

**BUILDING A SUSTAINABLE**

# WORLD





# BUILDING A SUSTAINABLE

4  
Powering  
BC's Bioeconomy

6  
Environmental  
Sustainability

14  
Health  
Sustainability

20  
Economic  
Sustainability

22  
Building  
Community

25  
Messages from  
the Board Chair,  
President & CEO



Sustainability is the capacity to endure, to maintain, and to produce indefinitely.

Maintaining a healthy world is a multifaceted, constantly evolving challenge. New technologies are helping manage the delicate balance of sustaining a healthy environment, healthy living conditions, healthy populations and a healthy economy. Genomics is the science that aims to decipher and understand the entire genetic information of an organism. This is generating an unprecedented wealth of knowledge and information. This ‘digitization of biology’ is transforming our world and finding solutions to complex biological challenges. The innovations emerging through this field are already driving a new wave of technology and having an impact on human health, our food supply and the responsible development of the world’s resources.



## Powering BC's Bioeconomy

Genomics is a powerful engine for innovation – and BC is a global leader in research and application of this technology, helping to drive BC's bioeconomy. A recognized catalyst for government, industry and academia, Genome British Columbia (Genome BC) invests in research and entrepreneurship and commercialization in life sciences to address challenges in key sectors such as health, forestry, fisheries and aquaculture, agri-food, energy, mining and environment.



Looking ahead, genomics will be the foundation of British Columbia's growing bioeconomy, which is estimated to be responsible for 2 per cent of GDP, or 28,000 jobs, by 2020. We estimate that with the right investment and policies, BC's bioeconomy could generate over \$12 billion in GDP and support up to 56,000 jobs by 2030.

Genome BC receives approximately 25% of its funding from the Government of British Columbia and then raises the balance through competitive research funding with Genome Canada and other partners. Genome BC partners with many national and international public and private funding organizations to drive BC's bioeconomy.

The Provincial Government has demonstrated its commitment for Genome BC's current five year strategic plan and provided an initial two year investment of \$34 million. In 2015, Western Economic Diversification Canada also made a \$750,000 contribution to Genome BC that is being directed towards significantly increasing our engagement with both public and private sector end users.

## A PLAN TO 2020

Genome BC's 2015-2020 strategic plan, "Powering BC's Bioeconomy" is focused on bringing genomic discoveries from the laboratory to real world applications.

To be successful in this critical space along the innovation continuum, Genome BC is dividing its portfolio of investments between discovery, strategic and commercialization.

This increased focus on translation is influencing our priorities, programs, partnerships and operations. As part of this, Genome BC is increasing support of entrepreneurial activities.

## SOME OF THESE OBJECTIVES INCLUDE:



Enhancing BC's recognition as a bioeconomy leader, attracting top talent and new investment;



Promoting and supporting world-class genomics research;



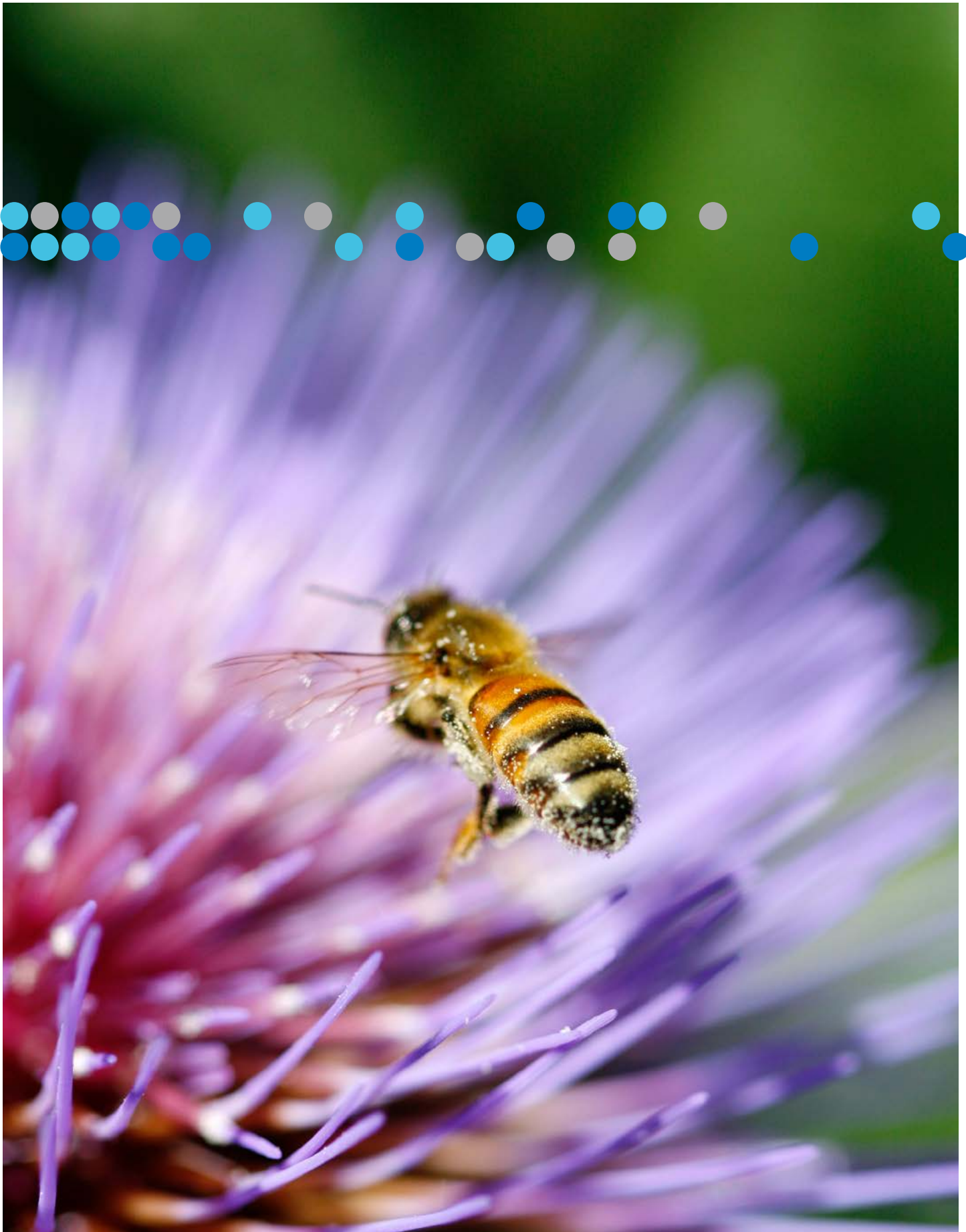
Developing a vibrant life sciences cluster;



Supporting innovation and sustainability in BC's key sectors through translation of research; and



Enhancing recognition of the value of genomics, while addressing societal concerns.





## Environmental Sustainability

Our environment is already benefiting from BC's global leadership in research and the application of genomic technologies to mitigate and adapt to climate change.

These genomic tools help scientists and policy makers determine the best approaches and solutions to the challenges facing our communities by helping us to understand, adapt and act.

Genome BC is supporting research in food security, ecosystem monitoring tools, clean technology, waste conversion and improved plant and animal breeding. In 2015-2016, four major projects were awarded to BC researchers in Genome Canada's *Large-Scale Applied Research Project Competition – Genomics and Feeding the Future*. These projects are a few examples of genomic applications to global challenges underway in BC and Canada.

### WHAT'S ALL THE BUZZ ABOUT?

Honey bees play a critical role in Canadian agri-food. They produce 75 million pounds of honey each year and are responsible for pollinating many fruits and vegetable crops, nuts and oil seeds like canola. Through these activities the bees help contribute more than \$550 million to the BC economy and \$4.6 billion to the Canadian economy each year.

Given this critical role in the health of our agri-food industry, the high rate at which bee colonies are dying off is particularly alarming, posing a serious threat to the productivity of Canada's agri-food industry and jeopardizing food security. Canadian beekeepers have lost more than a quarter of their colonies each winter since 2006–2007 with certain provinces

experiencing significantly higher death in some years. The need to replace these losses by purchasing queen bees from offshore, as beekeepers have been doing, risks importing new diseases or invasive strains of honey bees that can threaten local hives.

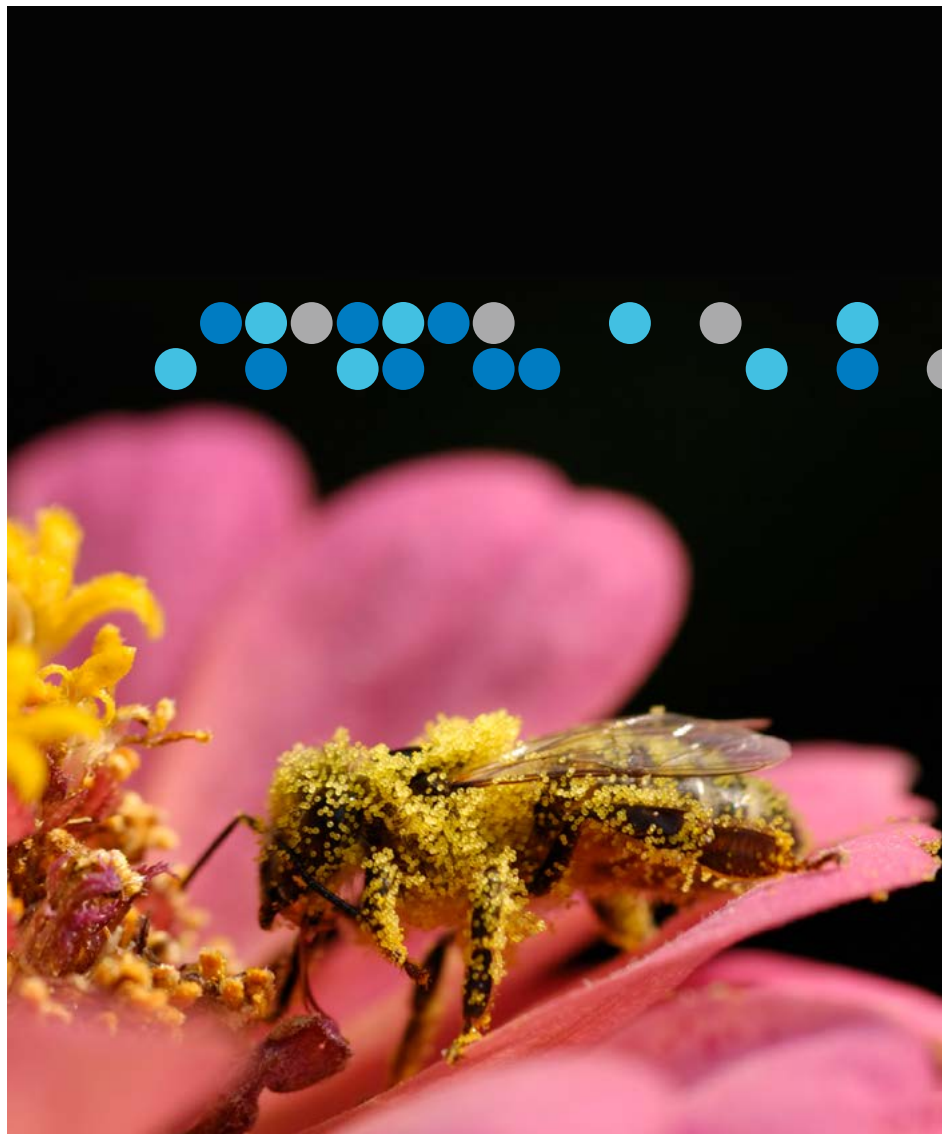
Dr. Leonard Foster from the University of British Columbia and Dr. Amro Zayed from York University are leading a project, valued at \$7.2 million, to guard the safety and sustainability of the beekeeping industry in Canada and the knock-on effects on our food supply. The team is developing genomics and proteomics tools that will provide markers to selectively breed for several economically valuable traits. This will enable beekeepers to quickly and cost-effectively breed healthy, disease-resistant, productive bee

colonies that are better able to survive harsh Canadian winters. While this will lessen the need to import bees from other regions, it will not eliminate it, so the team is also developing an accurate and cost-effective test to detect bees with non-desirable genetic traits.

The team will work with beekeepers, stakeholders and end users to ensure their tools are implemented and accessible to beekeepers by the end of the project. This will provide measurable social and economic benefits estimated up to \$150 million to Canada, including to beekeepers and the agri-food industry.



Identifying  
economically valuable  
bee traits



## FLOWER POWER

It's not easy being a plant. Drought, flooding, salt and low nutrient levels reduce growth and lower crop productivity. These environmental stresses have the greatest impact on our domesticated crops, which have not evolved the same mechanisms to overcome these challenges as their wild relatives.



Understanding these mechanisms in the face of climatic change will enable us to apply knowledge from wild crops to domesticated crops, thus helping to feed a rapidly growing global population. Sunflowers are ideal for this project, as they are limited by environmental stresses but have wild counterparts adapted to a variety of extreme environments.

In order to address the health of these plants and increase their capability of growing in a variety of habitats, Drs. Loren Rieseberg of the University of British Columbia and John Burke of the University of Georgia are leading an international team investigating why wild plants are more resistant to

environmental stresses. The project, funded for \$7.9 million, is focusing on the sunflower, a \$20 billion crop globally and the only oilseed in the Global Crop Diversity Trust's list of 25 priority food security crops. The project will identify and fully characterize the genetic basis of stress resistance in sunflowers and create resources that will enable partners, from the public and private sectors, to breed stress-resistant, high-yield cultivars. The team will also develop models to predict likely yields of the new cultivars in different soil and climate conditions across Canada. They will develop strategies to overcome barriers to research and development caused by international treaties on the use of plant genetic resources, thus allowing the best

use of new plant materials developed from this project for growers in Canada and around the world.

The expanded sunflower production, made possible by the new cultivars, is expected to yield a gross production value of up to US \$12 million annually within five years of the project's end and up to US \$230 million annually after ten years. BC's leadership in plant genomics is having a worldwide impact, as no other oilseed can maintain the stable yields across as wide a range of environmental conditions as that predicted for the new sunflower cultivars.



## CATCHING COHO UP

Fisheries and aquaculture are a \$2.5 billion industry in Canada, supporting many thousands of jobs across the country, impacting well-being and economic health. With 25 per cent of the world's coastline and 16 per cent of the world's fresh water, the importance of fisheries to Canada cannot be overstated.

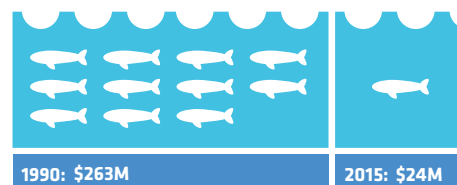


Seafood is the province's largest agri-food export (\$870 million) and contributes \$2.2 billion in direct industry revenues annually for the province. Since the 1990s, however, the commercial salmon fishery on the west coast has decreased in annual value from \$263 million to \$24 million. Coho salmon, previously one of the most highly valued species in BC, began to suffer serious declines in 1989 due to lower returns and high harvest rates to the point where the commercial fishery for Coho salmon was essentially closed in 1997. Reopening the Coho salmon fishery, based on recovered and enhanced populations, would bring both economic and social benefits to BC.

Enhancing Production In Coho: Culture, Community, Catch (EPIC4) is valued at \$9.9 million and led by Drs. Willie Davidson of Simon Fraser University and Louis Bernatchez of Université Laval. The project is working to develop and use new genomics tools to address challenges facing the safe, secure and sustainable production of Coho salmon. The interdisciplinary team of natural and social scientists will sequence the Coho salmon genome and determine how Coho salmon from different geographic regions vary genetically. They will apply this knowledge to help revive and sustain the wild Coho salmon fisheries. Working with stakeholders,

EPIC4 will explore and understand fully the economic, institutional, regulatory and socio-ecological opportunities for these genomic tools to optimize their deployment in real-world settings.

This work could lead to more economically viable Coho salmon fisheries serving both domestic and export markets. The results of the project should also be transferable to other species of Pacific salmon as well as salmonids from other regions of Canada.



## REVERSING CATTLE LOSSES

Infectious diseases continue to be a leading cause of sickness and loss in domestic animals and are of significant concern to human health due to the possible transfer from animals to humans.



The leading cause of sickness and loss in cattle is infections and these cause direct economic losses to producers and even more serious losses associated with international trade restrictions (as seen with mad cow disease) and decreased public confidence in food quality. The most effective way to prevent infectious disease in animals such as cattle is vaccination. A new research project aims to develop vaccines against two important infectious diseases of cattle, Johne's Disease: a gastrointestinal disease causing large losses in beef and dairy cattle and goat herds; and bovine tuberculosis: a debilitating disease that can spread to humans and other domestic and wild animals.

Dr. Andrew Potter of VIDO-InterVac, University of Saskatchewan, and Dr. Robert Hancock of the University of British Columbia are leading a team taking a "reverse vaccinology" approach to preventing infectious diseases in cattle. This project, valued at \$7.3 million, uses genomic technology to identify and screen large numbers of bacterial proteins simultaneously to identify those that have properties that can stimulate a protective immune response in cattle. These proteins are individually expressed and purified and form the basis for developing novel vaccines and immunization strategies. The team is focusing on two common cattle diseases, with the goal of developing and bringing to market vaccines within two

years of the project's end. The team is also developing companion diagnostics that will differentiate vaccinated animals from infected animals.

The team's work hopes to improve productivity and profitability for cattle producers and improve public confidence by reducing the use of antibiotics. It will also enhance Canada's reputation as a major agri-food producer. The annual financial impact of the vaccines in Canada is estimated to be \$100 million in savings from disease losses, and internationally the impact is expected to be at least \$400 million.

## BREATHING EASY

Aquaculture is BC's leading agri-food market with Atlantic salmon farming contributing \$475 million annually to the province's economy.



Integrating genomics into breeding programs allows aquaculture companies to be more competitive and address certain conditions that may affect broodstock.

In conjunction with Marine Harvest Canada, Drs. Patricia Schulte and Tony Farrell from the University of British Columbia have recently initiated a family-based breeding program to improve broodstock. The research is using genomics to explore the ability of farm-raised Atlantic salmon to tolerate low oxygen conditions (hypoxia) in the ocean. Increasing sea temperatures due to climate change are linked to increased hypoxia events.

Hypoxic events represent an important economic cost to Marine Harvest, due to lost revenue resulting from poor fish growth and health, and it is anticipated

that these losses will increase as the water temperatures continue to rise. The long-term goal of this research is to help industry take a genomics-based approach to this problem by increasing their capacity to incorporate hypoxia-tolerance in their broodstock selection program.

"Marine Harvest Canada is well positioned to take advantage of information regarding hypoxia-tolerance in their strains of fish by incorporating this phenotype into their breeding plans," says Dr. Diane Morrison, Project Leader and Fish Health and Food Safety Director at Marine Harvest Canada. Yvonne Sheehan, Brood Program Manager, adds, "moving towards a genomics-based broodstock program, paired with phenotype, will help us to make informed decisions about breeding selection."

### DR. SCHULTE

Professor, Department of Zoology at UBC



"Improving the ability of salmon to tolerate hypoxia will be critical for the competitiveness of salmon farming in BC because episodes of hypoxia are becoming increasingly common along the BC coast, particularly in late summer," says Dr. Schulte, Professor, Department of Zoology at UBC. "Hypoxia can be lethal for fish, and even at sub-lethal levels it has economic costs because the fish require more investment and take longer to get to market size."



## Q & A WITH: JOHN RUSSELL

Research Scientist, Tree Breeding, Forest Genetics Section, Tree Improvement Branch, BC Ministry of Forests, Lands and Natural Resource Operations

Covering almost two-thirds of BC's total landmass, our forests generated more than \$11.6 billion in economic activity in 2013. Forestry, one of BC's largest manufacturing sectors, is the largest single source of export, and accounts for 58,200 jobs.

More than 200 million tree seedlings representing over a dozen species are planted each year on public forest lands in BC. Over seven billion trees have been planted since reforestation programs began in the 1930s. Maintaining the health and productivity of these forests requires scientific knowledge as, like people, each tree's genetic make-up is different, and conifers, as a group, contain the most genetic diversity of all organisms.



**Q** Which tree species are involved in genomics research for the purpose of tree breeding?

**A** We operate multiple breeding programs, however, we are conducting genomics research for the four major species: Western redcedar, Coastal Douglas fir, Interior spruce (also known as White spruce), and Lodgepole pine. A genomic selection means that we will be able to provide select seed for forest companies and the province to plant in the future.

**Q** What kind of qualities can genomic selection identify?

**A** Some of the key insights are around chemicals and chemical pathways related to pests and pathogen resistance in different climates. Genomic selection can also identify and select for key traits like wood hardness – i.e. what makes a good two by four, wood durability and what makes wood last in outdoor situations such as decking and siding.

**Q** Where do you see opportunities in the future?

**A** I have been at this for over 30 years and now the black box has been opened. Currently companies are switching to second growth forests and we have been working with Western Forest Products, TimberWest, InterFor and Island Timberlands to demonstrate the benefits of planting select seeds now for future economic sustainability. Genomic research has the potential to change the way that we manage our forests.



## GENOMICS TAKES FLIGHT

In 2014, as part of the emerging issues priority fund, Genome BC, Genome Canada and other partners funded research to shed light on the source of a major avian influenza outbreak.

Wild waterfowl are the natural reservoir for these viruses. Through the genomics analysis of sediment samples, researchers were able to detect and characterize avian influenza viruses in wetlands throughout the Fraser Valley, including the virus responsible for the 2014/15 North American poultry pandemic. This was remarkable given that established surveillance technologies being used in Canada and the USA were not capable of detecting the virus in advance of the outbreak. This year a follow-up study, led by the Leader of Veterinary Science and Diagnostics at the BC Ministry of Agriculture, Dr. Chelsea Himsworth, will be funded to validate and implement the results.



## CRYSTAL CLEAR

Water – arguably the world's most precious commodity whether in its liquid form or its frozen state.

That's why Genome BC is investing in several projects that address the need for clean water.

Vancouver receives roughly 150 cm of rainfall each year and rainwater runoff from roadways often contains elevated levels of several metals, as well as heavy extractable petroleum hydrocarbons. Best management practices for stormwater

treatment include the design and installation of engineered, or man-made, wetland systems, such as the Lost Lagoon engineered wetland located within Stanley Park, Vancouver.

More genomics research is needed for engineered water treatment systems that decontaminate stormwater. A new research project funded in part by Genome BC will address the development of a DNA-based tool for monitoring and validating the performance of engineered water treatment systems. The end-user, Kerr Wood Leidal Associates, is partnering with the Stanley Park Ecological Society

and the University of BC's Department of Civil Engineering in order to develop insight around the trends and shifts in the microbial community along the course of the Lost Lagoon treatment wetland. Information gleaned from this research could enhance and improve management practices and the design of engineered treatment wetlands.

## Health Sustainability

Our genomes, and the genomes of the microbes that live in and on us, help determine many aspects of our lives: from our risk of mental and physical diseases, our response to drugs, our metabolism and more. Genomics is creating a paradigm shift from a disease-oriented healthcare system to one that is more precise, predictive, preventative and participatory.



### INSIDE OUT

Whole genome sequencing (WGS) will be widespread, but today there are still only a few thousand select individuals across the world who can claim they have had their genome sequenced and analyzed in its entirety.

In May 2015, Genome BC hosted the first Canadian WGS consumer program, Illumina's Understand Your Genome (UYG) in Vancouver.

Twenty participants embarked on a remarkable journey that began with registration, physician consultation and provision of a blood sample. They all came together for a one-day workshop detailing the findings of their genome and a report of adult onset conditions, carrier screening and responsiveness to certain drugs.

The full day workshop was led by industry experts who discussed topics such as the application and clinical utility of WGS, ethics in the genomic era, and the evolving and growing need for genetic counselling in health management.

Today, less than one per cent of the human genome is interpretable, but as more people get their genomes sequenced more insights will be revealed and that one per cent will become two per cent and so on. Increasing the number of genomes sequenced will provide further insight and guide precision medicine advancement. In the meantime there are many considerations including how to embed this technology into the healthcare system, how to develop expertise with physicians, and how to engage patients.

### DAWN BERRY

Vice President, Life Science & Applied Markets at Illumina

"We know the time is coming when people will not be able to imagine their lives without knowledge of their own genomes. Whole genome sequencing, in support of genomic medicine, is just getting started. Individuals already have the opportunity to explore the genetic underpinnings of conditions or characteristics, that until now, were not accessible."



### BRAD POPOVICH

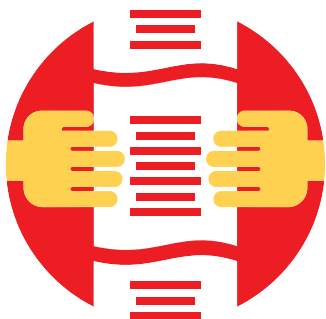
Past Chief Scientific Officer, Genome BC

"It's not the scientists, it's not the clinicians that are going to lead this, it's society at large."

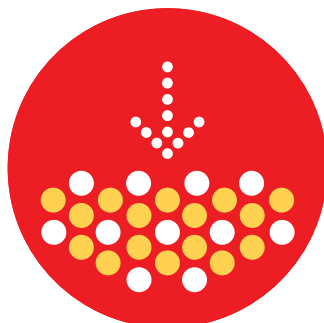




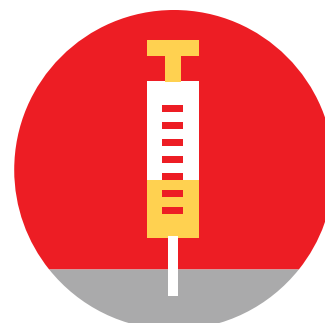
## GENOMICS CAN:



Provide precise information on an individual's cancer for better treatments and outcomes;



Accurately and quickly detect hard-to-diagnose infectious diseases;



Improve vaccines and citizen health responses to disease outbreaks;



Provide testing to optimize treatments and minimize adverse drug reactions;



Minimize the diagnostic 'odyssey' for patients with rare diseases to improve patient outcomes; and



Inform approaches to wellness, nutrition and health.

## GENOMICS ENGLAND

In 2015, Genome BC and Genomics England signed a Memorandum of Understanding (MOU) to pursue a bold initiative to improve diagnostic capability and outcomes for patients. Working together, the ultimate goal is to share and co-develop information and tools, and a mechanism for the international exchange of knowledge, data and materials in the field of genomics.

The first phase of the MOU involved building expert working groups to expand and assess some of the best ideas, generate project candidates and harmonize data sharing tools and processes. The MOU also includes the establishment of cross-institutional teams to address the mutually identified priority areas of cancer, rare diseases and infectious diseases, and the enabling tool of bioinformatics.

The second phase will roll out throughout 2016 and includes the launch of pilot projects in each strategic area.

"British Columbia has many similar ingredients to the UK; ingredients for being a leader in this area. You have identified the importance of bringing researchers and health teams together to improve links and efficiency."

"BC has the system, the institutions, the technology and the talent to do this... The time for genomic medicine is now and I encourage you to seize the opportunity or be left behind. A fast follower is always a fast follower," says Mark Caulfield, Chief Scientist, Genomics England.





## A TOUCHING SOLUTION FOR HOSPITAL INFECTIONS

Healthcare associated infections (HAIs) are a major burden on patients and healthcare systems worldwide. Despite strict hygiene practices and other preventative measures in hospitals, there are an estimated 220,000 HAI cases with 8,000 deaths per year in Canada.

Costs associated with HAIs are estimated to be over \$15 million per year for Vancouver Coastal Health (VCH) alone. One of the highest risk groups for HAIs are Bone Marrow Transplant (BMT) patients. These patients' immune systems are weakened during the course of their treatment making them highly vulnerable to pathogens until their immune system recovers.

Dr. Elizabeth Bryce, Regional Medical Director for Infection Prevention and Control, VCH, Dr. Raewyn Broady, Director of the BMT program, and Dr. Linda Hoang, Medical Microbiologist, at the BC Public Health Lab, part of the BC Centre for Disease Control, are leading a two-year pilot study that is tackling the risk of infection in BMT patients using two complementary and novel approaches. First, to reduce the bio-burden on all touch surfaces, three patient isolation rooms have been re-engineered with self-disinfecting surfaces containing copper-nickel and titanium dioxide and outfitted with contact-free motion activated devices, filtered water, and ultraviolet light in the bathroom. Second, surveillance for pathogens in patients, healthcare workers and rooms will be addressed by microbiome profiling and the current standard of care microbial culturing.

The study leaders anticipate valuable insights into the role that the hospital environment (and healthcare staff) may have on the evolution of a BMT patient's microbiome during the transplant and recovery process. This in turn should inform improved methods to reduce HAIs for this target patient cohort as well as inform general infection prevention strategies. Their hope is to gather enough evidence to establish a future large-scale study across the country to reduce HAIs and ultimately decrease the related morbidity and associated economic burden on healthcare spending.



## FROM YEARS TO DAYS – DIAGNOSING NEWBORNS

Currently, genetic disorders are a leading cause of infant mortality and make up a large percentage of the patients in BC Neonatal Intensive Care Units (NICUs).

Providing an accurate and rapid diagnosis to patients with these types of disorders remains a significant challenge as currently it can take years to reach a conclusion. Without a diagnosis, it's difficult to accurately address the needs of these patients with appropriate clinical management. It also means that many patients die without a diagnosis.

Addressing this challenge is the focus of the pilot RapidOmics (Rapid Genome Wide Sequencing in the NICU) project at

BC Women's Hospital and Health Centre, led by Dr. Horacio Osioyich, Division Head, Neonatology, UBC and Dr. Jan Christilaw, Vice President, Provincial Women's and Newborn Health, Provincial Health Services Authority (PHSA). This project's goal is to put into practice the use of rapid exome sequencing in the NICU, a technique for sequencing the protein-coding genes in a genome (known as the exome) to increase the turnaround and accuracy of diagnosing neonates with a suspected genetic disorder.

In this project, exome sequencing will be done for 25 trios (baby plus both parents). Initial results will be provided from the partner laboratory at UBC within five to seven days: this will allow time to influence clinical management and will include genetic evaluation and counselling.

This research project aims to enable the PHSA to implement rapid exome sequencing as a clinical service for critically ill babies in BC. The average length of stay for a patient with a suspected genetic disorder is 33.9 days with an associated direct cost of \$142,057 per baby – the hope is that reducing the need for such a long stay will improve outcomes for the patient and their families and provide cost savings to the system.



## TAILORED THERAPY

Prescriptions are intended to help patients but currently prescribers are, in some instances, unable to predict whether an individual patient will benefit as intended from the drug therapy, or if they may suffer potentially serious, unexpected adverse drug events. Understanding gene-drug associations will reduce the incidence of adverse drug events and inappropriate prescribing, and improve therapy compliance and effectiveness.



There are over 200,000 severe adverse drug events annually in Canada, costing upwards of \$14 billion, which place a significant burden on the Canadian healthcare system.



There are more than 150 currently identified medications – ranging from mental health to heart disease to cancer drugs – that can negatively impact a patient because of his/her DNA.

## TWO GENOME BC PROJECTS ARE TACKLING THIS ISSUE USING GENOMIC TECHNOLOGIES

1

**The first project, *The Implementation of Pharmacogenomics in Primary Care in British Columbia project***, is led by Dr. Martin Dawes at UBC. Dr. Dawes

and his team have developed and tested a unique medication decision-support-tool which identifies individual medication options adjusted for patient characteristics, drug to drug interactions, and pharmacogenetics.

A total of 191 patients were recruited by physicians and pharmacists. Genotyping was undertaken, and this data was linked to an evidence-based medication decision-support system. Genotyping resulted in 189 (99%) patients with pharmacogenetic reports linked to the decision-support program, with 96.8% of samples having at least one actionable genotype. The medication support system was used by physicians and pharmacists 236 times over a period of three months.

This project is also supported by The Michael Smith Foundation for Health Research, TELUS Health, the Personalized Medicine Initiative, Roche Canada, AstraZeneca, GSK, Janssen, Merck, Pfizer and Innovative Medicines.

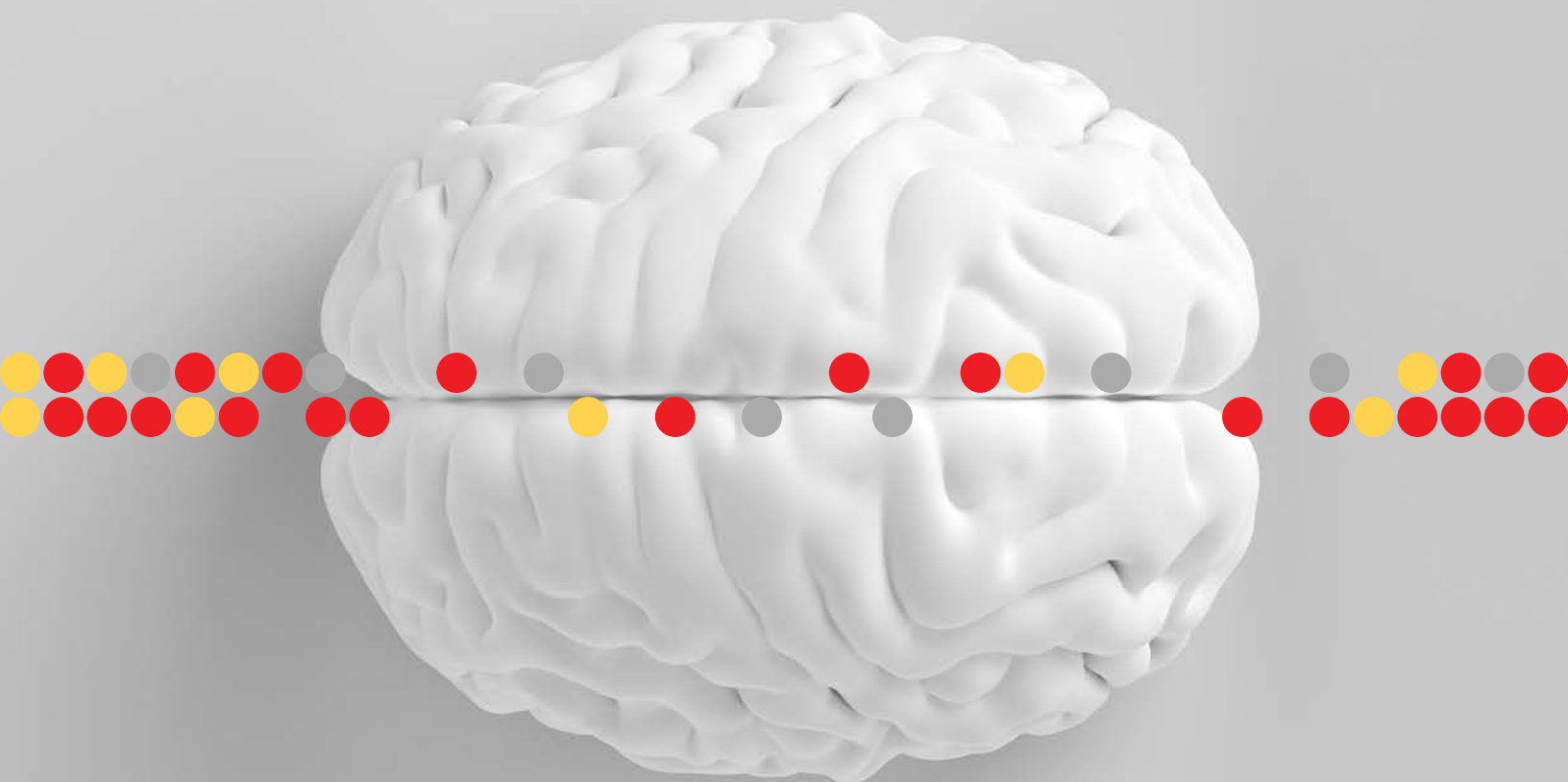
2

**The second project, *Genomics for Precision Drug Therapy in the Community Pharmacy***, is led by Dr. Corey Nislow and his team at the UBC Faculty of Pharmaceutical Sciences in partnership with the BC Pharmacy Association (BCPhA).

The first phase of this project focused on developing robust standard operating procedures for the collection of patient saliva samples, processing and sequencing of DNA at UBC and the development of educational tools used by pharmacists for patient awareness. Community pharmacists finished collecting all 200 saliva samples in late 2015, and UBC researchers finished sequencing samples in January 2016. UBC researchers are now doing a retrospective analysis of DNA information to learn how genetics may have altered the drug dosage prescribed to patients.

Participating pharmacies were located in Armstrong, Burnaby, Courtenay, Chetwynd, Cranbrook, Enderby, Fort St. John, Hope, Houston, Kamloops, Kelowna, Keremeos, Penticton, Port Coquitlam, Port McNeill, Prince George, Surrey, Vancouver, Victoria, West Kelowna and Williams Lake, making this truly a BC-wide study.

The frontier of cancer treatment is moving beyond a focus on a few selected genes known to be implicated in cancer to more broad surveys of cancer genomes.



This broader examination of cancer genomes is helping to optimize treatments for current patients, increasing our understanding of the causes and types of cancers and guiding development of future therapeutic strategies.

In January 2016, research co-led by The Hospital for Sick Children (SickKids) in Toronto and the BC Cancer Agency provided better insight into why new and experimental treatments fail for children with recurrent medulloblastoma, the most common cancerous brain tumour in children.

Medulloblastoma is known to be difficult to successfully treat and side-effects from current therapies including chemotherapy,

radiation and surgery can have a devastating impact on a child's developing central nervous system.

This \$9.86 million study, part of the Medulloblastoma Advanced Genomics International Consortium (MAGIC) project, is funded in part by Genome BC, Genome Canada, the Terry Fox Research Institute and others.

Drs. Michael Taylor and David Malkin at SickKids and Dr. Marco Marra at Michael Smith Genome Sciences Centre, studied samples of medulloblastoma tumours from children and found the genomes of tumours at the time of diagnosis had significantly transformed in recurrent medulloblastoma tumours. The current

standard of treatment doesn't take into account that the biology of tumours changes during the progression of the disease, meaning that the treatment approaches also need to change.

Nearly 30 per cent of cases result in a recurrence of the tumour, which is almost universally fatal. Knowing that the tumours are changing can better guide future interventions for these little patients.

## Economic Sustainability

Having a robust technology sector is an important component of maintaining a healthy and diversified economy.

According to the Organisation for Economic Co-operation and Development (OECD), genomics is the foundation for future growth of the bioeconomy. In 2010, BC's bioeconomy contributed close to \$2 billion in GDP. With the right investment and policies, BC's bioeconomy has the potential to increase its GDP contribution six-fold and job-growth four-fold by 2030. In order to deliver on this, research must be translated and commercialized for the market.

## ENTREPRENEURSHIP SUPPORT

To realize the social and economic benefits from the investments made over the last 15 years in genomics, Genome BC has increased its support of entrepreneurial activities to help stimulate SME (small to medium-sized enterprises) growth and support jobs for BC. This includes partnering with established accelerators and incubators such as e@UBC, The Centre for Drug Research and Development (CDRD), and the BC Technology Industry Association (BCTIA). Genome BC is also developing a resource program for the life science streams to further mentor and train people working towards commercializing their products.

### BY THE NUMBERS\*

Genome BC has built BC's internationally recognized capability for genomics, attracting co-investment, advancing companies, and supporting BC job growth. This supports commercialization, including 38 companies advanced.



Established over 400+ international collaborations



Generated academic results, including 1,798 scientific publications



Created over 21,149 jobs\*

\*Economic and Social Impact Analysis MNP LLP, March 2014



## OPEN FOR BUSINESS WITH INDUSTRY INNOVATIONS

Genomics, as an enabling technology, is being recognized by industry to have the potential for commercialization and to create new products, particularly as it becomes increasingly affordable.

This year, Genome BC launched the Industry Innovation program (I<sup>2</sup>) to help companies developing life sciences technologies in BC move from the seed stage to Series A funding or other significant financing events. The I<sup>2</sup> program offers repayable growth

capital to companies commercializing innovative life science technology-based products, processes or services. The I<sup>2</sup> program is a concrete step towards bridging the gap between innovation and commercialization in the BC bioeconomy.

### SOME OF THE COMPANIES WE'VE ADVANCED:



Attracted \$592 million in co-investments including international, industry & federal sources



Advanced 38 local companies



These companies have raised private investment of approximately \$200 million and secured over \$1 billion in co-development deals

## Building Community

In 2015–2016, Genome BC supported the life sciences community through a number of events which included:

- BCBC's Next Leaders
- Personalized Medicine Summit
- BC Business Summit
- HUP0
- Montpellier Workshop
- Genomics and Cancer – Gairdner Symposium
- 2015 Interface Health Vancouver
- Hatching Health Hackathon
- LSBC's Access to Innovation
- Genes and Jazz
- BC Tech Summit
- Canada Clean Tech
- Globe 2016

2015 – 2016  
YEAR IN  
REVIEW



**113**  
Unique  
Media Stories



**15**  
Community  
Events



**35**  
Communities  
Visited by  
Geneskool  
Program



**84**  
Schools  
Visited  
by Geneskool  
Program



**275**  
Teachers  
Trained by  
Geneskool  
Program

**17,327**  
People Reached

**8,327**  
Students Visited

## DNA TECHNOLOGY

DNA technology has become an essential means for ensuring accuracy and objectivity in the process of crime solving.

Dr. Bruce Budowle, renowned forensics expert, has been a leader in the field for four decades, applying his DNA expertise to the most compelling cases at the FBI. As Genome BC's 6th Annual Dr. Don Rix Distinguished Keynote Speaker, Dr. Budowle addressed a sold-out crowd



on the efficacy of genomic technologies in crime solving and the identification of human remains. He spoke about future improvements in technology that may advance current forensic practices and discussed privacy issues which are an ongoing area of discussion for forensic experts.

**“Genomics is key to the work I have accomplished in the forensics field,” says Dr. Budowle.**

## Around the Dome in 30 Days

13,904 Visitors to Genome BC's booth at Community Science Celebration



## 6th Annual Don Rix Distinguished Keynote Address – Bruce Budowle

- Standing room only, over 350 attendees
- Further public engagement through social media & YouTube videos



## Eight “Bringing Genomics Home” Public Dialogue Events

Events in:  
a) Cranbrook  
b) Nanaimo  
c) Prince George  
d) West Vancouver  
e) Victoria (2)  
f) Kamloops  
g) Comox

## Social Media



**3,651**  
subscribers



**2,133**  
followers



**720**  
likes



**6,877**  
followers



## THE STUDENT HAS BECOME THE TEACHER

In 2005, a Grade 9 student from J.N. Burnett High School in Richmond, BC heard about an interesting summer camp being held at her school that summer.

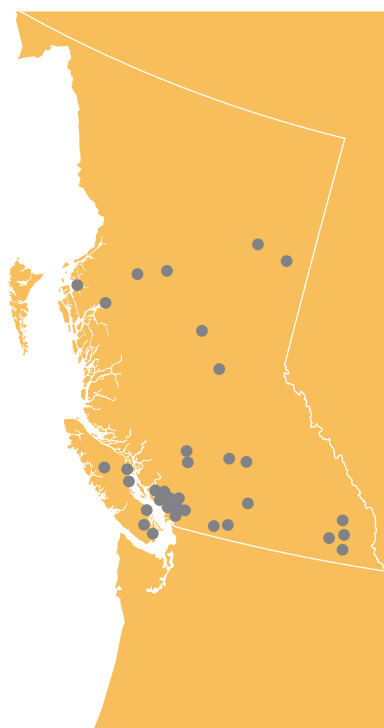


It was Genome BC's Geneskool (Geneskool) and it was unequivocally life changing. Now 25 years old, Evelyn Sun is a PhD candidate in the UBC's Department of Microbiology and Immunology in the laboratory of Genome BC funded researcher, Dr. Bob Hancock. Her thesis researches the infections implicated with the genetic disease Cystic Fibrosis (CF), and it was her foundation in genomics, through Geneskool, that brought her here.

Not only is Evelyn researching genetics, she is teaching it. In addition to being a Teaching Assistant (TA) for a first year biology course at UBC, she is returning to Genome BC this summer for her second stint as an instructor for Geneskool summer camps at Thompson Rivers and Capilano Universities. Since last year, Evelyn has kept in touch with campers acting as a sounding board and mentor for students as well as linking them with relevant faculty members for research opportunities during high school and beyond. And, in addition to her scientific

pursuits, Evelyn recently wrote a fiction novel that is being published in the summer of 2016.

Not shy about her ambitions, Evelyn's greatest desire is to teach at a post-secondary level for her professional career. Her joy is the interaction with students, the enrichment of education and the illumination of young minds. Evelyn can't say enough about how her experience at Geneskool camp forged her future path – she knew that first day what she was meant to do. And she is well on her way.



### Geneskool Classroom Visits

Ashcroft  
Burnaby  
Chetwynd  
Chilliwack  
Comox  
Coquitlam  
Courtenay  
Cranbrook  
Delta  
Ferne  
Fort St. John

Gold River  
Jaffray  
Kamloops  
Kelowna  
Kimberley  
Kitimat  
Maple Ridge  
Nanaimo  
North Vancouver  
Pemberton  
Port Coquitlam

Prince George  
Prince Rupert  
Quesnel  
Richmond  
Rosedale  
Shawnigan Lake  
Smithers  
Squamish  
Surrey  
Terrace  
Vancouver



## Message from the Board Chair

IAN DE LA ROCHE

It has, indeed, been a remarkable year. A time of change – a remapping of directions, a change in leadership but, throughout, there remains a steadfast commitment to enabling and catalyzing the role of genomics in bettering the lives of British Columbians. And, as Chair of the Board, it is my privilege to share a few messages from the Board of Directors. We would like to thank the Province of British Columbia for its commitment to Genome BC's current five year strategic plan and initial two year investment of \$34 million. This is a testament to the trust and understanding of Genome BC's vision and mission.

I would like to thank my fellow Board members for their dedication and wisdom this year. We have two new members, Len Boggio and Paul Terry. Both bring a wealth of experience and knowledge to impart. I would also like to welcome Ida Goodreau into the role of Board Chair and John Thompson as Vice Chair. This duo brings an ideal balance of health and natural resources, private and academic expertise to the Board leadership.

Lastly, and perhaps most importantly, we would like to thank Alan Winter for his many years of service, dedication and exceptional leadership. Under his guidance, Genome BC has flourished and is now set on a course to shift to a more balanced portfolio of discovery, applied and translational outputs. With team members dedicated towards industry innovation, entrepreneurship and commercialization, the goals set out in the current Strategic Plan will be achieved.

In closing, I wish to thank the staff and management of Genome BC and welcome Pascal Spothelfer into the role of President and CEO. I know that I speak for us all when I say we are looking forward to working with him and continuing to keep Genome BC at the forefront of genomics advancement and excellence.

*Ian de la Roche*



## Message from the President and CEO

ALAN E. WINTER

This year represents a time of unprecedented growth and significant advancement of the vision set out by Genome BC's founders, notably Michael Smith, some 16 years ago. I joined Genome BC shortly after this vision was set into motion by Roger Foxall, and many of you know that this has been my final year at the helm of this tremendous organization. In my time at Genome BC, the changes we have seen are much more fundamental than just a few applications. Genomics has become an enabling technology and is now integrated across communities, the environment and the economy.

Genomics is the next wave of technology and is moving along a similar trajectory to the IT industry some decades ago. When Genome BC was formed, the human genome project was the 'moon shot' and now people are getting their full genome sequenced and delivered on an iPad. Personal, precision healthcare is a reality. And we have learned that DNA is not destiny, but rather environmental influences interact and play a significant role in determining outcome.

In closing, I would like to say how proud I am to have been part of this inspired enterprise for nearly 15 years. It has been a joy to come to a stimulating work environment where staff, partners, researchers and government have worked with us to prove the value of genomics in BC. I have no doubt that the next 15 years will be even more successful and entrust the leadership to Pascal Spothelfer. It has been an honour to work alongside the extraordinary team members of the Genome BC family which includes staff, the Canadian genomics enterprise, Board members, in particular our Chairman for the past two years Ian de la Roche, and others. I thank you all for your ongoing support of Genome BC.

*Alan E. Winter*

# Independent Auditors' Report

## To the Board of Directors of Genome British Columbia

We have audited the accompanying financial statements of Genome British Columbia, which comprise the statement of financial position as at March 31, 2016, the statements of operations, 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 Financial Statements

Management is responsible for the preparation and fair presentation of these 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 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 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 financial statements are free from material misstatement.

An audit involves performing procedures to obtain audit evidence about the amounts and disclosures in the financial statements. The procedures selected depend on our judgment, including the assessment of the risks of material misstatement of the 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 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 financial statements.

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

## Opinion

In our opinion, the financial statements present fairly, in all material respects, the financial position of Genome British Columbia as at March 31, 2016, and its results of operations and its cash flows for the year then ended in accordance with Canadian accounting standards for not-for-profit organizations.

*KPMG LLP*

Chartered Professional Accountants  
June 3, 2016  
Vancouver, Canada

## Statement of Financial Position (Expressed in Canadian Dollars)

March 31, 2016, with comparative information for 2015

	2016	2015
<b>Assets</b>		
Current assets:		
Cash	\$ 1,123,582	\$ 35,590,444
Short-term investments (note 3)	89,585,373	67,428,582
Funding receivable	237,997	75,735
Other receivables (note 4)	155,283	56,403
Project advances	2,623,278	2,547,391
Prepaid expenses	180,089	186,982
Current portion of loan receivable (note 5)	200,000	—
	<b>94,105,602</b>	105,885,537
Loan receivable (note 5)	—	187,793
Capital assets (note 6)	466,310	556,894
	<b>\$ 94,571,912</b>	\$ 106,630,224
<b>Liabilities and Net Assets</b>		
Current liabilities:		
Accounts payable and accrued liabilities (note 7)	\$ 4,263,436	\$ 4,136,683
Deferred lease inducement	212,077	259,205
Deferred contributions:		
Future expenses (note 8)	89,630,089	101,677,442
Capital assets (note 9)	466,310	556,894
	<b>\$ 94,571,912</b>	\$ 106,630,224

Commitments (note 10)

See accompanying notes to financial statements.

Approved on behalf of the Board:

*Ian de la Roche*  
Dr. Ian de la Roche  
Director

*Mr. Joe Garcia*  
Mr. Joe Garcia  
Director



**Statement of Operations and Changes in Net Assets** (Expressed in Canadian Dollars)

Year ended March 31, 2016, with comparative information for 2015

	2016	2015
Revenues:		
Amortization of deferred contributions related to future expenses (note 8)	\$ 22,579,995	\$ 27,542,159
Amortization of deferred contributions related to capital assets (note 9)	146,460	129,788
Investment income	1,247,718	2,803,430
	<b>23,974,173</b>	30,475,377
Expenses:		
Corporate programs and management	7,345,249	6,558,639
Project expenditures	16,482,464	23,786,950
Depreciation	146,460	129,788
	<b>23,974,173</b>	30,475,377
Excess of revenues over expenses, being net assets, end of year	\$ –	\$ –

See accompanying notes to financial statements.

**Statement of Cash Flows** (Expressed in Canadian Dollars)

Year ended March 31, 2016, with comparative information for 2015

	2016	2015
Cash provided by (used in):		
Operations:		
Excess of revenues over expenses	\$ –	\$ –
Items not involving cash:		
Depreciation	146,460	129,788
Amortization of deferred contributions related to future expenses (note 8)	(22,579,995)	(27,542,159)
Amortization of deferred contributions related to capital assets (note 9)	(146,460)	(129,788)
Accretion of loan receivable	(12,207)	(11,461)
Unrealized discounted fair market value adjustment	–	(1,071,168)
Unrealized loss on short-term investments	3,693,606	245,611
	<b>(18,898,596)</b>	(28,379,177)
Funding (note 8)	<b>10,740,393</b>	49,807,172
Transfer of funds related to BC Clinical Research Infrastructure Network (BCCRIIN) upon inception (note 8)	<b>(199,003)</b>	–
Change in operating assets and liabilities:		
Funding receivable	(162,262)	155,527
Other receivables	(98,880)	10,989
Project advances	(75,887)	1,244,721
Prepaid expenses	6,893	(15,174)
Accounts payable and accrued liabilities	126,753	801,090
	<b>(8,560,589)</b>	23,625,148
Investments:		
Proceeds from sale of short-term investments	13,034,479	12,000,000
Purchase of short-term investments	(38,884,876)	(1,872,344)
Purchase of capital assets	(55,876)	(71,344)
	<b>(25,906,273)</b>	10,056,312
Increase (decrease) in cash	<b>(34,466,862)</b>	33,681,460
Cash, beginning of year	<b>35,590,444</b>	1,908,984
Cash, end of year	\$ <b>1,123,582</b>	\$ 35,590,444

See accompanying notes to financial statements.

# Notes to Financial Statements

(Expressed in Canadian Dollars) Year ended March 31, 2016

## 1. Operations:

Genome British Columbia (the Corporation) was incorporated on July 31, 2000 under the Canada Corporations Act and continued under the Canada Not-For-Profit Act as a not-for-profit organization and is exempt from income and capital taxes. The Corporation has the following objectives:

- (a) develop and establish a coordinated approach and integrated strategy in British Columbia to enable British Columbia to become a world leader in selected areas of genomic and proteomic research, including agriculture, aquaculture, environment, forestry and human health, among others, by bringing together universities, research hospitals, other research centres and industry, as well as government and private agencies for the benefit of British Columbia;
- (b) participate in national approaches and strategies to strengthen genomics research capabilities in Canada for the benefit of all Canadians;
- (c) create a genome centre in British Columbia to ensure that researchers can undertake research and development projects offering significant socio-economic benefits to British Columbia and Canada, to provide access to necessary equipment and facilities, and to provide opportunities for training of scientists and technologies;
- (d) establish a contractual relationship with Genome Canada, and contractual and collaborative relationships with others (including private and voluntary sectors and federal and provincial governments) in order to provide financial and personnel resources for the Corporation;
- (e) address public concerns about genomics research through the organization of intellectual resources regarding ethical, environmental, legal and societal issues related to genomics; and
- (f) increase public awareness of the need for genomics research and of the uses and implications of the results of such research, thereby helping Canadians understand the relative risks and rewards of genomics.

## 2. Significant accounting policies:

- (a) Basis of presentation:  
These financial statements have been prepared in accordance with Canadian Accounting Standards for Not-for-Profit Organizations (Accounting Standards for NPO's).
- (b) Short-term investments:  
Short-term investments are recorded at fair value with gains and losses recorded in the statement of operations and changes in net assets in the period in which they arise. Short-term investments are comprised of a portfolio of funds managed by investment professionals.
- (c) Project advances:  
The advances are comprised of amounts provided by the Corporation to approved research projects and platforms which have not yet been spent.
- (d) Capital assets:  
Capital assets are recorded at cost. Depreciation is provided using the straight-line method as follows:

Asset	Years
Furniture and fixtures	5
Computers and software	3
Telecommunications equipment	5
Project equipment	3 – 4
Leasehold improvements	remaining lease term

- (e) Revenue recognition:  
The Corporation follows the deferral method of accounting for contributions.  
*Externally restricted contributions:*  
Deferred contributions related to expenses of future periods represent 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. Externally restricted contributions for expenses of a future period and related investment income are deferred and recognized as revenue in the year in which the related expenses are incurred. Deferred contributions related to capital assets represent the unamortized amount of contributions received for the purpose of purchasing capital assets. The amortization of such contributions is recorded as revenue in the statement of operations and changes in net assets. Restricted contributions related to the purchase of capital assets are deferred and recognized as revenue using the same methods and amortization rates of the related capital assets.  
*Unrestricted contributions:*  
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.
- (f) Use of estimates:  
The preparation of financial statements requires the use of estimates and assumptions that affect the reported amounts of assets and liabilities, disclosure of contingent assets and liabilities and the reported amounts of revenues and expenses. Significant areas requiring the use of management's estimates relate to the determination of the useful life of capital assets and accruals for project expenditures. Accordingly, actual results could differ from these estimates.
- (g) Valuation of long-lived assets:  
If management determines that a capital asset no longer has any long-term service potential to the Corporation, such assets and related deferred contribution balances are written down to their fair values.

## 2. Significant accounting policies (continued):

- (h) Deferred lease inducement:  
Tenant inducement received associated with leased premises is deferred and amortized on a straight-line basis over the term of the lease.
- (i) Related foundation:  
The financial information of Genome British Columbia Foundation, a not-for-profit entity that is commonly controlled by the Corporation, is not consolidated but disclosed in these financial statements.
- (j) Financial instruments:  
Financial instruments are recorded at fair value on initial recognition. All financial instruments are subsequently measured at cost or amortized cost, unless management has elected to carry the instruments at fair value. The Corporation has elected to carry its short-term investments and long-term asset at fair value.
- At period-end, the Corporation assesses whether there are any indications that a financial asset measured at cost or amortized cost may be impaired. Financial assets measured at cost include funding receivable, other receivables and loan receivable. If there is an indicator of impairment, the Corporation determines if there is a significant adverse change in the expected amount or timing of future cash flows from the financial asset. If there is a significant adverse change in the expected cash flows, the carrying value of the financial asset is reduced to the highest of the present value of the expected cash flows, the amount that could be realized from selling the financial asset or the amount the Corporation expects to realize by exercising its right to any collateral. If events and circumstances reverse in a future period, an impairment loss will be reversed to the extent of the improvement, not exceeding the initial impairment charge.
- (k) Foreign exchange:  
The Corporation's monetary assets and liabilities denominated in foreign currencies are translated into Canadian dollars using exchange rates in effect at the balance sheet date. Revenue and expense items are translated at the rate of exchange prevailing on the date of the transaction. Foreign exchange gains and losses are included in the statement of operations and changes in net assets.

## 3. Short-term investments:

The Board of Directors has overall responsibility for the establishment and oversight of the Corporation's short-term investments. The Board has established an Investment Committee, which is responsible for developing and monitoring the Corporation's investment policy. The overall objectives of the Corporation's investment policy are to achieve security of principal that ensures a return of the capital invested, to maintain the liquidity necessary to meet the cash flow requirements of the Corporation and to maximize the rate of return without affecting liquidity or incurring undue risk. The policy was updated in December 2015 to expand investment categories to include equities that are publicly traded and listed on major stock exchanges.

The Corporation's short-term investments are comprised of a portfolio of funds and other investments. The portfolio consists of investments in a Canadian money market fund, a bank guaranteed Canadian mortgage fund, a fixed income fund and a Canadian and international equity fund. The portfolio is managed by independent investment professionals in accordance with the Corporation's investment policy. Other investments consist of common shares. All short-term investments are measured at fair value. The Corporation's short-term investments are subject to interest rate, market and liquidity risks.

Both the risk of significant changes in interest rates and the risk of significant changes in market prices are mitigated by the Corporation's policy that permits its portfolio managers to change the level of investment in the funds at short notice and the fact that interest earned on the portfolio is reinvested monthly at prevailing rates. The Corporation limits exposure to liquid asset credit risk through maintaining its short-term investments with high-credit quality financial institutions.

The Corporation's short-term investments are as follows:

	2016	2015
Canadian Money Market Fund	\$ 5,289,470	\$ 9,950,092
Canadian Mortgage Fund	38,591,247	56,160,543
Fixed Income Fund	13,695,233	–
Canadian and International Equity Fund	31,431,188	–
Other investments	578,235	1,317,947
	<b>\$89,585,373</b>	<b>\$67,428,582</b>

The Canadian Money Market Fund invests in a mixture of Treasury Bills, Bankers' Acceptances, Commercial Paper (minimum R-1 low rating) and bonds (minimum BBB rating) with maturities averaging 60-120 days and a minimum Government of Canada, Provincial or cash holding of 25%.

The Canadian Mortgage Fund invests in first mortgages on Canadian residential real property with loan value ratios of 65% or less. The mortgages are purchased by the fund from a Canadian Chartered Bank and in the event that a mortgage is in default for more than 90 days the bank guarantees both the interest and the principal of the mortgage.

The Fixed Income Fund invests in a mixture of bonds and debentures with a minimum average credit rating of BBB.

The Canadian and International Equity Fund invests in a mixture of Canadian, U.S. and international equities.

Other investments are common shares, converted from subscription rights, in a biotechnology company issued pursuant to a collaborative research agreement in the early development stage. Each subscription right entitled the Corporation to one common share for no additional consideration and was convertible into common shares of the Investee upon certain triggering events or three years from issuance. The subscription rights were converted into common shares in connection with the commencement of trading of the shares of the Investee in an active quoted market in November, 2014. The investment was carried at a discounted fair market value as the Corporation was subject to a lock-up agreement until May 15, 2015.

Fair values of the Corporation's portfolio investments are based on quoted bid price at the reporting date.



# Notes to Financial Statements (continued)

(Expressed in Canadian Dollars) Year ended March 31, 2016

## 4. Other receivables:

	2016	2015
Sales tax	\$ 73,642	\$ 32,860
Other accounts receivables	81,641	23,543
	<b>\$ 155,283</b>	<b>\$ 56,403</b>

## 5. Loan receivable:

The Corporation made a loan to a British Columbian academic institution to assist in attracting a senior scientific researcher. The loan is in the amount of \$200,000, bears no interest, and has a term of five years, expiring on May 9, 2016. The loan was measured at fair value on initial recognition, which was estimated using a net present value calculation with a discount rate of 6.50% per annum. The difference between the initial fair value and the principal amount was recorded in the statement of operations as a discount and the loan receivable balance has been accreted over the term of the loan using the effective interest rate method. The loan is expected to be repaid in the coming year.

## 6. Capital assets:

2016	Cost	Accumulated depreciation	Net book value
Furniture and fixtures	\$ 93,667	\$ 47,256	\$ 46,411
Computers and software	217,468	129,362	88,106
Telecommunications equipment	6,199	4,348	1,851
Leasehold improvements	545,767	215,825	329,942
	<b>\$ 863,101</b>	<b>\$ 396,791</b>	<b>\$ 466,310</b>

2015	Cost	Accumulated depreciation	Net book value
Furniture and fixtures	\$ 75,325	\$ 31,139	\$ 44,186
Computers and software	242,925	135,742	107,183
Telecommunications equipment	6,199	3,937	2,262
Leasehold improvements	545,767	142,504	403,263
	<b>\$ 870,216</b>	<b>\$ 313,322</b>	<b>\$ 556,894</b>

During the year ended March 31, 2016, fully amortized capital assets of \$62,992 (2015 – nil) were removed from the Corporation's accounting records.

## 7. Accounts payable and accrued liabilities:

	2016	2015
Accounts payable	\$ 256,108	\$ 239,184
Accrued liabilities	4,007,328	3,897,499
	<b>\$ 4,263,436</b>	<b>\$ 4,136,683</b>

## 8. Deferred contributions related to future expenses:

The Corporation receives funding from Genome Canada, the Province of British Columbia, Western Economic Diversification Canada and from other sources to be held, administered and distributed in accordance with the related funding agreements between the Corporation and other parties (note 10).

Deferred contributions related to expenses of future periods represent these unspent externally restricted funding, 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 contributions balance for the year are as follows:

	2016	2015
Balance, beginning of year	<b>\$ 101,677,442</b>	\$ 79,436,645
Funding received or receivable during the year:		–
Genome Canada	<b>10,360,369</b>	15,063,547
Province of British Columbia	–	34,000,000
Western Economic Diversification Canada	<b>235,333</b>	37,085
International collaboration	–	334,920
Provincial Health Services Authority	–	250,000
BC Clinical Research Infrastructure Network (BCCRI) partners	–	118,750
Service Canada	<b>4,305</b>	2,870
University of British Columbia	<b>33,000</b>	–
Other	<b>107,386</b>	–
	<b>10,740,393</b>	49,807,172
Lease inducement amortization	<b>47,128</b>	47,128
	<b>112,464,963</b>	129,290,945
Less:		
Amount amortized to revenue	<b>(22,579,995)</b>	(27,542,159)
Amount transferred to fund capital assets purchased during the year (note 9)	<b>(55,876)</b>	(71,344)
Amount transferred to BCCRI upon incorporation	<b>(199,003)</b>	–
	<b>(22,834,874)</b>	(27,613,503)
Balance, end of year	<b>\$ 89,630,089</b>	\$ 101,677,442

During the year BCCRI, which was previously included as a functional unit of the Corporation, was incorporated. In previous years, the funds related to BCCRI were reported by the Corporation as part of their operations. At the time of incorporation the Corporation transferred \$199,003, representing the surplus of funds received and unspent related to BCCRI's operations, to the new entity.

# Notes to Financial Statements (continued)

(Expressed in Canadian Dollars) Year ended March 31, 2016

## 9. Deferred contributions related to capital assets:

Deferred contributions related to capital assets represent the unamortized amount of contributions received for the purchase of capital assets. The amortization of such contributions is recorded as revenue in the statement of operations and changes in net assets.

The changes in the deferred contributions related to capital assets balance for the year are as follows:

	2016	2015
Balance, beginning of year	\$ 556,894	\$ 615,338
Allocation of funding for capital asset purchases (note 8)	55,876	71,344
	612,770	686,682
Less amount amortized to revenue	(146,460)	(129,788)
	\$ 466,310	\$ 556,894

## 10. Commitments:

(a) Funding:

(i) Genome Canada:

The Corporation enters into funding agreements with Genome Canada (the agreements). In accordance with these agreements the Corporation agrees to secure on an on-going basis cash or cash equivalent commitments from other parties representing at least 50% of the total costs of the projects covered by the agreements. In addition, Genome Canada agrees to disburse an amount only up to the amount of the formal commitments from other parties. However, Genome Canada may provide funding notwithstanding the fact that formal commitments from other parties have not yet been secured. Genome Canada has also agreed that funds, provided in good faith, where commitments from other parties have not yet been secured, shall not be reimbursable to Genome Canada.

In accordance with each respective agreement, the Corporation has agreed, among other things, to provide Genome Canada with a co-funding plan for each project. A co-funding plan for each project has been provided to and accepted by Genome Canada.

Funding agreement description	Support commitment
2010 Large-Scale Applied Research Project Competition	\$ 23,043,282
Entrepreneurship Education in Genomics Program	571,178
2012 Large-Scale Applied Research Project Competition	16,334,035
Bioinformatics and Computational Biology	2,563,577
Genomic Applications Partnership Program	2,447,268
2014 Large-Scale Applied Research Project Competition	15,296,041

(ii) Province of British Columbia:

In accordance with an agreement for funding received, dated March 30, 2015, the Corporation received funding of \$34,000,000 to support its 2015 – 2020 strategic plan: Powering British Columbia's Bioeconomy. In accordance with the agreement, the Corporation completed and submitted to the funder an accountability framework that included robust and detailed performance metrics on November 27, 2015. The Corporation launched its Industry Innovation Program in October 2015 as part of its commercialization strategy. Included as part of that strategy, and contingent upon the success thereof, is the intent to repay the funder \$6,800,000 over the next decade.

(b) Project commitments:

In the normal course of business, the Corporation enters into Collaborative Research Agreements for the completion of milestone-based research projects. Detailed below is the estimated remaining commitment of the Corporation's funds relating to active research programs. The Corporation typically provides co-funding to research projects, whereby its funds are combined with funds from other sources to provide the total project award amount. Funds provided directly to the research institution by third parties are included in the total award amount shown in the following table.



## 10. Commitments (continued):

### (b) Project commitments (continued):

The total award amount and estimated remaining commitment of the Corporation by program as of March 31, 2016 is as follows:

<b>Approved programs</b>	<b>Total award amount</b>	<b>Estimated remaining Corporation commitment</b>
Current programs:		
2010 Large-Scale Applied Research Project Competition	\$ 56,374,386	\$ 31,437
2012 Large-Scale Applied Research Project Competition	34,036,779	3,362,005
2014 Large-Scale Applied Research Project Competition	32,254,525	5,385,338
Entrepreneurship Education in Genomics Program	979,966	3,045
Bioinformatics and Computational Biology	5,276,029	226,842
Genomic Applications Partnership Program	3,670,147	526,166
Canadian International Data Sharing Initiative	3,287,331	500,000
2015 Technology Development	2,000,000	481,028
Applied Genomics Consortium Program	31,193,623	134,192
Human Microbiome (CIHR)	4,827,122	977
Human Epigenome (CIHR)	9,978,992	1,250,075
Transplantation (CIHR)	4,096,203	943,688
Quantitative Imaging Network (CIHR)	1,928,974	369,742
Centre for Drug Research and Development Fund	3,668,919	315,697
Brain Canada (MIRI)	9,176,572	311,614
Brain Canada (Alzheimer's)	7,042,580	379,522
Brain Canada (PSG)	1,391,750	214,574
Strategic Opportunities Fund	14,305,078	343,011
Strategic Opportunities Fund for Industry	5,211,340	372,997
WED – Proof of Concept	10,029,751	121,874
User Partnership Program	6,887,679	1,227,163
Science and Technology Platforms (2015-2017)	7,999,946	–
Emerging Projects	596,850	32,212
Pilot Programs	7,427,407	224,667
Science World British Columbia Outreach Program	200,000	171,426
	263,841,949	16,929,292
Closed programs:		
Competition I	42,707,207	–
Competition II	43,502,482	–
Competition III	100,153,663	–
Competition in Applied Genomics Research in Bio-products or Crops	24,346,330	–
International Competition	12,881,913	–
Applied Genomics and Proteomics in Human Health	44,099,840	–
Applied Genomics Innovation Program	24,437,610	–
Translational Program for Applied Health	17,891,275	–
New Technology Development Projects	5,509,566	–
WED Programs	10,713,337	–
Science and Technology Platforms	71,061,922	–
Technology Development Initiatives Fund	706,536	–
Other Pilot Programs	3,561,133	–
Advancing Technology Innovation through Discovery	5,702,315	–
Personalized Medicine Program	8,168,169	–
	415,443,298	–
<b>Total</b>	<b>\$ 679,285,247</b>	<b>\$ 16,929,292</b>

# Notes to Financial Statements (continued)

(Expressed in Canadian Dollars) Year ended March 31, 2016

## 10. Commitments (continued):

### (c) Operating lease and management agreements:

The Corporation has entered into operating lease agreements for office premises and management contracts which expire at various dates until September 30, 2020. Minimum payments for the next five fiscal years are as follows:

2017	\$ 499,291
2018	505,038
2019	505,038
2020	505,038
2021	252,518
Total	\$ 2,266,923

## 11. Genome British Columbia Foundation:

Genome British Columbia Foundation (the Foundation) is a registered charity established to promote and foster life sciences research for the public benefit by coordinating, sponsoring and carrying educational conferences, seminars, workshops and symposiums. The Foundation is exempt from income and capital taxes.

The majority of the Foundation's Board of Directors are also members of the Corporation, and as such, the Corporation is presumed to control the Foundation. In accordance with the CPA Canada Handbook Section 4450, the Corporation has chosen not to consolidate the Foundation but has followed the disclosure requirements. The Corporation has no economic interest in the Foundation.

Financial information of the Foundation as at year ended March 31, 2016 and March 31, 2015 and for the year ended are as follows:

	2016	2015
Cash, term deposits and receivables	\$ 126,941	\$ 148,091
Accounts payable and accrued liabilities	(26,639)	(22,365)
Deferred contributions	(100,302)	(125,726)
Net assets	\$ –	\$ –
Revenues	\$ 25,453	\$ 481,959
Expenses	(25,453)	(481,959)
Excess of revenues over expenses	\$ –	\$ –
Cash provided by (used in):		
Operations	\$ (21,150)	\$ (454,580)
Funding	–	312,318
Investing	–	251,460
Net change in cash	\$ (21,150)	\$ 109,198

There are no significant differences in accounting policies between the Foundation and the Corporation.

## 12. Financial risks:

### (a) Liquidity risk:

Liquidity risk is the risk that the Corporation will be unable to fulfill its obligations on a timely basis or at a reasonable cost. The Corporation manages its liquidity risk by monitoring its operating requirements. The Corporation prepares budget and cash forecasts to ensure it has sufficient funds to fulfill its obligations. There has been no change to the risk exposures during the year ended March 31, 2016.

### (b) Credit risk:

Credit risk refers to the risk that a counterparty may default on its contractual obligations resulting in a financial loss. The Corporation deals with creditworthy counterparties to mitigate the risk of financial loss from defaults. There has been no change to the risk exposures during the year ended March 31, 2016.

### (c) Market risk:

Market risk is the risk that changes in market prices, as a result of changes in foreign exchange rates, interest rates and equity prices, will affect the Corporation's income or the value of its holdings of financial instruments. The objective of market risk management is to manage and control market risk exposures within acceptable parameters, while maximizing the return.

#### (i) Currency risk:

Investments in foreign securities are exposed to currency risk due to fluctuations in foreign exchange rates. The Corporation is exposed to currency risk on its foreign currencies held within its cash accounts and through its investments in the International Equity Fund.

#### (ii) Interest rate risk:

Interest rate risk is the risk that the fair value of the Corporation's investments will fluctuate due to changes in market interest rates.

#### (iii) Other price risk:

Other price risk relates to the possibility that the fair value of future cash flows from financial instruments will change due to market fluctuations (other than due to currency or interest rate movements). The diversification across various asset classes is designed to decrease the volatility of portfolio returns.

# Corporate Information

## BOARD OF DIRECTORS

(For Fiscal Year Ended March 31, 2016)

### Ian de la Roche

Chair  
Past President  
FP Innovations  
Adjunct Professor – Forest Resources  
Management, UBC

### Ida Goodreau

Vice Chair  
Former CEO, Vancouver Coastal Health

### Alan E. Winter

President and Chief Executive Officer  
Genome BC

### Lenard F. Boggio

Retired Partner  
PricewaterhouseCoopers LLP

### Neena L. Chappell

Canada Research Chair in  
Social Gerontology,  
Professor of Sociology and  
Centre on Aging  
University of Victoria

### Jock Finlayson

Executive Vice President and  
Chief Policy Officer  
Business Council of British Columbia

### Joseph Garcia

Partner  
Blake, Cassels & Graydon LLP

### Janet Halliwell

Principal  
J.E. Halliwell Associates Inc

### Victor Ling

President and Scientific Director  
Terry Fox Research Institute

### Edward Safarik

Former President and CEO  
Ocean Fisheries Ltd.

### John Shepherd

Past Director  
Leukemia/Bone Marrow Transplant  
Program of BC, UBC

### Paul Terry

President and CEO  
PHEMI

### John F.H. Thompson

Consultant, PetraScience Consultants Inc.  
and Professor, Cornell University

## MANAGEMENT

### Alan E. Winter

President and Chief Executive Officer

### Tony Brooks

Chief Financial Officer and  
Vice President, Research Programs

### Suzanne Gill

Director, Corporate Development

### Sally Greenwood

Vice President, Communications  
and Education

### Gabe Kalmar

Vice President, Entrepreneurship  
and Commercialization

### Catalina Lopez-Correa

Chief Scientific Officer and  
Vice President, Sector Development

### Rachael Ritchie

Director, International Partnerships

## AUDITORS

KPMG LLP  
Vancouver, BC

## LEGAL COUNSEL

Richards Buell Sutton LLP  
Vancouver, BC

## Thanks to Our Funders

Genome BC would like to  
acknowledge and thank its corporate  
funding partners including:



## Acknowledgements

We would like to thank the following  
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Western Economic  
Diversification Canada

Diversification de l'économie  
de l'Ouest Canada



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