LIVING SUSTAINABLY. INNOVATING TOGETHER.

Unlocking Ontario's Bio-Potential

Ontario Genomics Strategic Vision & Framework 2021-2026

Ontario Genomics

Contents

We Thank Our Funders

Ontario Genomics' Strategic Vision and Framework was developed with contributions from our Board of Directors, various stakeholders, and Shift Health. We thank you all for your contributions.

ONTARIO GENOMICS is a not-for-profit organization incorporated in the province of Ontario. Ontario Genomics receives funding from the Ontario government, Genome Canada and other public and private partners for strategic initiatives.

Established in 2000, our **mission** is to lead the application of genomics-based solutions across key sectors of the economy to drive economic growth, improved quality of life and global leadership for Ontario.

Our **vision** is to enable healthy people, a healthy economy and a healthy planet through genomics innovations.

We work with researchers, small and large companies, not-for-profits and governments to create public-private and public-public partnerships that unlock made-in-Ontario, cutting-edge solutions and technologies for the world.

Ontario Genomics has an impressive track record of achieving results by catalyzing and supporting applied research, developing talent, and by funding the creation and growth of start-ups to commercialize Intellectual Property (IP).

Our team delivers deep technical and business expertise and has invested over 20 years in building strong, multi-sectoral networks across the province, nationally and internationally. Together we work to promote excellence, invest, and reduce barriers so Ontario's visionaries can drive and accelerate economic and social advancement through world-leading innovation.

Since 2000

$2.7B+
Funds Raised & Return on Innovation

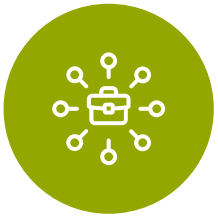
$367M+
Active Portfolio (2020-2021)

230+
Projects

500+
Partnerships

Since 2013

$1.8B+
GDP Growth Supported



20,000+
Jobs Created

WE EMBRACE inclusion, diversity, equity, and accessibility (IDEA) principles and we strive to incorporate these into our strategic actions. As part of our commitment to IDEA, Ontario Genomics has taken the following steps:

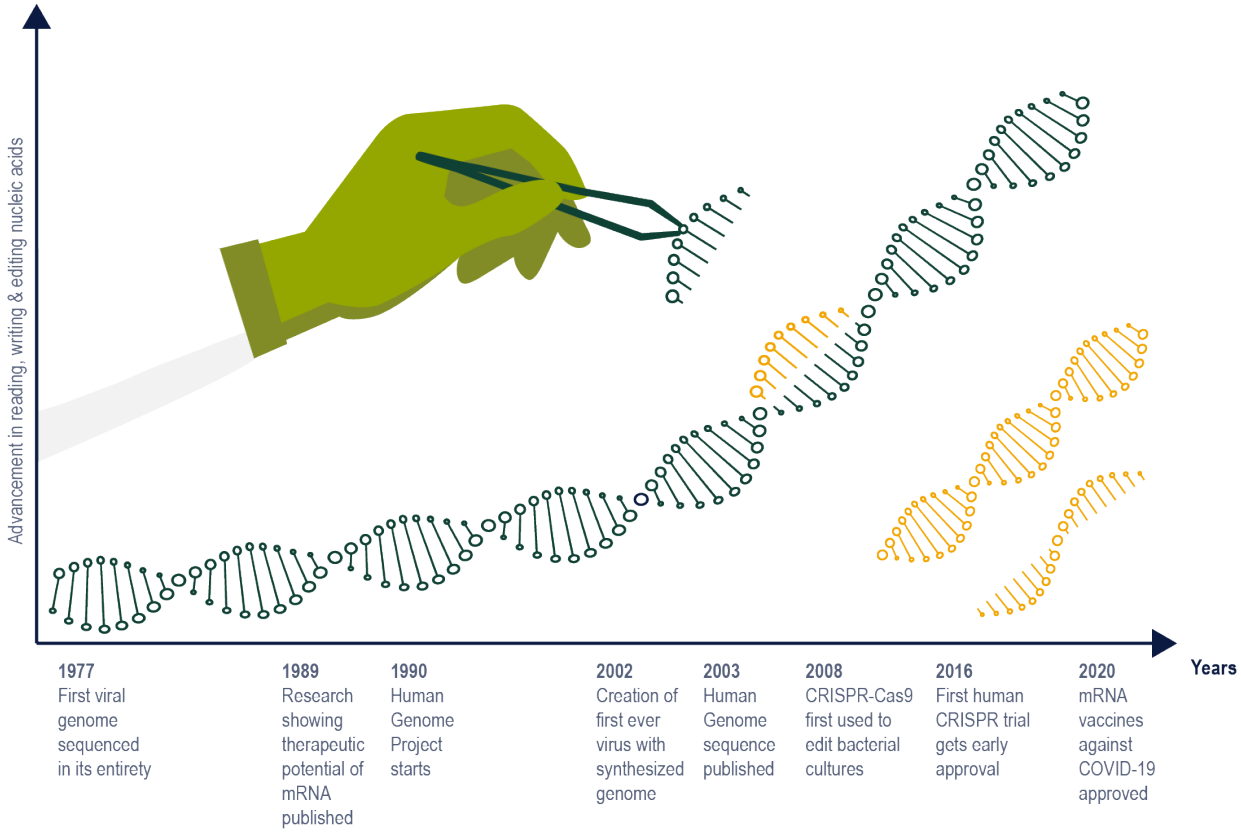
- Put in place an internal IDEA Committee composed of staff and leadership representatives and tasked to leverage internal and external resources to increase competencies and develop a short-, medium- and long-term Action Plan for a more diverse, equitable, and inclusive environment within our organization and our community.
- Signed on to the Government of Canada's 50-30 Challenge thereby committing to increasing representation of women at the Senior Management and Board of Directors level (aiming towards gender parity ["50%"]) and working towards significant representation ("30%") of other under-represented groups: racialized persons including Black Canadians, persons living with disabilities (including invisible and episodic disabilities), Canadians who identify as LGBTQ2+, and Indigenous peoples.

OUR STRATEGIC VISION INCORPORATES STUDIED GLOBAL SCIENTIFIC AND TECHNOLOGICAL TRENDS ALONG WITH ENGAGEMENT OF OVER 200 STAKEHOLDERS TO DETERMINE GAPS AND OPPORTUNITIES FOR ONTARIO GENOMICS' FORWARD-LOOKING IMPACT.

GENOMICS is the science of understanding, interpreting, and harnessing the DNA code in all living things to create real-world solutions. The pandemic identified genomics and data sciences as among the world's most needed scientific capabilities enabling the rapid development of COVID-19 diagnostics, sequencing and variant identification as well as vaccine and therapeutics development. The evolution of genomics technologies enabled the fastest development of vaccines in history.

- Within days, the SARS-CoV-2 viral genome could be **'read'**
- Within 2 days of its publication, Moderna's **mRNA vaccine** design was ready for '**writing**'
- 1 month later, **vaccine manufactured** and shipped for Phase I clinical trial

None of this would have been possible without the incredible advances in **genomics over the last 50 years.**



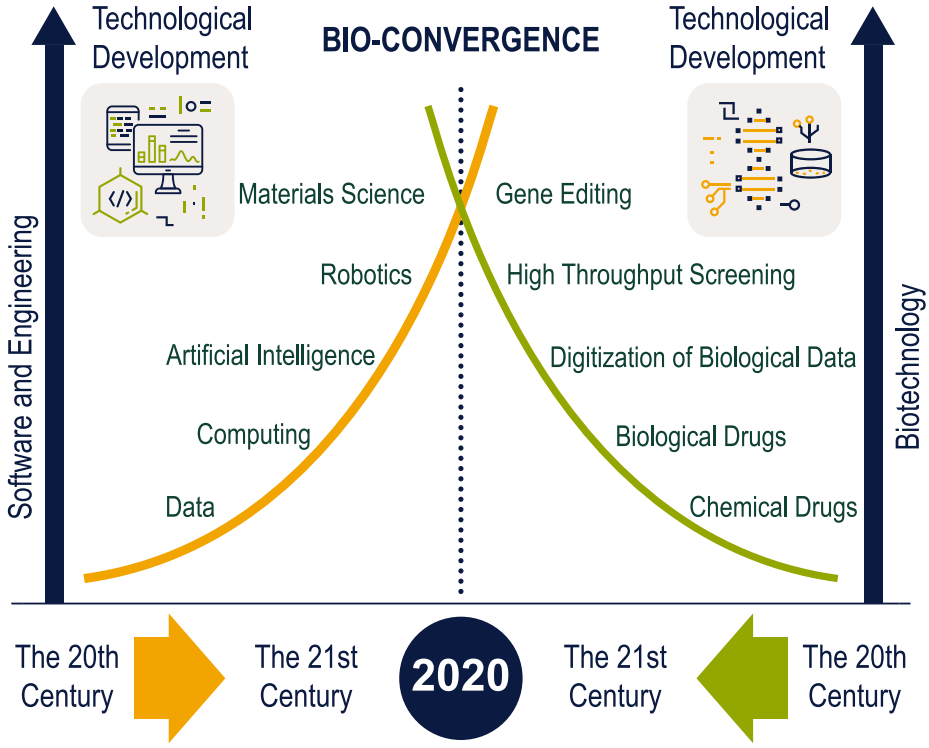
The pandemic has also intensified our challenges with food and materials supplies and has aggravated pressures on traditional industries. As Ontario looks towards post-pandemic economic recovery, it must do so through a lens of opportunity. Now, more than ever before, we need scientific breakthroughs that are translatable into immediate actions to make paradigm changes to peoples' lives.

SYNTHETIC or ENGINEERING BIOLOGY:

A branch of genomics that involves redesigning biological systems or organisms for useful purposes by engineering them to have new or stronger abilities. Engineering biology researchers and companies around the world are harnessing the power of nature to solve problems in medicine, manufacturing and agriculture. Examples include the harnessing of microorganisms for bioremediation, engineering yeast to produce green apple fragrance or whey protein or modifying rice to express beta-carotene to protect against Vitamin A deficiency. Ontario Genomics has identified engineering biology as a critical driver of Ontario's future economy and well-being, and actively promotes opportunities to forge a domestic synthetic biology Research & Development hub.

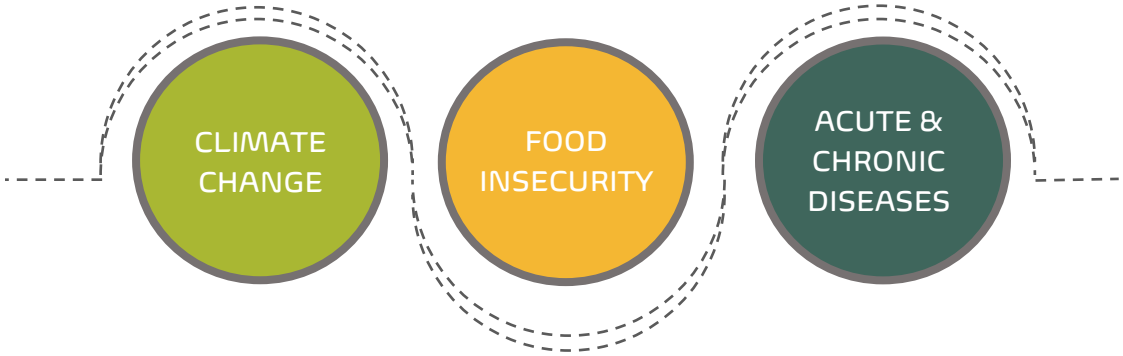
THROUGH THE GLOBAL BIO-REVOLUTION,

a genomics- and engineering biology enabled future, promises to transform our lives, the economy and the planet. The advent of groundbreaking and more affordable genome sequencing, bioengineering and gene editing technologies and the continued convergence of the life and data sciences have driven the broader application of genomics and engineering biology and the coming of age of a bio-revolution.



According to the McKinsey Global Institute, the bio-revolution can enable up to 60% of the world's physical goods to be produced biologically, generating $2 – 4 trillion annually by 2030 – 2040. These technologies fuel a new wave of innovative industries across human health, food security, and low carbon manufacturing. By adapting and developing its engineering biology research and biomanufacturing sector, Ontario can be a critical manufacturer of sustainable products using biotechnology and maintain and increase our global competitiveness.

WE ENGAGED NEARLY 200 STAKEHOLDERS from across Ontario, Canada and the world. Through this, Ontario Genomics identified three of **humanity's greatest challenges** as the primary drivers for our Strategic Vision:



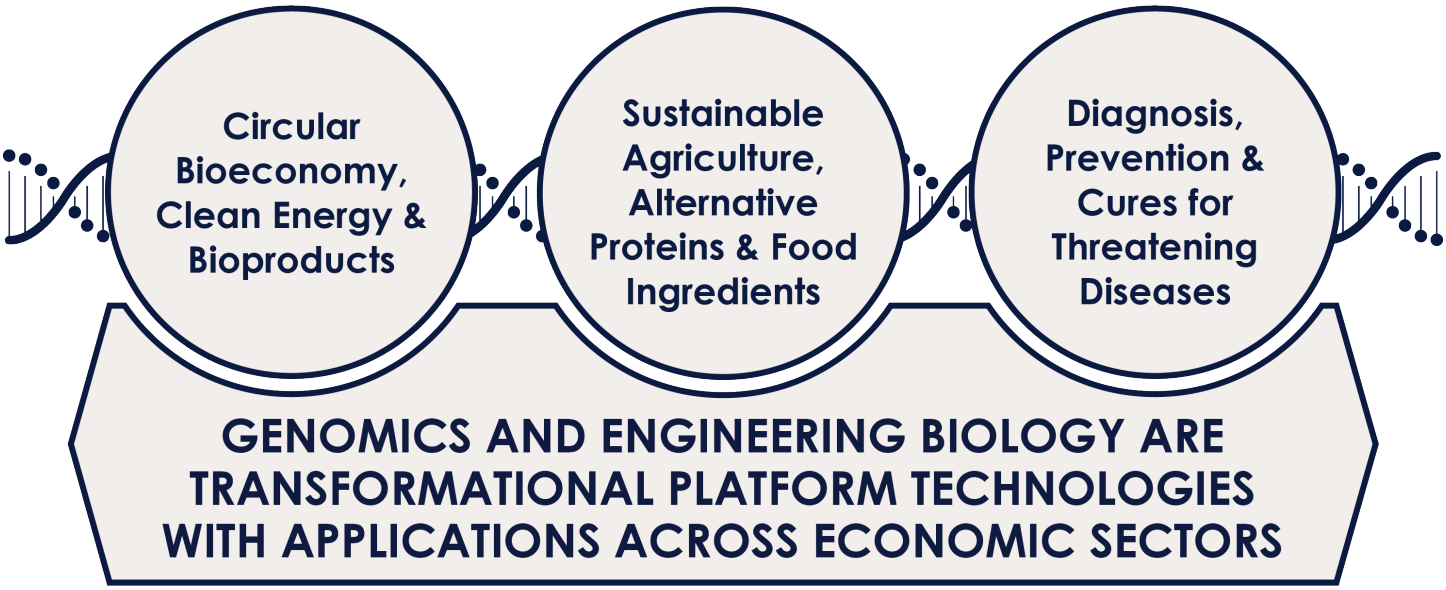
THE HEALTH AND WELL-BEING of Ontario's economy and people will be increasingly impacted by these growing challenges.

As the planet continues to warm at alarming rates, plastics waste is further intensifying the problem. Although Canada and other countries are seeking to transition away from plastics and petrochemicals, Canadians continue to throw away over three million tonnes of plastic waste each year. Only 9% of plastics are currently recycled. Ontario's industries need to innovate with new technologies to degrade plastics, create bioplastics and stay competitive globally.

The Ontario Agri-Food sector contributes over $47.3 billion/ year to our economy. Genomics-based innovations and technologies are improving breeding of crops and livestock and provide new approaches to securing sustainable food supplies. New innovations are necessary to contribute to food security and the resiliency of our food supply chains.

Health represents the single greatest expense for the Ontario government and costs continue to grow. High treatment costs for leading causes of death, cancer and heart diseases, are prohibitive for broad access. Pandemics are threatening our lives and livelihoods.

GENOMICS AND ENGINEERING BIOLOGY enable the global technology disruption necessary to address these challenges for a healthier future for all.



Growing a Sustainable Bio-Manufacturing

- Biodegradable plastics from food waste
- Biomonitoring tools for environmental assessment
- Pollution-fighting microbes
- Fermentation to produce fabrics (ex. spider silk)

Enhancing Food Security for a Growing Global Population

- Alternative proteins
- 'Smart' farming with customized microclimates and soil microbiomes
- Marker assisted breeding
- Climate change resistant crops

Decreasing Disease Burden

- Genomic testing as a routine healthcare decision tool
- Cell, gene, RNA and microbiome therapies
- More effective and efficient drug development and delivery
- Genomic surveillance for pandemic preparedness

TO CAPITALIZE on these transformational platform technologies, Ontario Genomics' broader stakeholder community identified four barriers that Ontario needs to address to thrive and contribute to the bioeconomy.

WHAT WE HEARD

LACK OF COORDINATION: Ontario's broader research ecosystem is characterized by inadequately connected infrastructure (e.g., data), suboptimal coordination of research initiatives, and lack of communication between stakeholders.

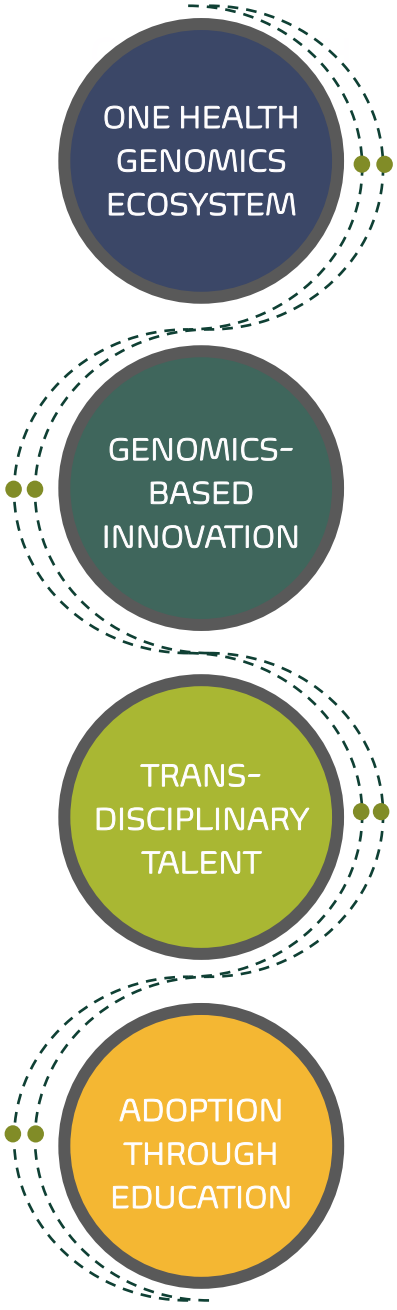
DIFFICULTY COMMERCIALIZING: The province's relatively poor access to commercialization infrastructure such as laboratory space, and funding, for example from VCs, institutional investors, or large business, continue to hinder the translation of its excellent research into market-ready innovations.

LIMITED TRANS-DISCIPLINARY EXPERTISE: Contributing to Ontario's commercialization challenges is a lack of cross-disciplinary and cross-sectoral experience as well as a lack in the combined expertise in science and business required to build and scale-up genomics-based companies.

SUBOPTIMNAL ADOPTION ENVIRONMENT: The broader base of stakeholders that will benefit from the rapidly advancing innovations in the field are not sufficiently versed in relevant topics to understand and prepare for the adoption of genomics-based technologies.

OVER THE NEXT FIVE YEARS, Ontario Genomics will leverage its unique position to help Ontario fully capitalize on the health, economic and environmental benefits in a genomics- and engineering biology-enabled world and catapult the province to national and international leadership in the global bio-revolution.

We believe that agility, efficiency, multi-disciplinary and cross-sectoral thinking, and deep genomics and engineering biology expertise are at the heart of a thriving biotechnology ecosystem. By breaking down siloes, driving policy modernization, and meeting market demands our Strategic Vision aspires to nurture Ontario's competitive and innovative advantage for generations to come.



Building a world-class, mission-driven **one health genomics and engineering biology innovation ecosystem** in Ontario to accelerate the collective achievement of beneficial outcomes.

Driving applied research, development, and commercialization of **made-in-Ontario genomics- and engineering biology-based innovations** to create new jobs, companies, and business outcomes.

Developing **talent for trans-disciplinary jobs** that integrates diverse and multidisciplinary scientific expertise with market-focused business acumen.

Engaging with key communities to **drive adoption** of genomics-based solutions and empowering people with an understanding of the positive impact of genomics and engineering biology in their everyday lives.

ONE HEALTH GENOMICS ECOSYSTEM

A comprehensive mission-driven genomics and engineering biology innovation ecosystem builds capacity across the environment, food and peoples' health to build resiliency during times of crisis and positions Ontario as a leader in a genomics-driven bioeconomy.

OUR IMPACT

- Secure funding for a state-of-the-art waste upcycling consortium
- Develop Ontario's leadership in the cellular agriculture economy
- Support better healthcare for Ontarians through integrated genomics strategy
- Access to scale up facilities for biomanufacturing and circular economy

ENVIRONMENT

The world is transitioning away from plastics and petrochemicals through a circular economy approach. Ontario's chemical and plastics industries need to innovate with new technologies like bioplastics to stay competitive and relevant.

FOOD

The Ontario Agri-Food sector contributes over $47.3 billion/ year to our economy. Genomics-based innovations and technologies are improving breeding of crops and livestock, and food processing. New innovations are necessary to contribute to food security and the resiliency of our supply chains.

HEALTH

Health represents the single greatest expense for the Ontario government and costs continue to grow. High treatment costs for leading causes of death, cancer and heart diseases, are prohibitive for broad access. Pandemics are threatening our lives and livelihoods.

STRATEGIES

1. Build and brand a Waste Upcycling Consortium
2. Explore consortium commercialization opportunities
3. Secure access to scale up facilities to support circular bioeconomy and additional sectors

1. Publish a report on the opportunities and economics of cellular agriculture in Ontario and Canada.
2. Build on our existing leadership to raise funds and engage new strategic partners to support a modern engineering biology-based agriculture and food ecosystem.

1. Develop state-of-the-art, real-time pandemic preparedness capacity, including biobank and shared data resources
2. Develop an integrated genomics strategy for better health
3. Catalyze and support bio-manufacturing of advanced therapeutic modalities in Ontario

GENOMICS-BASED INNOVATION

Driving applied research, development and commercialization of made-in-Ontario genomics and engineering biology-based innovations with our partners, including Genome Canada and the Ontario government, to create new jobs, companies and business outcomes.

OUR IMPACT

- Generate millions of dollars for large-scale public-private partnerships
- Improve Ontario's IP position through funding of applied research that result in filing of IP
- Support investment-readiness of high-potential genomics start-up companies

STRATEGIES

1. Advancing market-focused public-private research partnerships through expert advice, network partners, and hands-on project management;
2. Identifying and investing in promising Ontario-born genomics and engineering biology-driven technologies, IP and companies at an early stage; and
3. Providing technical & business advice and access to investors, accelerators and receptors of innovation to drive the growth of Ontario genomics and engineering biology ventures.

Trans-disciplinary Talent

Developing talent for trans-disciplinary jobs in a genomics and engineering biology-enabled world that integrates diverse scientific expertise with market-focused business acumen.

OUR IMPACT

- Create, retain and maintain thousands of jobs
- Enable hundreds college and university trainees with skills to drive the bioeconomy, including trans-disciplinary entrepreneurial thinking
- Develop genomics modules for elementary, high schools and colleges

STRATEGIES

1. Support trainees at universities, colleges and research institutions through experiential learning to secure job-ready genomics sector professionals;
2. Develop novel program modalities that enable diverse, trans-disciplinary entrepreneurial thinkers through partnerships and support teachers to adopt genomics into their curricula
3. Determine opportunity for integration and development of new resources developed by partners (e.g., Canadian Genomics Enterprise, AgScape etc.)

Adoption Through Education

Education and outreach to drive adoption of genomics and engineering biology-based solutions in Ontario and Canada and empowering people with an understanding of the positive impact of genomics in their everyday lives.

OUR IMPACT

- Heighten brand recognition
- Build community through webinars and conferences
- Create mentorship network for Women in genomics and engineering biology
- Host industry roundtables and workshops
- Facilitate public engagement and education

STRATEGIES

1. Increase brand awareness and concept of genomics and engineering biology as a platform technology operating across sectors;
2. Engage key groups and identify champions, across government, industry, academia and the general public
3. Promote Ontario's genomics and engineering biology assets to potential partners and investors, at home and abroad, to encourage partnerships and investment
4. Engaging communities/stakeholders to create a favourable environment for the development and adoption of emerging genomics-based technologies.