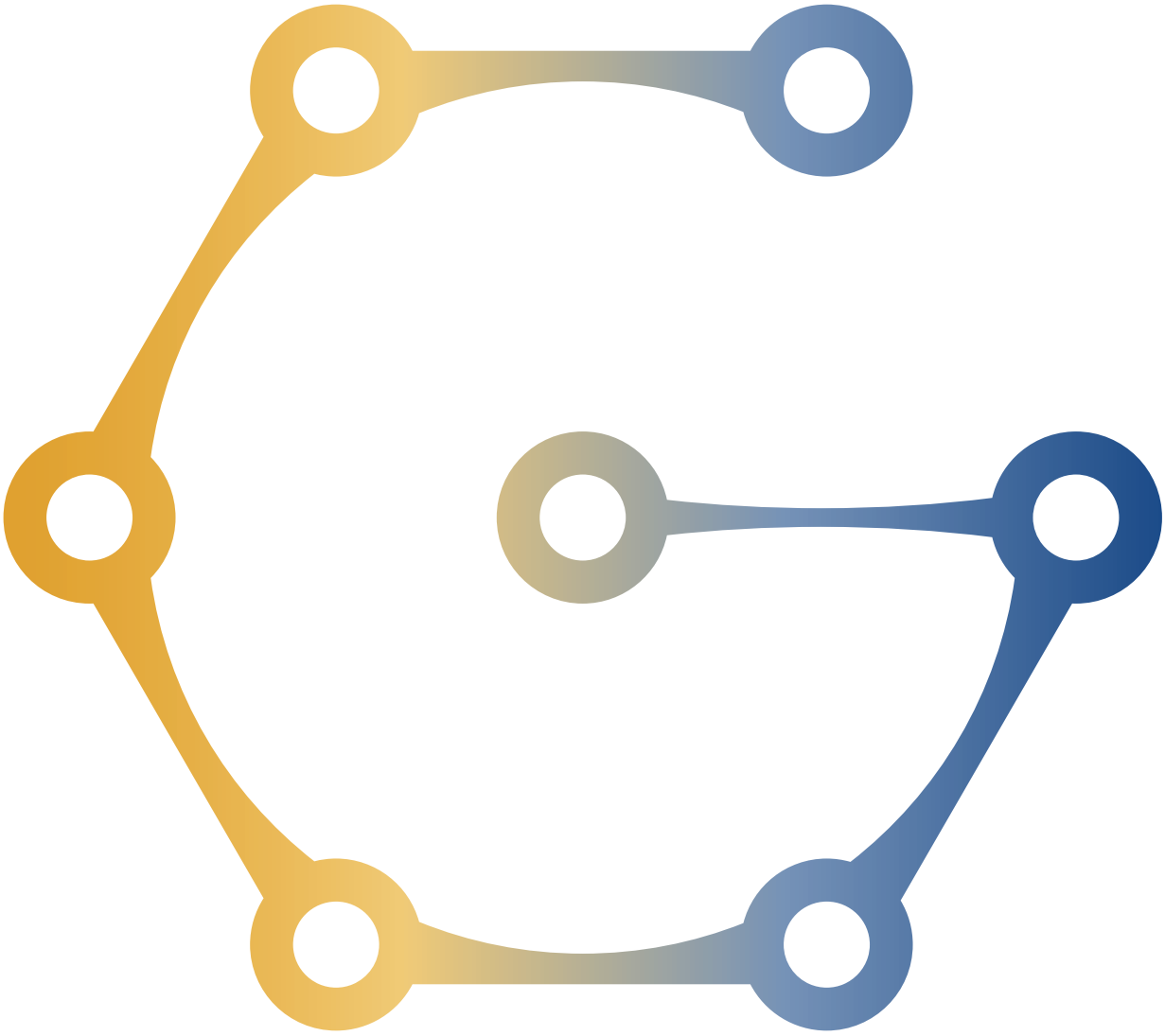


# PATHWAYS

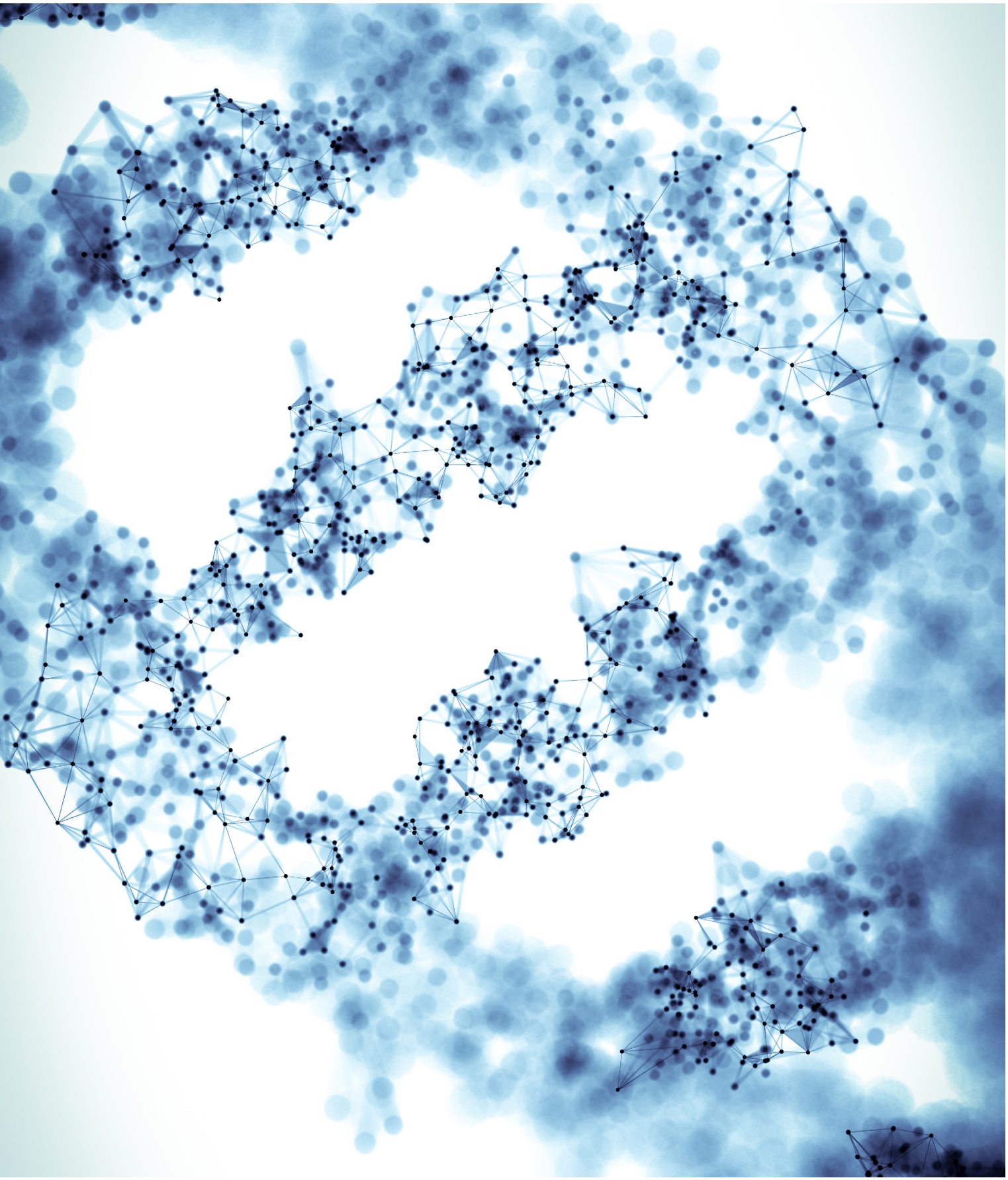
## 2017-2018 GENOME PRAIRIE MAGAZINE

GENOMICS WILL CHANGE WHAT WE KNOW TODAY, & HOW WE LIVE TOMORROW

# UNRAVELING THE CODE

The undulating landscape of the prairies reveals an amazing symbiosis of plants and animals. Exploring the relationships between these living beings is much like looking into an organism's tiniest particles and their potential to unlock new discoveries. Genomics provides a doorway to unimagined potential for healthcare, agriculture, and the environment. Genome Prairie, in partnership with Genome Canada, is leading researchers in this exciting frontier of scientific research. Saskatchewan and Manitoba are fostering world-calibre genomics research that is fundamental to all Canadians. The expected results are new stress tolerant crop varieties, higher yields, and new treatments for infectious and hereditary diseases.

Research leading to major breakthroughs will ultimately save billions of dollars and countless lives. Although Saskatchewan and Manitoba are already recognized for their research and development strengths in the areas of plant genomics, infectious diseases, disease model development, and nutrigenomics, building on these strengths will be critical to sustaining a position of leadership. Translating research results into socio-economic benefits for the prairies and for Canada involves making the most of the intellectual property developed from our research projects as well as working with key stakeholders in the value chain to communicate these results to the public.




## Our Mission

To accelerate and leverage knowledge translation of genomic discoveries to social and economic benefits for the people of Manitoba and Saskatchewan.

## Our Vision

Genomics will change what we know today and how we will live tomorrow.


## We have developed “Made-in-the-Prairies” projects since 2000

The highly competitive field of genomics requires significant levels of expertise, and access to capacity and resources. We have the knowledge, relationships and motivation to turn ideas into reality through discovery and innovation.

# OUR PATHWAY

Genome Prairie plays a pivotal role in advancing genomics research through facilitating collaborations in projects, promoting awareness of research undertakings, and aligning partners and resources. This is achieved through the following activities:

## 1. Project Development

Genome Prairie identifies and refines new project opportunities, facilitates national and international collaborations on projects, and aligns partners and resources to ensure adequate capacity is available to undertake the selected projects.

## 2. Research Management

Our projects are at the forefront of research and development in genomics and related biosciences. These projects bring together significant expertise and resources from different industries and institutions around the world. The complexity and breadth of these initiatives requires a strong project management capacity that coordinates and optimizes the completion of goals and objectives.

## 3. Community Engagement

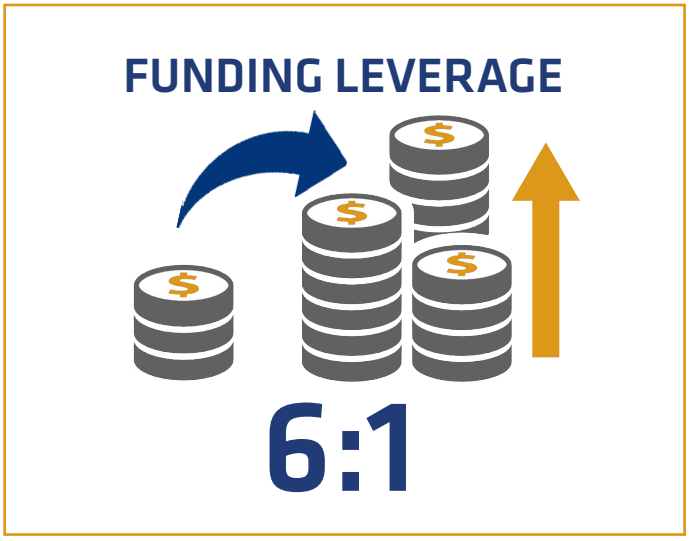
Success in any scientific field often depends on factors beyond the lab bench. Relationship building and information sharing are critical activities that can lead to unexpected connections and innovations. Through a wide range of communications and outreach activities, Genome Prairie is helping to strengthen the Prairie research community.

# OUR IMPACT

Genome Prairie's operational activities and investments in projects create economic and social contributions in Saskatchewan and Manitoba.

**Impactful activities include:**

- Leveraging of funding
- Developing of partnerships & collaboration
- Developing of new technologies and discoveries.
- Developing & advancing of companies
- Acquisition of patents
- Developing of solutions for industries
- Contributing to training and employment opportunities




## 6:1 Leverage Power

For every dollar invested in Genome Prairie activity by the provinces, another six dollars of near-term economic impact is generated, with a long-term 12:1 leverage power. With an increased focus on public private partnerships, we expect to double the share of regional industry investment in genomics over the next five years.

**$308M**
Total Output

**$233M**
Increase in Total GDP

**+2990**
Full-TIme Jobs

# OUR BOARD

Leadership and strategic direction is provided in partnership with our esteemed Board of Directors, which represents a diverse array of industry and research professionals who volunteer their time and expertise to ensure the continued success of Genome Prairie.

**Dr. David Gauthier (Outgoing Chairman)**

**Dr. Mitchell Abrahamsen**

**Dr. Gerald Brown (Incoming Chairman)**

**Mr. John Cross**

**Dr. Jenisa Naidoo**

**Ms. Susan Gorges**

**Dr. Digvir Jayas**

**Ms. Daphne Arnason**

**Dr. Grant Pierce**

**Dr. Janice Duguid**

**Dr. Curtis Rempel**

**We have the knowledge, network and motivation to help drive innovation in the prairies.**

# OUR TEAM

Considered the nerve centre of the organization, our team helps engage and align partners with the resources required to develop and manage research projects addressing regional priorities.

**Chris Barker**
Chief Scientific Officer
(Outgoing 2018)

**Joanne Bradley**
Corporate Secretary

**Peta-Gaye Burnett**
Business Development Officer

**Gladys Coombes**
Accountant
Office Manager (SK)

**Monica Gordon**
Program Coordinator

**Gabrielle Lint**
Project Development Assistant

**Faye Pagdonsolan**
Office Manager (MB)
EA to the President & CEO

**Patrick Pitka**
Chief Financial Officer

**Reno Pontarollo**
President & CEO

**Simon Potter**
Chief Scientific Officer
(Incoming 2018)

**Virginia Tomas**
Accounting Assistant

**Ariadne Valadares Souza**
Project Manager
(Outgoing 2018)

**Quyen Van**
Communications Officer

**Pamela Warren**
Administrative Assistant

# EXECUTIVE MESSAGES

# WORDS FROM THE CHAIRMAN

*The application of genomic knowledge provides us with new avenues for addressing and developing solutions for real-world challenges.*

From agriculture and agribusiness, to human health, the environment, and energy sectors, genomics research identifies opportunities to improve productivity and increase efficiencies. Through industry, we gain the means to translate our inventions and applications into practical use. The resulting new tools and technologies bolster our economy, the environment and society as a whole.

This year we delivered on a strategic plan that charts a course for the future – a course that keeps Genome Prairie focused on its mission and clearly aligned with and sensitive to the priorities of Manitoba and Saskatchewan. This includes strengthening the link between our research projects and provincial investments in areas where significant advances can be made in accelerating the pace of innovation and enhanced social and economic development.

To date we've supported over $351 million of research activity, thanks to support from the universities and governments of Manitoba and Saskatchewan, Western Economic Diversification, Genome Canada and our industry partners. Our successes in the past year are due to the dedication and talent of our regional scientists, the commitment of our leadership and support team, and the stewardship of our board of directors.

**This year we delivered on a strategic plan that charts a course for the future that keeps Genome Prairie focused on its mission and clearly aligned with and sensitive to the priorities of Manitoba and Saskatchewan.**

**Dr. David Gauthier**
Chairman of the Board (Outgoing 2018)

# WORDS FROM THE CEO

*Advances in genomics and biotechnology help us to better understand, protect, and enhance our world and our standard of living.*

Beyond our project successes, one of the most exciting announcements this year has been Western Economic Diversification's commitment of $1.145 million in our Genome360 Platform Initiative. This funding will help develop targeted, effective, and socially responsible projects to take advantage of the immense opportunities in Canada in the clean technology space, with a special emphasis on the partnership, protection and participation of aboriginal communities.

Forging collaborative partnerships with industry stakeholders and government has always been key to our success. The DivSeek International Network is an initiative that aims to accelerate plant breeding by leveraging the genetic diversity in the world's live collections and seed banks.

The evolution of our strategic direction was motivated by our desire to continually enhance Genome Prairie's position as a leader in the Prairie innovation system; to facilitate the further development of our regional capacity and hence our competitiveness for attracting investment in applied genomics; and, to build significant new opportunities for innovation and commercialization in Manitoba and Saskatchewan.

**The evolution of our strategic direction was motivated by our desire to continually enhance Genome Prairie's position as a leader in the Prairie innovation system.**

**Dr. Reno Pontarollo**
President & CEO

# WORDS FROM THE CSO

*On the prairies, we know how to grow food. It is a cornerstone of our economy and a great strength of both Manitoba and Saskatchewan.*

At Genome Prairie, we develop our research projects with regional priorities in mind — building a solid foundation of knowledge that addresses local and global challenges, such as food safety, security and sustainable production.

Whether employing a biological approach to cleaning up Arctic waters, reducing the impact of a common disease in commercial cattle production, or improving the yield, disease-resistance and quality of wheat, our projects remain focused on prairie priorities. Although regional in nature, they have a profound impact across the country and around the world.

Looking ahead, we are excited for the launch of Genome Canada's Large-Scale Applied Research Project competition: Genomics Solutions for Agriculture, Agri-food, Fisheries and Aquaculture. A competition where the prairies shine.

We are concurrently launching and developing projects with industry partners, and contributions from Genome Canada through its Genomic Applications Partnership Program, which will benefit our region, Canada and the world.

**Looking ahead, we are excited for the launch of Genome Canada's Large-Scale Applied Research Project competition, a competition where the prairies shine.**

**Mr. Chris Barker**
Chief Scientific Officer (Outgoing 2018)

## PROJECT HIGHLIGHTS

# AGILE

## Applications of Genomics Innovation in the Lentil Economy

**HARVESTING DIVERSITY**

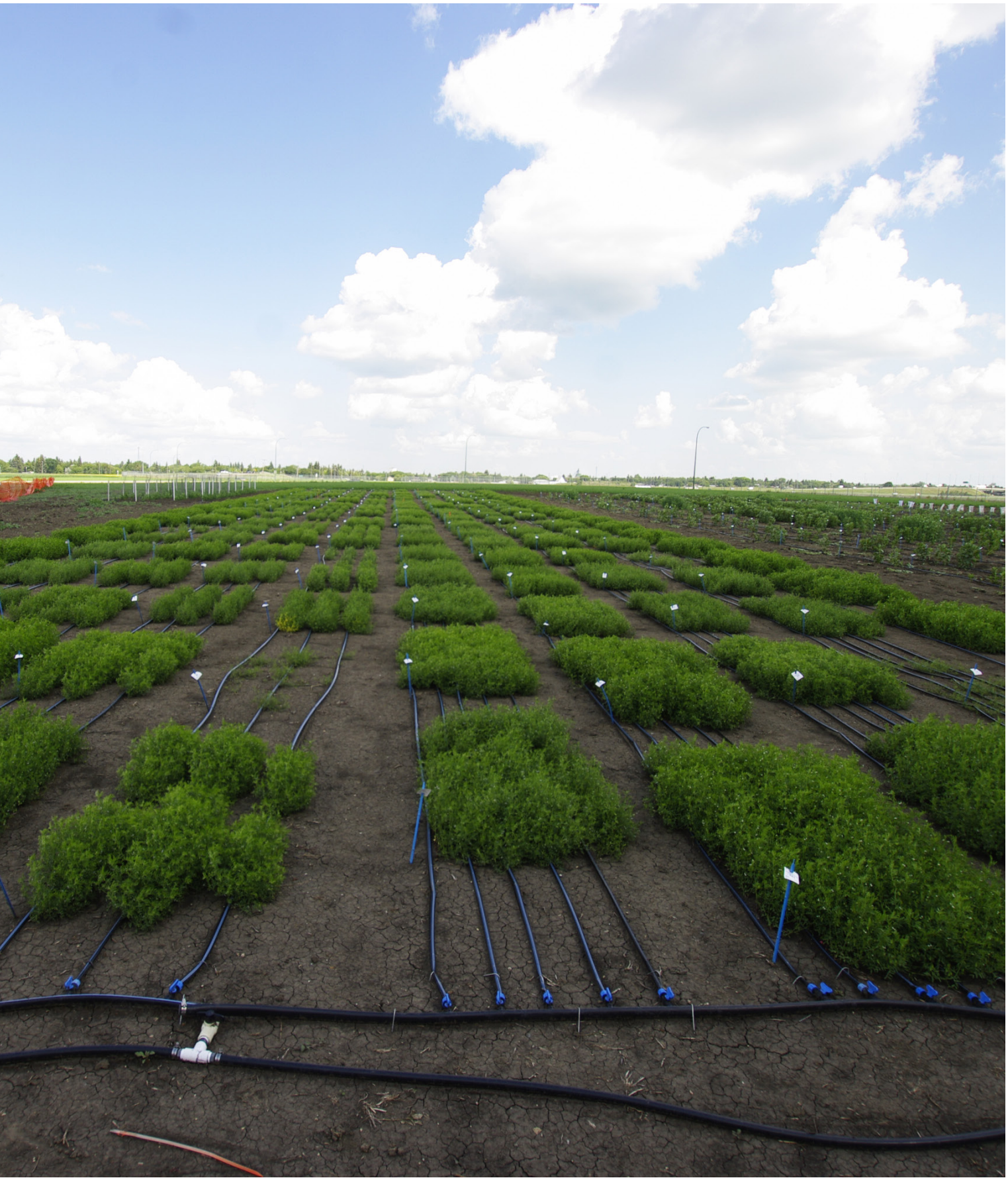
Canada is the world's largest producer and exporter of lentils, shipping to more than 120 countries, with a value of $2.5 billion in exports in 2015. With an ever-expanding population and demand for healthier food options, farmers' access to improved varieties are required to enhance the productivity and resilience of lentil in the face of global climate change.

Dr. Kirstin Bett and Dr. Albert Vandenberg of the University of Saskatchewan are researchers leading the Applications of Genomics to Innovation in the Lentil Economy (AGILE) project that aims to study genetic diversity of lentils to provide Canadian farmers with faster access to better lentil varieties that will excel under Canadian growing conditions. The AGILE team will characterize the variability found in an expansive collection of lentils to determine the genetics underlying the ability for lentils to grow well in different environments. The team will then develop breeder-friendly genetic markers that can be used to strategically introduce advantageous genes from other cultivars into new Canadian varieties while maintaining the right adaptation characteristics.

Two years into the project, the team has also completed the momentous sequencing of two wild lentil genomes in collaboration with NRGene. New genomic resources will further our understanding of the lentil speciation, and help identify beneficial traits of these wild species that could be transferred to cultivated lentils.

"After re-sequencing a global collection of lentils, along with selected wild relatives, the next challenge is to combine the genotypic data with phenotypic data collected by our international collaborators in temperate, South Asia and Mediterranean regions." said Dr. Bett. Field trials are slated for completion in the summer of 2018. "By this fall, we aim to have molecular markers that will predict adaptation response to various growing environments."

"The project just passed the half-way mark – and that's when the fun begins," says Dr. Bett.



## PROJECT HIGHLIGHTS

# PLM

## The Augmenting the Plant Metagenome to Improve Crop Yield and Stress Resilience

**FEEDING THE FUTURE**

The agriculture industry is facing major challenges due to the increasing effects of climate change and changing consumer demands. The Augmenting the Plant Metagenome to Improve Crop Yield and Stress Resilience (PLM) project is looking to provide enhanced tools and improved access to information to help sustain the industry and provide greater benefits to both the producer and the consumer.

Dr. Vujanovic, along with fellow researchers Dr. James Germida from University of Saskatchewan and Dr. Ray Riley from the American company Indigo Agriculture, are developing breakthrough products to improve seed germination, yield, and drought and heat-stress resilience using microbes from healthy plant cell tissues. By commercializing these enhanced products, producers will have the ability to grow and harvest more staple food crops to meet forecasted growing global demand, which estimates that world food production will need to increase by 70 per cent by 2050.

"Previous years seed coating results showing improved yield in wheat, winter wheat, durum, and barley have been exceeded in Canadian canola, pea, lentil, soybean, and corn field trials, says Dr. Vujanovic.

This represents commercial success offering next generation products, at the forefront of the sustainable revolution in agriculture to ensure food security.

"This past year has been marked with major steps towards commercialization of the endosymbionts as a direct result of this Genome-mediated industrial partnership" says lead researcher Dr. Vladimir Vujanovic, from the University of Saskatchewan. "Indigo Ag has publicly announced a successful launch of several products"

The next step is to determine which microbes can be produced on a commercial scale. "Our partners at Indigo have plans to continue exploring the activity of microbes with the greatest commercial potential, which we believe could have global reach," says Dr.

Vujanovic. “At the end of this project we can truly say that we have a product ready for commercialization on an international level.”

The newly discovered, next-generation microbial products will allow farmers to improve resilience of elite crop varieties, and to enhance yield without genetic manipulations or excessive use of fertilizers and or/pesticides. This was possible by using metagenome sequencing technology which provides high level resolution allowing rapid identification of beneficial microorganisms.

With these global ambitions, the technologies developed under this project will help their collaboration with Indigo to support agriculture sustainability across multiple crops and geographies.

## PROJECT HIGHLIGHTS

# ReVAMP

## Reverse Vaccinology Approach for the Prevention of Mycobacterial Disease in Cattle

**FIGHTING DISEASE**

An infectious disease can be destructive to the cattle industry, with the loss of livestock and consumer confidence. Without affordable vaccines for certain diseases, producers are sometimes forced to respond to outbreaks with drastic measures. Dr. Andrew Potter of VIDO-InterVac, University of Saskatchewan and Dr. Robert Hancock of the University of British Columbia, the lead researchers behind the Reverse Vaccinology Approach for the Prevention of Mycobacterial Disease in Cattle project, believe there is a way to sustain healthy animals and avoid such devastation for disease control.

Strict trade regulations dictate that when an infected animal is discovered in one herd, it could have major implications for the entire industry. One mycobacterial-infected animal can lead to the culling of the entire herd in order to preserve and protect the industry. The project objective is to develop two vaccines for cattle, one for Johne's disease and one for bovine tuberculosis. The success of this project will mean saving both the beef and dairy industry millions of dollars in the future.

To create the vaccines, the research team will identify potential vaccine components through a genomics-based approach known as reverse vaccinology. This means they use genomic technology to screen large numbers of bacterial proteins simultaneously and identify ones that are able to stimulate a protective immune response in cattle.

"It has been a very active year in looking at both disease models," says Dr. Potter. "We are currently screening 80 prospective antigens for Johne's disease, and 20 antigens for bovine tuberculosis in order to determine which ones have the greatest potential for disease protection."

"Reverse vaccinology was used to identify and then clone more than 300 antigens from the organism causing Johne's disease and bovine tuberculosis," says Dr. Hancock. "These are currently in advanced testing for vaccine efficacy."

By cloning the genes for selected antigens into the lab strain T 16 bacterium Escherichia coli, which is inexpensive to grow, the cost of vaccination to the consumer can remain low. The goal for the team this year is to identify prospect antigens for optimized vaccines developed and ready for market after the completion of the project in 2019.

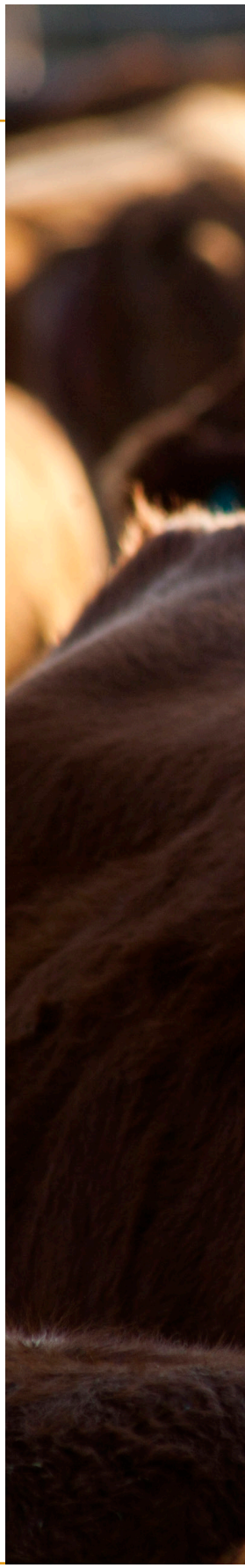



Photo Credit: Liam Richards

## PROJECT HIGHLIGHTS

# CTAG2

## Canadian Triticum Applied Genomics

**WHEAT GROUNDBREAKERS**

With an estimated global population of 9.6 billion by 2050, the demand for wheat production continues to increase each year to ensure global food security. Research for the CTAG2 project led by Dr. Curtis Pozniak at the University of Saskatchewan and Dr. Andrew Sharpe from the Global Institute for Food Security, are focusing on the development of new breeding tools to aid development of a new generation of wheat cultivars that produce higher yields and are able to withstand disease and weather-related stresses. A main focus of the group has been the development of high quality DNA sequences of multiple wheat varieties. The group have completed sequencing of two Canadian wheat cultivars as part of the "10+ Wheat Genome Project", an International program led by Dr. Pozniak designed to characterize DNA variation in commercially relevant wheat cultivars.

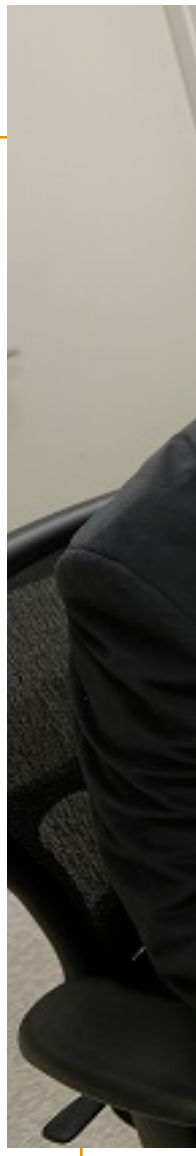
The CTAG2 researchers were also instrumental in sequencing the first wild wheat genome and contributed to the efforts of the International Wheat Genome Sequencing Consortium and International Durum Wheat Genome Sequencing Consortium. The group is now focused on studying durum wheat and completing the sequence of several cultivars to support functional annotation of this cultivar. These sequences will support the CTAG2 project to better understand the complex genome of one of the world's most important crops.

The CTAG2 team utilizes advance computation tools, sequencing technologies and genomics expertise across the globe to continue work towards completing a high quality, ordered sequence of the wheat genome. This includes annotating and identifying the precise locations of genes, regulatory elements, and markers along the chromosomes.

"The research conducted by the CTAG2 project will become a foundational resource to unlock the genetic code for traits in Canadian wheat varieties and will support advancing research into crop improvement all over the world," said Dr. Pozniak, whose research is being completed at the Crop Development Centre in the College of Agriculture and Bioresources.

With accessibility to study the entire genome of multiple wheat varieties, the research team can investigate particular genetic markers and traits that help certain wheat crops survive diseases and insect pests, ultimately saving billions of dollars in yield loss for the wheat industry.

## PROJECT HIGHLIGHTS



# FiCoGEN

## Fibre Composite and Biomatrix Genomics

**DRIVING INNOVATION**

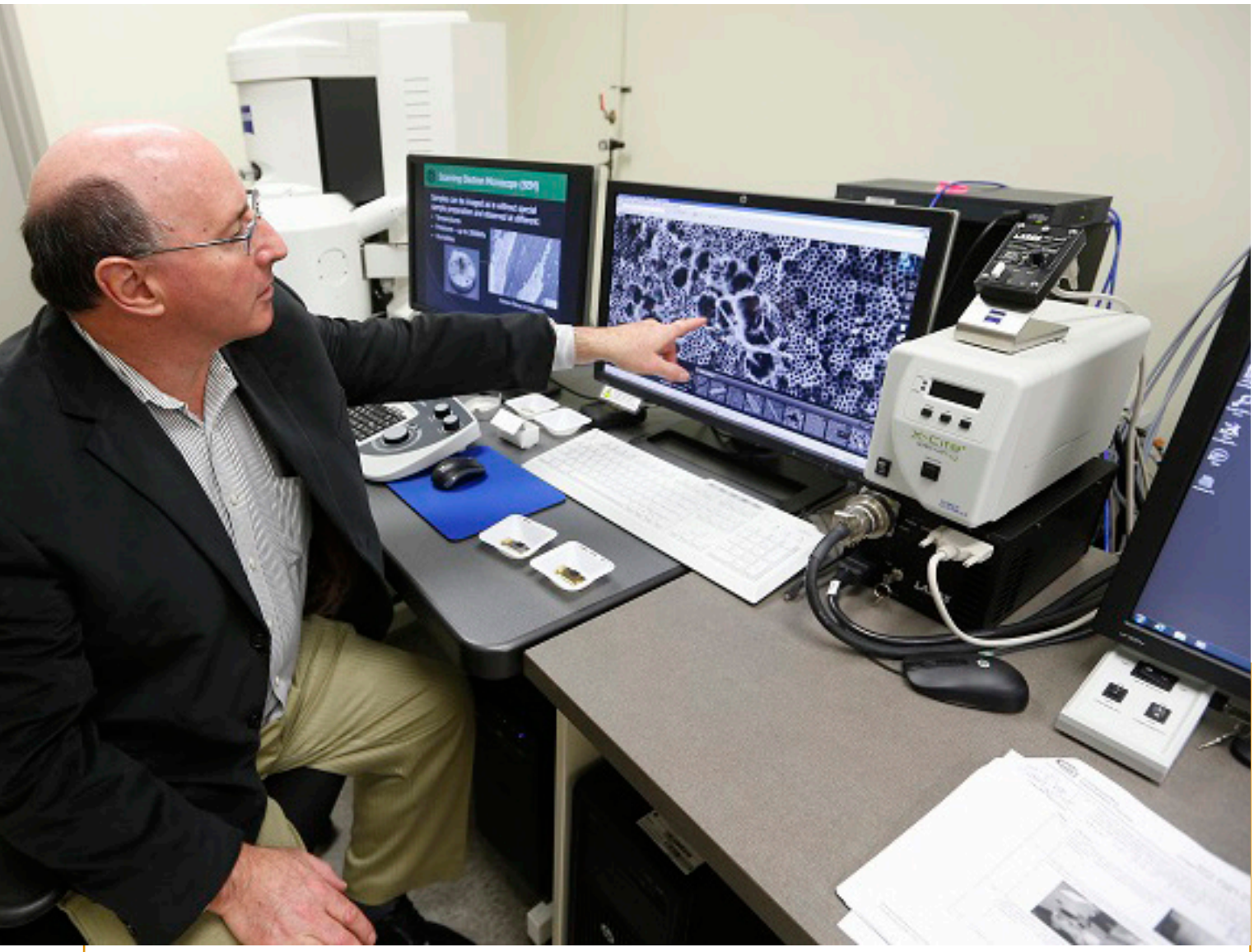
The automotive industry is being revolutionized by genomics to create a new generation of bio-composites. Bio-composites developed from agricultural crops such as flax have a multi-billion dollar market potential, with the development of optimized properties for both natural fibres and compatible renewable resins required to manufacture this revolutionary material.

The Fibre Composite and Biomatrix Genomics (FiCoGEN) project, conducted by the University of Manitoba and the Composites Innovation Centre (CIC), is working to develop and test a prototype parking enforcement GO-4 vehicle for Winnipeg manufacturer Westward Industries using bio-composites. The bio-composite uses flax fibres with traits enhanced for use in advanced composite materials and a binding resin/polymer produced in Dr. Levin's laboratory from novel microbial strains.

This year was full of activity for all teams on the project, from significant progress in polymer development to prototype design. Dr. Levin's team have made substantial development in strategies using high-density polymers to create composite materials. 'We have been able to create materials containing 38% to 42% cellulose and 2.9% to 3.1% PHA polymer, with epoxy resin making up the remaining portions,' says Dr. Levin. "This material was at least as strong, in terms of tensile strength, as fibre glass containing 25% glass fibres, and the presence of the polymers increased the 'toughness' of the material by 74% compared to cellulose fiber/epoxy composite."

"We worked on several different areas this year, including development of the prototype GO-4 vehicle design for Westward Industries, as well as testing of bio-resin samples to support PHA resin development at the University of Manitoba,' says Shawna DuCharme, project co-lead from CIC. "However, the majority of our efforts was focused on performing tests to characterize properties of straw samples from 2016 & 2017 flax variety trials that were coordinated by Dr. Deyholos through University of British Columbia."

Initial results from fibre quality evaluation performed on these varieties were used to down-select the most promising varieties for follow-up trials, including two new and experimental Canadian-developed flax



varieties. These varieties were chosen for their demonstrated superior performance in fibre yield, strength, and ease of extraction from the remaining components of the plant.

"We are currently working with another local company, Eco-Poxy, in the development of an epoxy resin made with soybean oil," says Dr. Levin. "If this is successful, we will have fulfilled our objective of making a fully 'green' bio-composite material."

The prototype design for the tub of the GO-4 vehicle was also successfully completed this year, transitioning to a proof-of-concept for Westward Industries. A fibreglass composite version of the passenger tub has been produced as an initial demonstration that has allowed Westward to check the fit and function of the parts.

"Progress towards development of a fully bio-composite GO-4 vehicle will be continued working in collaboration with Westerward Industries and their suppliers,' says Shawna. "By the end of the year, it is anticipated to have a demonstration vehicle available that is manufactured from at least partially bio-based materials."

## PROJECT HIGHLIGHTS

# CUC

## Advancement of Canola Oil & Meal

**IMPROVING OUR FOOD**

As the world's need for healthy oil continues to rise, global demand for canola oil over the next decade is expected to require a 40 percent increase in Canadian canola production. It is one of Canada's signature crops and generates $27.6 billion to the Canadian economy annually, supports some 250,000 jobs and $11.2 billion in wages, and generates one-quarter of all farm cash receipts. With its high level of monounsaturated and polyunsaturated fatty acids, this light oil has become a favourite among health-conscious consumers. As a result, plant breeding research is needed to make canola seeds produce more and higher quality oil and meal will have a large payoff for Canadian farmers and processors.

The Enhancement of Commercial Utilization of Canola Oil and Meal by Manipulation of Cellular and Sub-Cellular Metabolism (CUC) project, co-led by Jocelyn Ozga from the University of Alberta and M. Tahir of Dow AgroSciences. This project aims to use advance genomics tools to improve the quality of canola, both oil for human consumption and meal for animal feed, as well as reduce fibre and saturated fatty acid content.

Dr. Tahir's team at Dow AgroSciences has done pioneering work in developing canola hybrids for healthy oil production, while the team at the University of Alberta Phytola Centre is dedicated to providing market-responsive, oilseed biotechnology products and technology solutions in partnership with industry.

Success in this project will ensure that Canadian canola growers and associated sectors continue to play a leading role in capturing global markets. "Our facility has produced a unique, elite germplasm for the project, which ensures the knowledge and plant innovation will be rapidly commercialized," said Dr. Tahir. "And because the facility has become the global testing hub for canola breeding programs worldwide, breakthroughs made by the CUC project can be immediately available internationally."

## PROJECT HIGHLIGHTS

# ZIKV

## Zika Virus

**ADVANCING HEALTH**

A devasting outbreak of the Zika virus around the world is causing an epidemic of birth defects such as microcephaly and other developmental abnormalities in babies born to infected mothers. This mosquito and sexually-transmitted disease has an alarming potential for a global epidemic, a fear that is intensified by a lack of knowledge of the disease pathology and no vaccine is currently available.

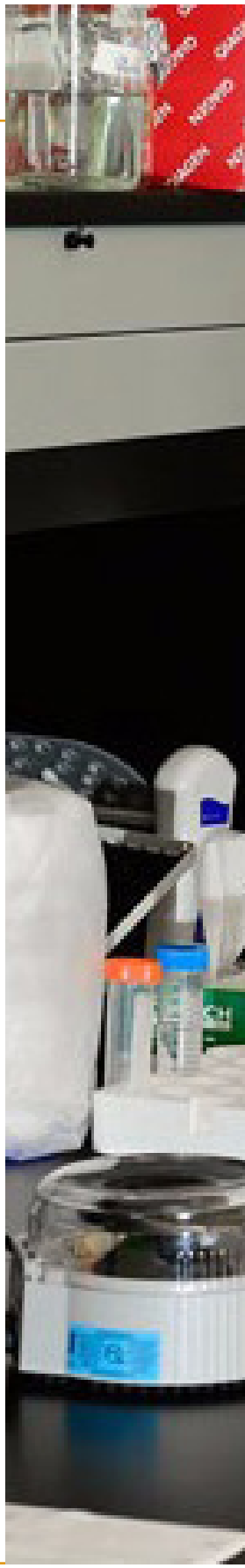
The Vaccine and Infectious Disease Organization-International Vaccine Centre (VIDO-InterVac) at the University of Saskatchewan (U of S) is the first place in the world to develop a swine model for the study of Zika virus infection.

Using genomics, the project will analyze and compare the gene expression between healthy and infected fetal pigs and establish an ex vivo explant model of the zika infection in the human maternal and fetal placental environment for subsequent genomics studies.

"This past year we were successful in establishing the fetal pig model for the Zika virus infection, showing fetal pigs are susceptible to infection mid-gestation," says Dr. Karniychuk. "Using genomics, we demonstrated that more than 600 genes in fetal brains are significantly affected by Zika virus infection."
These genes were linked to interferon responses, fetal brain development, stress responses, mood disorder, schizophrenia, and autism. Strikingly, these genes were identified in brains of fetuses which did not have severe pathology, suggesting that apparently healthy newborns affected with mild in utero Zika virus infection may have molecular pathology in their brains which might persist into distressed health after birth with long-term consequences.

"One notable discovery that we found was elevated levels of cortisol demonstrated with exposure to the Zika virus," says Dr. Karniychuk. "Increased exposure to this hormone can lead to neurotoxicity in fetal brain development and cause long-lasting consequences in offspring, including cognitive impairment."

His team is looking to start larger animal trials to replicate and study the fetal pathology of the disease, and analyze behaviour, immune responses, reactivity to stress and molecular pathology in brains from affected and healthy offspring after birth. Potentially, this new model may clarify pathogenesis of Zika virus infection and will allow us to develop and test interventions.



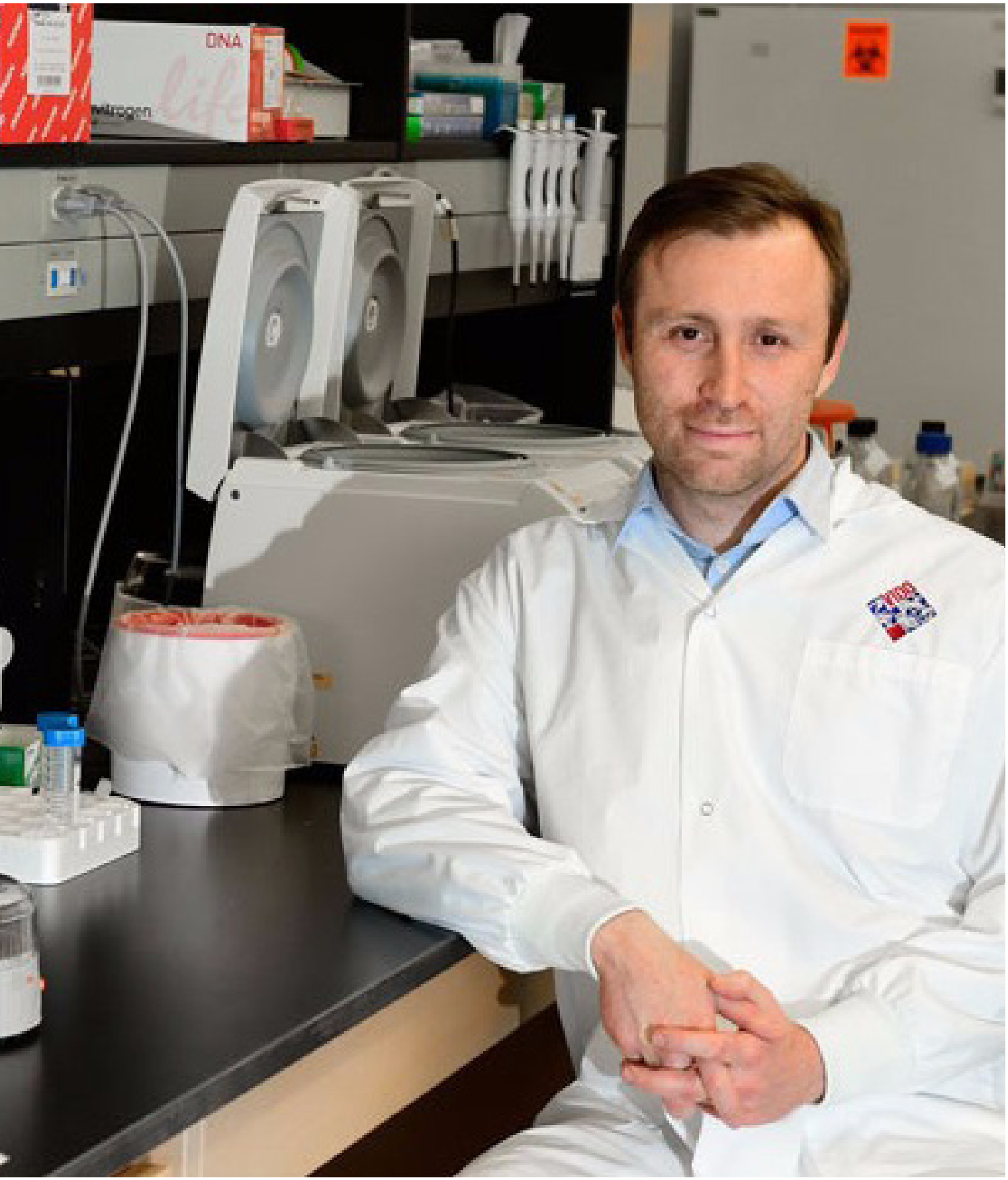

DNA


Photo Credit: Lee Thomas/Alamy
Photo Credit: Liam Richards

## PROJECT HIGHLIGHTS

# GENICE

## Microbial Genomics for Oil Spill Preparedness in Canada's Arctic Marine Environment

**IMPROVING OUR FOOD**

Increased shipping traffic through areas such as the Northwest Passage and climate change has amplified fears of potential oil spills in the Arctic Ocean. With no existing national protocol to address potential oil spills, a demand for an environmentally-friendly remediation response is high.

This collaborative research project, led by Dr. Gary Stern from the University of Manitoba and Dr. Casey Hubert from the University of Calgary, will investigate the potential for native microbial communities to mitigate oil spills through biodegradation.

The GENICE project will conduct research at the University of Manitoba's Sea-Ice Environmental Research Facility and the Churchill Marine Observatory, a state-of-the-art facility to be built in the near future, to integrate the technological, scientific, ethical, environmental, economic, legal and social research that is needed to develop nationally recognized policies for Arctic marine transportation, oil and gas exploration and development throughout the Arctic.

"In the context of oil, applying genomics and microbiology to studying Arctic waters is important because this is potentially a natural way to attenuate an oil spill," says Dr. Stern. "We strive to provide the science and tools that the government needs to develop policies and strategies for remediation."

Partnerships and collaboration with end-users such as Canadian Coast Guard, Transport Canada, Environment and Climate Change Canada will help their teams to address the needs, challenges and inquiries from Arctic marine activity, which will ultimately translate the research outcomes into government and industry directed policies.

"Our goal is to understand how different oils in potential spills interact with marine microbial populations," says Dr. Stern. "Our combined expertise in genomics, petroleomics and sea-ice physics will help us investigate the potential for native microbial communities to mitigate oil spills through biodegradation."

## PROJECT HIGHLIGHTS

# EcoToxChip

## A toxicogenomics tool for chemical prioritization and environmental management

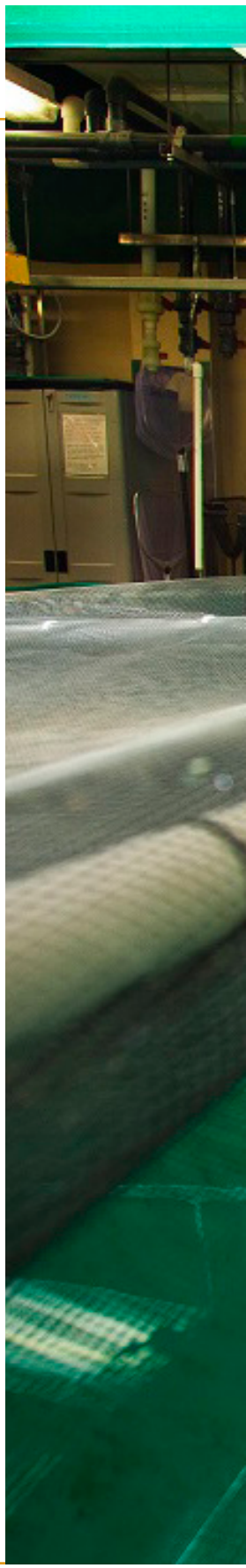
**ADVANCING HEALTH**

Chemical contamination of our ecosystems is considered one of the greatest threats to life on our planet. Regulatory agencies and businesses share responsibility for managing these chemicals, but the sheer number – more than 100,000 globally – that need to be evaluated has made it prohibitively time consuming and expensive to assess the risks of each chemical.

Drs. Markus Hecker of University of Saskatchewan, Niladri Basu of McGill University, and Doug Crump at Environment and Climate Change Canada are leading a team to develop, test, validate and commercialize EcoToxChip. This will be an internationally validated PCR-based tool that aims to help overcome the tremendous uncertainty associated with current risk assessment approaches. EcoToxChip will provide the global community with an advanced toxicity-testing platform that is accessible, affordable, consistent, and reliable.

The EcoToxChip could potentially generate savings of $27.3 million per year, speed testing activities by seven-fold, and reduce the number of animals used for testing by 90 per cent. Together, the EcoToxChip and EcoToxXplorer.ca, a user-friendly bioinformatics portal, will make ecological and chemical risk assessment more cost-effective, timely, informative, and ethical.

One component of the project is to produce social science knowledge about the phenomenon of “institutional entrepreneurship” that make project team members more effective as change agents who transform institutionalized practices in the field of ecological risk assessment of chemicals by developing, commercializing and ensuring widespread adoption of EcoToxChip program. This research component also aims to produce a Technical Guidance Document which will serve as a resource to advise end-users on how to adopt EcoToxChips.



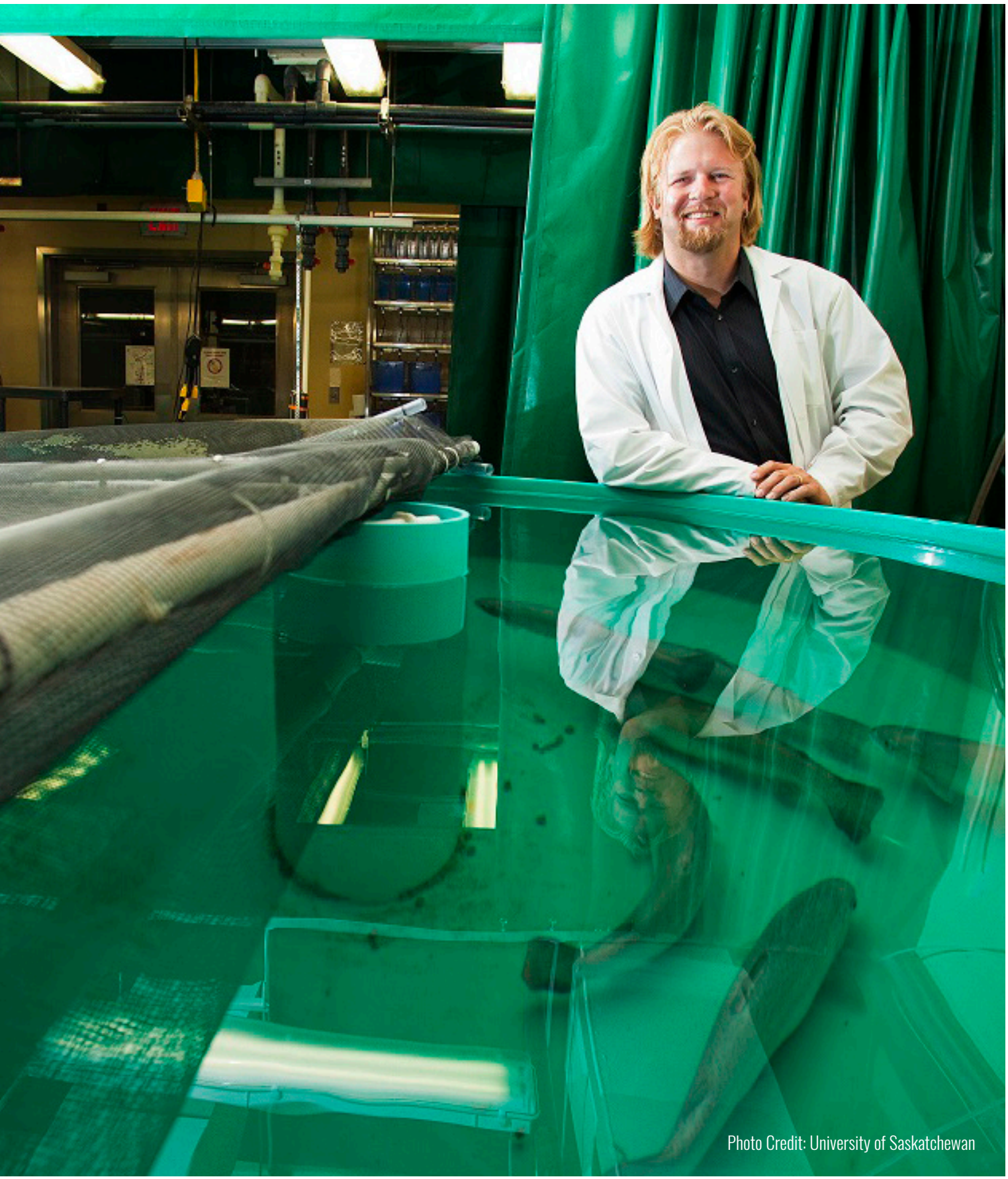


Photo Credit: University of Saskatchewan

# NEWS & ANNOUNCEMENTS


## Diversifying Manitoba's Economy by Investing in Clean Technology and Supporting Francophone Initiatives

The Government of Canada is committed to supporting diversity and sustainability in communities and local economies across Manitoba.

On January 9, 2018, The Honourable Navdeep Bains, Minister of Innovation, Science and Economic Development and Minister responsible for Western Economic Diversification Canada (WD), announced combined investments of more than $7.6 million towards seven economic development projects in Manitoba.

One of these seven projects include Genome Prairie's Genome$^{360}$ Platform, an intiative funded $1.145M to establish a mobile genomics lab to promote the commercialization of clean technologies.

Through Regional Development Agencies like WD, the federal government is supporting organizations that advance the government's environmental objectives, create jobs and stimulate growth across Western Canada.

# EXCITING INITIATIVES

## GENOME$^{360}$

### Genome Prairie and Fusion Genomics Partnering on Genome$^{360}$ Platform Initiative

Genome Prairie announced they are partnering with the Vancouver-based Fusion Genomics Corporation using Fusion Genomics' ONETestTM platform, including FusionCloudTM analytics, to move forward on Genome Prairie's Genome$^{360}$ Initiative, as announced in Winnipeg on January 8, 2018 by The Honourable Navdeep Bains.

The Genome$^{360}$ Initiative, based in Manitoba, will build a physical capacity in the form of a centralised analytical and satellite mobile genomics teaching laboratory incorporating, showcasing and demonstrating the latest in biomaterials / clean technology. The central capacity will be used to link organizations with a focus on the development of novel genomics and other biosciences-based solutions to bring the federal and provincial governments' priorities for clean technology and indigenous economic development together with state of the art genomics science. Within this structure, Genome$^{360}$ 's goals are to develop targeted, effective, inclusive and socially responsible projects that take advantage of the immense opportunities in Canada in the clean technology space, with a special emphasis on the partnership, protection and participation of aboriginal communities.

It will also ensure that Manitoba – including its remote and rural areas – has access to a genomics support platform to take maximum advantage of national programs, including Genome Canada, that will help deliver long-term health and economic benefits for the province. Because the ONETestTM Platform, developed by Fusion Genomics Corp., represents a significant advance in the state of the art for surveillance of animal and plant pathogens and can also assay microbiomes of plants, animals and soil, Genome Prairie asked Fusion Genomics to partner with them in their Genome$^{360}$ Initiative.

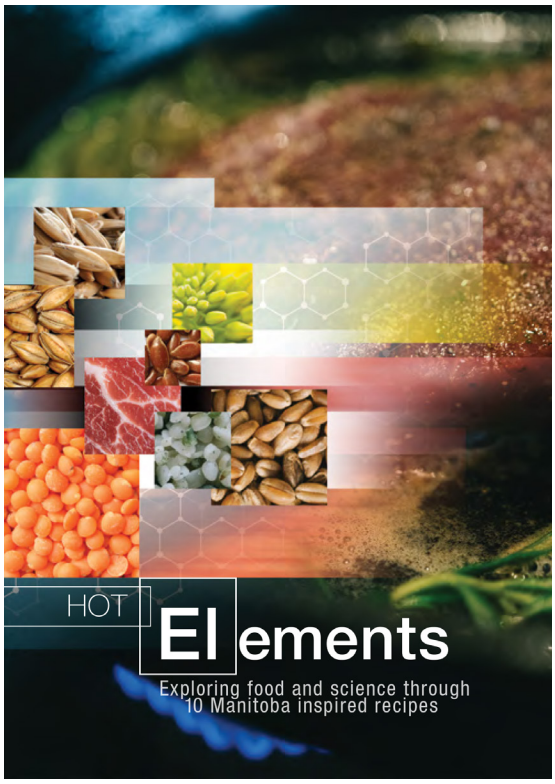
GENOME 360
Prairie Life. Powered by Genomics


# HOT ELEMENTS COOKBOOK

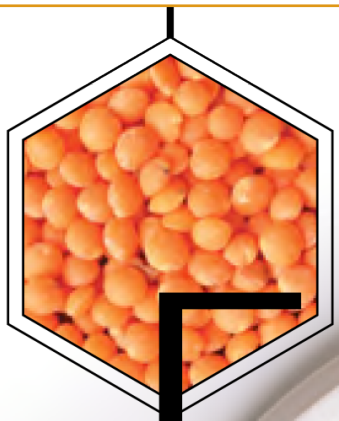
## From Research to Your Table

Improving the quality and nutritional content of crops as well as increasing the yield per season is vital to growing a consistent and nutritious supply of food to the world. Through its various research projects such as the ones highlighted in this cookbook, Genome Prairie and its collaborators have contributed to Canada's agriculture industry. Each ingredient and recipe in this cookbook is associated with a successful Genome Prairie project.

Some of Red River College's exciting culinary talents have contributed delicious recipes, each which feature ingredients improved by Genome Prairie research projects. That is how our collaborative cookbook takes agricultural innovation from the lab and field to your dinner table.




Genome Prairie has partnered with Red River College's Culinary Research & Innovation team and the Manitoba Agri-Health Research Network to create a Prairie-inspired cookbook.



### AGILE (Applications of Genomics Innovation in the Lentil Economy)

Canada is the world's largest producer and exporter of lentils, but breeders have only been able to access a small fraction of the total diversity in existence. The AGILE project aims to provide Canadian farmers with faster access to better lentil varieties that will excel under Canadian growing conditions. Output from AGILE is expected to result in a three per cent annual rate of increase in productivity, leading to a $550 million increase in export revenues.

Just 100 grams of dry split red lentils has more potassium than a large banana!

ELEMENT 3

# Lt

**Lentil**

Lens culinaris

# Lentil Perogies

YIELD: 30 PEROGIES

### Ingredients: (Filling)

1 cup split red lentils
2½ cups cold water
½ tsp. salt
1 garlic clove, sliced
3T scallion, sliced
½ cup Trappist monks cheese or Reblochon, diced

### Ingredients: (Dough)

1½ cups cold all-purpose flour, sifted
½ cup red lentil flour, sifted
½ tsp. salt
2 eggs, beaten
⅓ cup water, room temperature

### Directions: (Filling)

Place the lentils, water, salt and garlic in a pot and simmer for about 25-35 minutes until the lentils are tender. Strain and reserve the cooking liquid. Using a large spoon or potato masher, stir vigorously and incorporate the cheese with the lentil mixture to form a paste.
If needed, add some of the cooking liquid back into the mixture. Fold in scallions and let it cool.

### Directions: (Dough)

In a stand mixer, place the sifted flours and salt into the mixing bowl. Using a dough hook, mix on low speed and incorporate the eggs and water. Continue to mix the dough on medium speed for 3-5 minutes until the dough is formed and pulls away from the bottom of the bowl.
***(Note: If the dough is sticky add 1-2 tsp of flour on work surface and knead by hand until smooth.)***
Wrap the dough with plastic wrap and rest in the fridge for 30-60 minutes.
Cut the rested dough in two and roll out on a lightly floured surface. Roll to 1/16" (2 mm) thick.
Use a 3"(75 mm) pastry ring cutter to cut out circles from the rolled out dough.
Using a brush, wet the edge of the circle with water and place a teaspoon of the filling in the center. Fold the dough over and seal by pressing firmly with your fingers.
Place on lightly floured surface.

**To cook:** Bring a pot of salted water to a boil and cook perogies in batches for 2-3 minutes. When they float to the surface, they are cooked. Drain and fry in a pan with oil and butter or serve boiled.

**NUTRITIONAL FACTS** **Per Perogie:** Calories: 80 | Fat: 1.5g | Protein: 5g
CARB: 11g | FIBRE: 3g | SODIUM: 105mg

Consolidated Financial Statements of

# GENOME PRAIRIE

Year ended March 31, 2018

KPMG

# INDEPENDENT AUDITORS' REPORT

To the Directors of Genome Prairie

We have audited the accompanying consolidated financial statements of Genome Prairie, which comprise the consolidated statement of financial position as at March 31, 2018, the consolidated statements of operations, and changes in net assets and cash flows for the year then ended, and notes, comprising a summary of significant accounting policies and other explanatory information.

*Management's Responsibility for the consolidated Financial Statements*

Management is responsible for the preparation and fair presentation of these consolidated financial statements in accordance with Canadian accounting standards for not-for-profit organizations, and for such internal control as management determines is necessary to enable the preparation of consolidated financial statements that are free from material misstatement, whether due to fraud or error.

*Auditors' Responsibility*

Our responsibility is to express an opinion on these consolidated financial statements based on our audit. We conducted our audit in accordance with Canadian generally accepted auditing standards. Those standards require that we comply with ethical requirements and plan and perform the audit to obtain reasonable assurance about whether the consolidated financial statements are free from material misstatement.

An audit involves performing procedures to obtain audit evidence about the amounts and disclosures in the consolidated financial statements. The procedures selected depend on our judgment, including the assessment of the risks of material misstatement of the consolidated financial statements, whether due to fraud or error. In making those risk assessments, we consider internal control relevant to the entity's preparation and fair presentation of the consolidated financial statements in order to design audit procedures that are appropriate in the circumstances, but not for the purpose of expressing an opinion on the effectiveness of the entity's internal control. An audit also includes evaluating the appropriateness of accounting policies used and the reasonableness of accounting estimates made by management, as well as evaluating the overall presentation of the consolidated financial statements.

We believe that the audit evidence we have obtained is sufficient and appropriate to provide a basis for our audit opinion.

*Opinion*

In our opinion, the consolidated financial statements present fairly, in all material respects, the consolidated financial position of Genome Prairie as at March 31, 2018, and its consolidated results of operations and its consolidated cash flows for the year then ended in accordance with Canadian accounting standards for not-for-profit organizations.

KPMG LLP

Chartered Professional Accountants

June 5, 2018
Saskatoon, Canada

# GENOME PRAIRIE

Consolidated Statement of Financial Position

March 31, 2018, with comparative information for 2017

| | 2018 | 2017 |
|---|---|---|
| **Assets** | | |
| Current assets: | | |
| Cash and cash equivalents | $ 3,121,400 | $ 3,176,607 |
| Accounts receivable | 190,417 | 274,598 |
| GST receivable | 12,465 | 16,432 |
| Project advances receivable | 658,276 | 691,888 |
| Prepaid expenses | 13,907 | 4,845 |
| | $ 3,996,465 | $ 4,164,370 |
| **Liabilities and Net Assets** | | |
| Current liabilities: | | |
| Accounts payable and accrued liabilities | $ 121,838 | $ 189,247 |
| Project advances payable | 396,692 | 240,180 |
| Deferred contributions (note 4) | 3,212,448 | 3,469,456 |
| | 3,730,978 | 3,898,883 |
| Net assets | 265,487 | 265,487 |
| | $ 3,996,465 | $ 4,164,370 |

Commitments (note 5)

See accompanying notes to consolidated financial statements.

On behalf of the Board:

Director

Director

# GENOME PRAIRIE

Consolidated Statement of Operations and Changes in Net Assets

Year ended March 31, 2018, with comparative information for 2017

| | 2018 | 2017 |
|---|---|---|
| Revenue: | | |
| Project revenues (note 4) | $ 5,104,107 | $ 4,526,296 |
| Administrative support revenues (note 4) | 944,356 | 1,010,344 |
| Interest income | 67,502 | 55,069 |
| | 6,115,965 | 5,591,709 |
| Expenses: | | |
| Project expenditures | 5,104,107 | 4,526,296 |
| General and administrative | 970,989 | 985,426 |
| Project development and consulting costs | 40,869 | 79,987 |
| | 6,115,965 | 5,591,709 |
| Excess of revenue over expenses | – | – |
| Net assets, beginning of year | 265,487 | 265,487 |
| Net assets, end of year | $ 265,487 | $ 265,487 |

See accompanying notes to consolidated financial statements.

# GENOME PRAIRIE

Consolidated Statement of Cash Flows

Year ended March 31, 2018, with comparative information for 2017

| | 2018 | 2017 |
|---|---|---|
| Cash flows from (used in): | | |
| Operations: | | |
| Excess of revenues over expenses | $ – | $ – |
| Change in non-cash operating working capital: | | |
| Accounts receivable | 84,181 | (74,851) |
| GST receivable | 3,967 | (1,399) |
| Project advances | 190,124 | (683,492) |
| Prepaid expenses | (9,062) | 2,035 |
| Accounts payable and accrued liabilities | (67,409) | (6,048) |
| Deferred contributions | (257,008) | 997,832 |
| Increase (decrease) in cash and cash equivalents | (55,207) | 234,077 |
| Cash and cash equivalents, beginning of year | 3,176,607 | 2,942,530 |
| Cash and cash equivalents, end of year | 3,121,400 | $ 3,176,607 |
| Cash and cash equivalents consist of: | | |
| Cash | 2,121,400 | $ 2,176,607 |
| Investment certificate | 1,000,000 | 1,000,000 |
| | $ 3,121,400 | $ 3,176,607 |

See accompanying notes to consolidated financial statements.

# GENOME PRAIRIE

Notes to Consolidated Financial Statements

Year ended March 31, 2018

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**1. Nature of business:**

Genome Prairie (the "Corporation") was incorporated in 2000 under the *Canada Corporations Act,* and transitioned in 2013 to the *Canada Not-for-profit Corporations Act*, as a not-for-profit organization. The Corporation funds organizations and institutions that conduct genomic research and development for the economic benefit of the Prairie Region (Saskatchewan and Manitoba) and Canada. Approximately 70% of Genome Prairie's operational funding is received from Genome Canada.

**2. Significant accounting policies:**

(a) Basis of presentation:

The consolidated financial statements include the accounts of the Corporation and its subsidiary, Interra Biosciences Inc.

These financial statements have been prepared in accordance with Canadian accounting standards for not-for-profit organizations ("ASNPO").

(b) Use of estimates:

The preparation of financial statements in accordance with ASNPO requires management to make estimates and assumptions that affect the reported amounts of assets and liabilities and disclosure of contingent assets and liabilities at the date of the financial statements and the reported amount of revenue and expenses during the year. Actual results could differ from these estimates.

(c) Revenue recognition:

The Corporation follows the deferral method of accounting for contributions. Restricted contributions are recognized as revenue in the year in which the related expenses are incurred. Unrestricted contributions are recognized as revenue when received or receivable if the amount to be received can be reasonably estimated and collection is reasonably assured.

# GENOME PRAIRIE

Notes to Consolidated Financial Statements (continued)

Year ended March 31, 2018

**2. Significant accounting policies (continued):**

(d) Financial instruments:

Financial assets and financial liabilities are initially recognized at fair value and subsequent measurement is at amortized cost with investment income recorded on an effective interest basis. Transaction costs are expensed as incurred.

(e) Cash and cash equivalents:

Cash and cash equivalents include cash on hand and short term deposits which are readily convertible to known amounts of cash and are subject to insignificant risk of changes in value.

(f) Income taxes:

The Corporation qualifies as a tax exempt organization under Section 149 of the Income Tax Act.

**3. Financial instruments and risk management:**

The fair value of the Corporation's cash and cash equivalents, accounts receivable, and accounts payable and accrued liabilities approximate their carrying amounts due to the short-term to maturity of these financial instruments.

The Corporation has exposure to the following risks from its use of financial instruments:

**Credit risk**

The Corporation's financial assets including accounts receivable are not exposed to significant credit risk since the majority of receivables are from government organizations.

**Interest rate risk**

The Corporation is exposed to interest rate risk arising from fluctuations in interest rates on amounts invested in interest bearing accounts and investment certificates. Cash, when received, is deposited into an interest bearing account which earns interest at a rate of 1.50%. The current investment certificate is a term deposit which earns interest at a rate of 2.50% and matures on March 17, 2021. The term deposit may be redeemed by the Corporation at any date prior to the maturity date without penalty.

**Other risks**

The Corporation has no significant exposure to liquidity risk, currency risk or other price risk. There is a concentration of risk due to the limited number of individual counterparties to the Corporation's cash and cash equivalents and investment certificate.

# GENOME PRAIRIE

Notes to Consolidated Financial Statements (continued)

Year ended March 31, 2018

**4. Deferred contributions:**

The Corporation receives funding from Genome Canada, Provincial Ministries, Western Economic Diversification Canada and other sources to be held, administered and distributed in accordance with the related funding agreements between Genome Prairie and the other parties. Deferred contributions relate to expenses of future periods and represent the unspent externally restricted funding and related investment income, which are for the purposes of providing funding to eligible recipients and the payment of operating and capital expenditures in future periods. The changes in the deferred contribution balances for the period are as follows:

| | 2018 | 2017 |
|---|---|---|
| Opening deferred contributions for expenses of future periods | $ 3,469,456 | $ 2,471,624 |
| Contributions during the year: | | |
| Genome Canada | 3,194,296 | 3,695,958 |
| Province of Saskatchewan – Projects | 965,414 | 882,941 |
| Western Grain Research Foundation | 918,120 | 926,051 |
| Genome Alberta | 300,419 | – |
| Manitoba Agriculture, Food and Rural Development | 172,644 | 483,247 |
| Western Economic Diversification | 165,429 | 211,609 |
| Research Manitoba | 97,000 | 102,500 |
| Manitoba Wheat & Barley Commission | 18,750 | 75,000 |
| Workshops and other | (40,617) | 104,652 |
| DivSeek Partners | – | 40,014 |
| Saskatchewan Wheat Development Commission | – | 12,500 |
| | 5,791,455 | 6,534,472 |
| Total contributions available | 9,260,911 | 9,006,096 |
| Less amounts recognized as project revenues | (5,104,107) | (4,526,296) |
| Less amounts recognized as administrative support revenues | (944,356) | (1,010,344) |
| Closing deferred contributions for expenses of future periods | $ 3,212,448 | $ 3,469,456 |

# GENOME PRAIRIE

Notes to Consolidated Financial Statements (continued)

Year ended March 31, 2018

**5. Commitments:**

**Funding commitments:**

The Corporation signed a funding agreement with Genome Canada on March 27, 2013, which applies to all funding awarded and provided to the Corporation from April 1, 2013 until such time that a new or amended agreement is signed or the agreement is cancelled.

**Base funding**

The Corporation received a Notice of Award from Genome Canada on May 5, 2017 approving administrative support funding up to a maximum of $734,800 per year, for a period of three years commencing April 1, 2017 and ending March 31, 2020. As a condition of funding under this Notice of Award, the Corporation is expected to secure co-funding from other sources in an amount at least equal to the contribution of Genome Canada, or, provide Genome Canada with a documented plan to meet this requirement within a reasonable time period. As specified in the funding agreement, Genome Canada may provide funding to the Corporation notwithstanding the fact that formal commitments from other parties have not yet been secured. In such cases, funds provided in advance "in good faith" shall not be reimbursable in the event such commitments from other parties are not secured, but Genome Canada may then terminate the present agreement or suspend or reduce funding.

**Project funding**

Genome Canada has approved funding remaining of $2,367,841 to be provided to the Corporation for ongoing and future research projects. In accordance with the funding agreements, the Corporation will secure additional financial contributions or in-kind commitments at amounts specified in the Notice of Awards issued by Genome Canada. As at March 31, 2018, the Corporation had $7,796,957 in co-funding related to these projects still to be applied.

**Lease commitments:**

The Corporation has entered into a sub-lease agreement for its Saskatoon office space expiring on March 31, 2019, unless terminated prior to that date. The length of notice of termination required is three months. The approximate annual rental is $82,000. The Corporation has also entered into a sub-lease agreement for its Winnipeg office space expiring on March 31, 2019, unless terminated prior to that date. The length of notice of termination required is six months. The approximate annual rental is $30,000.

**6 Comparative figures:**

Certain comparative figures have been reclassified to conform with the financial statement presentation adopted in the current year.

GenomePrairie

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# “We Are Science That Matters”