New technologies.
Real solutions.
Imagine if tiny oil-eating microbes could lead us to offshore oil reserves. Or if lives could be saved by pinpointing a genetic mutation passed down through generations of families. And what if Atlantic Canada’s next big cash crop was just around the corner, promising regional producers a bigger bite of the markets?

**Genome Atlantic** is helping to turn ‘what ifs’ into solutions for Atlantic Canada. We work with private and public-sector partners to address regional challenges in agriculture, energy, aquaculture & fisheries, the environment, mining, forestry and human health. Genomic technologies help drive innovation and make our resource industries more resilient in the face of climate change.

This year, research spending through Genome Atlantic-enabled projects reached $6.7 million (based on a three-year rolling average from 2017-2019) – exceeding our 10% growth target. Private sector investment currently makes up more than one-quarter of our portfolio – a testament to how keen Atlantic Canadian businesses are to invest in genomics-based solutions.

Since we opened our doors in 2000, **Genome Atlantic** has helped to enable $117 million in applied genomics R&D – in the process, creating more than 1,800 person years of employment.

This annual report highlights the impact of these investments. We thank the Government of Canada through Genome Canada, ACOA and the National Research Council of Canada (Industrial Research Assistance Program) for supporting our work and recognizing that genomics is a key driver of Atlantic Canada’s bioeconomy. We also thank our provincial funders including the governments of Nova Scotia, Newfoundland and Labrador, and Prince Edward Island, as well as business and academic investors for their partnership and support.

**Genome Atlantic** is a not-for-profit corporation with a mission to help Atlantic Canada reap the economic and social benefits of genomics technologies. Since our inception in 2000, we have worked with a range of private and public-sector partners to enable more than $117 million in new genomics R&D.
Genomics is often associated with advancements in human health where this transformative technology is contributing to the development of personalized medicines and is helping us to detect and treat many kinds of cancers and other genetic diseases.

Genomics-based solutions have wider applications too – from improving food production to tackling pipeline corrosion.

Genome Atlantic is currently working with our partners in the private sector, government and universities on 20 active projects valued at more than $40 million in applied R&D, including:

- Combining genomics and traditional geoscience to map offshore petroleum deposits.
- Exploring the genetic factors of bipolar disorder as a basis for better screening tools and treatments.
- Selecting superior salmon broodstock to combat the effects of climate change.
- Developing novel approaches to improving potato production.
- Using genetic markers to identify superior cannabis traits.
- Tackling microbial corrosion in offshore and onshore oil production.
- Developing novel tools for identifying and treating spondyloarthritis, a subset of inflammatory diseases that cause lower back pain.
- Developing new therapeutic diets for farmed Atlantic salmon.
- Exploring sustainable alternatives to fish-based oils used in feed for farmed fish.
- Developing new genomics-based tools to fight superbugs.
- Finding new treatments for Atlantic Canadians with genetic diseases.
- Developing a halibut aquaculture broodstock strategy.

Dr. Lisa Geig is co-leading a project to shed some light on pipeline corrosion. Photo: Riley Brandt, University of Calgary
According to the Conference Board of Canada innovation report card, business enterprise R&D spending, or BERD, is a key factor, contributing to productivity, economic growth and job creation. The more companies spend on R&D, the more likely they are to develop new products, processes and services.

Atlantic Canadian companies are investing in genomics. Thanks to Genome Atlantic’s end user-driven strategy, private sector investment in our projects has grown steadily over the past decade and now makes up more than one-quarter of our current portfolio. We expect to see the trend continue as an ever-increasing number of companies look to us to find research talent and partnerships that can help them solve real-world problems in their industry.

As DNA sequencing continues to get cheaper and more accessible, DNA-based solutions are finding broader applications in our natural resource industries, the human health sector, the development of clean technologies, supporting environmental stewardship goals, and combatting the effects of climate change.

Genomics technologies are helping Atlantic Canadian companies improve their bottom lines and compete globally - and Genome Atlantic is proud to be a catalyst in moving Atlantic Canada’s economy to the next level, one business at a time.
By the Numbers

Since 2000, Genome Atlantic has helped to enable $117 million in genomics R&D to benefit Atlantic Canada.

In 2018-2019, Genome Atlantic:

- Achieved total R&D spending of $6.7 million in Atlantic Canada, exceeding our goal of $6.1 million.

- Achieved 29% BERD on the company-led portion of our portfolio – in line with our 25% target. Private sector investment has steadily grown over the years, which reflects Genome Atlantic’s systematic adoption of an end-user-led strategy.

- Supported a portfolio of 20 active projects with a total R&D value of more than $40 million, spanning 7 different sectors.

- Fostered an additional 28 opportunities with a total potential R&D value of $45 million, through various stages of the business development pipeline.

- Approved 3 applications under our Genomics Opportunity Review Program (GORP). GORP provides up to $10,000 for initiatives to help companies or select government agencies evaluate the ROI of potential genomics-based solutions.

- Co-hosted with various partners 2 public events focusing on the role of genomics in bipolar disorder and in selecting superior cannabis strains.

- Participated in 16 industry events and arranged for 4 genomics experts to present to industry on their use of genomics to solve private sector problems.

Drs. Matthew Rise and Chris Parrish are working to develop better therapeutic diets for farmed salmon. Photo: Chris Hammond, Memorial University
Years ago, we heard a lot about “the promise” of genomics; today we’re seeing results. Genomic technologies are proving their worth in bottom-line savings for local companies, in maximizing opportunities for our resource industries, and in measurable health outcome improvements for Atlantic Canadians. Here are some Genome Atlantic projects that are turning promise into results.

Boosting aquaculture production

New Brunswick’s Cooke Aquaculture Inc./Kelly Cove Salmon Ltd. (KCS) partnered with Genome Atlantic on a $4.9 million project to develop genomic tools known as ‘SNP Chips’ to improve traits in Atlantic salmon broodstock, such as growth rate, survival of eggs and juveniles, flesh quality, and disease and parasite resistance. The implementation of genomic information from the North American SNP-chip, used with conventional animal breeding techniques, is yielding significant increases in the growth rates of fish held in saltwater. In their Atlantic Canadian operations, KCS attributes a 5% increase in annual production to the implementation of genomic selection. Additional benefits include improved pathogen resistance and enhanced export potential given the product identification and traceability tools. Over the next three to five years, KCS expects the combined improvements will result in significantly increased sales per year and additional rural stimulation in the form of increased employment opportunities to handle the additional biomass.

De-Risking offshore oil and gas exploration

Nova Scotia’s Play Fairway Analysis (PFA) (geoscience mapping of certain areas of the Offshore) completed in 2011 resulted in more than $2 billion in offshore work commitments. Building on the PFA, the Nova Scotia Department of Energy and Mines is working with Genome Atlantic on a $5.1 million R&D project integrating genomics, geology, geochemistry and lipidomics to produce even higher quality maps of offshore potential. This important new data will de-risk offshore exploration for industry – potentially yielding more and higher exploration bids, greater success rates and potential development worth billions of dollars in expenditures and economic opportunities. The project has demonstrated a correlation between genomics results and petroleum geochemistry data, allowing researchers and companies to zero in on promising locations for potential hydrocarbon deposits. These locations will be further probed.
using autonomous underwater vehicles, remotely operated underwater vehicles, advanced ‘omics’ technologies and machine learning to deliver higher resolutions tools and maps. The project has also contributed to developing a Centre of Excellence in Petroleum Geochemistry at Saint Mary’s University.

**Project partners:** Genome Atlantic, Genome Canada, Genome Alberta, Nova Scotia Department of Energy and Mines, the Offshore Energy Research Association of Nova Scotia, Natural Resources Canada/Geological Survey of Canada, the University of Calgary, Saint Mary’s University, and Mitacs.

A new approach to combating potato wireworm

The P.E.I. Potato Board estimates that damage from wireworm costs the province’s potato industry more than $10 million per year. Because wireworm live in the ground, they can be a challenge to control. Currently, researchers and producers are applying a variety of approaches to controlling these pests, including crop rotation and even changes to tillage practices and harvesting times. Now a Genome Atlantic research project led by a Dalhousie University agriculture researcher is underway, exploring a promising new approach called RNA interference (or RNAi). RNAi is a ‘gene silencing’ tool that could turn off essential functions in the wireworm, causing them to die.

**Project partners:** Genome Atlantic, the P.E.I. Potato Board, Cavendish Farms, the P.E.I. Horticultural Association, and Mitacs (through the Applied Research and Innovation Program of the P.E.I. Department of Agriculture and Fisheries).

Speedier diagnosis and treatment for bipolar disorder

Genetic factors play a big role in determining who is at risk from bipolar disorder and how individuals respond to treatment. Genome Atlantic has embarked on a $975,000 R&D project with a team of psychiatrists at the Nova Scotia Health Authority and Dalhousie University, aimed at accelerating the path to effective diagnosis and treatment of bipolar disorder. The project team is developing new genetic-based clinical tools that could more accurately predict which treatments are most likely to work for certain individuals – thereby leading to speedier and more effective interventions.

**Project partners:** Genome Atlantic, Genome Canada (Regional Priorities Partnership Program), Research Nova Scotia, Nova Scotia Health Authority, Dalhousie University Department of Psychiatry, and Dalhousie Medical Research Foundation.
Developing better feed for healthier salmon

The health of farmed Atlantic salmon in Canada is threatened by infectious diseases including those caused by pathogenic viruses and bacteria. One of the best ways to protect fish is through therapeutic feeds that shield them against disease while improving their growth rate and reducing the need for antibiotics. Genome Atlantic, working with Cargill Aqua Nutrition and researchers at Memorial University and the University of Prince Edward Island, has embarked on a $4.5 million project to develop therapeutic diets that decrease disease and mortality in farmed Atlantic salmon.

Project partners: Genome Atlantic, Genome Canada, Cargill Aqua Nutrition, Memorial University, University of Prince Edward Island, and Mitacs.

Digging for answers on pipeline corrosion

Corrosion-causing bacteria account for approximately 20 percent of corrosion failures in oil and gas pipelines, and billions of dollars of damage each year. Yet, relatively little is known about how this phenomenon, known as Microbiologically Influenced Corrosion (MIC), occurs. In 2016, Genome Atlantic helped spearhead a four-year $7.8 million collaborative R&D project aimed at filling in some of our knowledge gaps about MIC. The project uses genomics to better predict how, where and why MIC occurs and how to mitigate it. Ultimately, a better understanding of MIC could improve infrastructure integrity, reduce the likelihood of oil spills, and improve worker safety.

Project partners include: Genome Atlantic, Genome Canada, Genome Alberta, Husky Energy, Suncor Energy, LuminUltra, Petroleum Research Newfoundland and Labrador, Research and Development Corporation of Newfoundland and Labrador, Memorial University, University of Calgary, University of Alberta, Dalhousie University, and Mitacs.
Bacteria are becoming increasingly resistant to antibiotics, posing an enormous risk to the agri-food industry and the health of Canadians. To better understand antimicrobial resistance (AMR), we need to understand which genes contribute to resistance and how they spread. A $1.4 million research project led by Genome Atlantic and supported by Genome Canada and Genome BC is working to develop new genomic surveillance tools that will not only identify these problem genes but also track their movements, providing a more dynamic snapshot of AMR transmission. The integrated software modules developed for tracking AMR will be open-sourced and freely available.

Project partners: Genome Atlantic, Genome Canada, the Public Health Agency of Canada, Research Nova Scotia, Simon Fraser University, McMaster University, and Compute Canada.

Improving cannabis quality and productivity

Genomics is critical to many high-value components of the cannabis value chain. Genome Atlantic, in partnership with the University of Moncton and Organigram, has embarked on a $1.2 million project to increase the quality of cannabis products by using genetic mapping to identify specific traits. The project aims to improve productivity and cut costs by introducing beneficial microbial inoculants, develop strains with improved traits, conduct genetic research to identify specific markers which will allow certain strains to be protected if necessary, and determine the impact of various growing practices on improving key cannabis attributes such as THC/CBD and terpene levels.

Project partners: Genome Atlantic, Genome Canada, Organigram, ACOA, New Brunswick Innovation Foundation, and the University of Moncton.

Developing supertools to combat superbugs

Rising water temperatures of even a few degrees can increase the incidence of disease and mortality in farmed salmon. Thanks to a $4.4 million project enabled by Genome Atlantic, the east coast salmon aquaculture industry may soon have new genomic tools to adapt production to rising ocean temperatures and to select more disease-resistant broodstock. Launched in 2017, the project is already yielding significant findings including a better understanding of how salmon physiology is affected by rising water temperatures and the identification of several key immune and stress-related genes that make the fish more susceptible to these changes.

Project partners: Genome Atlantic, Genome Canada, Memorial University, University of Guelph, University of Waterloo, Huntsman Marine Science Centre, Somru BioScience, and the Centre for Aquaculture Technologies Canada.
2018-19 Highlights

• The Government of Canada through Genome Canada announced a $1.4 million Genome Atlantic-led research project to develop new surveillance tools to help identify and track antimicrobial resistance (AMR) genes.

• Genome Canada, Genome Atlantic, ACOA, University of Moncton, Organigram, and New Brunswick Innovation Foundation announced a $1.2 million project to advance cannabis research and increase productivity. Genome Atlantic, in partnership with Opportunities New Brunswick and BioNB, also hosted a panel discussion in Fredericton focused on opportunities and the role of genomics along the cannabis value chain.

• Genome Atlantic, Research Nova Scotia, Nova Scotia Health Authority, Dalhousie University Department of Psychiatry, Dalhousie Medical Research Foundation, and Genome Canada hosted a public panel discussion on genomics & bipolar disorder and announced a $975,000 research project to explore the genetic determinants of bipolar disorder and response to treatment.

• A Memorial University medical research team was awarded a Governor General’s Innovation Award for their ground-breaking genetic heart research supported by Genome Atlantic and Genome Canada.

• Genome Atlantic was invited to be a partner in the Nova Scotia Department of Energy’s announcement of a four-year, $11.8-million commitment to phase two of its Offshore Growth Strategy. At the announcement, the Minister launched Genome Atlantic’s “Reducing the Risk”, video documentary about combining genomics and traditional geochemistry to de-risk offshore oil exploration.

• Invest NS announced an investment of $325,000 in Genome Atlantic to help drive growth in key sectors like aquaculture and fisheries, agri-foods, forestry, oil and gas, and sustainable energy.

• The National Apple Breeding Consortium was launched, bringing together Canadian researchers, breeders and marketers with an aim to streamline apple development and boost returns to the industry. Genome Atlantic was a founding partner of the Consortium.

• An opinion piece by Genome Atlantic President & CEO Steve Armstrong, Atlantic Companies Investing in Genomics: Riding the Wave of Innovation, was published in Atlantic regional newspapers.
Our People

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St. Catherines, PE

Steve Armstrong
President & CEO
Genome Atlantic
Halifax, NS

Dave Finn
Chief Operating Officer
Petroleum Research Newfoundland & Labrador
St. John’s, NL

Patricia Hearn
Deputy Minister
Intergovernmental Affairs
Government of Newfoundland and Labrador
St. John’s, NL

Ron Keefe
Counsel, Stewart McKelvey
Managing Partner, Island Capital Partners
Charlottetown, PE

Marc LePage (Observer)
President & CEO
Genome Canada
Ottawa, ON

Surita Maddox (Observer)
Atlantic Regional Executive Director of Innovation, Science and Economic Development (ISED)
Halifax, NS

Mark Ploughman
Consultant
St. John’s, NL

Ian Thompson
Executive in Residence
Cox & Palmer
Halifax, NS

Beth Webster
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Populus Global Solutions
Fredericton, NB

Steve Armstrong
President & CEO

Nil d’Entremont
Chief Financial Officer

Charmaine Gaudet
Director, External Relations

Andy Stone
Director, Business Development

MANAGEMENT

Financial Statements available on our website.
Documents available in French upon request.
Helping Atlantic Canada grow and thrive through genomics.

Connect with us.

#47- 1344 Summer Street
Halifax, NS B3H 0A8

Phone: 902-421-5683 / 902-442-4656
Web: genomeatlantic.ca