



UNIVERSITY OF MANITOBA

# ResearchLIFE

SUMMER 2018 | VOLUME 2

## CEREAL HEALER

DELVING INTO THE WHOLE GRAIN

## FAMILY MATTERS

Improving business

## RISKY COMMUNICATIONS

Inspiring trust

## BUNDLING UP FOR SUMMER

Ice-breaking  
Arctic research

# MESSAGE

FROM THE VICE-PRESIDENT  
(RESEARCH AND INTERNATIONAL)



We are home to many outstanding scientists and scholars, and continue to be the chosen university for researchers who are leaders in their field. In this issue, we are highlighting some of our exemplary Canada Research Chairs (CRC) and our Canada Excellence Research Chair Laureate.

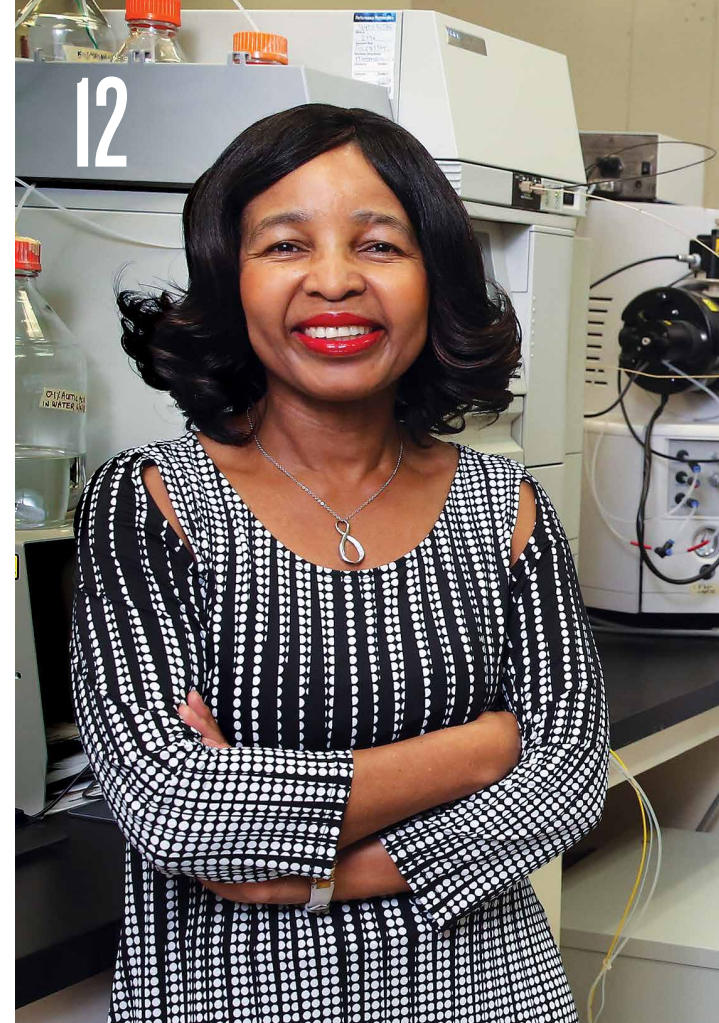
The CRC program, launched in the year 2000 by the government of Canada, has provided the funding to recruit and retain Canada's knowledge leaders. Along the way, it changed the way universities think about their research programs and the way researchers approach their work.

With the program allowing the funding choices and research focus to be institution driven, it allows the U of M to build on established and emerging areas of research strength. The CRCs are tiered with Tier 1 chairs acknowledged by their peers as world leaders in their fields, appointed for seven years with a possibility of renewal based on performance for another seven years, and Tier 2 chairs being exceptional emerging researchers, appointed for five years with a possible renewal for another five years. This approach grows strong research expertise across a broad spectrum and retains the chair holders after their terms expire.

Our featured chair holders—Trust Beta, Michelle Driedger, Zhenyu Wu and Søren Rysgaard—delve deeply into aspects of everyday life that affect society through their research programs: food, health, work and environment. This issue also highlights additional chair holders and research leaders, including graduate students. I hope it provides a sense of the passion and dedication that our faculty bring to their research.

—Digvir S. Jayas, PhD, PEng, PAg, FRSC

On the cover: Cereal grains. Photo: Mike Latschislaw



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OF MANITOBA

SUMMER 2018 | VOLUME 2

- 4 **HAPPENINGS & KUDOS**  
An array of research news and events
- 9 **CENTRES & INSTITUTES**  
Ongomiizwin—Indigenous Institute of Health and Healing
- 10 **INSIGHTS**  
Ted Hewitt
- 12 **CEREAL HEALER FEATURE**  
Delving into the whole grain
- 17 **VIEWPOINT**  
Improving Watershed Models for Northern Canada
- 18 **FAMILY MATTERS FEATURE**  
Improving Business
- 22 **BOOKS OF NOTE**  
Concurrent Imaginaries, Postcolonial Worlds
- 23 **IDEAS TO INNOVATION**  
At War Against the Most Toxic Agents on Earth
- 24 **RISKY COMMUNICATIONS FEATURE**  
Inspiring Trust
- 28 **SPOTLIGHT ON STUDENTS**  
Setting up the Next Gen
- 30 **BUNDLING UP FOR SUMMER FEATURE**  
Ice-breaking Arctic Research
- 34 **ON THE HORIZON**  
Events coming up Fall 2018

## ResearchLIFE

RETURN UNDELIVERABLE  
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# RE-AFFIRMING EXCELLENCE



TOP (l-r): Frank Deer, MP Terry Duguid, Elder Norman Meade, Jörg Stetefeld, Digvir Jayas

Solving a biological mystery; saving a cultural keystone; finding new hope in old drugs. These are the ambitious goals of three U of M researchers who were awarded Canada Research Chairs this past January.



**JÖRG STETEFELD**, chair in Structural Biology in the Faculty of Science, is unravelling the complexities of proteins. Just how many are there in the human body and what do they accomplish? Current research puts their number in the millions, with some cells containing close to 10,000 different proteins all working on individual tasks. His chair is funded by the Natural Sciences and Engineering Research Council of Canada.

Stetefeld’s research is focused on understanding, in minute detail, the structure-function relationship of proteins as dynamic systems, analyzing their involvement in signaling complexes related to human disease and how they can be used for biomedical applications. His work is also leading to practical applications outside the human body, and a new avenue of research: designing proteins to help industries like oil and gas monitor and clean spills.



**FRANK DEER**, chair in Indigenous Education, is on a rescue mission. His appointment is welcome support as he works to address a crisis in Indigenous culture: most Indigenous languages (with the exception of Cree, Anishinaabe and Inuktitut) are set to disappear in the next few generations.

Since language, culture and identity are intrinsically connected, there is an urgency to revitalize Indigenous languages in schools and communities. Deer is concentrating on three lines of inquiry: public school systems; Cree-language dialects; and the confluence between language and religion, particularly how churches have stored written language in their attempts to present scripture in Indigenous languages. His chair is funded by the Social Sciences and Humanities Research Council of Canada. Deer’s CRC appointment marks the first for the Faculty of Education.



**SALAH MAHMUD** is on the verge of an important breakthrough: an effective treatment for cancer could already be in the medicine cabinets of most Canadians. Chair in Pharmaco-epidemiology and Vaccine Evaluation in the Rady Faculty of Health Sciences, Mahmud had his appointment renewed so he can continue investigating commonly-used medications, like aspirin, cholesterol-lowering drugs and anti-depressants, to prevent prostate, colon, cervical and other major cancers.

His chair is funded by the Canadian Institutes of Health Research.

Because infections like the human papilloma-virus and hepatitis B cause one-fifth of cancers, preventing or treating these infections could generate cost-effective strategies for cancer control, improve our understanding of the disease and lead to the development of more effective drugs. **IR**

# NORTHERN EXPOSURE

**FROM ACROSS THE POND**, JULIENNE STROEVE has come to study an entirely different body of water: the Arctic Ocean. A climatologist from University College London, Stroeve is renowned for her research on remote sensing of ice and snow. She will serve as the Canada 150 Chair in Sea Ice Climate Coupling until 2025, receiving \$7 million in funding over that time from the federal government.

Stroeve’s research has shown that Arctic sea ice decline has occurred far more quickly than recent models predicted, and that human activities may be the leading cause.

“Over the last 40 years, we have seen that summer sea ice in the Arctic has declined by about 50 per cent,” explains Stroeve. “This ice loss is strongly linked to the amount of CO<sub>2</sub> we’re putting in the atmosphere and if we keep doing what we’ve been doing and we don’t make any changes, the Arctic Ocean is going to be ice-free in the summertime in the next 20 years.”



Julienne Stroeve, Climatologist, University College London

**“If we keep doing what we’ve been doing and we don’t make any changes, the Arctic Ocean is going to be ice-free in the summer time in the next 20 years.”**

Knowledge of how this event will affect precipitation and temperature patterns in southern Canada is in high demand. Poised to deliver is Stroeve and the university’s sea-ice research team in the Clayton H. Riddell Faculty of Environment, Earth, and Resources—already one of the world’s most comprehensive and innovative.

Stroeve will use satellite and ground-based data, community monitoring and climate models to improve our understanding of how sea ice changes impact climate, which reciprocates by impacting sea ice in new ways, further impacting climate.

Studying this “coupling” effect is also key to determining the implications for large-scale weather and ocean circulation patterns, polar ecosystems, marine biogeochemistry, the livelihoods of coastal communities, marine activity and resource extraction. **IR**



# TODAY'S PROMISE, TOMORROW'S LEADERS

A long-standing tradition and a prestigious honour, the Terry G. Falconer Memorial Rh Institute Foundation Emerging Researcher Awards shine a light on emerging research talent. The 2017 recipients are U of M faculty members in the early stages of their careers who display exceptional innovation, leadership and promise in their chosen fields.



**Applied Sciences**  
**ROBERT DUNCAN**

Canola and rapeseed breeder Robert Duncan (plant science) is focused on developing high-yielding, disease-resistant varieties with excellent end-use quality. He and his team are concentrating on increasing erucic acid (a fatty acid common in plastics and cosmetics) in plants to improve extraction efficiency and agronomic traits, allowing farmers to grow crops in a more economically and environmentally efficient manner.



**Humanities**  
**MARY J. SHARIFF**

Associate professor in the faculty of law, Mary J. Shariff examines the complexities of medical assistance in dying beyond the health-care system. Through a comparative laws approach, Shariff’s research helps to identify and unpack different policy concerns to be considered as termination-of-life practice continues to unfold and be operationalized.



**Applied Sciences**  
**YANG WANG**

Teaching computers to understand what they see, like humans do, is at the heart of Yang Wang’s research. The computer scientist is developing algorithms that automatically understand images and videos, including image classification, object detection, human action recognition and image segmentation. His research has potential applications in many real-world domains, including surveillance, entertainment, image/video search, health care and assistive technology.



**Social Sciences**  
**ROBERT C. MIZZI**

Robert C. Mizzi (education) examines the work and welfare of educators in educational organizations, specifically those who identify as lesbian, gay, bisexual, transgender and queer, as well as educators who work abroad. He reconceptualizes employment situations in order to help educational administrators understand the connections between work culture, inclusion/exclusion practices and social change, and then considers the conditions required for diverse ideas and identities to flourish, leading to improvements in student success, organizational learning, job satisfaction and educator development.



**Natural Sciences**  
**DAVID HERBERT**

Synthetic inorganic chemist David Herbert leads a research team that probes the ability of chemistry to answer critical questions in energy and sustainability, all through the lens of fundamental bonding and reactivity at a molecular level. This includes designing novel molecules and materials for solar energy capture and conversion, and molecular battery materials for off-grid energy storage, in addition to applying electrochemistry and catalysis in the pursuit of environmentally friendly alternative routes for the production of value-added chemicals.



**Health Sciences**  
**NATHAN NICKEL**

Assistant professor Nathan Nickel (community health sciences) uses big data to answer a big question: how can we help families lead healthy, happy lives? Using health, social services, education and justice information from the Manitoba Population Research Data Repository, Nickel identifies policies and programs that promote the health and well-being of children, mothers and their families. He is particularly interested in finding those programs that reduce health inequities.



**Interdisciplinary**  
**EHSAN KHAFIPOUR**

Ehsan Khafipour wants to change the current “one-size-fits-all” approach to preventing and treating metabolic disorders and infectious diseases to one of personalization and precision. Using cutting-edge molecular microbiological techniques combined with bioinformatics and statistical approaches, Khafipour (animal science/medical microbiology and infectious diseases) is able to link the composition, function and dynamics of microbiomes found in the gut, mammary system and vaginal tract with an individual’s diet, lifestyle factors and health/disease status. **IN**

# WIELDING WORDS



There is a powerful image of Peter Kulchyski on the U of M’s department of Native studies’ website. In 2006, he and other picketers gathered on Winnipeg’s midtown bridge to protest the Six Nations Caledonia land dispute.

**I**N THE PHOTO, KULCHYSKI IS FLANKED BY POLICE OFFICERS. His jacket is twisted, left hand stretching towards the camera, as he is pulled—backwards—over a guardrail. That such a photo exists would not surprise anyone who knows the respected professor and prolific author. In fact, it illustrates clearly what he has often been recognized and celebrated for: a passion for addressing highly charged political subjects and an uncanny ability to influence Indigenous affairs.

TOP: Faculty of Arts professor Peter Kulchyski

Most recently, the Bisset-born and Residential-School-raised Kulchyski was honoured with the 2017 Dr. John M. Bowman Memorial Winnipeg Rh Institute Foundation Award. Presented annually to a U of M faculty member, it acknowledges outstanding contributions to scholarship and research in any field. Kulchyski has been instrumental in establishing the academic and professional credibility of Native studies in Canada. Indeed, most scholars would be hard-pressed to conduct serious research in Indigenous culture, rights or Canada-First Nations relations without encountering his work.

**“Kulchyski has been instrumental in establishing the academic and professional credibility of Native studies in Canada.”**

He has published nine books and numerous scholarly essays and articles, all of which tackle regional and nationally significant issues with forceful but carefully argued analysis. *Like the Sound of a Drum: Aboriginal Cultural Politics in Nunavut and Denendeh* (2005) received the Isbister Prize for best non-fiction book in Manitoba and is universally utilized as a benchmark in northern research involving Dene and Inuit communities. He co-leads the Social Sciences and Humanities Research Council-funded partnership project (\$2.5 million) on a journey to build a Canadian Consortium for Performance and Politics in the Americas. His novel and topical scholarly work regularly attracts the attention of politicians and policy makers, having analyzed the continued used of the Indian Act, problems with modern treaties and resource development in northern Canada. He is sought after by both media and First Nations communities alike for commentary, advice and advocacy. While a protest photo may say a thousand words, for Kulchyski, the real power lies in his expert narrative and trailblazing research to create positive social change. **IK**



# ONGOMIIZWIN

INDIGENOUS INSTITUTE CLEARS A PATH FOR GENERATIONS TO COME

BY ANNETTE ELVERS

**O**N THE MORNING OF JUNE 2, ELDERS AND KNOWLEDGE KEEPERS guided the historic launch of the Indigenous Institute of Health and Healing – Ongomiizwin with a pipe and tobacco ceremony, “I would not have imagined this a long time ago, when I was growing up in Sagkeeng,” said Elder Margaret Lavallee, who spoke at the launch. The name Ongomiizwin stems from the Anishinaabe word meaning “clearing a path for generations to come.” The new institute brings together three units that were historically part of the Max Rady College of Medicine: the Manitoba First Nations Centre for Aboriginal Health Research, the Centre for Aboriginal Health Education and the J.A. Hildes Northern Medical Unit. Rady Faculty of Health Sciences dean Brian Postl described the journey to Ongomiizwin as a long one—reaching back to the 1960s, when Dr. J.A. Hildes championed the idea that a medical unit was required to serve the North. Since that unit opened in 1970, the J.A. Hildes Northern Medical Unit has become nationally and internationally recognized as one of the most successful models of service delivery to remote northern populations. “It’s a remarkable set of achievements over 50 years,” said Postl. “It’s really the culmination of all those years of work that have brought us to this stage of our evolution.”

**“The name Ongomiizwin stems from the Anishinaabe word meaning ‘clearing a path for generations to come.’”**



ABOVE: Carrie Bourassa, director of CIHR’s Institute of Indigenous People’s Health speaks. TOP: Honour song at the launch of Ongomiizwin.

Catherine Cook is vice-dean, Indigenous health and part of the Ongomiizwin leadership team. She opened her remarks with one simple statement: “This is beyond my wildest dreams.” Cook then told her story of leaving her traditional Métis community as a young woman and experiencing daily racism. She focused on her education, discovering medicine through one of the university’s Access programs. “The biggest motivator for success was not only the support of our allies, but our peers,” said Cook. “Having other students from the Indigenous community, working together, studying together, that made all the difference.” It has become her mission to ensure that students have that same safe space to learn and build their own dreams. With the creation of the new institute, president and vice-chancellor David Barnard said, the university reaffirms its commitment to providing a place where Indigenous students can thrive and where we can begin to address the harms of our colonial history. “We know that the success of Aboriginal people and communities is vital for the health and well-being of our province and our nation,” he added. Ongomiizwin, the largest Indigenous education and health unit in Canada in terms of scope and mandate, is tasked with advancing excellence and providing leadership in research, education and health services in collaboration with First Nations, Métis and Inuit communities. Its formation—and its work going forward—is guided by Indigenous Knowledge Keepers and Elders. **IK**

# RE/ INNOVATING INNOVATION

BY TED HEWITT

PRESIDENT, SOCIAL SCIENCES AND  
HUMANITIES RESEARCH COUNCIL OF CANADA

Canada’s science and innovation agenda is vital among current national priorities.

The Government of Canada recognizes that fundamental science is essential to economic growth, but that it must also work together with innovators in all fields for the results to reach their full potential.



**A**S PART OF THE RECENTLY-ANNOUNCED protein industries supercluster, the University of Manitoba knows this first-hand. Activities at the core of the supercluster surround genetic research, but expertise from social sciences and humanities, such as law, economics, sociology, business and ethics, will be integral to help Canada be a leading source for plant proteins and, ultimately, help feed the world.

Social sciences and humanities fill a key role in all innovation. Collaboration is fundamental to the health, functioning and sustainability of the innovation ecosystem. This is what we need in order to avoid the stuff of Jennifer Doudna’s nightmares.

The world is facing serious international issues—of climate change, increased migration, inequality, faltering economies, health, food and water security, and cyber insecurity. Militant groups are defying traditional boundaries. Populist and radical movements have surged around the world. And changes to society and to economies are challenging global trade patterns and international relations.

I recently participated on a mission to Mexico City with colleagues from postsecondary institutions in both countries. Greater talent exchange, research collaboration and Indigenous high education dominated discussions.

## IT IS CLEAR TO EVERYONE THAT COLLABORATION ACROSS BORDERS AND ACROSS DISCIPLINES IS PARAMOUNT FOR MEETING THE NEEDS OF THE 21ST-CENTURY WORLD.

It is clear to everyone that collaboration across borders and across disciplines is paramount for meeting the needs of the 21st-century world.

Much of fundamental research today is problem-based and is carried out by interdisciplinary teams, and as research-funding agencies, we must continue to find great ways of working together. Reinvigorating the research ecosystem is now more important than ever.

As you know, Ministers Duncan and Petitpas-Taylor announced the creation of the Canada Research Coordinating Committee (CRCC) in October as part of the federal government’s response to the Fundamental Science Review recommendations. The CRCC’s mandate is to improve the coordination efforts of Canada’s research granting agencies—the Social Sciences and Humanities Research Council of Canada, the Natural Sciences and Engineering Research Council of Canada, and the Canadian Institutes of Health Research—as well as the Canada Foundation for Innovation.

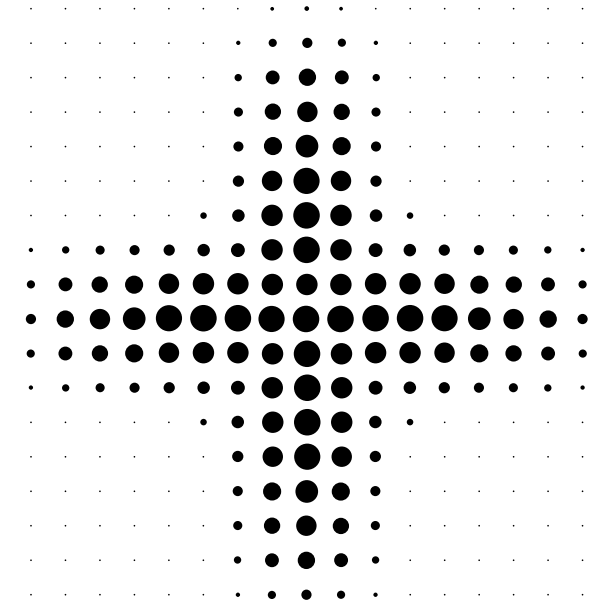
CRCC members are working together to strengthen Canada’s ability to grow in the rapidly evolving global research landscape while focusing on key priority areas such as strengthening equity and diversity in research; increasing the capacity of Indigenous communities to conduct research and partner with the broader research community; and improving support for the next generation of scientists and scholars.

## THE CCRC IS WORKING TO FIND MORE EFFECTIVE WAYS TO LINK GOVERNMENT SCIENCE WITH ACADEMIC RESEARCH TO BUILD RESEARCH CAPACITY AND INCREASE OUTREACH AND IMPACT OF RESEARCH.

The funding announced in Budget 2018 will be instrumental for carrying out the CRCC’s priorities, particularly the \$3.8M announced in support of engaging with Indigenous communities and stakeholders to identify new ways of doing research together and creating partnerships that are led by Indigenous researchers with the broader research community; and the recently announced tri-agency fund (\$275 million over five years in Budget 2018)—for programming that will focus on innovative and rapid response research that is international, interdisciplinary, and higher risk.

Budget 2018 also included additional funding for the Canada Research Chairs program to ensure that emerging scholars are given the support they need to turn their dreams into reality. Ultimately they will be ones responsible for researching and finding solutions for the consequences tomorrow’s biggest issues.

The CCRC is working to find more effective ways to link government science with academic research to build research capacity and increase outreach and impact of research. By supporting and promoting collaboration across the academic, public, private and not-for-profit sectors—nationally and internationally—we can examine the cultural and technical tensions affecting health, food, the environment, and everything in between. We can then ensure that the knowledge gained meets the needs of Canada’s own research community—and the needs of those who will put this knowledge into action. ■



# CEREAL HEALER

BY SEAN MOORE

In the past 10,000 years, the human population has grown from less than 10 million to more than seven billion today. Most of the calories that made that boom possible have come from three grains: maize, rice and wheat. Their familiarity leads many to overlook them for fad food that seems innovative. But peel grains apart, and you discover they've been hiding a bounty of riches.



**S**HE KNEW THE DRINK HER MOTHER made from maize on her family’s small farm in Zimbabwe was nutritious, but as a little girl, Trust Beta preferred the sweetness of Coca-Cola to the murky goodness of her mother’s brew.

Her mother, undeterred, kept leading the family towards wholesome foods, and Beta experienced a revelation of sorts when her mom had the family dry corn under the sun, boil it, then mix it with legumes to eat.

“We ate them whole, not ground,” Beta recalls. “And you can almost trust that there must be some health benefits in eating something in its wholeness, not fragmented with parts thrown out. Look at the wholesome seed of wheat, how it is packaged. In your wisdom, you think you can make it more attractive by discarding parts, but what have you missed by doing that? Many, many, many things.”

**“LOOK AT THE WHOLESOME SEED OF WHEAT... YOU THINK YOU CAN MAKE IT MORE ATTRACTIVE BY DISCARDING PARTS, BUT WHAT HAVE YOU MISSED BY DOING THAT? MANY, MANY, MANY THINGS.”**

As a former Tier 2 Canada Research Chair in Food Processing for Grain-Based Functional Food funded by the Natural Sciences and Engineering Research Council of Canada, Beta has investigated what components of whole grains can play a role in reducing obesity, cardiovascular disease, diabetes and cancer.

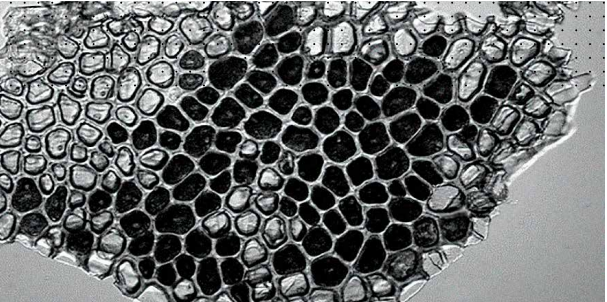
Her research program has evolved from fundamental exploration of plant biochemistry to discovering abundant stores of health-promoting compounds in Manitoba’s wild rice. Indeed, she has found over 30 such phytochemicals—non-nutrient chemicals, like antioxidants, made by a plant—in wild rice, wheat, barley, corn and rice. Now, companies such as Kellogg and Heinz seek her expertise to make their offerings healthier.

Beta’s research accelerated in 2008 when she received a mass spectrometer, an unusual piece of equipment for a food scientist. It allows her to investigate food like a chemist would—determining what molecules are locked inside the grain’s packaging.

PREVIOUS PAGE:  
(L-R): Professor Trust Beta in her lab with students Yuwei Song and Pamela Drawbridge.

RIGHT: Digital image of stained wheat aleurone residue with empty and filled cells.

BELOW: PhD student, Pamela Drawbridge weighing a wheat flour sample as an initial step to determine the phytochemicals in this particular variety of wheat.



Her resulting work built a database we have lacked since our ancestors began growing cereals 11,000 years ago.

“Getting this equipment was a highlight of my career because it was a game-changer,” she says. “We made a breakthrough with wild rice. That was the first time we actually saw the various phytochemicals in wild rice, using that machine. Honestly, it’s like a dream come true in terms of just getting to know the details of any type of grain that you have been eating and taking for granted. Just to see how the phytochemicals were packaged. It’s a beautiful thing.”

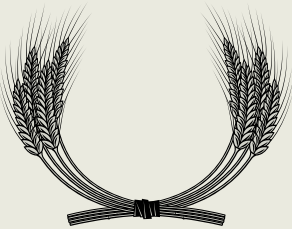
**“GETTING THIS EQUIPMENT WAS A HIGHLIGHT OF MY CAREER BECAUSE IT WAS A GAME-CHANGER.”**

A cereal grain’s kernel has three prominent parts: the bran, or hard outer layer; the germ, a nutrient rich embryo that can grow into a new plant; and the endosperm, a large store of starch that bakers know as flour.

But nature is always more wondrously complex than it first appears.

A few years ago, Victoria Ndolo, a PhD student from Malawi working in Beta’s lab, undertook the excruciatingly cumbersome process of dissecting a grain of corn and barley—manually cutting the kernels’ bran under a microscope, without crushing it, into remarkably thin segments.

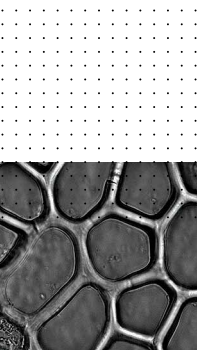
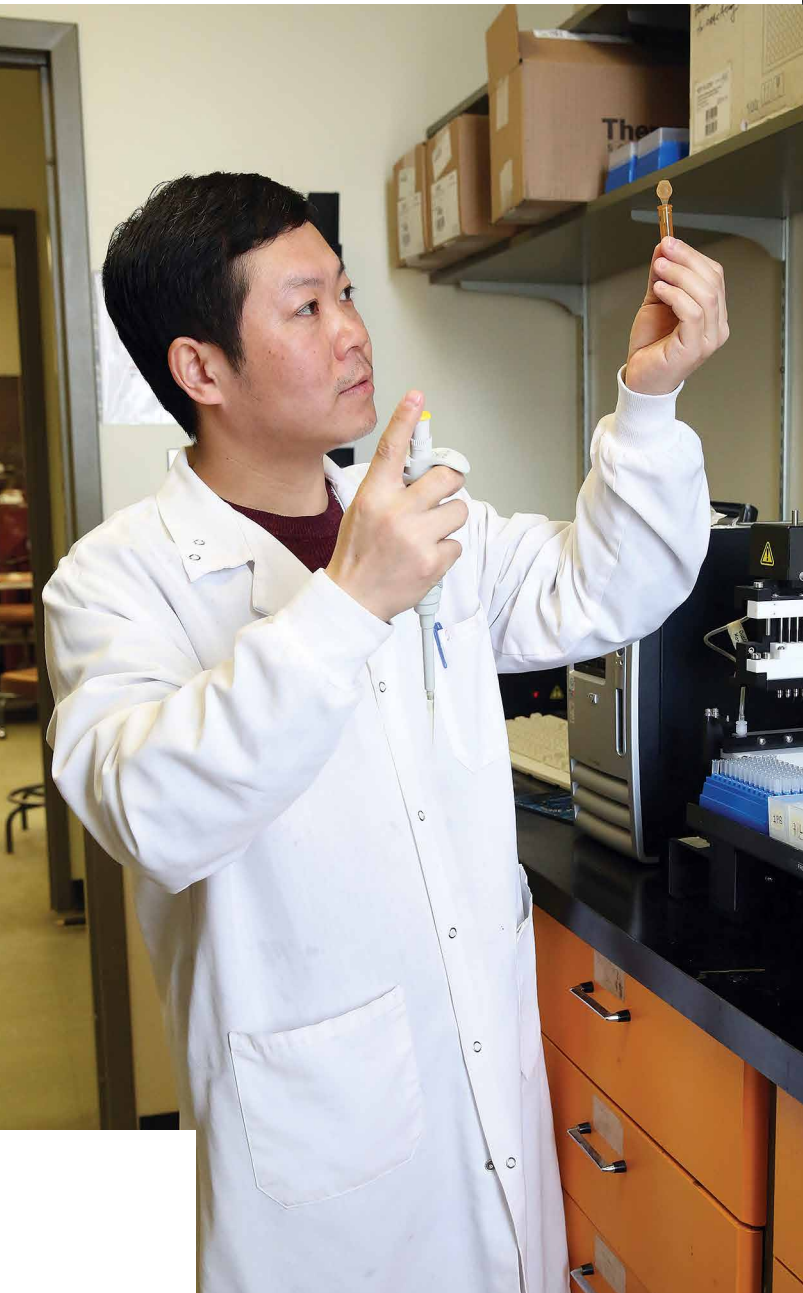
The frustration was worth it. She saw something no one else had seen: the bran had perfectly defined layers within it, and the layers held different human-health-promoting chemicals. Prior to this, science knew there were layers, but imagined them as blurry, intermingling boundaries.



# THE HARVEST

**TRUST BETA IS REGARDED AS ONE OF THE WORLD’S FOREMOST CEREAL SCIENTISTS.**

- She has published over 100 peer-reviewed papers and they have garnered over 2,000 citations, making her one of the most influential scientists in the field. Indeed, using an internationally recognized research metric tool, her papers are cited five times more than the world average in three different fields – Agricultural and Biological Sciences, Chemistry, and Medicine.
- She has a book currently in production by the UK’s Royal Society of Chemistry that she has co-edited on *Cereal Grain-based Functional Foods*.
- She has enhanced our understanding of how a plant’s genes and environmental conditions impact how many health-promoting compounds cereal grains can contain.
- She has contributed to improving grain breeding programs, with the goal of producing grains of more uniform phytochemical [non-nutrient chemicals, like antioxidants, made by a plant] content and functional properties.
- Training and mentoring is integral in Beta’s program. In the past five years, she directly supervised 47 national and international highly-qualified students, including: eight postdoctoral fellows, 25 graduate and 14 undergraduate students from Canada, Brazil, China, France, Italy, Mexico, Peru and South Africa. To date, 12 of her trainees have become independent academic scientists and 28 are professionals within government agencies and leading food companies.



“It took new technology and the patience of a woman to discover this,” Beta says with a laugh, which she does easily and often.

Ndolo saw that an area called the aleurone is not, in fact, part of the endosperm. It is its own entity and it is rich—most of the health-boosting chemicals we want are tucked in this small space. This dietary treasure, hiding for thousands of years, was finally found.

**“WE ALWAYS THINK WE ARE THE MOST SOPHISTICATED, HIGHER ORGANISM, BUT WITHIN THE GRAIN, IF YOU LOOK AT THE DETAILED STRUCTURE, YOU CAN APPRECIATE THAT THEY ARE JUST AS SOPHISTICATED AS WE ARE IN A WAY.”**

Beta’s lab created the map, and now functional food companies are following it to exploit the bounty of this molecular hinterland.

“We always think we are the most sophisticated, higher organism, but within the grain, if you look at the detailed structure, you can appreciate that they are just as sophisticated as we are in a way,” Beta says.

Near the end of her PhD, Ndolo spoke at a symposium on functional foods. She was nervous because there were many medical doctors attending, speaking about flashy animal studies and the intriguing effects of chemicals on livers. Ndolo felt timid. All I have are these measly grains, she thought.

“I said, ‘You have to stop that mentality,’” Beta recalls. “Because those same grains, if they were being treated with respect, not just thrown away, no one would be unhealthy because they have the nutrition that we need. So I told her, ‘You are going to stand tall and show how sophisticated that grain is and why some people will be out of business—because if we can convince everyone to eat their whole grains, then we don’t need much of our medical facilities.’”

TOP RIGHT: Empty aleurone cells.

ABOVE: Visiting Chinese scholar from Henan University of Science & Technology, Dr. Jinle Xiang admires a vial containing extracts from a Malawian finger millet variety prior to phytochemical analysis and comparison with millets purchased in Manitoba retail shops.

# IMPROVING WATERSHED MODELS FOR NORTHERN CANADA

BY TEGAN HOLMES

**W**ATER IS ESSENTIAL TO MANITOBA, from agriculture to drinking water to hydroelectric generation, but it can also be dangerous; floods and droughts are both threats to our province.

We can reduce the negative impacts from both too much and too little water with good water management and appropriate infrastructure, both of which depend on accurate predictions of future water supply. With a changing climate, we should no longer assume that our future river flows will continue as they were in the past. Instead, water managers are turning to computer models of watersheds to predict floods and plan for long-term hydroelectric development.

However, modeling rivers accurately is a significant challenge in regions where streamflow and weather observations are sparse, and/or have limited data record lengths. Data scarcity is particularly acute in northern Canada, where the region’s remoteness and limited accessibility restricts the expansion of data networks. We can use models to simulate flows in these northern watersheds, and reproduce flows from the historical record, but will these models predict future flows accurately? We need models that can get the right answer for the right reasons, accurately representing the physical processes generating streamflow, in order to predict flows under different climatic conditions. Information on individual processes like evaporation, however, is even less common than weather or flow data—and is even more costly and less feasible to obtain across large, remote regions.

To get more information on the sources of river flow, we’ve turned to stable water isotopes as tracers. These naturally occurring water molecules are slightly heavier than normal water, but that small mass difference leads to different isotope concentrations in



Tegan Holmes is an engineer-in-training (EIT) and PhD student in civil engineering. She is studying the value added to hydrologic models by stable water isotope data. She has completed an MSc degree, for which she received an NSERC master’s scholarship.

rain and snow, and lets us identify how much water has been lost to evaporation. It’s also relatively easy to collect stable water isotope data in remote regions, with just a sealed grab sample needed from the field.

By simulating not only water in a watershed model, but also stable water isotope concentrations, I can identify models that have the wrong amount of snowmelt coming

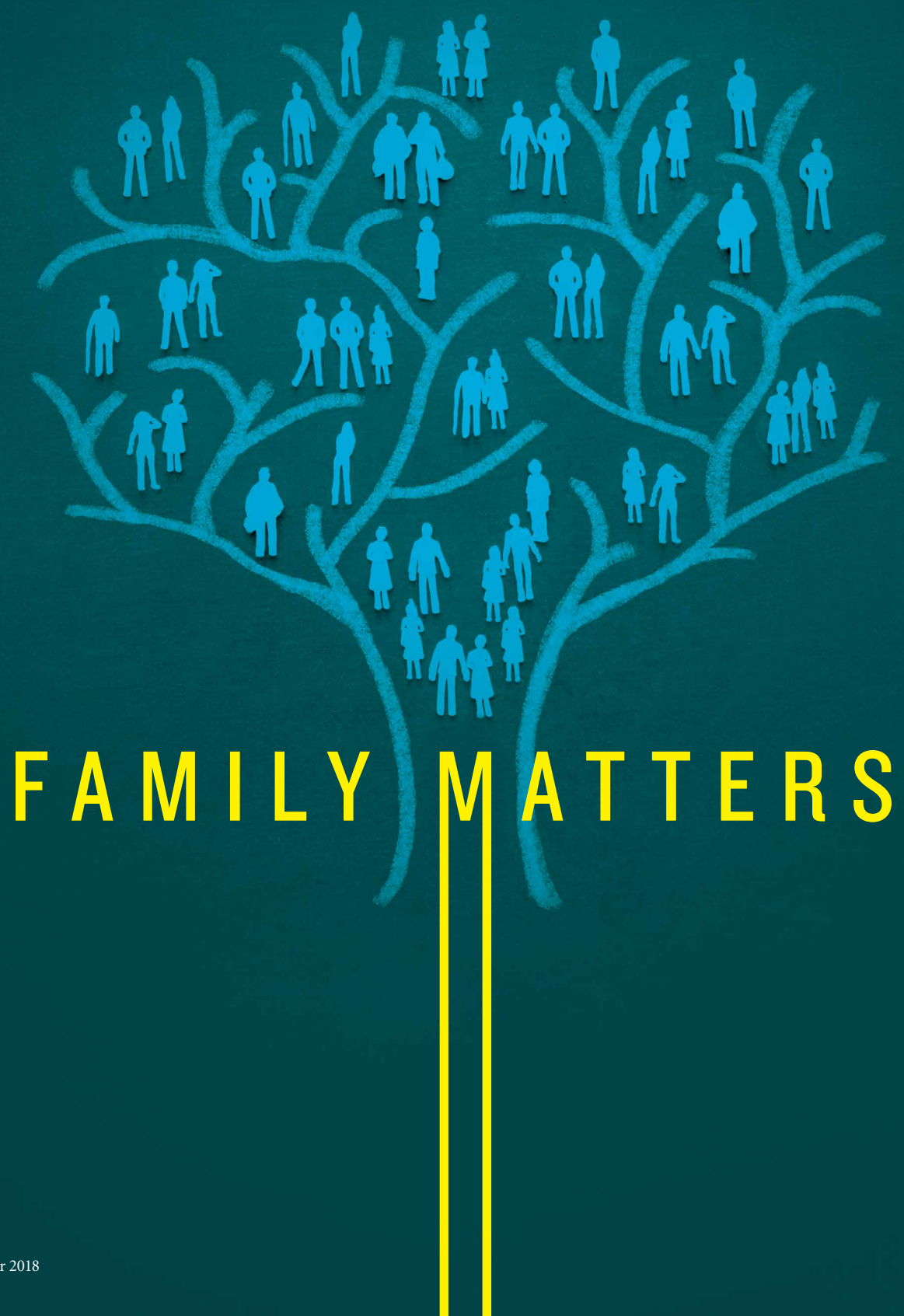
into the river, or lose too much or too little water to evaporation. Using both flow data and stable water isotope data to evaluate if a model can accurately simulate historical flows

improves our confidence that the model is giving the right answer for the right reason. Now I’m trying to find out if this increased confidence will reduce the uncertainty in simulated river flows. Predicting the future is easy, getting your prediction right is hard; I hope to make predicting our future water a bit easier. **IN**

**“Predicting the future is easy, getting your prediction right is hard; I hope to make predicting our future water a bit easier.”**

Tributary of the Nelson River, north of Lake Winnipeg. PHOTO: Chani Welch





BY RYAN MCBRIDE

The study of family dynamics might seem, at first blush, to fall squarely under the purview of psychology, sociology and other social sciences. But consider that a third of Canadian and U.S. businesses are family-owned, and that these businesses employ more than half of workers. Small wonder, then, that family matters have come under the scrutiny of Asper School of Business researcher Zhenyu Wu.

“OUR GOAL IS TO BUILD A SOLID FOUNDATION FOR OTHER STUDIES TO HELP US BETTER UNDERSTAND HOW FAMILY INVOLVEMENT IMPACTS THE MANAGEMENT AND DECISION-MAKING OF ORGANIZATIONS.”



**A** PROFESSOR OF BUSINESS ADMINISTRATION with a background in economics and finance, Wu is now in the second term of a Canada Research Chair (CRC) in Entrepreneurship and Innovation supported by the Social Sciences and Humanities Research Council of Canada, in which he is exploring the decision-making processes of family firms.

“It’s largely uncharted territory and we have a lot of ground to cover,” he says. “Our goal is to build a solid foundation for other studies to help us better understand how family involvement impacts the management and decision-making of organizations.”

Why is this important? Wu’s research program will provide information that improves the probability of entrepreneurial success, and will help improve the financial and emotional well-being of entrepreneurial firms, their employees and the efficiency of the Canadian and global economies.

More specifically, he says, “Findings from this program will help Canadian entrepreneurs and decision-makers in entrepreneurial firms—especially family-owned-and-managed ones—and financial institutions and other potential stakeholders better understand the determinants of promoting entrepreneurial activities in order to improve employment and economic growth. Our findings can also be generalized to the global economy.”

Over the next four years, he will determine how hundreds of family firms fit into what current economic theory defines as the four dimensions of family involvement (see sidebar). He and his

OVER THE NEXT FOUR YEARS, HE WILL DETERMINE HOW HUNDREDS OF FAMILY FIRMS FIT INTO WHAT CURRENT ECONOMIC THEORY DEFINES AS THE FOUR DIMENSIONS OF FAMILY INVOLVEMENT.

research team have begun by examining the proxy statements and annual reports of large, publicly listed firms, such as those with common stock on the Standard and Poor’s index of the top 500 companies listed on the New York Stock Exchange or NASDAQ. From there, they’ll explore the family dynamics of privately held family firms.

“These two types of companies work very differently,” he says. “I want to establish some empirical understanding of what those differences are in a family-business setting.”

In the U.S., for instance, publicly listed companies are monitored and regulated by the U.S. Securities and Exchange Commission. The key relationships that impact decisions are the agency issues between owners and managers, majority and minority shareholders, and shareholders and creditors.

In privately held companies, however, it can get much more complicated because the business family’s self-interest, so-called socio-emotional wealth, often holds sway.

“Personal relationships between family members play a larger role in decision-making, along with the desire to leave a legacy, to maintain harmony within the family, to preserve the family’s reputation in the community. You have to balance all these things against business objectives such as profitability.”

Wu says he’s developed more than 60 variables to measure the extent of a family’s involvement in a company—an undertaking that requires the help of a robust team of graduate student researchers, which the CRC has helped him finance.

“PERSONAL RELATIONSHIPS BETWEEN FAMILY MEMBERS PLAY A LARGER ROLE IN DECISION-MAKING, ALONG WITH THE DESIRE TO LEAVE A LEGACY, TO MAINTAIN HARMONY WITHIN THE FAMILY, TO PRESERVE THE FAMILY’S REPUTATION IN THE COMMUNITY. YOU HAVE TO BALANCE ALL THESE THINGS AGAINST BUSINESS OBJECTIVES SUCH AS PROFITABILITY.”

Wu’s current CRC builds on previous CRC research into risk-taking behaviours in new venture financing. He worked with three PhD candidates and three master’s degree students on the earlier project, which sought to make it easier for entrepreneurs to secure financing and bolster economic growth. For his current research, he’s working with three additional PhD candidates, as well as a research team with partners in the U.S., Europe, Asia and Australia. He says that his current research program will likely create some of the same opportunities for academic and professional growth as the first.

“I didn’t expect the impact it had on them, to be honest,” he admits. “Every single one of my students graduated with at least one academic publication under his or her belt. Several of my master’s students went on to analyst roles in the venture capital industry and at entrepreneurial firms, and they’ve been hugely successful there, in part because they’ve been able to apply what they learned in our research. When we talk about knowledge creation and dissemination, we’re usually pleased when it happens within the university, across faculties—but here I see my students impacting industry itself. That’s exciting.”

Wu’s CRC program funding has also helped him organize workshops and conferences and bring in visiting scholars from outside fields. “My expertise is in finance and entrepreneurship, so being able to reach out to colleagues in other areas and create positive synergies has proven invaluable.” ■



# THE FOUR DIMENSIONS OF FAMILY INVOLVEMENT IN BUSINESS

**IN HIS CRC-FUNDED RESEARCH** into the dynamics of family firms, Zhenyu Wu and his team will explore how hundreds of publicly listed and privately held family firms measure up to the following criteria:

## OWNERSHIP

“Ownership is about how big a chunk of shares the family owns,” says Wu. “In private companies, it’s usually at least 50 per cent, which enables the family to keep control. In publicly listed companies, the holdings are usually much lower. That difference can be critical to how the family influences a company’s decision-making process.”

## MANAGEMENT

“Involvement refers to the number of family members embedded in different layers of the company’s management, from mid-level managers all the way up to the top executive team.”

## GOVERNANCE

“In the past, in many firms, family members typically sat on a company’s board of directors, where they could monitor what was happening and make strategic decisions. These days, they’ve gone one level higher, to what we call a family or advisory board.”

## INTENTION FOR SUCCESSION

“This is not just about the succession plan, or training younger family members for senior leadership roles, or determining whether the older generation is hanging on to control for too long. It’s about leaving a legacy. How are they giving back? Are they donating to business schools that take on their name, like S.C. Johnson? It can be difficult to gauge and measure the impact of this intention in publicly listed companies, but it can have a huge impact on decision-making.”

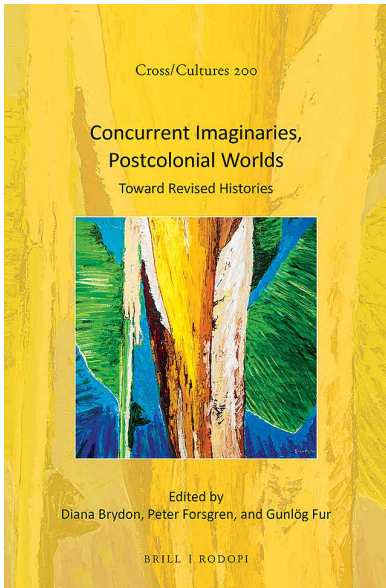
# CONCURRENT IMAGINARIES, POSTCOLONIAL WORLDS: TOWARD REVISED HISTORIES

**B**RYDON, FORSGREN AND FUR'S EDITED COLLECTION, *Concurrent Imaginaries, Postcolonial Worlds*, demonstrates the productivity of reading for concurrences in studying archives, voices and history in colonial and postcolonial contexts. This multidisciplinary volume situates Nordic colonial practices within transworld contexts.

Starting with the premise that our pluriversal world is constructed from concurrent imaginaries [representational systems that both mediate reality and form identities against the backdrop of differing ideas of histories] yet the role of concurrences has seldom been examined, the collection brings together case studies that confirm

**“The collection brings together case studies that confirm the productivity of reading, looking and listening for concurrences across established boundaries of disciplinary or geopolitical engagement.”**

the productivity of reading, looking and listening for concurrences across established boundaries of disciplinary or geopolitical engagement. Contributors working in art history, sociology, literary and historical studies bring examples of Nordic colonialism together with analyses of colonial prac-



Edited by Diana Brydon, Peter Forsgren and Gunlög Fur (Brill Rodopi, 2017)

tices worldwide. The collection invites uptake of the study of concurrences within the humanities and in interdisciplinary fields such as postcolonial, cultural and globalization studies. This collection will appeal to students, teachers and scholars interested in colonial and postcolonial studies, Nordic colonialism, archival research, and analyses of voice and place in literary and historical studies. **IN**



## ABOUT THE AUTHOR

Diana Brydon, Canada Research Chair in Globalization and Cultural Studies, teaches in the department of English, film and theatre at the U of M. She works primarily in the areas of postcolonial literary and cultural studies. Her work characteristically bridges gulfs between disciplines and methods.

Peter Forsgren, professor in Swedish and comparative literature, teaches in the department of film and literature at Linnaeus University, Sweden. He has published books and articles in Swedish 20<sup>th</sup> century prose.

Gunlög Fur, professor of history and dean of arts and humanities at Linnaeus University. Her research and publications focus on colonial cultural encounters, indigenous histories, gender, and entangled histories of Scandinavian immigrants and American Indians.



# AT WAR AGAINST THE MOST TOXIC AGENTS ON EARTH

BY CHRIS RUTKOWSKI

**L**AST YEAR, A WOMAN IN NUNAVUT DIED and others fell sick from botulism contracted by eating whale meat that wasn't properly refrigerated because ocean temperatures were warmer than usual. In Ukraine, there were more than 100 cases of botulism reported in 2017, with 11 deaths due to eating improperly cooked or stored food.

Fortunately, if botulism is diagnosed early enough, it can be treated with an antitoxin that is produced in Winnipeg at Emergent BioSolutions, a global life sciences company located in SmartPark, the U of M's research and technology park. It makes and provides antitoxins, vaccines, and chemical compounds to address accidental, intentional, and naturally occurring public health threats.

Headquartered in Maryland, one of Emergent's largest footprints is here in Manitoba, employing more than 350 technicians, researchers, and professionals, and also training graduate students in fields related to biotechnology. More than 20 per cent of its 300+ staff are alumni of the university in fields such as chemistry, microbiology, immunology and molecular biology.

Senior vice-president of the antibody therapeutics business unit, Laura Saward [PhD/01] is an adjunct professor of medical microbiology at the Rady Faculty of Health Sciences.

"It has long been an interest by the American government to have something that could be used against a bioterrorism attack, so we worked initially with the Centers for Disease Control and Prevention and then with the U.S. Department of Health and Human Services to license an

antitoxin that would treat all types of botulism toxin. Emergent produces the botulism antitoxin for both public and government use," says Saward. Another alumna, Xiaobing Han, who studied immunology and trained in medical microbiology, is currently principal scientist in research and development at Emergent as well as adjunct professor of immunology and is working on developing antibody therapeutics against infectious diseases.

**“This is a good example of how the commercialization of research can benefit people around the world.”**



TOP: Work underway in the lab at Emergent BioSolutions

ABOVE: Adjunct professor of immunology Xiaobing Han

PHOTOS: Emergent Biosolutions

"I am very grateful for the training and academic connections I received from the U of M," she says. "I now serve on two graduate student advisory committees, helped with tutorial sessions for Rady Faculty of Health Sciences students and teach graduate courses in immunology and methodology."

"For the past decade, Xiaobing Han has contributed in a multitude of ways to the success of programs, growth and development of our company," says Cory Nykiforuk, Emergent BioSolutions. "She is passing along her experiences and expertise to the next generation of scientists."

Around the world, botulism continues to be a serious health threat. Fortunately, the life-saving antitoxin is produced in Winnipeg, and can be rushed to the scene of outbreaks wherever it is needed.

Saward notes: "This is a good example of how the commercialization of research can benefit people around the world." **IN**

# RISKY COMMUNICATIONS

BY SHARON CHISVIN

Clear and effective communication is vital to all human endeavour and interaction. But clear and effective communication in the public health sphere is particularly essential, as it can mean the difference between action and inaction, assurance and alarm, and even life and death.

**M**ICHELLE DRIEDGER IS FASCINATED by the power of communication and knowledge translation and the effect that they have on public health policy and public trust. This fascination has informed her academic research as a health geographer, a U of M associate professor at the Rady Faculty of Health Sciences, and former Tier 2 Canada Research Chair (CRC) in Environment and Health Risk Communication in the department of community health sciences. Her CRC was funded by the Canadian Institutes of Health Research.

Driedger was raised in Winnipeg, but was recruited originally from the University of Ottawa, where she was an assistant professor in the department of geography.

During her tenure as a CRC, which began in 2006, was renewed in 2012 and ended in 2017, Driedger focused on the juxtaposition of environment and public health. She studied, and continues to study, how both real and potential health risks are communicated, how public health knowledge is translated and the ways in which communication and knowledge translation can be improved. She examines health policy decision-making and areas of potential controversy, and seeks to understand why public health communication and knowledge translation frequently inspire uncertainty rather than trust, and how that uncertainty can be eradicated.

**“I SPECIFICALLY EXPLORE HOW SCIENTIFIC EVIDENCE IS USED, OR NOT USED, IN POLICY DECISIONS THAT AFFECT OUR HEALTH, AND WHAT HAPPENS WHEN THESE ISSUES SURFACE IN PUBLIC DISCOURSE.”**

Her research, she says, actually serves as a bridge between health risk communication and knowledge translation.

Health risk communication refers to communication about potential threats and safety recommendations between groups in an interactive fashion. Knowledge translation, on the other hand, implies a transfer of evidence to inform health practice or health policy decision-making.

“I specifically explore how scientific evidence is used, or not used, in policy decisions that affect our health, and what happens when these issues surface in public discourse,” Driedger explains. “A central defining question that characterizes my research is how can the science and practice of risk communication and knowledge translation be advanced in a manner that engages civil society in effective dialogue when situations are characterized by uncertainty?”

That uncertainty, she elaborates, refers to times when, in spite of a lack of firm evidence, a health policy decision or recommendation must be made.

That kind of situation arose during the 2009 H1N1 pandemic and the 2014 Ebola outbreak, and regularly emerges in discussions of vaccine hesitancy and whether or not certain cancers and MS therapeutic treatments should be approved or made accessible to the public.



While much of Driedger’s qualitative research has taken place among the general population, several of her studies have specifically targeted the Indigenous community. In particular, her CRC support has enabled her to enjoy an extensive, enduring and productive partnership with the Manitoba Metis Federation (MMF).

**“SHE IS ABLE TO EXPLORE DECISION MAKING, POLICY AND HEALTH PRACTICES FROM MULTIPLE LENSES, AND SHE IS ABLE TO EXPLAIN COMPLEX TOPICS IN A WAY THAT IS MEANINGFUL AND RELEVANT FOR ALL PEOPLE.”**

In one of her MMF-supported projects, Driedger, who is Métis, is investigating if health-related messages that derive directly from Indigenous youth are more effective than messages delivered by government and health agencies. In a newer project, she is studying the way in which physicians communicate with patients about tests and procedures that they are, or are not, recommending, and whether or not that communication and those recommendations are affected by cultural biases.

The CRC program support also made it possible for Driedger to mentor students like Elizabeth Cooper, who recently completed a PhD focused on empowering health and safety-related decision-making in Indigenous

ABOVE: (L-R): Michelle Driedger, with research partners at Manitoba Metis Federation, Georgina Liberty and Sheila Carter (Julianne Sanguins, with back to camera)

women and girls. Like Driedger’s extensive body of research, Cooper’s thesis examined risk communication and environment, and ways of sharing study findings in an ethical and respectful way.

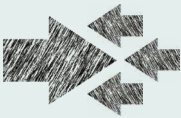
Driedger is an excellent role model who likes to push the boundaries, Cooper says of her mentor.

“She is able to explore decision-making, policy and health practices from multiple lenses, and she is able to explain complex topics in a way that is meaningful and relevant for all people.”

Driedger, in turn, insists that it was the multi-year support that she received from the CRC that nurtured her passion and curiosity and helped her develop into a leader in her field.

As a trailblazer, she has enhanced the public’s understanding about inherent risks and how and why certain health policy decisions are made. At the same time, she has enhanced policy makers’ and medical experts’ understanding about how and why their decisions sometimes breed uncertainty and distrust and how that scenario can be improved.

By consistently using clear and straightforward language in her questions, research and findings, Driedger has demonstrated the need for and the effectiveness of clear and straightforward communication whenever and wherever public health is at stake. **■**



# CHANGING THE DIALOGUE

**MICHELLE DRIEDGER IS ON A MISSION** to improve communication between medical practitioners and their patients, especially their Métis and marginalized patients.

Her newest study—Changing the patient-primary care provider dialogue: fostering trust through joint clinical decision making—aims to improve the way that clinicians explain to their patients their decision-making regarding follow up tests and treatments.

Do they clearly explain why they are not recommending specific tests? Are they concerned about taxing an already overburdened health care system? Do they respect their patients’ agency and culture? Do they ever withhold care? Do their patients ever think that they are withholding care?

Driedger developed an interest in this topic after learning about the global Choosing Wisely® movement. The movement, recently introduced in Canada, aims to eliminate unnecessary medical diagnostic tests.

“Choosing Wisely® is designed to provide health recommendations about what tests or procedures shouldn’t be undertaken for particular conditions when no red flags are present,” she explains.

While these recommendations are always based on an evaluation of the evidence, Driedger has some concerns about the process from a communication perspective.

“If there is no real engagement with the public around this, or if physicians don’t adopt this in a more culturally sensitive way,” she asks, “could patients be exiting an encounter with a physician thinking the doctor is withholding a particular test or treatment from them in order to save the health system money, or worse, because the doctor doesn’t feel that the life of an Indigenous person matters?”

Driedger is pursuing this study in partnership with the Manitoba Metis Federation Health and Wellness Department, as well as Shared Health (formerly Diagnostic Services Manitoba). Her ultimate aim, she explains, is to enhance physician-patient trust within the Métis community and improve health care communication for all Manitobans.

# SETTING UP THE NEXT GEN

The Science, Engineering and Technology (SET) Day hosted by the U of M was outstanding this year! Each event was well thought-out and planned carefully to ensure the day was used to its maximum potential. This day gave us high school students an opportunity to see what the university had to offer.

BY KATELYN LLOYD



**BOTTOM LEFT:** Katelyn Lloyd participating in kinesiology activity (small balls on her legs monitor movement and force exerted and display via computer animation).

**LEFT: SET** Talk presenter Annemieke Farenhorst

**TOP: (L-R)** Arctic science activities at the Sea-ice Environmental Research Facility; Biological Sciences activities (2).



Katelyn Lloyd is a grade 11 student at St. Boniface Diocesan High School and the winner of the 2018 SET Day Essay Competition.

**W**OW, U OF M OFFERS A WIDE VARIETY of sciences for those keen in biological studies to something perhaps a little smaller: microbiology (pun intended). We listened to lectures on proteins and making kidney transplants safer for both patient and donor from Dr. Julie Ho. Kidney transplants are not always successful due to acute or chronic rejection of the kidney. This can damage the patient's new kidney before a problem is even identified. Dr. Ho is currently working on a protein, found in urine, which can reveal a rejection fast. Her work is inspirational. They are doing what they can to improve the lives of those undergoing a kidney transplant.


PhD candidate Deirdre Khan taught us about how important canola oil is to Manitobans and how they are unlocking the genetics to a seemingly ordinary plant. Their goal is to improve the plant's protein content and the quality. Modifying this plant would make it a better source of food for both humans and animals. I personally have never been interested in plants, but Deirdre Khan has changed my opinion about that. Although I might not pursue a career in seed development or plant life, this lecture has opened my eyes to exactly what people are doing to improve Canada's crops: to benefit human and animal life.

Humans need water, but what we know little about is exactly what is in our water. Dr. Annemieke Farenhorst knows quite a lot about what we are drinking. Water not properly cleaned or filtered is filled with pesticides and bacteria. Dr. Farenhorst, along with her team, is working to provide better solutions to clean drinking water for Manitobans who might not have access to clean, properly functioning water systems.

Besides learning of all the ways these people are benefitting human life, we also had the opportunity to participate in an activity of our teacher's choosing. Our activity was in the Faculty of Kinesiology and Recreation Management. My friends and I had the benefit of taking a kinesiology course earlier this year, so learning about the faculty was thrilling. With the use of

**"WE LEARNED ABOUT THE UNIVERSITY'S EXCEPTIONAL FACILITIES AND CAMPUS. I WOULD RECOMMEND THIS DAY TO ANYONE INTERESTED IN SCIENCE, ENGINEERING, TECHNOLOGY OR WHOMEVER WANTS TO LEARN MORE ABOUT THE U OF M."**

advanced equipment, we tested our motor skills, balance and reaction time. We also had the opportunity to take part in a test closely related to a VO<sub>2</sub> max test. This test measured the increase in oxygen levels while simultaneously increasing intensity. This part of the day was so exhilarating that I just had to share this cool experience with all my friends.

What an exciting day! Not only was it interactive and fun, but we learned about the U of M's exceptional facilities and campus. I would recommend this day to anyone interested in science, engineering, technology or whomever wants to learn more about the U of M. 

# BUNDLING

# UP

# FOR

# SUMMER

BY SHARON CHISVIN



Wieter Boone



## SØREN RYSGAARD IS A MAN OF CONTRADICTIONS.

He researches global warming while studying Arctic ice, spends the summer in winter conditions and roams the vast Arctic region while examining tiny microbial organisms. He observes the disappearance of ice caps from the air and the appearance of anaerobic bacterial activity in the sea, and divides his time between spartan field stations and multi-million-dollar state-of-the-art research facilities.

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(L-R) Søren Rysgaard, Virginie Galindo, Yubin Hu, Jens Ehn, Wieter Boone and Jørgen Bendtsen, near Station Nord, Northeast Greenland.

**A**S WELL, RYSGAARD CONDUCTS RESEARCH in Winnipeg as well as Denmark, is the founder of the Greenland Climate Research Centre and, until recently, was the Canada Excellence Research Chair (CERC) in Arctic Geomicrobiology and Climate Change at the Centre for Earth Observation Science at the University of Manitoba. During his CERC tenure, which ended in April 2018, Rysgaard became one of the world’s most renowned and respected Arctic ice experts. With CERC support and resources, he measured, explored and examined the disappearance of sea ice and the interface of that ice with the ocean and the atmosphere, while studying the way in which the warming of the Arctic affects the micro-environment, land, temperature, severe weather and northern wildlife and society. “In both Canada and Greenland,” Rysgaard says, “changes in sea ice coverage have large implications for local communities as well as for commercial fisheries and businesses.” Working with more than 250 international scientists and students, Rysgaard divided his CERC research into two related tiers. The first tier, he explains, focused on biogeochemical processes in sea ice and how changes in ice conditions may impact the Arctic in a broad sense from marine ecosystems and marine uptake of greenhouse gases.

“OUR RESEARCH EFFORTS ON SEA ICE HAVE LED TO NEW KNOWLEDGE ON PROCESSES INVOLVED IN ICE FORMATION AND MELT AND HOW CHEMICAL PROCESSES IN SEA ICE AFFECT THE CARBON CHEMISTRY IN ARCTIC WATERS.”

The second tier, he continues, focused on enhancing understanding of the climate’s influence on the Arctic marine system and specifically on sea ice algal production. “Our research efforts on sea ice have led to new knowledge on processes involved in ice formation and melt and how chemical processes in sea ice affect the carbon chemistry in Arctic waters,” Rysgaard elaborates. “The melting of sea ice, algal production and dissolution of the observed concentrations of ikaite,” he continues, “resulted in melt water with very low carbon dioxide concentrations, which, in turn, increases the potential for seawater uptake of carbon dioxide from the atmosphere.” These, he adds, also greatly affect pH conditions in sea ice and surface waters and hence, play a role in ocean acidification in Arctic seas. It was in the course of uncovering these new dynamics that Rysgaard and his team provided the first-ever report on gypsum precipitation in sea ice and developed techniques, now used worldwide, for quantifying the three-dimensional distribution of gases and brines in sea ice and for studying frost flowers and chemical and biological processes in them.

“DR. RYSGAARD’S INNOVATIVE AND CREATIVE RESEARCH HAS PROVIDED US WITH NEW INSIGHT INTO CLIMATIC FEEDBACKS BEING RECORDED IN ARCTIC ICE.”



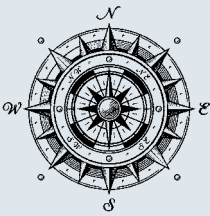
ABOVE: Samples in the CERC lab. BELOW: Søren Rysgaard and Wieter Boone near Station Nord, Northeast Greenland. PHOTO: Jørgen Bendtsen

“Dr. Rysgaard’s innovative and creative research has provided us with new insight into climatic feedbacks being recorded in Arctic Ice,” says Norman Halden, dean of the Clayton H. Riddell Faculty of Environment, Earth, and Resources. “He also was instrumental in creating the university’s Arctic Science Partnership, which has opened doors and unique international opportunities for our researchers, particularly graduate students.” Those graduate students acknowledge how fortunate they have been to work with Rysgaard. “Dr. Rysgaard always leads by example,” says postdoctoral researcher Karley Campbell. “At the heart of his approach,” she says, “is his respect towards fellow students and staff and that all ideas are granted thought and consideration independent of one’s position.” Odile Crabeck, who completed his Ph.D. under Rysgaard in 2017, agrees with Campbell’s assessment. “The joy and enthusiasm Dr. Rysgaard has for the research is contagious and motivational, which make him a great mentor,” she says.

“And, after so many years doing Arctic research, he is still strongly passionate and driven by his work.” Recently, Rysgaard has focused that passion and drive on researching ocean-glacier interactions, the processes behind the melting of glaciers and icebergs, and the tracking of icebergs and ocean currents in relation to ice hazards.

“THE JOY AND ENTHUSIASM DR. RYSGAARD HAS FOR THE RESEARCH IS CONTAGIOUS AND MOTIVATIONAL, WHICH MAKE HIM A GREAT MENTOR.”

“Through my many years in the Greenland and Canadian Arctic, I have witnessed that sea ice and glaciers are melting very fast,” Rysgaard explains. “Many of the glaciers I originally visited more than 20 years ago are rapidly disappearing.” This, he adds, is a salient topic due to increased traffic and oil exploitation in the Arctic. As Rysgaard pursues this newer line of research as a CERC laureate, he looks forward to working with the new Canada 150 Research Chair, Julianne Stroeve, who begins her tenure in September. After spending hundreds of days as a CERC in the challenging and unforgiving cryosphere, Rysgaard is nowhere near ready to come in from the cold. After all, he knows better than anyone that there is still so much more to learn about thinning sea ice, thawing permafrost and the detrimental effects of climate change on the Arctic environment. **IR**



ICE-BREAKING ARCTIC RESEARCH



**SØREN RYSGAARD WAS AN IDEAL SELECTION** for the inaugural CERC program, launched by the Canadian government in 2008. The aim of the program, after all, was to enhance Canada’s reputation as a global leader in cutting-edge science and innovation, establish global partnerships and generate lasting social and economic benefits for Canadians. During his CERC tenure, Rysgaard has done all of that on a massive scale. One of Rysgaard’s first steps as a CERC was to create the Arctic Science Partnership, an extensive international research collaboration between the U of M, Aarhus University, the Greenland Institute of Natural Resources and The Alfred Wegener Institute, that brings together the world’s leading Arctic scientists. He then led those scientists, and hundreds of students, on 30 major field campaigns, many of them to the most remote and unforgiving parts of the Arctic. Working closely with his team, Rysgaard discovered numerous physical, chemical and biological processes related to sea ice formation, sea ice melt and the way in which sea ice affects greenhouse-gas exchange between the atmo-sphere and ocean. He also developed new techniques for measuring the global nitrogen cycle in the oceans, and published more than 200 papers on his research. Rysgaard mentored and inspired countless young scientists and Arctic explorers in both the lab and in the field, and generated millions of dollars in global funding for new Arctic projects. In the course of doing all of this, he also turned the Centre for Earth Observation Science at the University of Manitoba into the world’s foremost intellectual hub for Arctic and climate change exploration and discovery.

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Celebratory ribbons, in the four colours of the Medicine Wheel, were launched in Brodie Centre Atrium (see story page 10).



Research**LIFE**