with unsellable wheat and make chickens happy.

AGRICULTURE AND **BIORESOURCES**

n 2016, Fusarium fungus contamination in wheat caused more than \$1 billion in economic losses across Canada. It affected almost 80 percent of Saskatchewan and Manitoba cereal crops, leaving farmers scratching their heads on how to dispose of tons of worthless wheat. Fiona Buchanan, Animal and Poultry Science professor and her master's student, Carlos Ochoa, have a potential solution.

"We want to help producers by making use of grain that is worth nothing and that no one knows how to dispose of safely," says Buchanan. They have found that yellow mealworms can eat wheat infected with fungus whose mycotoxins are harmful to humans and livestock. The worms remain unaffected after eating the grain, regardless of the level of mycotoxins. The fattened mealworms can be a new, nutritious source of protein for chickens and fish.



Yellow mealworms are a safe, more sustainable and cheaper feed, and can eliminate a contaminated product from the environment at the same time.

CARLOS OCHOA

"Yellow mealworms are a safe, more sustainable and cheaper feed, and can eliminate a contaminated product from the environment at the same time," says Ochoa.

Buchanan explains that farmers usually bury or burn the contaminated wheat, but these are not great options. Burying the grain does not eliminate the fungus and it may spread to next year's crops. Burning it causes pollution and worsens the environmental impact.

Funded by the Saskatchewan Agriculture Development Fund, this project may potentially put cash in farmers' pockets and open up a new worm-based niche market in the feed industry.

If the researchers get approval from the Canadian Food Inspection Agency, their goal is to start a company selling worms to chicken farmers in four to five years.

ADAPTED FROM STORY BY FEDERICA GIANNELLI, RESEARCH PROFILE AND IMPACT PHOTO BY CHRISTINA WEESE

AGRICULTURE AND BIORESOURCES

Envisioning Food Security for Africa

The urge to fight hunger led Abimfoluwa Olalaye and Taylor Procyshen to their current project as Soil Science graduate students. They are researching ways to improve African soil practices to boost crop yield, especially in West Africa.

Procyshen visited Zambia while he was an undergrad student. He remembers "Farming there was conducted on small plot farms of about an acre, where the farmer would hoe, dig a hole and put in seed, cover it and dig another hole. I was interested in why they used such an archaic way of farming and how to improve it to feed those who are struggling to eat."

Olalaye and Procyshen examine "microdosing" usage of fertilizer in West African farming practices. Project supervisor, Derek Peak, explains that the microdosing is the "in-soil application of inorganic fertilizer after seedling emerges. It can double yields compared to controls, and often provides similar yields to broadcasting twice as much fertilizer."

Procyshen has collected soil samples from farms in Nigeria. Using the synchrotron, the researchers determine the exact nutrients in the African soil samples. Peak describes the technique they are using as similar to chemical fingerprinting. Their next step is to use advanced molecular techniques to determine what microbes are present and how they cycle nutrients in the soil.

Results of their data analysis will offer a clear picture of West African soil systems. This research is in progress, and the researchers hope that the findings will help African farmers grow indigenous vegetables to feed millions.

ADPATED FROM STORY BY DEE HOBSBAWN-SMITH





Parents Transforming School Curricula

Repositioning minority parents alongside educators and combining their respective knowledges unites the divided worlds of home and school.

EDUCATION

h.D. candidate in Curriculum Studies, Momina Khan, is examining how minority parents' engagement would develop more inclusive school curricula. "Curriculum plays a critical role in the identity affirmation of students from varied social backgrounds," Khan says. "Using my own experiences as a Muslim Canadian mother of four, I am looking at questions about who is represented in schools and who is marginalized? Whose knowledge counts and whose knowledge is silenced? What factors prevent and promote the engagement of ethnically diverse parents in educative ways on school landscapes?"

"Through sharing my poetry, personal lived experiences and the stories of my children's experiences with school and curriculum, I challenge the current trends in our educational system," Khan explains. Supervised by Dr. Debbie Pushor, professor at the College of Education, Khan's research makes central the complexities of

Arts, Humanities and Education

The Humanities and Fine Arts are concerned with human culture and expression, while Education is as much an art of imparting knowledge as it is a science. The College of Arts and Science and the College of Education are the centres of research in these fields at the U of S.



growing up between two cultures and balancing cultural and religious identities. Khan emphasizes that Canadian children of various ethnicities often deal with a "home culture" and a "school culture" and lead double lives. This poses a serious threat to their sense of self and belonging, both to place and people.

> Khan examines the unique leadership role parents can play to promote the engagement of teachers and parents in practices that create a more inclusive place for these students in schools.

"By making parents' knowledge central to schooling processes, we can create possibilities for power and authority to be shared mutually by educators and parents," Khan says. "I believe that minority parents have a depth of lived experience, knowledge, and insight to bring to the educational domain."

"Hopefully, this research will create the possibility of a space for transformation and learning for parents and educators," Khan says. STORY AND PHOTO BY ZAHRA GHOREISHI



Empowerment from Ground Up or from Within?

Bangladeshi-Canadian student explores new ways of empowering women in her community.

HUMANITIES

ebunnessa Chapola, a Ph.D. student in Women's and Gender Studies, is examining Bangladeshi newcomer immigrant women's experiences of community building in Saskatoon. Her research is supervised by Dr. Marie Lovrod. "Bangladeshi immigrant women's empowerment is often framed in relation to masculinized, neoliberal models of development," Chapola says. "These women do not have equal

rights regarding education, family management, or

other basic needs in their communities in Canada.

They often end up doing deregulated work with lower wages, and their lives become exhaustive due to poor working conditions," she explains.

Chapola further comments that "As an immigrant woman, I may not be able to receive what Canadian settlement agencies have to offer. I might have different choices, different ways of making myself stronger and resilient in the host country."

Evolved from her lived experiences, Chapola's doctoral research addresses Bangladeshi newcomer women's cultural, economic, and social challenges in the resettlement processes through a multi-level community engagement project.

Chapola's research involves three main tools of community engagement: community gardening (interpersonal), cultural performances (intercultural), and cross-cultural, anti-racist education through community radio (transnational). She has been an engaged gardener since 2011 and has served as the U of S community garden coordinator for three years. Chapola also performs and teaches traditional Bengali music to second-generation community children and hosts a Bengali radio show called Banglar Gaan O Kotha (music and stories from Bengal).

"I explore how these projects will help build solidarities that could empower Bangladeshi immigrant women's lives," Chapola says. "To me, empowerment is the process of expanding the capacity of individuals to make their own choices and transform them into desired actions and potential outcomes. I've found that community engagement and networking can be informal but powerful tools to develop feminist consciousness and to improve life skills of marginalized women as they transition to their new home."

COLLEGE OF ARTS AND SCIENCE

The College of Arts and Science is the largest, most diverse college at the university. Serving over 10,000 students and nearly 45% of the total student population, it spans the sciences, social sciences, humanities and fine arts.

Combining both arts and science programming into one integrated college provides students with a broad, yet in-depth, perspective of the world that enhances their focus on individual disciplines and fosters an interdisciplinary approach to graduate education.



\$49.4 MILLION in research funding awarded in 2016/17

298 full-time equivalent faculty



980 graduate students

ARTS AND HUMANITIES

The College of Arts and Science is home to nine departments that specialize in arts and humanities education and research: Art and Art History, Drama, English, History, Languages, Literatures and Cultural Studies, Linguistics and Religious Studies, Music, and Philosophy. Students can pursue Master of Arts, Master of Fine Arts, Master of Music or Ph.D. degrees through more than a dozen graduate programs.

The College of Arts and Science hosts several research facilities and exhibition venues for humanities and fine arts projects and research, including:

- HUMANITIES AND FINE ARTS DIGITAL **RESEARCH CENTRE** – an innovative facility equipped with industry-standard audio, video and graphics hardware and software;
- HISTORICAL GEOGRAPHIC INFORMATION SYSTEMS LAB - one of the first digital history labs in Canada, specializing in environmental, energy, borderland, agricultural, urban and social histories:
- GREYSTONE THEATRE housed in the oldest drama department in the Commonwealth;
- GORDON SNELGROVE GALLERY both a teaching facility and a public gallery;
- KENDERDINE AND COLLEGE ART GALLERIES - home to the University of Saskatchewan Art Collection, and exhibitions and programs of national and international scope;
- MUSEUM OF ANTIQUITIES a collection of Greek, Roman, Egyptian and Near Eastern sculpture in full-scale replica.



See the Bigger Picture

Immigrants' early life memories reveal a different side to children's picture books.

EDUCATION

icture books are commonly viewed as important materials for young children learning language, but Yina Liu, master's student at the College of Education has found another function. She investigates the role of contemporary Canadian picture books in children's immigration and adaptation processes. Supervised by Dr. Bev Brenna, Liu's research focuses on the stories of three adult immigrants recalling childhood transitions to Canada.

"My research concentrates on picture books" cultural function for immigrant children," Liu explains. The goal of her research is to identify how childrens' literature can provide a platform for

helping immigrant children overcome transition difficulties and better adapt to life in Canada. Anticipating that picture books might help immigrant students to ease the challenges they have in their transitions, Liu hypothesized that these books may act as bridges for students to access cultural information.

Liu's project first seeks to explore what transition challenges the participants experienced during their childhood. Second, she strives to match their experiences to the content of a set of Canadian picture books.

Liu has developed a template for picture book analysis that she uses during interviews with



Children's picture books in Canada have very useful content, but there is a long way to go to make sure they have the cultural information required to overcome immigration challenges and adapt to Canada more smoothly.

YINA LIU, MASTER'S STUDENT AT THE COLLEGE OF EDUCATION

participants. The themes and patterns from the interviews fall into three categories: visual information about cultural elements, textual themes on cultural aspects, and textual themes on social perspective.

"Based on the template of analysis, I then studied a set of picture books," Liu says. "In the first category of visual information, a large portion of the books had illustrations presenting cultural knowledge. As for the themes on cultural aspects, the most recurrent was multiculturalism, and on the top was 'being helpful to others.' But no picture books had themes on dealing with loneliness, expanding one's social comfort zone, and strategies for socially fitting into a new environment." "Children's picture books in Canada have very useful content, but there is a

long way to go to make sure they have the cultural information required to overcoming immigration challenges and adapting to Canada more smoothly," Liu says.

COLLEGE OF EDUCATION

Reaching beyond the classroom to shape futures and impact lives, we train highly professional teachers, develop successful strategies for the education of Indigenous people, and ensure environmental and social stewardship. The College has four departments: Curriculum Studies, Educational Administration, Educational Foundations, and Educational Psychology and Special Education, and is home to the following research centres:

- Aboriginal Education Research Centre (AERC), ensuring Indigenous voices are heard, understood, and translated into innovative and exemplary ethical practices.
- Counselling Assessment Intervention and Research Services (CAIRS) integrating practice and research in psychoeducational assessment and intervention.
- Saskatchewan Educational Leadership Unit (SELU), providing strategic planning, consultation and professional development services for senior leaders in education
- Sustainability Education Research Institute (SERI) - Canada's first research centre to focus on sustainability education.



\$1 MILLION in external research funding

49 faculty and librarian



465 graduate students

Image of Research



COMMUNITY IMPACT THROUGH COMMUNITY PARTNERSHIPS Lee Swanson.

Edwards School of Business, Management & Marketing



What an Oil Spill Means for Freshwater Ecosystem

Toxicology research sheds light on the smallest creatures damaged by oil spills.

TOXICOLOGY

n an ever-developing world, we constantly face the challenges of understanding the effects of our actions on our planet. Oil spills are some of the most noticeable forms of damage to the environment and particularly affect aquatic life. However, we mostly seek answers when we see larger animals are harmed. What about the hidden and the too small to see?

Bacteria are crucial for health and survival of species, but little is known about how chemicals affect the gut bacteria of fish. Abigail DeBofsky, Ph.D. Toxicology student, is studying the impact of PAHs (a class of chemicals found in crude oil) on fish gut bacteria.

"Following an oil spill, what happens to the bacteria in fish that are exposed to those



Global human population growth, emerging disruptive technologies and rising material consumption have had disastrous impacts on ecosystems. To understand and solve environmental problems, we need to integrate concepts from various disciplines and involve researchers from multiple fields of knowledge—natural and social sciences, economics and public policy, engineering and anthropology.

The University of Saskatchewan's nexus of expertise in the Environmental Sciences is distributed between the School of Environment and Sustainability, the Global Institute for Water Security, and the Toxicology Centre, along with faculty in many other colleges and research facilities.







chemicals?" asks DeBofsky. "Because these bacteria are important for the health of the fish and their overall fitness, changes in their communities and environment can reduce the ability of these fish to thrive."

Working with Dr. John Giesy, DeBofsky uses field-based and laboratory techniques to assess the effects of PAHs and their interplay with immune responses in fish.

"I hope that my work will expand our understanding and appreciation of services that the gut bacteria in the digestive tract of fish provide," DeBofsky says. "This research has the potential to guide eco-toxicological risk assessment for management of fisheries after oil is released into freshwater ecosystems."

STORY AND PHOTO BY ZAHRA GHOREISHI



EcoToxChip is an Epic Win

A brand-new tool, the EcoToxChip enables researchers to identify adverse effects of chemical pollutants on fish and amphibians.

TOXICOLOGY

oday, over 100,000 chemical contaminants pose toxicological risks to human health and the environment worldwide. Evaluating these chemicals is as challenging as it is necessary. The process is timeconsuming, expensive, and heavily reliant on animal testing, and yet produces uncertain results. What if we could develop a commercial testing tool that could help industry assess the safety of chemicals with greater certainty, while saving

costs, time, and the need for live animals?

Nicole Baldwin, a master's student in Toxicology, and her supervisor Dr. Natacha Hogan, a Toxicology professor and faculty member of Northern Ecosystem Toxicology Initiative, are working together to develop a novel tool to screen chemical pollutants efficiently.

"Chemical contamination of our ecosystems is one of the planet's greatest threats," says Baldwin "Fish and amphibians are among the species that

are too prone to toxic exposures. So I decided to do research on the danger that chemicals cause to these species."

Fish and amphibians' exposure to chemicals may result in their growth abnormalities, reproductive effects, and immune suppression. There is also growing concern over the survival of entire species.

"Harmful effects are often preceded by subtle changes in molecular processes that cannot be seen with the eye," reports Baldwin. They have designed a tool, the "EcoToxChip," that uses toxicogenomic technologies to identify subtle changes in key genes. These changes are used as "signposts" to predict the hazards of various chemicals. This toxicity-testing tool is affordable and reliable, helping researchers produce results with a high degree of certainty, and it reduces the emphasis on animal exposure.

Once developed, the EcoToxChip is expected to deliver cost savings to Canada of more than \$27 million annually in conducting environmental risk assessments. Also, the required time for tests will be significantly less, and the need for animal testing will be cut by as much as 90 percent. STORY AND PHOTO BY ZAHRA GHOREISHI

UNIVERSITY OF SASKATCHEWAN SPRING 2018

TOXICOLOGY CENTRE

Toxicology is the science that deals with the study of how toxic substances behave in the body and in the natural environment; how they adversely affect individual organisms, populations and ecosystems; how to measure these poisonous substances and their various effects and how to assess their risks to human and environmental health. Students and faculty work side-by-side in the Aquatic Toxicology Research facility, the foremost university-based research facility for water pollution in Canada, and associated laboratories for analytical, aquatic, biochemical, environmental, mechanistic, radiation and wildlife toxicology research from the molecular to the ecosystem level.

The interdisciplinary nature of the Toxicology program provides students with a diverse array of potential research opportunities. Prospective students can apply to the program from such varied undergraduate backgrounds as agriculture, biology, chemistry, ecology, environmental sciences, medicine, physiology, pharmacology, toxicology, and veterinary medicine.



Over **\$3 MILLION** in annual research funding

48 graduate students

Image of Research



DIATOM ANOTHER DAY Lorne Doig, Research Scientist at the Toxicology Centre



Transitions to Decentralized Energy

Sustainability transitions offer exciting prospects for a more accessible, economical energy system.

ENVIRONMENT AND SUSTAINABILITY

Environment and Sustainability, is developing models of decentralized energy systems based on a strategy that includes different generation, distribution and conservation technologies that work in tandem. His SSHRCfunded project is supervised by Dr. Jeremy Rayner, from the Johnson Shoyama Graduate School of Public Policy.

artin Boucher, Ph.D. candidate in

"There are advantages to using decentralized strategies," Boucher reports. "For example, localized energy generation will allow us to better deal with the challenges of cost-effectiveness and environmental concerns. Remodeling infrastructures also has the potential to create greater opportunities for small business and community investment."

This model combines the use of microgrid and storage technologies with a portfolio of electricity generation technologies. "A transition to decentralized energy is not simply an engineering or scientific effort. Social, economic and environmental considerations are also at stake," Boucher explains. A critical review of sustainability transition theories underpins this project. Boucher's review will provide insights into understanding the implications of a major shift towards decentralized energy.

"As northern cities face unique challenges for the generation and transmission of energy, my research focuses on three medium-sized northern cities: Saskatoon (Canada), Lulea (Sweden), and Anchorage (United States)," Boucher reports. "The outcomes of this research will be twofold. From an academic perspective, this research will help to fill a gap in comparative analyses of sustainability transition theories. From an applied perspective, my work will help inform policy makers and practitioners in Saskatchewan and Canada of potential transition strategies to increase the prevalence of decentralized energy in urban localities."

The results of Boucher's research have been published in the *Journal of Energy Research and Social Science*.

STORY BY ZAHRA GHOREISHI PHOTO BY MEAGAN HINTHER

SCHOOL OF ENVIRONMENT AND SUSTAINABILITY

SENS is a destination site for interdisciplinary, problem-oriented and experience-based research and learning for issues dealing with environment and sustainability. Our faculty bridge multiple disciplines across the natural, physical and social sciences, as well as the humanities and engineering, to address the most challenging environmental and sustainability issues. We believe in an interdisciplinary approach to research and teaching and in building long-lasting beneficial partnerships with stakeholders outside the academy. SENS offers both course-based and research-based master's programs and a doctoral program in various research priorities including sustainable communities, sustainable ecosystems, and water security.



\$65.8 MILLION in funding since 2010

27 core and 22 associate faculty

108 graduate students

UNDERSTUDIED PRAIRIE LAKES NOW UNDER SCRUTINY

Degraded water quality is affecting freshwater resources globally. In Saskatchewan, a chain of economically significant prairie lakes along the Qu'Appelle River is being affected by nutrients from both treated effluent from urban wastewater systems and an agriculturally dominated landscape. Ph.D. student Michelle Wauchope-Thompson, working with Dr. Helen Baulch, investigates the biogeochemical processes that govern the recovery of these nutrientimpacted freshwater ecosystems to assess water quality and sediment nutrient flux rates. This data on water quality and sediment nutrient dynamics in freshwater systems will illuminate how lake sediment processes are affecting efforts to combat the problem of dense algae blooms due to excessive nutrients in water. Ultimately, this knowledge will help guide water policy and water management in the prairies and beyond.

SUMMARY BY ZAHRA GHOREISH PHOTO BY MARK FERGUSON



Water Security on the Prairies and Beyond

A better understanding of cold regions' hydrological processes is critical for predicting Arctic freshwater fluxes under climate change.

WATER SECURITY

old regions around the world are experiencing unprecedented challenges to manage water resources in a time of extreme weather events. The Global Institute for Water Security (GIWS) is at the forefront of hydrology research, adopting a socio-hydrology approach to go beyond traditional water resources management. GIWS researchers integrate humans and their activities into water science to ensure that

water decision-making incorporates a range of perspectives about the meaning, value and use of water.

For Ph.D. students Lucia Scaff and Sebastian Krogh, the chance to come to Canada from their native Chile is an opportunity to work with some of the top researchers in the world. Located in the Rocky Mountains at the GIWS Coldwater Laboratory in Canmore, Alberta, they are part of a \$143-million U of S-led international Global Water

Futures project seeking to improve the way climate change is diagnosed and predicted, and to provide adaptation and risk management tools.

Supervised by Dr. John Pomeroy, U of S distinguished professor and Canada Research Chair in Water Resources and Climate Change, Krogh is currently conducting large scale hydrological modelling in subarctic basins to study the impact of climate change on the hydrology of the Canadian arctic. Under the supervision of Dr. Yanping Li, a School of Environment and Sustainability professor, Scaff examines summer storms and atmospheric mechanisms on the lee side of the Rockies.

"Water is huge, everywhere in the world," says Krogh. "The University of Saskatchewan is leading one of the biggest water research programs in the world, which is the Global Water Futures Program. There are lots of outstanding researchers and you get to talk with them, work with them, and have a very good supervisor. These are critical to develop, to go through your program successfully."

Scaff's and Krogh's research results will be used to develop tools and safeguards for access to water resources and services for humans, as well protection against water-related hazards, and ensure water security for the province and beyond.

STORY BY ZAHRA GHOREISHI PHOTO BY DANIEL HALLEN, RESEARCH PROFILE AND IMPACT

GLOBAL INSTITUTE FOR WATER SECURITY

The Global Institute for Water Security (GIWS) undertakes world-class research that enhances water security through the sustainable use and protection of water resources, the safeguarding of access to water functions and services for humans and protection against water-related and environmental hazards such as flood and drought.

Led by Dr. Howard Wheater, one the world's foremost hydrologist, faculty and government scientists work with students and postdoctoral fellows to understand how climate change, land management practices, and development of natural resources are affecting our water environment. Interdisciplinary teams develop improved modelling tools needed to sustainably manage water, combining expertise in natural sciences, engineering and the social sciences, and recognizing that people and their activities are of critical importance for water science and management.

Home to the pan-Canadian Global Water Futures (GWF), a U of S led research program co-funded by partners: University of Waterloo, McMaster University and Wilfrid Laurier University. Transforming the way communities, governments and industries in other cold regions of the world prepare for and manage increasing water-related threats.



\$249.6 MILLION in total funding since 2011; cellence Research Fund



77 core faculty and 254 associate members rom **21** academic units across campus

72 graduate students; 29 postdoctoral fellows

Image of Research



HOME AWAY FROM HOME Katelyn Luff, Research Assistant at Environment and Climate Change Canada—Graduate and Postdoc Studies

Human and Animal Health

The University's five colleges: Medicine, Pharmacy and Nutrition, Nursing, Kinesiology and Veterinary Medicine along with Vaccine and Infectious Disease Organization – International Vaccine Centre (VIDO-InterVac) are leaders in improving the health and well-being of people and animals around the world. With impressive capacity in the area of human and animal health, these academic units are engaged in a significant number of ground-breaking research projects and offer a broad range of academic programming. Notably, the College of Arts and Science and the College of Engineering are also actively involved in health research.





Innovative Approach to Treat Brain Tumours in Dogs

New research may lead to better cancer treatment for the pet population.

VETERINARY MEDICINE

t is estimated that one in two dogs ar diagnosed with cancer after the age and there is a growing need to addres

this issue," says Celina Yukari Morimoto, a mas student at the Western College of Veterinary Medicine (WCVM). Morimoto is seeking an efficient way to treat brain tumours in dogs using advanced radiation technology.

"Very few universities in North America have access to a linear accelerator machine wi on-board cross-sectional imaging capabilities and we are privileged to have this technology, says Morimoto. "The ultra-modern radiation therapy technology has made this pioneering research possible."

Working with Dr. Monique Mayer, a U of professor and a board-certified veterinary radiation oncologist, Morimoto is determining the precise margins around brain tumours to b included in radiation therapy planning.

"These margins are important because the current technology is so precise that even half a

e	millimetre makes a difference," Morimoto
of 10,	explains. "If the margin is too wide, it will be a
ss	radiation overdose of normal cells, and if the
ster's	margin is too small, cancer cells might not be
ster s	fully targeted in the treatment, and the tumour
	will grow."
	The linear accelerator's three imaging
ng	modalities create remarkably accurate images of
	the tumour and ensure treatment accuracy.
	Morimoto is examining ways that veterinarians
th	who do not have access to on-board cross-sectional
З,	imaging can still deliver highly accurate radiation
»	treatment to brain tumours by using a certain
	immobilization system. If her research proves this
	is possible, many more facilities can offer this
	treatment, increasing access to advanced care for
S	dogs with brain cancer.
	"Studies in companion animals serve as a
3	model to better understand some human diseases,"
e	Morimoto says. "Hopefully, the findings of this
	research may one day contribute to human health
e	because most tumours in animals and humans
ı	have similar characteristics." 🗕

STORY BY ZAHRA GHOREISHI PHOTO BY ALEXANDRA BELOTTA



Research Will 'Bee' Key to Better Bee Health

Veterinary pathologists devote their time to the health of honeybees.

VETERINARY MEDICINE

alking about honey bees often conjures up sweet thoughts of golden honey, idyllic meadows and perhaps even a beekeeper or two. But it turns out that bees need veterinarians, too.

"People need to understand that bees have many pests and pathogens just like any other species," says Sarah Wood, a Ph.D. student in Veterinary Pathology at the Western College of Veterinary Medicine (WCVM).

"They need care just like any other specieswhether that be drug care or husbandry [or] taking care of the environment around them-we need specialists to be in charge of that care. Just because they are insects doesn't mean we can ignore them."

Wood is part of the WCVM's new honey bee research group led by veterinary pathologist Dr. Elemir Simko. His team of researchers and graduate students are breaking new ground, applying their training in vertebrate pathology to invertebrates such as honey bees.

They hope to identify the possible physiological effects of chemicals such as neonicotinoids (a class of insecticides applied to flowering crops) on honey bees. Employing histopathology techniques, they use microscopes to examine bee tissues for visible abnormalities.

In recent years, headlines have been flooded with doomsday proclamations of declining bee numbers and its effect on the global food supply. Insecticides are frequently labelled as the culprit, often accompanied with horror stories of entire beehives wiped out after a neighbouring field was sprayed for pests.

The intersection of agriculture and ecology and of farmers and beekeepers has never been so apparent, and the health of bee populations is undeniably at risk. It may be that neonicotinoids, often used for canola crops grown in Western Canada, are partially to blame.

To learn more, WCVM researchers are performing studies of chemicals such as neonicotinoids on living, developing bee larvae and pupae. By exposing developing bees to varying doses in different chemical cocktails, researchers hope their study accounts for the complex social structure of bee colonies as well as varying weather conditions.

"It's about judicious use of pesticides and determining what is the safe dose because we know that we need pesticides," Wood says. "We need to find the dose range that is acceptable for pollinators, while at the same time, protecting crops."

ADAPTED FROM STORY BY ESTHER DERKSEN PHOTO BY MADDY FRIESEN

WESTERN COLLEGE OF **VETERINARY MEDICINE**

Researchers at the Western College of Veterinary Medicine (WCVM) are making internationally significant discoveries in animal health and management, biomedical research, comparative medicine and all aspects of One Health, including food safety, toxicology and public and environmental health.

WCVM's exceptional mix of basic and clinical scientists, its newly upgraded facilities and technological resources, and its thriving graduate programs all combine to create an effective force in the research world with great potential to expand its efforts in bridging animal and human health.

Faculty members and graduate students at the WCVM participate and collaborate in many multi-disciplinary research groups that bring together scientists who work on campus or in other centres around the world.



\$8.92 MILLION in research undina for 2016-17

90 full-time faculty

145 graduate students

Image of Research



CELL PARTY IN ASTHMATIC LUNG Nguyen Phuong Khanh Le, Ph.D. Student in Veterinary Biomedical Sciences



Bats to the Rescue

Bat "super immunity" provides clues to preventing fatal respiratory diseases in humans.

VIDO-INTERVAC

oronaviruses such as Severe Acute Respiratory Syndrome (SARS) and Middle-East Respiratory Syndrome (MERS) cause serious and often deadly disease in people, but bats remain unharmed.

Arinjay Banerjee, a Ph.D. candidate in Veterinary Microbiology and his supervisor, Vikram Misra, have found some clues to explain this phenomenon.

In a recent article published in Nature Publishing Group's Scientific Reports, they conclude that unlike human cells, big brown bat cells actively suppress inflammation when they are infected with viruses.

Bat "super immunity" is still a mystery but Banerjee reported "We are among only a few groups worldwide working to decipher it."

The 2003 SARS outbreak in Toronto, originating in Asia, infected 400 people and resulted in over 40 deaths. Banerjee explains SARS and MERS are deadly to humans because they cause extensive inflammation leading to severe tissue damage. Both viruses are thought to have 'jumped over' from bats to people and other animals.

"In people, these diseases work in a way that's like revving your car at very high rpms for a long time – you end up destroying the engine," Banerjee says.

"Bats seem to have evolved to suppress the revs, even when you floor the gas pedal." Banerjee has used cells from prairie bats to produce the first commercially available cell line (a layer of cells that continuously replicate) ever developed for North American bats. This cell line was tested by VIDO-InterVac scientist Yan Zhou and by researcher Vincent Munster at the U.S. National Institutes for Health laboratory in Montana. They found that the cell line can effectively grow coronaviruses such as MERS, pig epidemic diarrhea viruses and others including Ebola.

Misra and Banerjee injected the cell line with a synthetic molecule resembling a SARS bat coronavirus, and studied the bat cells' immune response in comparison to human cells.

They found both types of cells activate anti-viral genes for combatting this infection. Unique to the bat immune system, a protein called c-Rel stops a key inflammation-triggering signal. Banerjee, Misra and Darryl Falzarano (VIDO-InterVac) are currently studying MERS coronavirus in human and bat cells. Their long-term goal is to identify therapeutic targets and molecules for humans.

ADAPTED FROM STORY BY FEDERICA GIANNELLI, RESEARCH PROFILE AND IMPACT PHOTO BY DARRYL FALZARANO

VIDO-INTERVAC

Located on campus, the Vaccine and Infectious Disease Organization-International Vaccine Centre is a world leader in infectious disease research and vaccine development. Scientists and students investigate diseases that impact human and animal health. VIDO-InterVac has some of the most advanced containment level 2 and 3 research facilities in the world, including virology, immunology, bacteriology and biochemistry labs as well as 160-acre research station. Main research areas are:

MAIN RESEARCH AREAS INCLUDE:

- EMERGING AND RE-EMERGING INFECTIONS, emphasis on zoonotic pathogens.
- PATHOGENESIS RESEARCH AND VACCINES, focusing on pathogens that impact human health including Mycobacterium tuberculosis, MERS coronavirus, respiratory syncytial virus, Zika virus, influenza virus, and Chlamydia trachomatis.
- ENTERIC AND RESPIRATORY DISEASES, in cattle, pigs, sheep and poultry including Porcine Reproductive and Respiratory Syndrome Virus, Porcine Epidemic Diarrhea virus, swine influenza, Mycoplasma infections in cattle and bison, and bacterial and viral infections in poultry.
- ANIMAL MODEL DEVELOPMENT, one of the largest inventories of alternate animal models for infectious disease and vaccine research.



8 commercialized vaccines and 6 orld firsts and **100+** U.S. patents

\$200+ MILLION in containment

Image of Research

DESCENDING FROM 11 Miranda Zwiefelhofer, Graduate and Postdoc Studies, Veterinary **Biomedical Sciences**



Remote Imaging Advances Medical Diagnoses

Patients in remote communities are closer to ultrasound imaging diagnosis without travelling long distances.

MEDICINE

edical student, Scott Adams proves that MELODY telerobotic sonography, a French-developed system that allows doctors to do long-distance ultrasound imaging, is possible for abdominal and prenatal imaging. Adams is part of the first research team to test this technology in North America.

"The new telerobotic system could help save time and money. Patients may get earlier diagnoses while reducing the strain on major referral hospitals," says U of S medical imaging professor Paul Babyn, Adams' supervisor along with surgery professor, Ivar Mendez.

In two preliminary studies, one involving 18 patients and the other 30 pregnant women, Adams found that the telerobotic system is reliable for visualizing organs, and matches results and examination times obtained with conventional ultrasound. Adams has published the results of this study in the Canadian Association of Radiologists journal, and has recently presented his findings on prenatal imaging at an international radiology conference in the United States.

"Saskatchewan now leads the country in the application of remote technology," reports Mendez. "People from across Canada have come to learn what we're doing to develop models that could potentially be implemented in all jurisdictions."

Bought with a \$300,000 donation from the Leslie and Irene Dubé Foundation, "the new system was able to adequately visualize organs and abnormal findings. Abdominal and fetal measurements were similar to those obtained using conventional ultrasound," Adams says.

The research team has moved the device to Stony Rapids, a Saskatchewan Indigenous community 50 miles south of the Northwest Territories border. This project is part of the Remote Presence Robotics Program for health care at the U of S and Northern Medical Services.

ADAPTED FROM STORY BY FEDERICA GIANNELLI. RESEARCH PROFILE AND IMPACT PHOTO BY DAVID STOBBE

COLLEGE OF MEDICINE

The College of Medicine has a full range of academic programming and research projects. In addition to drug design and discovery, and research in the areas of cancer, cardiovascular health, molecular design, bacteriology, imaging, development biology and immunology, the three research priority areas for the college are:

- **NEUROSCIENCES:** Particularly in the areas of dementia, epilepsy, movement disorders, stroke and medical imaging.
- HEALTH SERVICES DELIVERY: Working with health leaders, policy makers and future health care providers to ensure the effective translation of research findings into practice.
- ABORIGINAL HEALTH: Finding ways to eliminate the longstanding disparity in health between the Aboriginal and the non-Aboriginal population.



150 faculty



200+ graduate students

\$88.2 MILLION in research

WHAT NEUROSCIENCE **TELLS US ABOUT ANXIETY** AND DEPRESSION



Pharmacology Ph.D. student, Hajar Miranzadeh, researches the source of neurological diseases such as severe anxiety and depression. Working with Dr. Changiz Taghibiglou, and in collaboration with the world-renowned neuroscientist Dr. Graham Collingridge, Miranzadeh investigates the functional difference between glutamate receptors in the raft and non-raft compartments of brain cells. Early stage behavioral studies show that disrupting the raft protein's interaction, using a novel interfering short peptide, results in behavioural abnormalities in rodents. This NSERC-funded research shows promise in explaining the neurological patterns leading to brain imbalances that cause psychiatric and neurological disorders.

SUMMARY BY ZAHRA GHOREISHI PHOTO BY DAVID STORBE

Helping Thousands in Ethiopia

Small seeds power change, feeding thousands in Ethiopia, a country with one of the highest rates of food insecurity in the world.

PHARMACY AND NUTRITION

ince 1997, dozens of faculty and students have collaborated with Hawassa University to improve food and nutrition security for thousands of people in southern Ethiopia. Farmers everywhere face an increasing challenge to feed everyone adequately, safely and sustainably as world population grows, and these challenges are felt most keenly in less industrialized countries.

By introducing new varieties of pulses, such as haricot beans and chickpeas, researchers have provided smallholder farmers with high-protein crops rich in iron and zinc to combat hunger and malnutrition. The cultivation of these plants, which have good nitrogen-fixing capabilities, has also helped improve the extremely degraded Ethiopian soil.

Almost 36,000 women and their children have benefited from educational campaigns on the advantages of eating pulses. Through education for sustainable, climate-smart, gender-transformative agriculture, they have empowered small holding land owners and women entrepreneurs to become self-sufficient. Local female entrepreneurs are using bikes to distribute nutritious pulse-based food and snacks to low-income consumers in remote regions of southern Ethiopia.

"Our 20-year journey has demonstrated the value of pulses in empowering the healthy future of Ethiopia," says Carol Henry, assistant dean in Nutrition and Dietetics and the principal U of S investigator for the project.

Through this partnership, over 200 graduate students at Hawassa University, 40 percent of them female, have been successfully trained in a variety of fields. Literally thousands of farmers have learned about and are benefitting from better nutrition and more stable income as a result of these collaborative efforts. Their healthier children will be the next generation of change.

Building on these positive outcomes, the collaboration between the U of S and Hawassa University continues to improve food security and sources of income for rural women, youth and their households in sub-Saharan Africa.

ADAPTED FROM STORY BY FEDERICA GIANNELLI, RESEARCH PROFILE AND IMPACT PHOTO BY PETTERIK WIGGERS

COLLEGE OF PHARMACY AND NUTRITION

The College of Pharmacy and Nutrition is committed to providing an interdisciplinary environment for quality research where faculty and students can make significant contributions to science and society. Our faculty and students are involved in clinical, applied, and basic research leading to improvements in health and health care delivery in the following areas:

- PHARMACY: Pharmaceutics and drug delivery, medicinal and pharmaceutical chemistry, bio- and nanotechnology, molecular biology, pharmacokinetics, clinical pharmacy, pharmacy education, pharmacoeconomics, pharmacoepidemiology, toxicology, synchrotron science, mass spectrometry, and social and administrative pharmacy.
- NUTRITION: Clinical nutrition, dietary assessment, nutritional biochemistry, nutrition services administration, community nutrition, nutrition education, and food security.



33 faculty

70 graduate students



\$6.1 MILLION in research fundina in 2017





Franklyn De Silva, Ph.D. student in Pharmacy working under the supervision of Dr. Jane Alcorn, investigates the role of nuclear receptor PPARy mediated networks in cancer and fibrosis and is mapping pathways and processors targeted by mammalian lignans. His work shows promise to enhance the effectiveness of various chemotherapeutic agents against certain cancers.

SUMMARY BY THE COLLEGE OF PHARMACY AND NUTRITION



Northern Nursing Breakthrough

Learn Where You Live—a new approach establishes a stable nursing workforce across Northern Saskatchewan.

NURSING

ffering a 4-year B.Sc. of Nursing, delivered in La Ronge and Ile-a la-Crosse, is a huge step to overcoming the challenges of providing a stable nursing workforce in northern Saskatchewan reports Dr. Heather Exner-Pirot, strategist for outreach and Indigenous engagement at the College of Nursing. To provide a contextually relevant education, they sought national and international partners with experience in delivering nursing education in northern communities. "Nursing practice and health care delivery are unique in the north," Exner-Pirot explains.

Working with UiT The Arctic University of Norway, the College of Nursing led the establishment of a Northern Nursing Education Network (NNEN), which currently boasts over a dozen members from Canada, Greenland, Norway, Sweden, Finland, Iceland and Russia.

A number of graduate scholarships offered through the NNEN have allowed graduate

students to conduct field research internationally on topics such as telehealth, technology-enhanced learning, and professional development for rural and remote nurses. Nursing master's student Rachel Johnson travelled to Norway to learn about UiT's decentralized education program. After examining up-close UiT's innovations in using telehealth in rural communities, seeing the parallels with our Learn Where You Live program, Johnson reports "UiT is really on the cutting edge of telehealth and e-health. It was inspiring to see how much they emphasized innovation and inter-sectoral collaboration, both in terms of education delivery, and enhancing accessibility to health services in rural and remote communities."

"The Network hosts an annual Innovative Learning Institute on Circumpolar Health," Exner-Pirot says, "bringing together northern nursing students, many of whom are Indigenous, to better understand the similarities and differences in nursing practice across their regions."

In the spirit of accessible education, the College of Nursing is leading the development of an open textbook on northern and Indigenous health and health care, with contributions from members of the NNEN and beyond. "There is so much to learn from one another across borders," Exner-Pirot says. "New technologies are allowing nursing education and research to reach new levels not only in the north, but also across the northern regions."

STORY BY ZAHRA GHOREISHI PHOTO BY KYLIE KELSO

COLLEGE OF NURSING

As a member of the Northern Nursing Education Network, and with many international partnerships, our faculty are leading innovations in healthcare research and professional education. The College has strong alliances, internally with Pharmacy and Nutrition colleagues, and with community partners and researchers around the world, to engage with young scholars and leaders from across the Commonwealth to encourage international education, discovery and professional practice.

The College of Nursing prioritizes research in:

- CHILD AND MATERNAL HEALTH: Optimizing maternal health and child health and development.
- HEALTHY AGING: Enhancing delivery of health services for elderly or those in palliative care.
- HEALTH EQUITY: Promotion of individual, group and community health, within their own social, economic, political, and cultural context.
- HEALTH SERVICE AND EDUCATION: Enhancing service delivery in the health care system and improving interprofessional education and the use of technology.



51 faculty

133 graduate students

\$

\$2.3 MILLION in faculty research funding since 2014

Image of Research



SYNERGY Connor Brenna, Anatomy and Cell Biology



Toward a Brighter Future for Indigenous Women Athletes

Study lights the road to greater participation and flourishment for Indigenous women athletes in competitive sports.

KINESIOLOGY

hara Johnson, a master's student in Kinesiology, and her supervisor Dr. Leah Ferguson, assistant professor, are exploring the experiences of Indigenous women athletes pursuing sport in mainstream competition, examining their well-being and adaptation experiences.

There is little research providing an understanding of the unique experiences of Indigenous women athletes. Ferguson reports,

"Indigenous women experience athletic activities differently from Indigenous men and non-Indigenous women. Their challenges are far greater as they cross physical and cultural boundaries to compete in the mainstream urban sport context."

Funded by the Saskatchewan Health Research Foundation, this research explores the stories of Indigenous women who have relocated from remote and rural First Nation communities to play sports in an urban centre. "In undertaking this

qualitative case study, we have adopted an Indigenous research framework, and we use methods of data generation that facilitate story-telling," Johnson says. "With a decolonizing approach to our research, we are flexible to incorporate suggestions from the participants as to how best explore our research question."

"We conduct sharing circles and use an interactive research tool called 'photovoice," Ferguson reports. "Participants capture photos of their activities and reflect on them in sharing circles. They share their stories of pursuing mainstream sport, including potential relocation challenges, experiences adapting to their new environment, and subsequent influences on reaching their potential in sport."

Intending to share the research results with national-level audiences, Ferguson and Johnson are confident that their findings about the perspectives, experiences, and needs of Indigenous women athletes will help guide policy development and sport programming into the future. It will serve as a starting point to promote equitable opportunities for these women.

"Through an Indigenous research framework that incorporates storytelling, these findings are going to be unique and more relevant to Indigenous women athletes than other research," Ferguson says.

STORY AND PHOTO BY ZAHRA GHOREISHI

COLLEGE OF KINESIOLOGY

With a strong history of exemplar research and building collegial and community partnerships, the College of Kinesiology strives for excellence in the scholarly activities of teaching, discovering, preserving, and applying knowledge. Three themes frame our research:

- MUSCULOSKELETAL HEALTH: Advancing bone health and related preventive strategies by examining the impact of physical activity, utilizing innovative imaging and clinical research tools.
- SOCIAL PSYCHOLOGICAL: Research social psychological factors that influence adherence to physical activity for health promotion/ disease prevention/rehabilitation.
- WOMEN'S HEALTH: Multidisciplinary examination of the role and impact of physical activity among women and girls, including sport and exercise, in their health and well-being.



20 faculty



45 graduate students



PATIENT'S QUALITY OF LIFE COMES FIRST



A newly designed chemotherapy procedure leapfrogs research ahead by 20 years and saves billions of dollars. M.Sc. student in Pharmacy Ayat Zagzoog, and her supervisor Dr. Azita Haddadi, are working to develop a chemotherapy medication that specifically targets cancer cells and leaves the healthy ones untouched. Hidden in polymer, the chemotherapy medication attaches itself only to cancer cells, penetrates the cell and gradually kills it. The project is about 70% completed, and preliminary testing shows promising results. This method minimizes the side effects of chemotherapy, lowers medication dosages and reduces the number of treatment sessions.

SUMMARY AND PHOTO BY ZAHRA GHOREISHI



Barley Straw Does Wonders in Wastewater

Barley straw shows promise as an environmentally-friendly material to remove antibiotic pollutants from waterways.

ENGINEERING

harmaceuticals, including antibiotics, are increasingly common pollutants in water systems. Traces of pharmaceuticals used by humans and animals end up in sewage and from there into the environment. Their presence is a risk to human and environmental health.

Catherine Hui Niu, associate professor of Chemical and Biological Engineering, comments "There are some materials that attract pharmaceutical pollutants in a process called adsorption and could be used to help remove them from water. But their adsorption capacities need to be enhanced to make them useful for large scale clean-up efforts."

Working at the Canadian Light Source synchrotron, Niu, along with Ph.D. candidate

Science and Engineering

The College of Arts and Science, the College of Engineering, and the Canadian Light Source lead science research at the U of S.

Faculty and graduate students address a wide range of basic and applied research guestions, including how to protect the natural environment with the ever increasing demands for energy and natural resources; exploring the fields of human-computer interaction, inference from large data-sets, modelling and simulations; studying nuclear and particle physics and space; harnessing powerful imaging and analytical techniques offered by the synchrotron science; theoretical investigations of advanced materials.

Our ability to translate these scientific insights into ground-breaking practical applications is further strengthened by collaborations with government research agencies such as Environment Canada, National Research Council and Saskatchewan Research Council, and with the private sector companies, many located at Innovation Place on campus.



Bei Yan, study samples of pre-treated barley straw exposed to norfloxacin. This is a common antibiotic used to treat bladder infections and other conditions, which has been detected as a pollutant in some water and sewage samples.

Publishing in Chemical Engineering Journal, these scientists reported that subjecting the straw to a chemical and microwave heating procedure increased its adsorption capacity for removal of the antibiotic norfloxacin by about six times higher than untreated, raw barley straw.

Niu concludes "This research is still at a laboratory stage, but understanding the mechanisms is an important step for developing eco-friendly materials that can help remove harmful antibiotics from water." ADAPTED FROM STORY BY PIPPA WYSONG



Engineers Join Hands with the Police

Advanced licence-plate recognition software fights crime.

ENGINEERING

uan Yepez, a Ph.D. student in Computer Engineering, developed fast and highly accurate software to identify vehicle licence-plates by analyzing plate images.

Plate-recognition technology is becoming more common, but current systems are expensive and relatively slow, say Yepez and his supervisor professor Seok-Bum Ko.

"Our goal is to create affordable software that can be used with any type of camera," Yepez says. "It could be used for many applications such as automatically finding cars that run red lights, exceed the speed limit, or enter restricted areas."

Yepez and Ko's software uses an improved design and can "read" plates almost 2.5 times faster and cheaper to operate than software currently available on the market which needs special cameras and a high-speed computer to identify the licence-plates. Yepez reports "The main advantage of our software is that it doesn't need any special equipment. It is also very accurate, able to read 100 per cent of all clear



I chose Canada because I really believe that it is a good country to be with family and I wanted to do research at this university JUAN YEPEZ

PH.D. STUDENT IN COMPUTER ENGINEERING

image licence-plates and more than 98 per cent of all plates, including dirty and blurred ones.

"Our research can help companies that currently work with licenceplate recognition to update their software and develop new devices with the algorithm we designed," Ko reports.

The software could make a difference in helping police track stolen cars. Yepez says, "with this software, police and parking enforcement can simultaneously share licence-plate information. Since this system does not require any image-processing servers, police would not require additional expensive devices to access parking enforcement servers."

Yepez first came to the university to do a master's degree on a scholarship from SENESCYT under a partnership agreement with the Ecuadorian government. Currently, he is working on his doctoral research with funding from his supervisor. "I chose Canada because I really believe that it is a good country to be with family and I wanted to do research at this university," Yepez says. "Canada opened the door to a world of opportunities for me."

ADAPTED FROM STORY BY FEDERICA GIANNELLI, RESEARCH PROFILE AND IMPACT PHOTO BY DAVID STOBBE

COLLEGE OF ENGINEERING

With an outstanding regional, national and international reputation for excellence in teaching and research, faculty in the college work in these five broad thematic areas: Bio-engineering and Bio-processing; Environment Infrastructure and Sustainable Development; Energy Production, Processing and Transport; Information **Communication Technologies and Intelligent** Systems; Materials Science.

Departments and divisions include Biomedical, Chemical and Biological, Civil, Geological and Environmental, Electrical and Computer, and Mechanical Engineering, as well as the Ron and Jane Graham School of Professional Development.



\$11.49 MILLION million in research funding for 2016-17



FASTER TOUCHSCREENS FOR EXPERTS



Ph.D. student in Computer Science, Mohammad Sami Uddin, investigates simpler ways to interact with touchscreen devices. He is currently developing a new multi-touch menu called HandMark-Finger. The interface, which is designed for large touchscreens such as tablets, makes it easier and about 30% faster to input commands. Uddin's supervisor, Dr. Carl Gutwin says, "We are looking at ways to make touchscreen menus fast for experts." Findings indicate that by speeding up human interaction with devices and by fitting in more commands, HandMark-Finger may have real-life applications in devices such as in tablets, computer desktops, and smart TVs.

ADAPTED FROM STORY BY FEDERICA GIANNELLI. RESEARCH PROFILE AND IMPACT PHOTO BY DAVID STOBBE



Vampire Bugs' Fatal Flaw

Next-generation pest control may thwart South American insects carrying a deadly disease.

SCIENCE

ife-threatening Chagas' disease affects six to seven million people, mostly in Latin America. It spreads mainly through triatomine bugs, including Rhodnius prolixus, known as the "kissing bug" for its habit of biting its victims around the mouth.

"These insects are developing resistance to insecticides, so we need to better understand their biology to find new ways for killing them and limit the spread of Chagas disease," says Physiology professor Juan Ianowski.

Infected bugs deposit the Chagas' disease parasites into a victim's blood system. The human immune system cannot kill the parasites and they cause severe heart problems that lead to death within 10 to 30 years.

Ianowski and his Ph.D. student Xiaojie Luan, collaborating with Claudio Lazzari (University of Tours), have been the first to provide evidence that the special circulation system in the kissing bug's head prevents the heat of the incoming blood meal from harming the bug. Their findings, published in the journal *eLife*, may be used to develop pest control strategies that could disrupt the insects' heat exchange system to kill the critters.



We've seen similar mechanisms in the body of other insects, but this is the first time we found it in the head of an insect.

JUAN IANOWSKI PHYSIOLOGY PROFESSOR

With CIHR and NSERC funding, the research continues at the Canadian Light Source (CLS) synchrotron. "We needed very high imaging resolution and the CLS was the only place that had x-rays powerful enough to visualize how the blood moves from the insects' mouths to their bodies," says Luan, who developed a new imaging technique at the CLS to scan live insects.

"We've seen similar mechanisms in the body of other insects, but this is the first time we found it in the head of an insect," says Ianowski. "Some Latin American kissing bug species can survive cold, so one day we may have them close to here." To stop the spread of this disease, it is crucial that the research continues.

ADAPTED FROM STORY BY FEDERICA GIANNELLI, RESEARCH PROFILE AND IMPACT PHOTO BY DAVID STORBE

CANADIAN LIGHT SOURCE

The CLS, a national research facility, is a source of light millions of times brighter than the sun - used to examine the structural and chemical properties of materials at the molecular level. Over 1,000 scientists from around the world use our light every year in groundbreaking health, agricultural, environmental, and advanced materials research. Located on campus, the CLS applies advanced scanning techniques to improve mining site reclamation, fight crop disease and advance breeding programs. It helps develop methods to clean up nuclear waste, study the molecular mechanism of cancer drug resistance, and examine response to lung infections in cystic fibrosis patients. For 2017:



1.100+ researchers from academic institutions, government, and industry



500 scientific publications



5,530 hours of user operation per year (53% of users are students)

FEEDING THE WORLD



As the only synchrotron in the world developing techniques specifically for agriculture research, the CLS has developed technologies for fast and improved crop development in an unprecedented way. The facility boasts a unique suite of experimental stations, light beams, ideal for the characterization of plant and soil samples, making it possible to study the internal structures of live plants and soil-root systems using high resolution and fast X-ray imaging methods.

Using synchrotron light beams, researchers will image living plants to determine structural and biomolecular signatures. Ultimately, over 300 students, faculty and researchers, from areas as diverse as big-data computing, advanced plant imaging, and social science, policy and economics, will help plant breeders and geneticists to develop hardier, healthier breeds of agricultural crops both at home and abroad.





Project Beetle Battles against Crop Disease

Artificial intelligence provides efficient platform for crop disease diagnosis.

SCIENCE AND MATH

ahat Yasir, a Computer Science M.Sc. student, has teamed up with Cuylar Conly to develop a mobile application dubbed "Project Beetle" that detects crop diseases and pesticide infestations. Most farmers check their crop health by "... walking through the fields and checking each individual leaf to see if there are visual changes," Yasir explains. "Then, they apply medicine all over the land. If they use our system, they won't need to do that."

Yasir's brainchild, Project Beetle, is a user-friendly app installed on a smartphone that the farmer uses to take a photo of a plant leaf. The app scans the photo and delivers an analysis of nutritional information and potential diseases. It can also estimate how much the surrounding crops are affected.

"We're teaching the software how to recognize disease symptoms," Conly says. "It's much like how you might teach an expert how to use their eyes to recognize disease symptoms."

"This app is equipped with predictive analysis. It can identify potential diseases through visual changes in crops and can predict when and where larger outbreaks may occur," Yasir reports. He uses artificial neural networks that allow him to condense the content of his database in the app. Although it provides more detailed information when online, the app runs smoothly without access to the internet.

There is potential for this technology to save millions of dollars in crop loss per year. "We came up with the idea that if we could develop a solution that can reduce the number of crops lost to diseases or insects, then we would be able to make our world hunger-free," Yasir states.

Yasir has won the 2017 Emerging Agriculture Hackathon, a provincewide competition celebrating innovation in agriculture technology. Project Beetle has earned recognition at regional and provinicial levels, and is in Co.Labs, Saskatchewan's first technology incubator that supports early stage technology startups with prototype development, professional networking, and mentorship with world-class tech entrepreneurs.

ADAPTED FROM INTERVIEW BY LAURA WOODWARD, CTV NEWS SASKATOON PHOTO BY ZAHRA GHOREISH

SCIENCE AND MATHEMATICS

College of Arts and Science

From subatomic physics to human-computer interaction, researchers in the College of Arts and Science are breaking new ground in science and mathematics to find solutions to issues of global importance. Six departments:

- Biology
- Chemistry
- Computer Science
- Geological Sciences
- Mathematics and Statistics
- Physics and Engineering Physics

Advanced discovery centres that strengthen and promote collaborative research in the sciences include the Institute of Space and Atmospheric Studies, the High Performance Computing Centre, the Centre for Hydrology, and the Plasma Physics Laboratory.

NEW TECHNOLOGY FOR CHEAPER BIOFUEL



Ph.D. Chemistry student Leila Dehabadi was attracted to the U of S by friends who "talked highly about the lab facilities, high standard of education and possibilities of having a good career after graduating." Dehabadi and her supervisor, Dr. Lee Wilson, are developing a new way to separate water from ethanol, the key component in alcoholic beverages and biofuel. Using corn as a starch-based material and incorporating principles of green chemistry, the methodology is 40 times more effective than previous approaches. Wilson says, "If all goes well with the research, I hope to commercialize our starch-based materials in five years." Ultimately, it will change how water is removed from ethanol, paving the way for cheaper gas and booze.

ADAPTED FROM STORY BY FEDERICA GIANNELLI RESEARCH PROFILE AND IMPACT

Social Science, Law and Policy

Four colleges come together to provide the hub of research at the University of Saskatchewan for Social Science, Law and Public Policy—the College of Arts and Science, the College of Law, Johnson-Shoyama School of Public Policy and Edwards School of Business. Together, they are working hard on a multitude of issues affecting the well-being of people and society on all levels, from the City of Saskatoon to Planet Earth.





If the Suit Fits

Political imagery has been an important consideration for as long as there were politicians.



ranklin Roosevelt famously hid his need for a wheelchair, as he believed that it would make him look weak and hinder his electoral success. A perusal of images of Vladimir Putin may have you questioning whether he spends more time bare-chested than not. And comedians have had a glut of material to work with recently with the fashion misadventures of politicians like Donald Trump and Roy Moore. These examples all come from popular media and little academic research has been conducted on the role of clothing and fashion on a politician's voter appeal.



Marketing M.Sc. student, Lincoln Lu, and professor Barbara Phillips are studying the impact of clothing on electoral success. Most contemporary research on appearance and political appeal has focused on physical features rather than malleable traits, such as fashion style and clothing choices. Lu is exploring whether different categories of fashion clothing can have an impact on a politician's voter appeal, as measured by examining candidate likability and prospective voter intentions.

STORY BY ZAHRA GHOREISHI PHOTO BY DAVID STORBE



About as White as White Can Be

Psychology student investigates the experiences of white-passing Indigenous people.

SOCIAL SCIENCE

y father is Russian and Haida, and my mother is Irish and German," reports Iloradanon Efimoff, a master's student in Applied Social Psychology. "I look white - about as white as white can be.'

Efimoff's Indigenous and white identities, coupled with her white appearance, have greatly influenced her life. Working with Dr. Melanie A. Morrison, Efimoff is looking at the perceptions of and attitudes towards Indigenous people who physically appear white.

"I remember sitting in introductory Political Science classes, shaking with anger, as people listed the ways in which they disagreed with 'special treatment' of Indigenous peoples, with no regard for abysmal current and historical treatment. Obviously, those words wouldn't have been said in front of me if I 'looked' Indigenous. Often I hear 'you don't look Indigenous!""

The goal of Efimoff's research is not to discount the white privilege that she has benefited from as a white-passing person, but to understand the experiences of an increasingly growing segment of the Indigenous population. These individuals sometimes are disconnected from their cultural heritage, and therefore, may be disenfranchised from the benefits of cultural and community connection. She thinks that "It will be interesting to dig into the roots of white privilege by looking at the unique experiences of white-passing Indigenous peoples."

How others see us inevitably affects our lives. Efimoff's research will have participants view a series of fictional characters to rate them on a variety of traits, including a white individual, a white-passing Indigenous person and an Indigenous individual who looks "stereotypically" Indigenous. She hopes her findings will illuminate the attitudes towards Indigenous people through a comparative analysis of the characteristics attributed to the individuals in each of the groups presented.

Ultimately, Efimoff believes that "We are all stronger together. Understanding ways to bring our communities together, to accept each other as the Creator made us with our diverse gifts, will help us maintain strong nations."

SOCIAL SCIENCE **COLLEGE OF ARTS AND SCIENCE**

Social science research is concentrated in these departments: Archaeology and Anthropology, Economics, Geography and Planning, Indigenous Studies, Political Studies, Psychology and Sociology.

Social science encompasses numerous fields of study including Indigenous histories, cultures, and practices, the relation between people and the built environment, cognitive neuroscience, critical approaches to human health, international relations, socioeconomic issues and economic theory, regional and urban planning, geographic information, and citizenship, immigration, race and ethnicity. Our research enables community empowerment and informs public policy from the local to the national level.

Through the state-of-the-art Social Sciences Research Laboratories (SSRL), faculty and students have access to shared research infrastructure along with technical and administrative support. This premier research facility enables and supports investigatordriven and community-engaged research and includes eight laboratories specialized for different areas of study.

Image of Research



TAKING A BREAK James Waldram, Professor, Archaeology and Anthropology



Centralizing Educational Decision Making a Cost Saving Measure? Or Not?

Master's student casts doubt on the benefits of amalgamating school boards in Canada.

PUBLIC POLICY

cKenzie Kibler is examining recent changes in the distribution of decision-making authority between provincial departments of education, local communities and parents. "In centralized governance, the province is the dominant authority, while decentralized systems mostly involve parents and local communities as the decision-makers," Kibler explains. Kibler's research concentrates on the extent of policy convergence in centralizing education governance across three provinces: Ontario, Alberta, and Newfoundland. These three are all Englishspeaking provinces, but of differing sizes with various educational governance practices. Whereas Alberta tends to be more decentralized, Newfoundland is centralized decision making and Ontario lies somewhere between the two. He is extracting his data from public budget documents, school board regulations, and provincial legislation."

Under the supervision of Dr. Michael Atkinson, professor at the Johnson Shoyama Graduate School of Public Policy, Kibler is reviewing and analyzing decisions around local taxing powers, the number of school boards and their elections, collective bargaining impacts and curriculum change. Since new public management practices justify centralizing decisions in terms of economies and cost savings, Kibler will also critique whether these policy changes have or will control spending. Using the gathered data, he plans to test the degree of provincial centralization against Statistics Canada data on per pupil spending.

"Based on previous interviews with provincial budget officials, I predict that budget savings will not be achieved," Kibler reports. He believes that policy convergence is more due to power-seeking on the part of provinces and he concludes, "My research informs policy makers of the wisdom of local institutions, the overconfidence of central planning, and good governance."

STORY BY ZAHRA GHOREISHI

JOHNSON SHOYAMA GRADUATE SCHOOL OF PUBLIC POLICY

Co-located at the University of Saskatchewan and the University of Regina, this is a provincial centre for advanced study and research in public policy and administration. The school delivers an innovative, practical and theoretically-based education in a diversity of graduate certificates and degrees at both the master's and doctoral level, that is reflective of the needs of its federal, provincial and municipal partners, Indigenous and global communities, and non-profit and industry partners. Aggregate data from both the U of S and U of R:



\$8.3 MILLION in research funding since 2013

21 core faculty

484 graduate students

LEGALIZED CANNABIS AND POLICY CHALLENGES



Restricting youth access, mitigating criminal activity, protecting public health and safety, and ensuring a safe supply chain will all be critical for the success of the legalized cannabis sector. A paper written by JSGS researchers and students at the University of Saskatchewan and the University of Regina entitled Legalizing & Regulating Cannabis in Saskatchewan details the complexity of cannabis legalization in Canada and the implications in the provincial policy context. This paper outlines 40 policy and programming recommendations that will provide Saskatchewan with a significant opportunity to achieve the federal objectives while also maximizing economic opportunities and capitalizing on innovation.

ADAPTED FROM STORY BY KATHLEEN MCNUTT, ET AL



Over-Sentencing of Indigenous People: Resolution is Underway

New Zealand, another commonwealth country, provides an alternative to the incarceration of Indigenous people.

ncarceration of Indigenous people has been addressed in R. v. Gladue by the Supreme Court of Canada. Gladue legally requires judges to consider the unique circumstances affecting Indigenous people in an express attempt to address the over-incarceration problem. But, evidence shows that Canadian judges resist to apply R. v. Gladue principles.

"Fifteen per cent of the total population of Saskatchewan is Indigenous, and Indigenous people comprise 80% of the prisoners in the province," says Glen Luther, a College of Law professor. "The 2012 court review statistics show that the situation is getting worse."

New Zealand's Indigenous Maori people are similarly over-represented in the courts, which like Canada, has resulted in a disproportionate number of offenders being kept behind bars. Luther and master of Law student, Hillary Peterson are conducting a comparative study between Canadian law and New Zealand law to identify the parallels and divergences.

"New Zealand is a world leader in restorative justice initiatives," Peterson says, "and I believe that our research would be much helped by seeing and learning about initiatives they have taken in their criminal justice system."

"Professor Luther and I have been in contact with academics from Auckland University of Technology," Peterson reports. "I am planning a trip to New Zealand and I am going to look at their research and gather their insights about the treatment of Indigenous populations in the criminal court system. These interactions are powerful and allow for a deeper understanding of why Indigenous people are so frequently brought before the courts."

Canadian law requiring judges to consider R. v. Gladue principles in sentencing has not rectified the disproportionate number of Indigenous offenders being incarcerated. The alternative and innovative path forged by New Zealand's legal system may provide the solution. Luther states, "We are looking for alternatives to prison, and I believe New Zealand has a lot to offer."

STORY AND PHOTO BY ZAHRA GHOREISH

COLLEGE OF LAW

As the oldest law school in Western Canada, the College of Law is a leader in Indigenous, constitutional, business and commercial law. and international and resource development law. The college offers strong clinical programs, externship and global exchange opportunities, and highly competitive moot experiences.

Research expertise includes access to justice and poverty law, Indigenous law and Indigenous peoples' rights, health and disability law, and environmental law. Recent projects include developing a framework for legal risk analysis and the impact this has on delivery of legal services, the interaction between natural resource development and local communities around the world, and the impact of Indigenous-industry agreements on Indigenous peoples.

In 2016, CREATE Justice (Centre for Research, Evaluation, and Action towards Equal Justice) was established to address key gaps in research data and access to justice in Canada. The college also hosts the Native Law Centre of Canada, which facilitates access to legal education for Indigenous peoples, and provides extensive expertise on issues related to Indigenous peoples and the law.



\$433,239 MILLION in faculty research

27 full time faculty



18 graduate students

Image of Research



Katherine Wheatley, Graduate and Postdoc Studies, Archaeology and Anthropology



Covert Persuasion Attempts: Do People Notice?

Research proves Facebook users do not recognize covert marketing tactics used by pharmaceutical companies on social media platforms.

EDWARDS

dam Slobodzian, an M.Sc. Marketing student, investigates a relatively new covert social media tactic used by pharmaceutical companies to promote and market prescribed medications. Many L of these companies have started to use social networking support groups to educate, engage, and monitor potential consumers.

"This is problematic because pharmaceutical companies that own market leading prescribed medications are not clearly disclosing their involvement in these online support groups for chronic illnesses," Slobodzian explains. As a result, the viewer may assume certain credibility traits for the support group, which can distorts the degree of skepticism they bring to the process of receiving the information being reported.

"Current attention in the pharmaceutical domain online focuses on company controlled communications such as corporate web portals and drug information sites," Slobodzian says. "These are both regulated, but what needs more in-depth research is social media that plays an important role in consumer-to-consumer interaction."

Working under the supervision of Dr. Marjorie Delbaere, Slobodzian is testing common theories and assumptions about covert tactics using the Persuasion Knowledge Model. "This model shows how people develop and use their knowledge of persuasion to cope with marketer's attempts to persuade them," Slobodzian explains.

"Whether or not consumers identify a persuasion attempt in a covert setting is still controversial among researchers and practitioners," Slobodzian says. "We conducted two experiments and found that Facebook users do not recognize covert tactics of marketing that online support groups use."

This study shows that priming for persuasion knowledge will activate consumers' persuasion knowledge and will result in lower evaluations of trust and lower intentions to use the information in the community.

"This research is only an initial step in the emerging debates on covert marketing's effects on persuasion knowledge, specifically in the context of health and wellness communities on Facebook," Slobodzian reports.

STORY BY ZAHRA GHOREISH PHOTO BY DAVID STOBBE

EDWARDS SCHOOL OF BUSINESS

Through the last century, the Edwards School of Business has grown from a small program linked to the professional accounting community, to become a comprehensive business school. Here, education has deep functional roots in the core disciplines of accounting and finance, marketing and management, human resources and business strategy. The characteristics of integrated decision-making, communications, and leadership skills, within a framework of ethics and social responsibility are embedded in all of our programs.

Edwards offers graduate programs in Accounting, Business Administration, Finance, and Marketing. Edwards School is also home to the Hanlon Centre for International Business Studies and Grandey Leadership Initiative.



60+ faculty

260+ graduate students

over \$390,000 in graduate

TRANSACTIONAL LIFE EVENTS AND COMPULSIVE BUYING



Compulsive buying has the potential for significant financial and social consequences. M.Sc. Marketing student, Natasha Nagel is exploring life course literature and related theorizing and argues that transactional life events can have a noteworthy influence on the likelihood of engaging in compulsive

buying. Also, the state of an individual's self-esteem and materialistic orientation would mediate this relationship. Supervised by Dr. Monica Popa, an associate professor of Marketing, Nagel's thesis conceptualizes the influential factors to compulsive buying. Early results of her research promise to show a deeper understanding of this phenomenon and will offer insight into preventative or rehabilitative means to address compulsive buying

SUMMARY BY NATASHA NAGEL PHOTO BY DAVID STOBB

Images of Research

Graduate students, postdoctoral fellows and researchers know that knowledge is beautiful, perhaps better than anyone else. This year, the fourth annual University of Saskatchewan Images of Research competition received over 90 submissions of visually-impressive images and clearly-written research descriptions. This competition, organized by the Office of Research Profile and Impact, is an avenue for members of our university community to showcase the groundbreaking research, scholarly and artistic work taking place here. On these pages, we offer some highlights of the winning entries.



Steven Mamet, postdoctoral fellow in Soil Science

Long-term ecological monitoring is essential for placing ecosystem change into a historical context. In the confluence of the Selwyn and Mackenzie Mountains in the Northwest Territories, we began recording permafrost temperature and distribution in 1990. Each August since 2006, citizen scientists from around the globe (like the intrepid group pictured here) converge on this ancient landscape of stored carbon to measure permafrost thaw in an alliterative assortment of permafrost features called palsas, pingos, and peat plateaus. Supported by the global environmental charity Earthwatch International, we employ a science-education model in which we are able to record an enormous wealth of data in a short amount of time, while engaging the general public in climate and ecological research in remote landscapes rich in eco-cultural history.

Funders: Earthwatch International, Aurora Research Institute

Little Bird in a Big World ► (Research in action, first place)

Katelyn Luff, master's student in Biology

A recently hatched Semipalmated Sandpiper (Calidris pusilla) chick is banded and measured at the Karrak Lake Research Station in central Nunavut. The effects of environmental contaminants like mercury on local biota - including these sandpipers - are unclear. These birds are part of an ongoing study in the central Canadian Arctic which aims to investigate the levels of contaminants on breeding shorebird species. Data collection will provide insight to contaminants present in the local system, whether these levels change over the breeding season, and whether chick fitness is influenced by contaminant loads.

Funders: Northern Scientific Training Program, Government of Canada Research Affiliate Program







The Great Thaw (From the field, first place, Best Description, runner up)

Mark Ferguson, communications specialist for the Global Institute for Water Security

The Athabasca Glacier is melting at more than five metres per year. As the headwaters for the Saskatchewan and Mackenzie River Basins, as well as the Columbia River System to the west, this glacier will likely cease to exist by the end of the century based on current estimates. University of Saskatchewan Climate Scientists like (I-r) Phani Adapa, Joe Shea and John Pomeroy are keeping a close eye on this precarious ice field to help communities better prepare for the uncertain future that will certainly include more floods, droughts, wildfires, and extreme weather events. Sometimes it is hard to picture what climate warming is doing to Western Canada, but when you picture a glacier without ice, it becomes more evident.

Funder: Canada First Research Excellence Fund



Gender Equity in Basic Education: A Reality or an Illusion (Best Description, first place)

Zita A. Seshie, Ph.D. candidate in Sociology

My mother could not complete her basic education in the 1960s in Ghana due to scarce family resources and the cultural expectation that a woman's contribution is in the domestic sphere. As the highly educated daughter of an African woman that could not complete the grade 6 level, I was inspired to focus my doctoral research on Gender Equity and Education Policy in Ghana. In spite of Ghana's Free Compulsory Universal Basic Education policy, girls continue to have lower completion rates compared to boys. I took this picture during my fieldwork because it is a reminder that we must continue to explore why girls have lower educational attainment globally.

Funder: International Development Research Centre (IDRC) of Canada

A Squirrel in the Hand is Worth the Whole World (Grand Prize)

One person keeps their eyes on the nest while the other starts to climb the tree. It is a race that pits human against mother squirrel in a vertical obstacle course race to reach the precious nest contents. We last saw this same baby North American red squirrel "pup" 25 days ago, after tracking mom's pregnancy and finding her pups within a day of being born. Back then, we weighed, sexed, and marked them, all in anticipation of today: ear tag day! Both of these dates are critical to our long-term squirrel monitoring project (the first because the day a mother squirrel gives birth is under natural selection and can give her babies an edge in certain years; the second, because giving each individual unique tags allows us to track their key life moments from birth to death). This squirrel, newly tagged, is being hand delivered back home, to snuggle into the natal nest with mom. Funders: Northern Scientific Training Program, NSERC

Andrea Wishart, doctoral student in Biology



OUR STUDENTS



1 CANADA

POPULATION: 35+ million **CAPITAL:** Ottawa **SIZE:** 9.98 million km²

2 SASKATCHEWAN

POPULATION: 1.1 million **SIZE:** 651,900 million km² **FRESH WATER:** home to 100,000+ lakes



SASKATOON

POPULATION: 250,000+ CLIMATE: Canada's Sunniest City

SPRING 8.9°C TO -3.3°C • SUMMER 24.3°C TO 10.5°C WINTER -10.2°C TO -20.7°C



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Vancouver: 1H 55M Toronto: 3H 05M New York: 4H 31M Los Angeles: 6H 01M Beijing: 14H 53M London: 11H Sao Paulo: 16H 20M New Delhi: 14H 14M

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