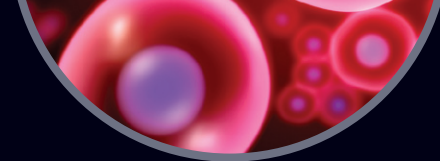


# Applications Genomic Approach



2013-2014  
**Annual**  
report



GenomeCanada



**Genome**Canada

who we are

Genome Canada is a catalyst for developing and applying genomics and genomic-based technologies that create economic and social benefits for Canadians. Genome Canada: connects ideas and people across public and private sectors to find new uses for genomics; invests in large-scale science and technology to fuel innovation; and, translates discoveries into applications, new technologies, societal impacts and solutions across key sectors of national importance, including health, agriculture, forestry, fisheries & aquaculture, energy, mining, and the environment.

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'Canada is uniquely positioned to leverage its excellent knowledge base in genomics through applications across many sectors of importance to the country.'

# GLOBAL CHALLENGES

## Genomic Solutions

**T**HE WORLD FACES GREAT challenges. Food security, climate change, energy demand and rapid population growth are chief among them. Innovative solutions are urgently needed to help humanity cope with these challenges.

Genomics research, with its diverse applications across a whole range of sectors, is providing the knowledge needed to address such problems at a global scale.

What's more, Canada is among the world leaders in this still very young, very promising field of research, thanks to sustained federal investments through Genome Canada and partners. The stories presented in this report illustrate some of the breakthroughs and impacts to date in the realms of health, the energy sector, and policy, as well as Genome Canada's central role in international consortia.

This is just the beginning. Canada is uniquely positioned to leverage its excellent knowledge base in genomics through applications within our immense natural resources, agriculture and other sectors. The problems we solve here at home — breeding trees that are adapted to the changing climate, using bacteria to clean up seepage at mining sites, improving fish quality and growth, cultivating desirable traits in cattle and crops — will not only improve Canadians' quality of life, but will give our industries a competitive edge on the world stage and equip Canada to help solve global challenges.

This past year, Genome Canada designed and launched new programs to enable just that. Great strides were made in building bridges between academia and end-users of genomics to facilitate its applications and realize value for society from research investments. Given that the cost of doing this kind of research is huge, greater public-private sector collaboration is an attractive approach for all parties to de-risk investments and make real headway in finding solutions to collective problems.

I wish to thank my colleagues on the Board and members of the Board's committees for their continued dedication to Canada's genomics research enterprise. I also wish to commend Genome Canada leadership and staff for making considerable progress on meeting the objectives set out in Genome Canada's Strategic Plan 2012-2017.



Lorne Hepworth  
Chair, Board of Directors, Genome Canada

*Hear more from Lorne Hepworth on the power of public-private partnerships in this short [video](#).*

# MOVING GENOMICS

## Out of Labs Into Society

**G**ENOME CANADA MADE considerable progress this year on delivering its Strategic Plan 2012-2017. A major milestone was the launch of the Genomic Applications Partnership Program (GAPP), whose goal is to move genomics-based solutions from laboratories to society. It's a \$90-million program, with \$30 million to be invested by Genome Canada, and the balance from co-funding partners.

We were delighted with the tremendous interest in the program from such a broad range of end-users of genomic research — industry, governments, and not-for-profits. We are excited to be announcing soon the results of our first and second competition rounds. All projects selected for funding feature strong potential for genomics-based innovations with considerable economic and social impacts for Canadians in the near term.

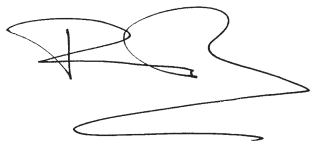
This was a notable year in terms of breakthroughs from some of the international collaborations that Genome Canada supports. For instance, our researchers in British Columbia and Quebec, working with Swedish scientists, released the genome sequences of two of the most economically important forest trees in the world — the white spruce and Norway spruce.

Meanwhile, eminent cancer researchers Drs. Tak Mak and John Dick each announced major discoveries — one on a new “sharpshooter” cancer drug, the other on a pre-leukemic stem cell that may initiate the disease.

Genome Canada recognizes that such breakthroughs can be accelerated by breaking down barriers to the responsible sharing of genomic and clinical data across borders. This is why we became an early signatory to the recently-formed Global Alliance for Genomics and Health.

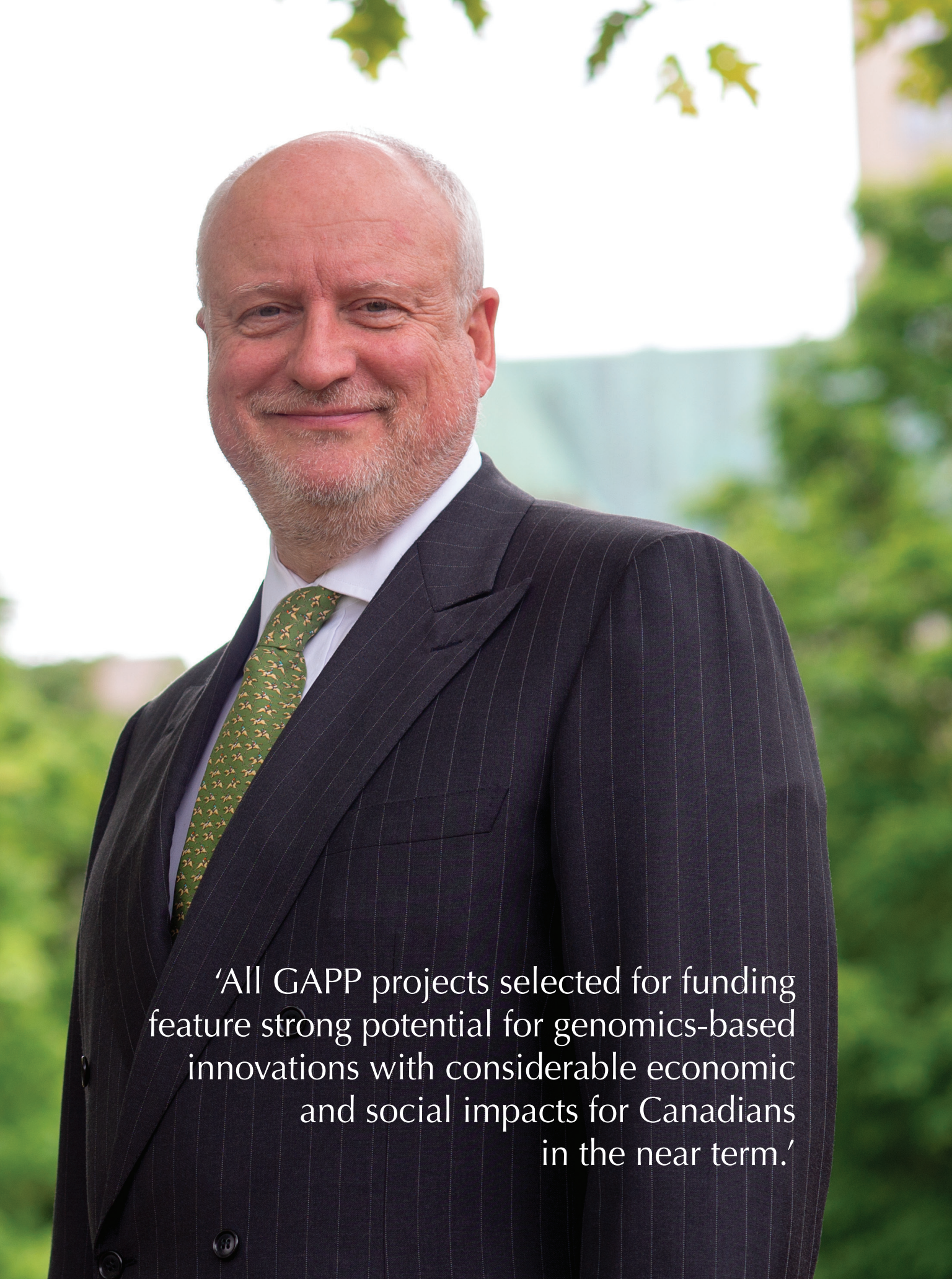
We are proud of the progress, success, and impacts of the major international initiatives we support, including the Structural Genomics Consortium, the International Barcode of Life, and many other large-scale research projects that are generating knowledge, skills and tools to benefit multiple sectors of the Canadian economy. We are also pleased to continue funding five world-class Science and Technology Innovation Centres.

Thank you to our Board, our staff, the regional Genome Centres, our research community, and our growing number of partners for a great year. And a sincere thank you to the Government of Canada for its continued support of genomics research in Canada.



Pierre Meulien, Ph.D.  
President and Chief Executive Officer, Genome Canada

*Hear more from Pierre Meulien on genomic applications in this short [video](#).*



'All GAPP projects selected for funding feature strong potential for genomics-based innovations with considerable economic and social impacts for Canadians in the near term.'



# managing microbes



Understanding the biological processes of oil sands' tailings ponds could lead to lower greenhouse gas emissions



**I**N THE ATHABASCA OIL SANDS region of northeastern Alberta, an estimated 170 billion barrels of crude oil lie beneath 75,000 square kilometres of forest — about 20 percent of which is close enough to the surface to allow extraction, typically through a hot-water process.

Commercial mining began here in 1967 and as bitumen recovery has increased, so, too, has extraction waste, which is stored in settling areas called tailings ponds. Daily production of 1.2 million barrels of crude oil creates 500,000 cubic metres of waste — a mix of water, sand, clay, toxic compounds, and residual bitumen that releases greenhouse gases into the atmosphere.

To stop the expansion of tailings ponds, which now span 176 square kilometres, oil companies are testing and using mechanical and chemical ways of accelerating the settling process and, by extension, the eventual land reclamation. Academic researchers, meanwhile, co-led by Dr. Gerrit Voordouw of the University of Calgary and Dr. Julia Foght of the University of Alberta, are looking to genomics for biological solutions to tailings ponds, as well as pipeline corrosion and reservoir souring.

Over the past four years, the scientists have analyzed 250 samples collected by four companies from eight tailings ponds. From the DNA of millions of microbes, they have generated genomic profiles of the ponds' whole microbial communities. These revealed that each pond has a unique community of naturally occurring bacteria, but the predominant microorganisms are similar and they have common biological processes.

By understanding these processes, the researchers aim to harness the genetic potential of tailings ponds' microbes to decrease the water and land they use, as well as their greenhouse gas emissions. They now know, for example, that organisms called methanotrophs are oxidizing 20 to 40 percent of methane in the top layer of many ponds, naturally reducing emissions. "Going forward, we'd like to improve that ratio," says Dr. Voordouw.

Documenting activities in these microbial communities has already allowed the researchers to assure an oil company that it was safe to begin closing one of its tailings ponds.

Suncor's senior scientist, Dr. Joseph Fournier, says such research is "absolutely beneficial" to the oil industry. As an example, Dr. Fournier says, Dr. Voordouw's team "brought to our attention that sulfide production was well advanced in the ponds, more so than anticipated. Having that awareness, allowed us to do further work in preparation for risk reduction."

**'The question is, How do we best manage the oil sands? Understanding the microbial processes is a big part of that.'**

*— Dr. Gerrit Voordouw, biochemist*



Genome Canada invested \$5.4 million in the four-year "Metagenomics for Greener Production and Extraction of Hydrocarbon Energy" project, launched in 2009 with a budget of \$11.6 million. Its public partners were Genome Alberta and Genome BC; its 10 industrial partners included Suncor, Syncrude, ConocoPhillips, Shell and EnCana. The resulting catalogue of oil sands' microorganisms, genes, and biological processes will be publicly accessible online at [hydrocarbon.metagenomics.com](http://hydrocarbon.metagenomics.com).



# making distinctions

Uncovering genetic differences in pediatric brain tumours is improving treatment



**‘We think we have removed a major stumbling block.’**

—*Dr. Michael Taylor, neuroscientist and pediatric neurosurgeon*

**T**UMOURS ARE THE LEADING CAUSE of death for children with cancer. The most common type, medulloblastoma, is diagnosed in about 100 pediatric patients a year in Canada.

Until now, these infants and children have been treated alike with surgery, whole-brain radiation, and aggressive chemotherapy. Despite treatment, 30 to 40 percent die as a result of their primary tumours. A further 30 to 40 percent of the initial survivors develop recurring tumours, which are almost inevitably fatal. And many of the remaining patients are left with neurological, intellectual, and physical disabilities from the treatment’s effects on their developing brains.

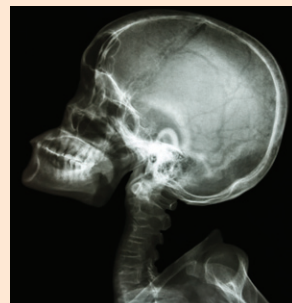
Determined to transform the way these children are treated, scientists at the BC Cancer Agency Genome Sciences Centre teamed up with clinicians and researchers at The Hospital for Sick Children in Toronto and 46 cancer centres around the world to launch the MAGIC (Medulloblastoma Advanced Genomics International Consortium) project. Together they gathered more than 1,000 pediatric medulloblastoma samples.

Using cutting-edge technology, the Canadian scientists analyzed the entire genomes of primary tumours and matched recurrences. They confirmed not only that there are four distinct molecular subgroups of medulloblastoma, but that these have clinically significant subsets. They also discovered that the genetic profile of a recurring tumour has little in common with the original tumour. “This explains why nothing would work on the recurring tumours,” says Dr. Michael Taylor, a pediatric neurosurgeon and scientist at SickKids.

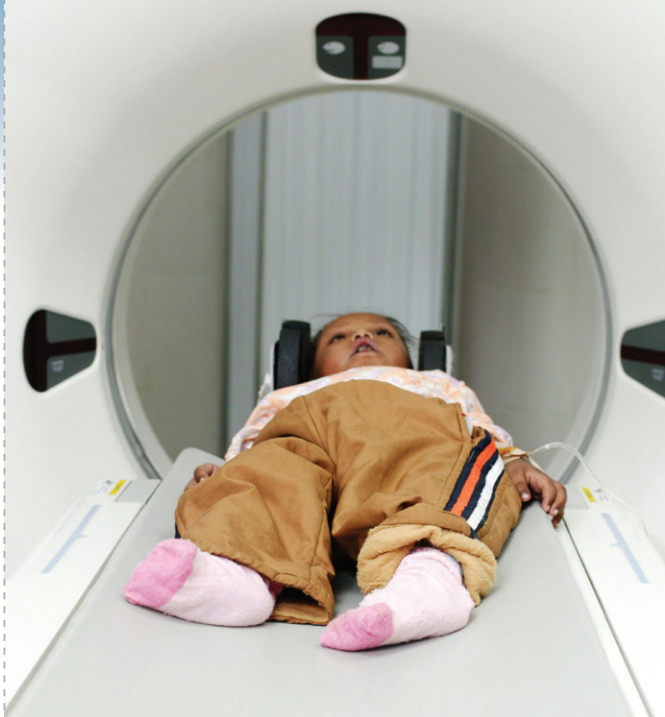
By classifying the tumours, clinicians will be able to diagnose and treat future pediatric patients with medulloblastoma with much greater precision — reducing radiation in children with a low-risk type, for example, to preserve their quality of life, while maintaining cure rates.

By identifying specific molecular targets for interventions, the research will also improve clinical trials and support the development of new drug therapies tailored to individual patients.

Dr. Taylor co-leads the MAGIC project with Dr. Marco Marra, director of the Genomics Innovation Centre at the BC Cancer Agency Genome Sciences Centre (one of Genome Canada’s five funded Science and Technology Innovation Centres), and Dr. David Malkin, senior oncologist at the Hospital for Sick Children.



Genome Canada and its partners have invested almost \$10 million in the MAGIC project, which was launched in 2012 and is rapidly achieving its goal of transforming the way that infants and children with medulloblastoma brain tumours are treated. The project is also supported by Genome BC, the Terry Fox Research Institute, and nine other partners.



# culture change

Scientists show collaborative research is the key to future drug discovery



**D**R. ALED EDWARDS has spent the past 10 years doing what many deemed impossible — convincing scientists in academia and the pharmaceutical industry to work together in an open-access, not-for-profit system to discover and validate targets for new medicines.

By pooling resources and collaborating in the early stages of drug development, he says, they avoid duplication, save time and money, increase knowledge of human biology, and dramatically improve the chances that new drugs will be successful in clinical trials. A growing number are embracing this sea change.

Dr. Edwards is a University of Toronto professor and chief executive of the Structural Genomics Consortium (SGC), an international public-private partnership that supports the development of new medicines through noncompetitive research. Nine of the world's largest pharmaceutical companies are now on board. Their chemists are working with about 200 university scientists at SGC's laboratories in Toronto and Oxford, England, to determine the properties of proteins involved in disease processes.

This information reveals potential drug targets.

SGC researchers publish an average of two papers a week in the scientific literature, but their findings are not kept confidential until publication; they are released immediately into the public domain. "The model works," says Dr. Edwards, "because we never file for patents." They have now identified, mapped, and shared worldwide, the three-dimensional structures of 1,500 human proteins.

In spring 2014, the Montreal Neurological Institute and Hospital was the first clinical centre to become a full partner with SGC. Dr. Viviane Poupon, executive director of partnerships and strategic initiatives at the Neuro, says researchers there "embrace the collaborative spirit and very open process." Finding new medicines for neurological conditions is especially difficult because the brain is so complex. "There is no way that anyone can do it on their own; otherwise, it would have been done."

The synergy between SGC and the Neuro was obvious from the start, says Dr. Poupon. "There is a common vision that puts patients first."



‘Clinical proof of concept is where the lottery ends. Then the competition can start.’

— *Dr. Aled Edwards, CEO, Structural Genomics Consortium*



By the end of June 2015, Genome Canada will have contributed \$42 million to the Structural Genomics Consortium.

Its current public funding partners are the Wellcome Trust in the UK, the Canada Foundation for Innovation, and the Ontario Ministry of Research and Innovation. The Canadian Institutes of Health Research has also been a major contributor. The consortium’s nine pharmaceutical partners have contributed \$95 million without any proprietary benefits. As a direct result of SGC’s research, six clinical trials have been launched.



# social science solutions

agriculture

An interdisciplinary research group called VALGEN has been studying Canada's innovation environment



**S**OCIAL SCIENTISTS SHOULD be involved up front in new technology projects to ensure the environment is conducive to commercial success.

That's the informed opinion of Dr. Richard Gold, a McGill University law professor, and one of a team of leading-edge researchers across Canada studying the economic, social, and cultural aspects of scientific discoveries. For the past four years, they have been investigating roadblocks to innovative products moving into the marketplace, and evaluating alternative policies and practices.

"We do science very well in Canada," says Dr. Gold. "We punch above our weight — publishing, connecting internationally — but, sometimes, it goes nowhere." One reason is that we have the paradigm

**'The environment in which science happens is as important as the actual science.'**

— *Dr. Richard Gold, law professor*



backward. “We work on the science and hope the rest will fall into place. What we should be doing is making sure the environment is right, and then let the science fit in.”

The innovation environment is complex. “There are many different regulators across the country, federal and provincial, and many different granting agencies, each with different agendas. Then there’s the whole intellectual property regime: patent law, copyright law, privacy laws, trade secret laws. All more or less uncoordinated.” The situation engenders a tendency to “ignore it and just fund the science.”

Dr. Gold’s research with the VALGEN project shows how Canada can best regulate and manage intellectual property. It reveals, for example, that we cannot simply borrow policies from other countries; we require made-in-Canada solutions to create an innovative intellectual property regime. His findings offer invaluable evidence for decision makers within government to positively shape public policy, enhancing Canada’s competitiveness on the world stage.

To expedite commercial success, he says, Canada should capitalize on its strengths; agricultural research is just one example. “We need to set priorities. We can’t be good at everything. We have to think it through. Where do we have a competitive advantage? What incentives will encourage people to invest? What about the public; are we doing enough to explain the science?”

Answering these questions is where social scientists take the lead.

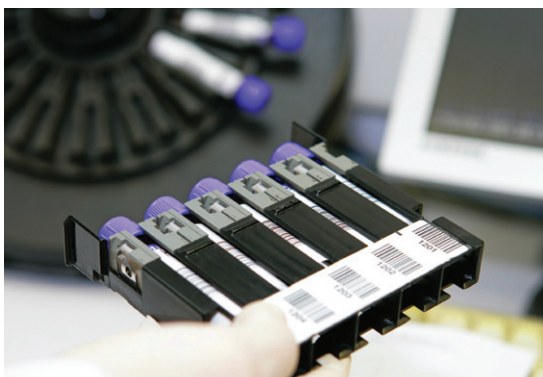
Political economist Dr. Peter Phillips of the University of Saskatchewan and bioethicist Dr. David Castle of the University of Victoria led the four-year VALGEN project, designed to inform public policy and streamline regulations in order to move discoveries from the laboratory toward practical applications. It was supported by Genome Canada and partners and managed by Genome Prairie.





# thinking big

Merging two disparate technologies, a team of chemists and engineers created a revolutionary new tool for cell biologists



industry

**I**N 2001, JUST AS A NEW scientific field called systems biology was emerging, Toronto chemist Dr. Scott Tanner, who was working in private industry, happened to meet biologist Dr. John Dick, a senior scientist at the city's University Health Network. It was the first of several coincidences that helped lay the groundwork for a Canadian success story heard around the world: the acquisition this past February of a pioneering biotechnology company in Markham, Ontario, called DVS Sciences, by California's Fluidigm Corporation for \$207.5 million in cash and stock.

When the two scientists were introduced, Dr. Tanner was working with atomic mass spectrometry, a technology previously used only to identify the atomic composition of matter — arsenic in water, for example. He says Dr. Dick pointed to the



In late 2014, Genome Canada is launching a Disruptive Innovation in Genomics Initiative to support ideas for cutting-edge technologies that are truly transformative — capable of displacing an existing technology, disrupting an existing market or creating a new one.

**‘Genome Canada had the courage to invest because, if it worked, it would transform the way we do biology. Most review committees want everyone to agree; that doesn’t answer transformative opportunities.’**

— *Dr. Scott Tanner, chief technology officer, Fluidigm Canada*



importance in biomedical research of looking at individual cells separately. Their subsequent collaboration led Dr. Tanner and his team of chemists and engineers to invent a game-changing laboratory tool: a protein analysis system that provided the first detailed pictures of what’s going on with single, often rare, cells at the molecular level. Dr. Dick’s lab bought the first of about 80 instruments now in use around the globe.

Without early investors prepared to accept some risk, however, Dr. Tanner says he would not now have a commercial technology “poised to provide a quantum step toward the provision of personalized healthcare.” Fortuitously, Genome Canada launched a competition in 2005 for new genomics-related research technologies, encouraging “novel, even revolutionary, approaches.” Dr. Tanner’s proposal was one of 13 that made the cut and shared a total of \$9.4 million.

At that time, says Naveed Aziz, Genome Canada’s director of technology programs, researchers were required to show proof of principle for their proposals to be successful. In future, they will be invited to present ideas.

February’s agreement was a win-win for Dr. Tanner and DVS Sciences, now Fluidigm Canada. The company will continue to employ 64 full-time staff at its research-and-development and instrument-manufacturing facility in Ontario.



PHOTO: P. STROPPA/CSEA

# the year in review

April 25, 2013

**data** \$11 million for 17 bioinformatics and computational biology research projects is announced. These will help manage, analyze and interpret vast amounts of genomics data, so they can be translated into useful applications.

May/June 2013

Scientists from British Columbia, Quebec, and Sweden release genome sequences of two of the most economically important forest trees in the world — the white spruce and Norway spruce (published in *Bioinformatics* and *Nature*, respectively). Among the largest genome assemblies to date, they will allow us to develop innovative tools for tree breeding that address economically and ecologically important targets such as insect resistance, wood quality, growth rates, and adaptation to changing climate.



June 3, 2013

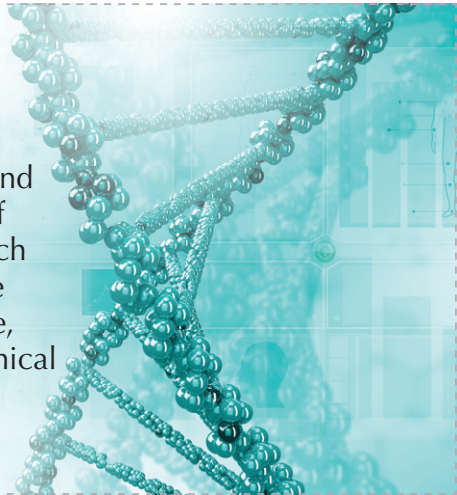


The \$90-million Genomic Applications Partnership Program is launched. The program is designed to move genomics-based solutions from laboratories to the marketplace through collaboration between genomic scientists and “end-users” of their research, such as industry, government, and not-for-profits.

\$29 million in renewed funding is announced to support five world-class genomics technology facilities across Canada, which provide cutting-edge genomic, proteomic, metabolomics, and bioinformatics technologies and consulting services to the research community.

June 6, 2013

Plans to form the Global Alliance for Genomics and Health are announced. Genome Canada is one of 70 inaugural members. The Global Alliance, which has since grown to 170-plus members, will create harmonized approaches to enable the responsible, voluntary, and secure sharing of genomic and clinical data, thus accelerating the potential of genomic medicine to advance human health.



June 18, 2013

Dr. Tak Mak of the Toronto-based Princess Margaret Cancer Centre and his team declare a major breakthrough in the decade-long pursuit to develop a new class of “sharpshooter” cancer drugs.

breakthrough

July 15, 2013

\$1.6 million is awarded to two research projects (with team leaders based in Alberta, Ontario and Quebec) to tackle the emerging consumer health issue of *E. coli* in food-processing facilities.

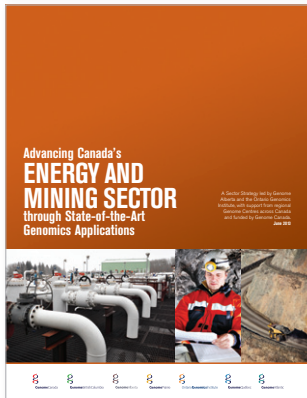
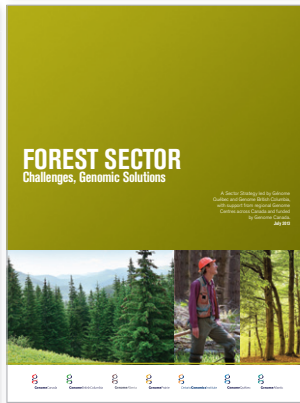
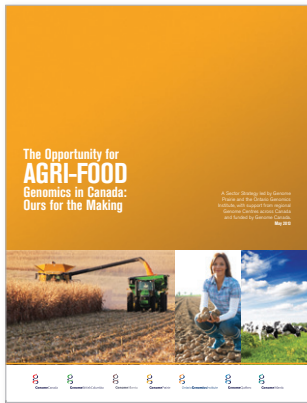
June 27, 2013

Dr. Linda Chui of the University of Alberta and her team are awarded \$1.4 million to sequence and map the genomes of many *Listeria* strains in an effort to bolster food safety for Canadians.



August 2013

Genome Canada publishes a series of sector strategies (agri-food, energy and mining, fisheries and aquaculture, and forestry).



Each maps out how that sector can further leverage the transformative power of genomics, and related disciplines, to its advantage.

August 13, 2013

In a genetic study of childhood epilepsies, an international team of researchers including Dr. Patrick Cossette of the Centre hospitalier de l'Université de Montréal Research Centre (CRCHUM), link two new genes to severe forms of disease and provide a novel strategy for identifying new targets for therapy.

November 20-22, 2013

**G**enomics has a high profile at the 2013 Canadian Science Policy Conference. It is the topic of multiple keynote sessions and panel discussions, including a vivid discussion among industry representatives on how genomics can equip Canada's natural resource-based sectors with a competitive edge.

February 13, 2014

discovery

Dr. John Dick of the Princess Margaret Cancer Centre and team announce the discovery of a pre-leukemic stem cell that may be the first step in initiating disease and also the culprit that evades therapy and triggers relapse in patients with acute myeloid leukemia.

March 18, 2014

The Montreal-based "Leucégène" research group, co-directed by Drs. Guy Sauvageau and Josée Hébert, publicize a major breakthrough in developing new cancer drugs as a result of a discovery enabling the laboratory growth of leukemic stem cells.



Dr. Kym Boycott of CHEO is co-lead of PhenomeCentral and CARE for RARE.

February 28, 2014

A new web portal — PhenomeCentral — is launched by the Ottawa-based CARE for RARE research team to connect clinicians and scientists worldwide in an effort to speed up the discovery of genes responsible for rare disorders.

## Genome Canada's Five-Year Evaluation

An independent evaluation of Genome Canada's performance over the past five years (from 2009-10 to 2013-14) concluded:

- The underlying rationale for Genome Canada remains strong. The current organizational model is appropriate in the Canadian context and has helped develop specific regional and sector expertise/capacity in genomics.
- Genome Canada's coordinated national strategy has resulted in increased output and impact of funded researchers (i.e., through peer-reviewed papers) and has had a positive influence on Canada's international profile and visibility in genomics research.
- Genome Canada-funded researchers increasingly play a central role in national and international collaborations and Genome Canada is seen as an effective "neutral broker," bringing together stakeholders and ensuring that global projects are coordinated effectively.
- Canada is among the world leaders in the production of GE<sup>3</sup>LS (genomics and its ethical, environmental, economic, legal and social aspects) peer-reviewed papers, ranking third worldwide and being one of the few countries that has a major focus in this area.
- There has been a gradual increase in the development of genomic applications leading to social and economic benefits for Canada. More work must be done to quantify the benefits derived from Genome Canada funding, as well as effectively communicate them to policymakers, industry and the public.
- Genome Canada could offer a more diverse portfolio of programs and ensure that the funded Science and Technology Innovation Centres (S&T Innovation Centres) remain competitive by increasing their focus on innovation and enhancing analytical capacities.

Genome Canada has already begun to take action on issues raised in the report, which had been identified independently by management, and is responding to the report's proposed recommendations. *A full copy of the final evaluation report is available upon request.*



knowledge • innovation



# Pursuing our

# Objectives

Genome Canada made considerable progress toward fulfilling its mission and objectives, as outlined in its Strategic Plan 2012-2017, namely to lead Canada's Genomics Enterprise by:

1. **CONNECTING** ideas and people across sectors to find new uses and applications for genomics;
2. **INVESTING** in large-scale science and technology to fuel innovation; and
3. **TRANSLATING** discoveries into applications to maximize impact across all sectors.

---

## 1. Connecting ideas and people across sectors to find new uses and applications for genomics

- Following broad consultation with industry and other stakeholders, Genome Canada published a series of **sector strategies** (Agri-Food, Energy and Mining, Fisheries and Aquaculture, Forestry). The development of these papers was led by the regional Genome Centres, providing regional depth and national breadth to the initiative and allowing relationships to be forged with a variety of new potential research partners. The strategies offer a blueprint for Canada to capitalize on the emerging bio-economy by marrying our traditional resource sectors with cutting-edge genomics science and technology. Genome Canada has used them as the framework to design two new Large-Scale Applied Research Project Competitions to be launched in 2014-15 and 2015-16 on the themes "Feeding the Future" and "Natural Resources and the Environment" respectively.
- Supported the **International Barcode of Life** project, the largest biodiversity genomics initiative ever undertaken with the objective to construct a DNA barcode reference library. Applications are diverse — from detecting food fraud and regulating cross-border trade to monitoring invasive species and ensuring safer food. In Canada, DNA barcoding has begun to be used in 14 of Canada's national parks to provide baseline biodiversity data. A pilot project with a mining company is underway to

use barcoding to monitor site bioremediation. As of mid-February 2014, the project had generated more than 2.8 million barcodes representing approximately 350,000 species, remaining on track with its targets for building the library.

- Supported Phase III of the Structural Genomics Consortium, an international public-private partnership of nine pharmaceutical companies and public funders from Canada and the United Kingdom that aims to determine the three-dimensional structures of proteins of medical relevance and place them in the public domain without restriction on their use. The Consortium has formed more than 250 active collaborations worldwide, published peer-reviewed papers extensively and made significant progress on its scientific mandate. (See story on page 12).
- Many ongoing initiatives, which Genome Canada-funded researchers are involved in, have been making considerable progress, including:
  - **International Rare Diseases Research Consortium**, whose members to date have developed 64 new therapies toward their goal of 200 by 2020.
  - **International Mouse Phenotyping Consortium**, which has produced increased coordination of mouse phenotyping research leading to better understanding of human diseases.
  - **Cancer Stem Cell Consortium**, whose researchers delivered major breakthroughs this year including a “sharpshooter” cancer drug, and the discovery of a pre-leukemic stem cell that may be implicated in initiating disease.
  - **International Cancer Genome Consortium**, which is studying more than 25,000 tumour genomes and where Canadian researchers are making inroads on understanding prostate, pancreatic, and pediatric brain cancers to better manage and treat the diseases (See impact story on page 10.)
- Partnering with the Canadian Institutes of Health Research to establish a national consortium — **Research Catalyst Network: Expediting collaboration between basic and clinician scientists in functional studies of novel rare disease genes** — with the goal of developing treatments and therapeutics for rare diseases.
- Working toward partnering with the **Canadian Institute for Advanced Research** on its Global Call for Ideas program. This will position Genome Canada to work with world-leading researchers tackling complex challenges of global importance.
- Became a founding member of the **Global Alliance for Genomics and Health**, positioning Canada to become a world leader in the responsible sharing of genomic and clinical data to accelerate



## 2. Investing in large-scale science and technology to fuel innovation

progress in human health. Membership in the Global Alliance has been growing rapidly and now involves more than 170 leading health care, research, and disease advocacy organizations across more than 40 countries.

- Steadily increasing the level of investment in genomics research by other partners, in particular industry. A **2:1 funding ratio** (partner/Genome Canada) for the 2012 Genomics and Personalized Health Competition was achieved and Genome Canada has set the same co-funding ratio for GAPP and its new Large-Scale Applied Research Competitions.
- Reviewed and made decision to continue to support 16 projects funded under **Genome Canada's 2010 Large-Scale Applied Research Project Competition**, as they make progress toward sustainable forestry, improving the health of livestock and crops, and developing new treatments for cancer and rare diseases.
- Planned events and programs to drive the cross-fertilization of ideas and research findings among the 17 projects funded as part of the **2012 Large-Scale Applied Research Project Competition in Genomics and Personalized Health**, to expedite translation of the research into practical solutions for Canada's health care system. These projects are addressing diverse health fields including epilepsy, autism, HIV/AIDS, cancer, cardiovascular disease, rare disease and stroke, and Genome Canada is promoting networking and synergies among the project teams. Also, worked with regional Genome Centres and other partners to put in place Research Oversight Committees for these projects, which in addition to oversight and monitoring will provide advice.
- Invested \$29 million in five **S&T Innovation Centres** that provide state-of-the-art technologies, expertise and infrastructure to the Canadian research community and others. Further, conducted a comprehensive review of Genome Canada's technology delivery model to inform its next funding competition in this area. The next competition will establish a **Genomics Innovation Network** for Canada enhancing collaboration and building on synergies among centres across Canada to advance genomics research.
- Received results of the Finding Rare Disease Genes in Canada consortium (**FORGE Canada**) project, which has identified 149 disease genes, 52 not previously linked to human disease. This is among the most successful rates of discovery for rare disease genes worldwide. The research touches the lives of patients and their families who finally have clear answers and better disease management strategies after what has often been years of a painful "diagnostic odyssey."

### 3. Translating discoveries into applications to maximize impact across all sectors

- Supporting 17 projects currently underway as part of Genome Canada's **Bioinformatics/Computational Biology 2012 Competition**, a partnership with the Canadian Institutes of Health Research. These projects are working on the next-generation tools and methodologies needed to deal with the influx of large amounts of data produced by modern genomic technologies.
  - Accelerating cancer research through the development of new "**big data**" **software tools** in partnership with the Natural Sciences and Engineering Research Council, Genome Canada, the Canadian Institutes of Health Research, and the Canada Foundation for Innovation.
  - Developing a multi-year roadmap detailing current state and future opportunities in bioinformatics via the **National Bioinformatics and Computational Biology Strategy**, in partnership with the Canadian Institutes of Health Research and other stakeholders.
  - Developing a **Disruptive Innovation Initiative**, for launch in late 2014, to accelerate genomics research and provide opportunities for commercialization. The program will support innovation from conception of an idea to its impact.
- 
- Increasing research partnerships between academia and end-users of genomics through the new **Genomic Applications Partnership Program (GAPP)**. GAPP funds downstream research and development projects that are driven by challenges and opportunities facing industry, governments and not-for-profits. The \$90-million program (\$30 million in Genome Canada funds to be leveraged through project co-funding) will stimulate Canadian innovation and global competitiveness. The program launch attracted high-profile national media attention.
  - Garnered media and public attention for initiatives geared at food safety and consumer protection (i.e. **Listeria** and **E. coli** research-funding competitions)
  - Raised stakeholder awareness and understanding of genomic applications to Canada's resource sectors through sector strategy publications and related **fact sheets and video**, as well as targeted advertisements in industry and policy-oriented publications.
  - Showcased genomics science to targeted audiences nationally and internationally through **strategic events and sponsorships**, such as BIO International, Agriculture Biotechnology International Conference, Canadian Science Policy Conference, and others.
  - Delivered evidence-based policy options to policymakers through multiple events and policy papers as part of **Genome Canada's Genomics, Public Policy and Society (GPS)** series.

# Active Projects Funded

2013-2014

A RIGOROUS COMPETITIVE process determines which research projects and S&T Innovation Centres throughout Canada will be funded. Projects are selected through a system of peer review that includes an assessment of the scientific merit of the proposal and its potential socio-economic benefits for Canada, and a concurrent due diligence review of the proposed management structure, the proposed budget, and related financial data, including co-funding. Reviewers are chosen for their recognized expertise in the science, socio-economic benefits and management of large-scale genomics projects, and are drawn primarily from the international scientific community to avoid conflict of interest. Genome Canada's Board of Directors makes the final decision on which proposals to fund, based on recommendations received from the international panel of reviewers.

All Genome Canada funded projects are actively monitored through different mechanisms that depend on the nature of the funding program and type of projects. Typically, Research Oversight Committees are created for each funded large-scale research project, which assess the progress of the project, provide oversight and advice, and make recommendations regarding continued funding.

The following table lists active research projects in fiscal year 2013-2014 and includes total Genome Canada-approved funding for each project.

## Large-Scale and Other Projects

CENTRE	SECTOR	STATUS	PROJECT LEADER(S)	PROJECT TITLE	GC CONTRIBUTION
Genome British Columbia	Agriculture	Interim Review Completed	Lund, Steven van Vuuren, Hennie	Grape and Wine Genomics	\$1,629,702
Genome Alberta	Agriculture	Interim Review Completed	Facchini, Peter Martin, Vincent	Synthetic Biosystems for the Production of High-Value Plant Metabolites	\$6,443,096
Genome Alberta	Agriculture	Interim Review Completed	Plastow, Graham Harding, John Kemp, Bob	Application of genomics to improve swine health and welfare	\$4,899,109
Genome Alberta	Agriculture	Interim Review Completed	Miller, Stephen	Whole Genome Selection through Wide Imputation in Beef Cattle	\$3,860,664
Genome Alberta	Agriculture	In-Progress	Bergeron, Michel Blais, Burton	Point-of-Need Gene-Based System for Detection of Priority STEC in Beef	\$125,000
Genome Alberta	Agriculture	In-Progress	Pilarski, Linda McMullen, Lynn	Sampling and Detection of STEC in Meat	\$125,000

CENTRE	SECTOR	STATUS	PROJECT LEADER(S)	PROJECT TITLE	GC CONTRIBUTION
Genome Prairie	Agriculture	Interim Review Completed	Rowland, Gordon Cloutier, Sylvie	Total Utilization Flax GENomics (TUFGEN)	\$5,645,463
Genome Prairie	Agriculture	Interim Review Completed	Pozniak, Curtis Hucl, Pierre	CTAG-Canadian Triticum Advancement through Genomics	\$4,102,385
Ontario Genomics Institute	Agriculture	Interim Review Completed	Grbic, Miodrag	Genomics in Agricultural Pest Management (GAP-M)	\$2,789,939
Ontario Genomics Institute	Agriculture	In-Progress	Lukens, Lewis Griswold, Cortland	Applying genomic signal processing methods to accelerate crop breeding	\$220,000
Ontario Genomics Institute	Agriculture	In-Progress	Provard, Nicholas Wright, Stephen	Large Data Sets and Novel Tools for Plant Biology for use in International Consolidation – Tier Data Repositories and Portals	\$499,998
Genome Québec	Agriculture	Interim Review Completed	Bureau, Thomas	Bridging comparative, population and functional genomics to identify and experimentally validate novel regulatory regions and genes for crop improvement	\$2,199,181
Genome Québec	Agriculture	Interim Review Completed	Blanchette, Mathieu Bureau, Thomas	PIATEA: A portal for integrative approaches to transportable element annotation	\$62,479
Genome Atlantic	Agriculture	In-Progress	Myles, Sean	Exploiting the full potential of next generation DNA sequencing for crop improvement	\$249,176
Genome British Columbia	Energy	Interim Review Completed	Rieseberg, Loren	Genomics of Sunflower	\$4,961,933
Genome British Columbia	Energy	Interim Review Completed	Douglas, Carl Mansfield, Shawn	POPCAN: Genetic improvement of poplar trees as a Canadian feedstock	\$4,879,622
Genome Alberta	Energy	Interim Review Completed	Voordouw, Gerrit	Metagenomics for Greener Production and Extraction of Hydrocarbon Energy	\$5,033,698
Genome Prairie	Energy	Interim Review Completed	Levin, David Sparling, Richard	Microbial Genomics for Biofuels and Co-products from Biorefining Processes	\$4,877,146
Genome British Columbia	Environment	Interim Review Completed	Eltis, Lindsay Mohn, William	Harnessing microbial diversity for sustainable use of forest biomass resources	\$3,869,964
Genome British Columbia	Environment	Interim Review Completed	Tang, Patrick Isaac-Renton, Judith	Applied Metagenomics of the Watershed Microbiome	\$1,582,765
Genome British Columbia	Environment	Interim Review Completed	Foster, Leonard	Next-generation integrated pest management tools for beekeeping	\$2,858,080
Ontario Genomics Institute	Environment	Interim Review Completed	Edwards, Elizabeth Major, David	BEEM: Bioproducts and Enzymes from Environmental Metagenomes	\$5,090,990
Ontario Genomics Institute	Environment	Interim Review Completed	Hajjibabaei, Mehrdad	Biomonitoring 2.0: A high-throughput genomics approach for comprehensive biological assessment of environmental change	\$1,556,879
Genome Québec	Environment	Interim Review Completed	Tsang, Adrian	Genozymes for Bioproducts and Bioprocesses Development	\$8,138,852
Genome Québec	Environment	Interim Review Completed	Lang, B. Franz Hijri, Mohamed	Improving Bioremediation of polluted soils through Environmental Genomics	\$3,789,354
Genome British Columbia	Forestry	Interim Review Completed	Bohlmann, Jorg Cooke, Janice	Genomics-Enhanced Forecasting Tools to Secure Canada's Near-Term Lignocellulosic Feedstock Supply for Bioenergy using the Mountain Pine Beetle-Pinus spp. System	\$3,691,541
Genome British Columbia	Forestry	Interim Review Completed	Aitken, Sally Hamann, Andreas	AdapTree: Assessing the adaptive portfolio of reforestation stocks for future climates	\$2,320,251

CENTRE	SECTOR	STATUS	PROJECT LEADER(S)	PROJECT TITLE	GC CONTRIBUTION
Genome British Columbia	Forestry	Interim Review Completed	Hamelin, Richard	Genomics-Based Forest Health Diagnostics and Monitoring	\$2,055,554
Genome Québec	Forestry	Interim Review Completed	MacKay, John Bohlmann, Joerg	SMarTForest : Spruce Marker Technologies for Sustainable Forestry	\$4,880,948
Genome Alberta	GE <sup>3</sup> LS	In-Progress	McCabe, Christopher Bubela, Tania	PACE - 'Omics: Personalized, Accessible, Cost-Effective applications of 'Omics technologies	\$1,049,258
Genome Prairie	GE <sup>3</sup> LS	Interim Review Completed	Phillips, Peter Castle, David	Value Addition to Genomics and GE <sup>3</sup> LS (VALGEN)	\$2,553,659
Genome Québec	GE <sup>3</sup> LS	In-Progress	Rousseau, Francois Langlois, Sylvie	PEGASUS: PERsonalized Genomics for prenatal Aneuploidy Screening USing maternal blood	\$2,409,070
Genome British Columbia	Health	Interim Review Completed	Taylor, Michael Malkin, David Marra, Marco	Stratifying and Targeting Pediatric Medulloblastoma Through Genomics	\$4,847,669
Genome British Columbia	Health	In-Progress	Connors, Joseph Marra, Marco	141LYM - Personalized Treatment of Lymphoid Cancer: British Columbia as Model Province	\$2,420,000
Genome British Columbia	Health	In-Progress	Gascoyne, Randy Harrigan, Richard	142HIV - Viral and Human Genetic Predictors of Response to HIV Therapies	\$1,103,367
Genome British Columbia	Health	In-Progress	Montaner, Julio Penn, Andrew Borchers, Christoph Coutts, Shelagh	143TIA - Reducing Stroke Burden with Hospital-Ready Biomarker Test for Rapid TIA Triage	\$4,755,969
Genome British Columbia	Health	In-Progress	Sin, Don Ng, Raymond	144COP - Clinical Implemetation and Outcomes Evaluation of Blood-Based Biomarkers for COPD Management	\$1,700,000
Genome British Columbia	Health	In-Progress	Sahinalp, Cenk	A compressed sensing framework for identifying differentially expressed isoforms and transcriptomic aberrations in cancer samples	\$62,312
Genome British Columbia	Health	In-Progress	Brinkman, Fiona 'Van Domselaar, Gary	A federated bioinformatics platform for public health microbial genomics	\$499,108
Genome British Columbia	Health	In-Progress	Hsiao, William Wasserman, Wyeth	Applied Bioinformatics of Cis-regulation for Disease Exploration (ABC4DE)	\$500,000
Genome British Columbia	Health	In-Progress	Shah, Sohrab Boutros, Paul	Computational interpretation of cancer genomes: defining mutational landscapes for translational genomics	\$499,547
Genome British Columbia	Health	In-Progress	Shah, Sohrab Birol, Inanc	Measuring and modeling tumour evolution from next generation sequencing data: enabling clinical study of clonal diversity in cancer patients	\$102,213
Genome British Columbia	Health	In-Progress	Jones, Steven Karsan, Aly	Next Generation Bioinformatics for Clinical Genomics: using de novo assembly in personalized medicine	\$499,928
Genome British Columbia	Health	In-Progress	Gsponer, Joerg	Tool for proteome-wide identification of regulatory switches	\$53,734
Genome British Columbia	Health	Interim Review Completed	Livingstone, Angus Muzyka, Daniel	Genomics Research Entrepreneurship to Accelerate Translation (GREAT)	\$408,788
Genome British Columbia	Health	In-Progress	Sorensen, Poul	The Canadian Pediatric Cancer Genome Consortium	\$773,121

CENTRE	SECTOR	STATUS	PROJECT LEADER(S)	PROJECT TITLE	GC CONTRIBUTION
Genome Alberta	Health	In-Progress	Cairncross, Gregory	Modeling and Therapeutic Targeting of the Clinical and Genetic Diversity of Glioblastoma	\$612,000
Genome Alberta	Health	In-Progress	Chui, Linda Zhang, Jian Pagotto, Franco	Listeria Detection and Surveillance using Next Generation Genomics (LiDS-NG)	\$249,936
Ontario Genomics Institute	Health	Interim Review Completed	McKerlie, Colin Brown, Steve	NorCOMM2 - In vivo models for human disease & drug discovery	\$4,900,000
Ontario Genomics Institute	Health	Interim Review Completed	Sidhu, Sachdev Boone, Charles	Synthetic antibody program: novel therapeutics and reagents	\$4,849,415
Ontario Genomics Institute	Health	In-Progress	Scherer, Stephen Szatmari, Peter	Autism Spectrum Disorders: Genome to Outcomes	\$2,479,999
Ontario Genomics Institute	Health	In-Progress	Stein, Lincoln Godfrey, Tony	Early detection of patients at high risk of esophageal adenocarcinoma	\$795,272
Ontario Genomics Institute	Health	In-Progress	Boycott, Kym MacKenzie, Alex	Enhanced CARE for RARE Genetic Diseases in Canada	\$2,425,000
Ontario Genomics Institute	Health	In-Progress	Stintzi, Alain Mack, Dave	The Microbiota at the Intestinal Mucosa-Immune Interface: A gateway for personalized health	\$716,360
Ontario Genomics Institute	Health	In-Progress	Lerner-Ellis, Jordan Lebo, Matthew	Development of a unified Canadian clinical genomic database as a community resource for standardizing and sharing genetic interpretations	\$500,000
Ontario Genomics Institute	Health	In-Progress	Parkinson, John	Leveraging Meta-Transcriptomics for Functional Interrogation of Microbiomes	\$87,483
Ontario Genomics Institute	Health	In-Progress	Brudno, Michael Bader, Gary	MedSavant: An integrative framework for clinical and research analysis of human genomes	\$499,273
Ontario Genomics Institute	Health	In-Progress	Stein, Lincoln	Pathway and Network Visualization for Personal Genomes	\$62,499
Ontario Genomics Institute	Health	In-Progress	Gingras, Anne-Claude Tyers, Mike	ProHits Next Generation: A flexible system for tracking, analyzing and reporting functional proteomics data	\$250,000
Ontario Genomics Institute	Health	In-Progress	Dick, John	Development of Highly Active Anti-Leukemia Stem Cell Therapy Project	\$11,500,000
Ontario Genomics Institute	Health	In-Progress	Mak, Tak	Therapeutic Opportunities to Target Tumor Initiating Cells in Solid Tumors	\$2,500,000
Ontario Genomics Institute	Health	In-Progress	Boycott, Kim	Finding of Rare Disease Genes in Canada	\$1,679,744
Genome Québec	Health	In-Progress	Rioux, John D Bitton, Alain	IBD Genomic Medicine Consortium (iGenoMed): translating genetic discoveries into a personalized approach to treating the inflammatory bowel diseases	\$2,386,180
Genome Québec	Health	In-Progress	Sauvageau, Guy Hébert, Josée	Innovative chemogenomic tools to improve outcome in acute myeloid leukemia	\$4,908,515
Genome Québec	Health	In-Progress	Simard, Jacques Knoppers, Bartha Maria	Personalised Risk Stratification for Prevention and Early Detection of Breast Cancer	\$2,353,481
Genome Québec	Health	In-Progress	Perreault, Claude Roy, Denis-Claude	Personalized Cancer Immunotherapy	\$2,409,386
Genome Québec	Health	In-Progress	Cossette, Patrick Michaud, Jacques Minassian, Berge	Personalized medicine in the treatment of epilepsy	\$4,909,616
Genome Québec	Health	In-Progress	Tardif, Jean-Claude Dubé, Marie-Pierre	Personalized medicine strategies for molecular diagnostics and targeted therapeutics of cardiovascular diseases	\$4,672,882

CENTRE	SECTOR	STATUS	PROJECT LEADER(S)	PROJECT TITLE	GC CONTRIBUTION
Genome Québec	Health	In-Progress	Jabado, Nada Majewski, Jacek Pastinen, Tomi	The ICHANGE (International CHildhood Astrocytomas iNtegrated Genomics and Epigenomics) Consortium	\$1,183,123
Genome Québec	Health	In-Progress	Waldispuhl, Jerome Blanchette, Mathieu	Cadre de détection comprimée pour l'identification des isoformes d'expression différentielle et d'aberrations transcriptionnelles dans des échantillons de cancer	\$62,330
Genome Québec	Health	Interim Review Completed	Garant, Denis	Boosting Entrepreneurial Skills and Training: BEST in Genomics	\$401,442
Genome Atlantic	Health	Interim Review Completed	McMaster, Christopher Fernandez, Conrad	Identifying New Genes and Medicines for the Treatment of Orphan Diseases (IGNITE)	\$2,393,299
Program Management Fees	Centres				\$8,832,470
<b>TOTAL</b>					<b>\$185,296,217</b>

## Science & Technology Innovation Centres

CENTRE	SECTOR	STATUS	PROJECT LEADER(S)	PROJECT TITLE	GC CONTRIBUTION
Genome British Columbia	STICs	In-Progress	Borchers, Christoph	University of Victoria - Genome BC Proteomics Centre	\$4,295,881
Genome British Columbia	STICs	In-Progress	Marra, Marco Jones, Steven Holt, Rob	Genomics Innovation Centre (GIC) at the BC Cancer Genome Sciences Centre	\$8,668,682
Genome Alberta	STICs	In-Progress	Wishart, David Borchers, Christoph	The Metabolomics Innovation Centre	\$1,739,169
Ontario Genomics Institute	STICs	In-Progress	Scherer, Stephen	The Centre for Applied Genomics	\$4,032,350
Genome Québec	STICs	In-Progress	Lathrop, Mark	McGill University / Genome Québec Innovation Centre	\$9,830,426
Program Management Fees	Centres				\$400,000
<b>TOTAL</b>					<b>\$28,966,508</b>

## International Consortium Initiatives

CENTRE	SECTOR	STATUS	PROJECT LEADER(S)	PROJECT TITLE	GC CONTRIBUTION
Ontario Genomics Institute	Environment	In-Progress	Hebert, Paul	International Barcode of Life Project (iBOL)	\$2,445,000
Ontario Genomics Institute	Health	In-Progress	Edwards, Aled	Structural Genomics Consortium III	\$5,000,000
Genome Québec	Health	In-Progress	Knoppers, Bartha Maria	Public Population Project in Genomics - bridging	\$476,603
Program Management Fees	Centres				\$135,000
<b>TOTAL</b>					<b>\$8,056,603</b>

# Genome Centre Base Funding Operations



GENOME CANADA delivers its mandate by funding and managing large-scale, interdisciplinary, and internationally peer-reviewed research projects, and S&T Innovation Centres. This is achieved by working with our primary partners: the six regional Genome Centres. The relationship between Genome Canada and each Genome Centre is defined by means of a funding agreement that acknowledges the independence of each Centre and the way in which each contributes to Genome Canada's overall mandate.

The Genome Centres play significant roles in fostering regional expertise in genomics research, developing partnerships to strengthen regional leadership and competitiveness, facilitating access to the S&T Innovation Centres, creating unique and innovative public outreach programs, and most importantly, securing co-funding for projects from both domestic and international investors.

## Genome Centre Base Funding

CENTRE	CATEGORY	STATUS	PRESIDENT and CEO	GC CONTRIBUTION*
Genome British Columbia	Centre Ops.	In-Progress	Winter, Alan	\$1,760,000
Genome Alberta	Centre Ops.	In-Progress	Bailey, David	\$1,469,600
Genome Prairie	Centre Ops.	In-Progress	Pontarollo, Reno	\$1,469,600
Ontario Genomics Institute	Centre Ops.	In-Progress	Poznansky, Mark	\$1,760,000
Genome Québec	Centre Ops.	In-Progress	Lepage, Marc	\$1,760,000
Genome Atlantic	Centre Ops.	In-Progress	Armstrong, Steve	\$1,469,600
<b>TOTAL</b>				<b>\$9,688,800</b>

\*Figures represent funding over the fiscal years 2012-13 and 2013-14.



# Notes on Governance

Genome Canada is governed by a Board of Directors comprising no less than nine, but not more than 16 directors, recruited from the academic, private and public sectors. New directors are appointed for two-year terms, which are renewable. The presidents of each of the following organizations — the Canada Foundation for Innovation, Canadian Institutes of Health Research, National Research Council, Natural Sciences and Engineering Research Council, and Social Sciences and Humanities Research Council — are non-voting, ex officio advisors to the Board of Directors.

THE BOARD OF DIRECTORS has overall responsibility for the stewardship of the business and affairs of Genome Canada. Its fiduciary responsibilities include strategic leadership, succession planning, risk mitigation, performance and evaluation, and financial oversight. A number of permanent committees assist the Board in fulfilling its duties:

namely, an Executive Committee, Audit and Investment Committee, Governance, Election and Compensation Committee, and Programs Committee. As well, the Board has a Science and Industry Advisory Committee, which provides advice that will assist the Board in achievement of the organization's strategic plan mission and objectives.

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## Number of meetings held by the board and its committees in 2013-14:

Board of Directors	6
Audit and Investment Committee	4
Governance, Election and Compensation Committee	4
Programs Committee	5
Science and Industry Advisory Committee	6

During fiscal year 2013-14  
**GenomeCanada**

Board of Directors

**Lorne Hepworth**  
(Chair)  
Past President  
CropLife Canada  
Ottawa, Ontario

**Moura Quayle**  
(Vice-Chair)  
Professor, Strategic Design  
Sauder School of Business  
University of British Columbia  
Vancouver, British Columbia

**Fiona Brinkman**  
Professor of Molecular Biology and  
Biochemistry  
Simon Fraser University  
Burnaby, British Columbia

**Abdallah Daar**  
Professor of Public Health Sciences and  
Professor of Surgery  
University of Toronto  
Toronto, Ontario

**Sylvie Dillard**  
Past President  
Conseil de la science et de la technologie  
Quebec, Quebec

**René Douville**  
Managing Director, National Client Group  
RBC Royal Bank  
Montreal, Quebec

**Peter Harder**  
Senior Policy Advisor  
Dentons Canada LLP  
Ottawa, Ontario

**Yvan Hardy**  
Panel Member, International  
Resource Panel for  
Sustainable Resource Management  
Ottawa, Ontario

**Jay Ingram**  
Broadcaster and Science Writer  
Bragg Creek, Alberta

**Kim McConnell**  
Founder and Former CEO  
AdFarm  
Calgary, Alberta

**Pierre Meulien**  
President and CEO  
Genome Canada  
Ottawa, Ontario

**Robert Orr**  
President and CEO  
Slamhor Pharmaceutical Inc.  
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**George Weinstock**  
Professor of Genetics  
Washington University  
St. Louis, Missouri, USA

**Barbara Wold**  
Bren Professor of Microbiology  
California Institute of Technology  
Pasadena, California, USA

**Donald Ziraldo**  
Co-founder  
Inniskillin Wines  
St. Catharines, Ontario

Ex Officio Advisors

**Alain Beaudet**  
President  
Canadian Institutes of Health Research  
Ottawa, Ontario

**John R. McDougall**  
President  
National Research Council Canada  
Ottawa, Ontario

**Janet Walden**  
Acting President, Natural Sciences and  
Engineering Research Council of Canada  
Ottawa, Ontario

**Chad Gaffield**  
President  
Social Sciences and Humanities  
Research Council of Canada  
Ottawa, Ontario

**Gilles G. Patry**  
President and CEO  
Canada Foundation for Innovation  
Ottawa, Ontario

**Lorne Hepworth**  
Chair

**Moura Quayle**  
Vice Chair

**Jean Brunet**  
Secretary  
Stein Monast L.L.P.

**Cindy Bell**  
Executive Vice-President  
Corporate Development

**Guy D'Aloisio**  
Vice-President, Finance

**Carol Anne Esnard**  
Chief Administrative Officer

**Pierre Meulien**  
President and CEO

**Dale Patterson** (*until August 2013*)  
Vice-President, External Relations

**Karl Tibelius**  
Vice-President, Genomics Programs

**Jacques Simard**  
(Chair)  
Professor, Canada Research  
Chair in Oncogenetics  
Faculty of Medicine  
Université Laval  
CHUQ Research Centre  
Québec City, Québec

**Anne-Christine Bonfils**  
Research Program Manager  
Program and Project Services  
National Research Council Canada  
Ottawa, Ontario

**David J. Drutz**  
President  
Pacific Biopharma Associates, LLC  
Chapel Hill, NC, USA

**Joseph R. Ecker**  
Professor, Plant Molecular and Cellular  
Biology Laboratory  
Howard Hughes Medical  
Institute and Gordon and  
Betty Moore Investigator  
Salk International Council  
Chair in Genetics  
Salk Institute for Biological Studies  
La Jolla, CA, USA

**Stacey B. Gabriel**  
Director, Genomics Platform  
Broad Institute of MIT and Harvard  
Cambridge, MA, USA

**Eric M. Meslin**  
Director, Center for Bioethics  
Professor of Medicine, Medical and Molecular  
Genetics, Public Health and Philosophy  
Indiana University  
Indianapolis, IN, USA

**Francis Ouellette**  
Associate Director,  
Senior Scientist, Informatics and Bio-computing  
Ontario Institute for Cancer Research  
Toronto, Ontario

**Jean Weissenbach**  
Director, Centre National de Séquençage  
Paris, France

**Paul A. Willems**  
Director,  
Technology Vice President, Energy  
Biosciences, BP Group  
Associate Director, Energy Biosciences  
Institute, UC Berkeley  
Berkeley, CA, USA

During fiscal year 2013-14  
**GenomeCanada**

Genome Canada Staff

**Pierre Meulien**  
President and CEO

**Koko Agborsangaya**  
Program Manager

**Naveed Aziz**  
Director, Technology Programs

**Cindy Bell**  
Executive Vice-President,  
Corporate Development

**Genny Cardin**  
*(until August, 2013)*  
Analyst

**Kim Corbett**  
Program Manager

**Mallory Dunlop**  
*(until February 2014)*  
Administrative Assistant

**Guy D'Aloisio**  
Vice-President, Finance

**Karen Dewar**  
Director, Genomics Programs

**Carol Anne Esnard**  
Chief Administrative Officer

**Julie Edwards**  
Corporate Development Consultant

**Samantha Evans**  
Director, Evaluation

**Lorna Jackson**  
Program Manager

**Megan Jardine** *(until September 2013)*  
IM/IT Manager

**Andrea Matyas**  
Director, Communications

**Stephanie McDuff**  
Administrative Assistant

**Hélène Meilleur**  
Director, Events and  
Sponsorships

**Michael Midmer**  
Genomic Applications Programs  
Portfolio Manager

**Karine Morin**  
Director, National GE<sup>3</sup>LS  
Program

**Dale Patterson**  
*(until August 2013)*  
Vice-President, External Relations

**Brianne Scott**  
*(until March 2014)*  
IM/IT Manager

**Kate Swan**  
*(on maternity leave  
as of November 2013)*  
Associate Director,  
Genomics Programs

**Normand Therrien**  
Director, Project Finance

**Karl Tibelius**  
Vice-President, Genomics  
Programs

**Brigitte Vaillant**  
Executive Assistant to the President  
and CEO

# Statement of Remuneration

## Total Compensation

### Officers and Employees

Effective April 1, 2013, Genome Canada implemented a new compensation policy based on job classifications and related salary ranges. The policy applies to all officer and employee positions of Genome Canada except the position of President and CEO. Genome Canada officers and employees receive fringe benefits amounting to 15% of their gross salary and are eligible for performance awards ranging from 0-25%.

The compensation of positions which exceeded \$100,000 in the year ended March 31, 2014 fell within the salary ranges shown below:

### Officers

President and CEO	\$300,000 - \$419,212
Executive Vice-President, Corporate Development	\$128,075 - \$209,938
Vice-President, Genomics Programs	\$128,075 - \$193,159
Vice-President, Finance	\$128,075 - \$192,113
Chief Administrative Officer	\$128,075 - \$192,113

### Employees

Director, Genomics Programs	\$99,526 - \$149,289
Director, Technology Programs	\$99,526 - \$149,289
Genomic Applications Programs Portfolio Manager	\$99,526 - \$149,289
Director, National GE <sup>3</sup> LS Program	\$99,526 - \$149,289
Director, Evaluation	\$99,526 - \$149,289
Director, Events and Sponsorships	\$77,341 - \$125,974
Director, Communications	\$77,341 - \$116,011
Director, Project Finance	\$77,341 - \$116,011



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# Management Discussion

Since Genome Canada's creation in 2000, the federal government has formally committed \$1.2 billion to the organization for the purpose of supporting genomics research, the most recent being \$165 million, which was announced in the federal Budget 2013, and for which a funding agreement was signed by Genome Canada and Industry Canada in March 2014. This and previous agreements provide funding to support the regional Genome Centres, large-scale research projects, S&T Innovation Centres, and the operations of Genome Canada.

ALL RESEARCH PROJECTS supported by Genome Canada through federal investments are required to be co-funded with other parties, including provinces, universities, the private sector, and other national and international organizations. As of March 2014, \$1.3 billion in co-funding had been raised.

Prior to the Funding Agreement of March 2014, the funding ratio of Genome Canada to co-funding was 1:1. Under the Funding Agreement of March 2014 the required funding ratio is increased to approximately 1:2 with \$280 million in co-funding required for the \$165-million federal investment.

A rigorous competitive process determines which research projects and S&T Innovations Centres throughout Canada will be funded. Projects are

selected through a system of peer review which includes an assessment of the scientific merit of the proposal and its potential socio-economic benefits for Canada, and a concurrent due diligence review of the proposed management structure, the proposed budget and related financial data, including co-funding. The regional Genome Centres are also subject to regular external assessments.

Guided by the terms and conditions of the funding agreements with each of the six Genome Centres, Genome Canada disburses funds to each for approved projects and S&T Innovation Centres. In turn, each Centre directs the funds to individual projects and S&T Innovation Centres located within its region. Genome Canada also contributes to the funding of base operations of the Genome Centres.

2014-2015

# Financial

## Highlights

In the year ending March 31, 2014, Genome Canada dispersed a total of \$75 million for both its own operations and for the funding of projects, S&T Innovation Centres and Genome Centres, up 34 percent from \$55.9 million in fiscal 2012-13.

### Operations

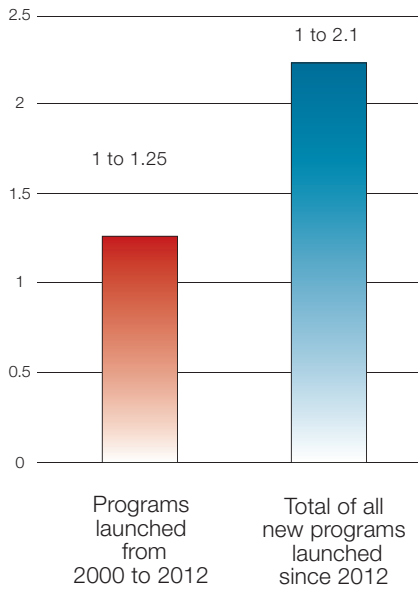
- Genome Canada's cost of operations totals \$6.8 million of which 50.2 percent relates to salaries and benefits that support operational activities in the areas of administration, program management, corporate development and fundraising, communications, governance, and workshops and symposia.

### Projects, S&T Innovation Centres, and Genome Centres

- From inception to March 31, 2014, Genome Canada disbursements for research projects, S&T Innovation Centres, and regional Genome Centre operations total \$921.2 million.
- From total disbursements of \$68.2 million in fiscal year 2013-14, \$47.6 million was in support of research projects, \$15.7 million for the S&T Innovation Centres, and \$4.8 million for base funding of the regional Genome Centres.
- As at March 31, 2014, a total of \$25.2 million remains as deferred contributions, representing disbursements that will be made in subsequent years for Genome Canada operations and for approved research projects and S&T Innovation Centres.
- Through the combined efforts of Genome Canada, Genome Centres, and project leaders, it is estimated that more than \$1.3 billion in co-funding has been raised and committed from inception to March 31, 2014, bringing the total committed value of investments in genomics and proteomics research through Genome Canada funded projects and initiatives to more than \$2 billion.

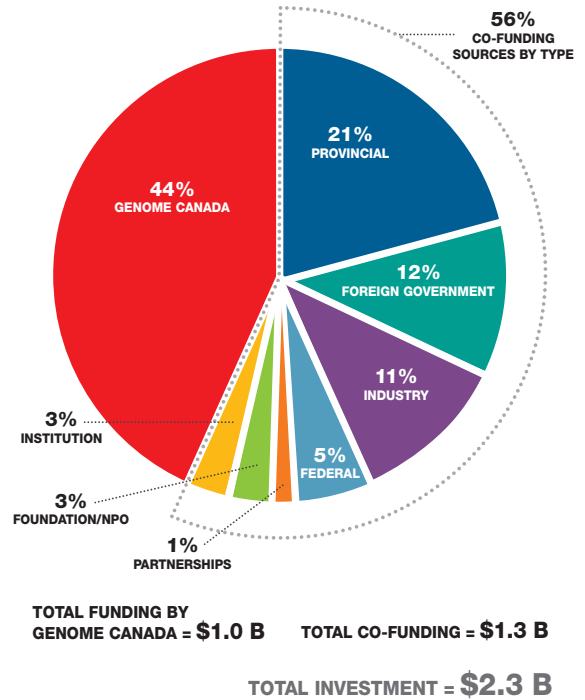


## Co-Funding Ratio for Current Strategic Plan

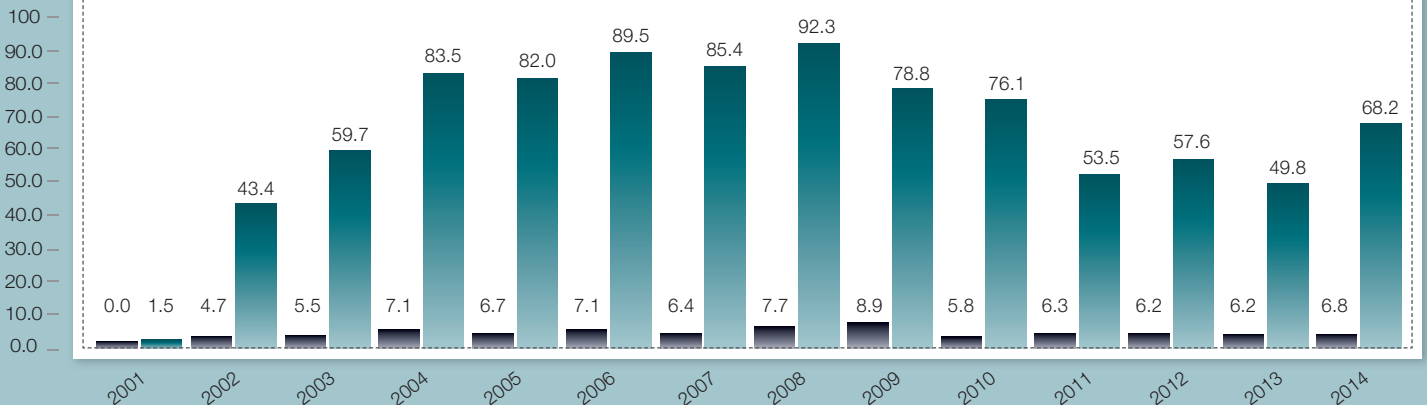


## Investment by Genome Canada and co-funding by partners since 2000

Figures from May 31, 2014

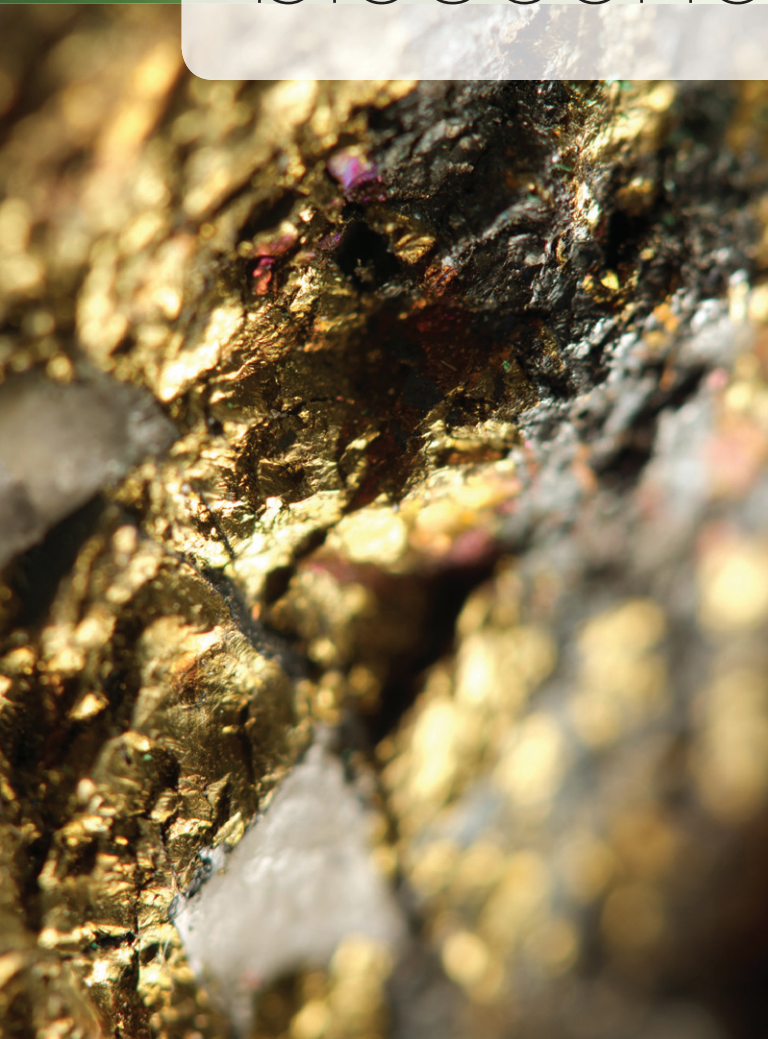


## Annual Expenditures in Millions of Dollars





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# Outlook

## 2014-2015

Deferred contributions of \$25.2 million as at March 31, 2014, are committed to research projects approved through previous competitions and are scheduled for disbursement in 2014-2015 and subsequent fiscal years.

The \$165-million funding agreement with Industry Canada signed in March 2014 includes funding for the operations of Genome Canada for the next three fiscal years ending March 31, 2017.

All funding from Industry Canada is provided to Genome Canada in annual installments based on estimated cash requirements for the year. Under currently active funding agreements, an amount of \$69.8 million is estimated to be received in 2014-2015 to finance already approved research projects and operations.



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# Genome Canada

March 31, 2014

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## Independent Auditor's Report

To the Directors of  
Genome Canada

We have audited the accompanying financial statements of Genome Canada, which comprise the statement of financial position as at March 31, 2014, and the statements of operations and changes in net assets and of cash flows for the year then ended, and 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.

### Auditor's 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 the auditor's judgement, including the assessment of the risks of material misstatement of the financial statements, whether due to fraud or error. In making those risk assessments, the auditor considers 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 is sufficient and appropriate to provide a basis for our audit opinion.

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## Opinion

In our opinion, the financial statements present fairly, in all material respects, the financial position of Genome Canada as at March 31, 2014, and the results of its operations and its cash flows for the year then ended in accordance with Canadian accounting standards for not-for-profit organizations.



Chartered Professional Accountants, Chartered Accountants  
Licensed Public Accountants

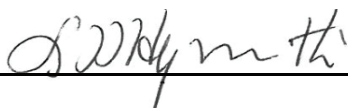
June 19, 2014

## Genome Canada

### Statement of financial position as at March 31, 2014

	2014	2013
	\$	\$
<b>Assets</b>		
Current assets		
Cash and cash equivalents (Note 3)	25,645,251	28,659,538
Interest receivable	23,116	272,536
Other receivables	149,521	125,335
Prepaid expenses	194,657	384,419
	<b>26,012,545</b>	29,441,828
Investments (Note 4)	-	14,166,072
Capital assets (Note 5)	24,659	35,217
	<b>26,037,204</b>	43,643,117
<b>Liabilities</b>		
Current liabilities		
Accounts payable and accrued liabilities	829,210	633,476
Government remittances payable	-	712
Deferred contributions (Note 6)	25,183,335	42,973,712
Deferred contributions related to capital assets (Note 7)	24,659	35,217
	<b>26,037,204</b>	43,643,117
Commitments (Note 10)		
Contingencies (Note 11)		
<b>Net assets</b>	-	-
	<b>26,037,204</b>	43,643,117

On behalf of the Board

 Director

 Director

See accompanying notes to financial statements

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# Genome Canada

## Statement of operations and changes in net assets year ended March 31, 2014

	2014	2013
	\$	\$
<b>Revenues</b>		
Amortization of deferred contributions (Note 6)	74,955,270	55,922,132
Amortization of deferred contributions related to capital assets (Note 7)	10,559	15,811
	<b>74,965,829</b>	<b>55,937,943</b>
<b>Expenses</b>		
Contributions to Centres and approved projects	68,165,064	49,769,412
General and administrative	4,514,869	4,596,588
Program management	451,531	581,929
Communications	472,348	333,496
Corporate development	328,983	157,399
Government relations	93,806	95,582
Governance	129,141	98,485
Evaluation	293,115	-
Amortization of capital assets	10,559	15,811
Workshops and symposia	506,413	289,241
	<b>74,965,829</b>	<b>55,937,943</b>
<b>Excess of revenues over expenses, being net assets, end of year</b>	<b>-</b>	<b>-</b>

See accompanying notes to financial statements



**Genome Canada**Statement of cash flows  
year ended March 31, 2014

	2014	2013
	\$	\$
<b>Net inflow (outflow) of cash and cash equivalents related to the following activities:</b>		
<b>Operating</b>		
Excess of revenues over expenses	-	-
Items not affecting cash		
Amortization of capital assets	10,558	15,811
Change in fair value of investments	(284,873)	(56,234)
Amortization of deferred contributions (Note 6)	(74,955,270)	(55,922,132)
Amortization of deferred contributions related to capital assets (Note 7)	(10,558)	(15,811)
Excluded from the increase in deferred contributions (Note 9)	(101,811)	(1,170,950)
	<b>(75,341,954)</b>	<b>(57,149,316)</b>
Interest received on investments	916,124	1,674,260
Grants received from Government of Canada (Note 6)	56,600,000	67,800,000
Change in operating assets and liabilities		
Increase in other receivable	(24,186)	(46,798)
Decrease (increase) in prepaid expenses	189,762	(251,737)
Increase (decrease) in accounts payable and accrued liabilities	195,734	(10,109)
Increase (decrease) in government remittances payable	(712)	489
	<b>(17,465,232)</b>	<b>12,016,789</b>
<b>Investing</b>		
Purchase of investments	-	(57,871,020)
Proceeds on disposal of investments	14,450,945	56,936,275
	<b>14,450,945</b>	<b>(934,745)</b>
Net cash and cash equivalent inflow (outflow)	<b>(3,014,287)</b>	<b>11,082,044</b>
Cash and cash equivalents, beginning of year	<b>28,659,538</b>	<b>17,577,494</b>
<b>Cash and cash equivalents, end of year</b>	<b>25,645,251</b>	<b>28,659,538</b>

See accompanying notes to financial statements

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# Genome Canada

## Notes to the Financial Statements

March 31, 2014

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### 1. Description of the business

Genome Canada (the "Corporation") was incorporated on February 8, 2000 under the Canada Corporations Act as a not-for-profit organization and has the following objectives:

- (a) The development and establishment of a co-ordinated strategy for genomics research to enable Canada to become a world leader in areas such as health, agriculture, environment, forestry and fisheries;
- (b) The provision of leading-edge technology to researchers in all genomics-related fields through regional Genome Centres across Canada, of which there are currently six, one each in British Columbia, Alberta, the Prairies, Ontario, Quebec and the Atlantic;
- (c) The support of large-scale projects of strategic importance to Canada by bringing together industry, government, universities, research hospitals and the public;
- (d) The assumption of leadership in the area of ethical, environmental, economic, legal, social and other issues related to genomics research (GE<sup>3</sup>LS), and the communication of the relative risks, rewards and successes of genomics to the Canadian public; and
- (e) The encouragement of investment by others in the field of genomics research.

### 2. Significant accounting policies

The financial statements have been prepared in accordance with Canadian accounting standards for not-for-profit organizations and include the following significant accounting policies:

#### *Revenue recognition*

The Corporation follows the deferral method of accounting for contributions for not-for-profit organizations, which include grants from the Government of Canada.

Externally restricted contributions and related investment income are recognized as revenue in the year in which the underlying expenses are incurred. A receivable is recognized if the amount to be received can be reasonably estimated and collection is reasonably assured.

Externally restricted contributions for purchase of capital assets are deferred and amortized to revenues on a declining-balance basis at a rate corresponding to the amortization rate for the related capital assets.

#### *Cash and cash equivalents*

Cash and cash equivalents consist of cash as well as highly liquid short-term investments. The Corporation considers highly liquid short-term investments as those having a maturity of less than three months from the date of acquisition. Cash and cash equivalents are recorded at fair value.

#### *Receivables*

Interest receivable and other receivables are recorded at amortized cost.

#### *Investments*

Investments are recorded at fair value. Fair value is determined at quoted market prices. Sales and purchases of investments are recorded at the settlement date. Transaction costs related to the acquisition of investments are expensed.

**Genome Canada**

## Notes to the Financial Statements

March 31, 2014

**2. Significant accounting policies (Continued)***Capital assets*

Capital assets are stated at their net book value. Amortization is provided for using the declining-balance method at the following annual rates:

Furniture and fixtures and office equipment	20%
Computers and software	50%
Telecommunication equipment	30%

*Accounts payable and accrued liabilities and government remittances payable*

Accounts payable and accrued liabilities and government remittances payable are recorded at amortized cost.

*Pension plan*

The Corporation maintains, for the benefit of almost all of its employees, a defined contribution pension plan. The cost of the plan is recorded in the statement of operations as it is incurred. The charge for the year totals \$207,083 (2013 - \$208,025).

*Use of estimates*

The preparation of financial statements in conformity with Canadian accounting standards for not-for-profit organizations requires the use of estimates and assumptions that affect the reported amounts of assets and liabilities, disclosures of contingent assets and liabilities at the date of the financial statements and the reported amounts of revenues and expenses during the reporting periods. Accordingly, actual results could differ from these estimates. The most significant estimates used in the preparation of the financial statements include the fair value of investments, the amount of accrued liabilities and the estimated useful lives of capital assets. These estimates are reviewed annually and as adjustments become necessary, they are recorded in the financial statements in the year in which they become known.

**3. Cash and cash equivalents**

	2014	2013
	\$	\$
Cash	468,372	3,977,618
Short-term investments	25,176,879	24,681,920
	<b>25,645,251</b>	<b>28,659,538</b>

# Genome Canada

## Notes to the Financial Statements March 31, 2014

### 4. Investments

	2014	
	Fair Value \$	Cost \$
Provincial government bonds	-	-
Corporate bonds and debentures	-	-
	-	-
<hr/>		
	2013	
	Fair Value \$	Cost \$
Provincial government bonds	7,579,488	7,846,800
Corporate bonds and debentures	6,586,584	6,604,145
	14,166,072	14,450,945

### 5. Capital assets

	2014			2013
	Cost \$	Accumulated amortization \$	Net book value \$	Net book value \$
Furniture and fixtures and	180,044	160,386	19,658	24,573
Computer and software	177,536	173,732	3,804	8,934
Telecommunications equipment	32,134	30,937	1,197	1,710
	389,714	365,055	24,659	35,217

Cost and accumulated amortization at March 31, 2013 amounted to \$488,233 and \$453,016, respectively.

### 6. Deferred contributions

The Corporation receives grants from the Government of Canada to be held, invested, administered and disbursed in accordance with the related funding agreement between Genome Canada and the Government of Canada.

The Corporation currently operates under four active funding agreements with Industry Canada. The terms and conditions of these agreements call for payments to be made to the Corporation annually, subject to the appropriation by Parliament, at the beginning of each fiscal year, based on the estimated cash requirements for the coming year. During the year ended March 31, 2014, the Corporation received \$12,800,000 under the agreement dated March 31, 2010, \$22,600,000 under the agreement dated January 3, 2012 and \$21,200,000 under the agreement dated January 29, 2013. The changes in the deferred contributions balance for the year are as follows:

**Genome Canada**Notes to the Financial Statements  
March 31, 2014**6. Deferred contributions (Continued)**

	2014	2013
	\$	\$
Balance, beginning of year	42,973,712	30,491,368
Add: grants received	56,600,000	67,800,000
Add: investment income	564,893	604,476
Less: amounts amortized to revenue	(74,955,270)	(55,922,132)
Balance, end of year	<b>25,183,335</b>	42,973,712

**7. Deferred contributions related to capital assets**

Deferred contributions related to capital assets represent restricted contributions with which capital assets were originally purchased. The changes in the deferred contributions balance for the year are as follows:

	2014	2013
	\$	\$
Balance, beginning of year	35,217	51,028
Less: amounts amortized to revenue	(10,558)	(15,811)
Balance, end of year	<b>24,659</b>	35,217

**8. Capital management**

The Corporation defines capital as its deferred contributions.

The Corporation's objectives in managing capital are to safeguard its ability to continue as a going concern and pursue its strategy of promoting genomics research by funding eligible projects that meet the mandate and criteria of its funder, the Government of Canada, and provide benefits to other stakeholders. Management continually monitors the impact of changes in economic conditions on its investment portfolio and its funding commitments. There were no changes to the Corporation's approach to capital management during the year.

**9. Supplemental cash flow information**

	2014	2013
	\$	\$
Loss on disposal of investments	(386,684)	(1,211,014)
Fair value adjustment	284,873	40,064
	<b>(101,811)</b>	(1,170,950)

**Genome Canada**

## Notes to the Financial Statements

March 31, 2014

**10. Commitments***Committed funding*

The Corporation is committed to finance approved research projects, science and technology platforms and Genome Centre operations in accordance with established agreements. As at March 31, 2014, the payments committed are approximately \$45,218,645 in 2015 and \$41,070,456 for other future years.

*Consulting*

The Corporation has entered into two consulting agreements expiring in the 2017 fiscal year. The payments committed amount to \$104,691.

*Operating leases*

The Corporation leases its premises and equipment under long-term operating leases, which expire at various dates between 2014 and 2018. The minimum aggregate lease payments are approximately as follows:

	\$
2015	144,809
2016	147,319
2017	145,044
2018	144,098
2019	24,100

**11. Contingencies**

In the normal course of business, the Corporation has entered into a lease agreement for premises. It is common in such commercial lease transactions for the Corporation as the lessee, to agree to indemnify the lessor for liabilities that may arise from the use of the leased assets. The maximum amount potentially payable under the foregoing indemnities cannot be reasonably estimated. The Corporation has liability insurance that relates to the indemnifications described above.

**12. Fair value of financial instruments**

The carrying value of interest receivable, other receivables, accounts payable and accrued liabilities and government remittances payable approximates their fair value because of the relatively short period to maturity of the instruments.

The fair value of investments is disclosed in Note 4 to the financial statements.

The Corporation is not subject to significant currency risk arising from its financial instruments. The Corporation is exposed to credit and interest rate risk with respect to its interest-bearing investments. The Corporation diversifies its investments to reduce the credit risk to an acceptable level.



We would like to thank the  
Government of Canada for  
its continued support.



**Genome**Canada





**Genome**Canada

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