Genome Canada Leaders' Roundtable Series on the Future of Genomics in Canada

Pre-event briefing note for Roundtable 3

How do we support innovative genomics in Canada? Delivering our Future.

A VIRTUAL MEETING ON OCT. 21, 2021, AT 1:00-4:00 PM EDT

INTRODUCTION

For 20 years, Genome Canada has invested in building Canada's genomics capacity across sectors through applied research and innovation partnerships. As we look to the next 20 years, Genome Canada is convening a series of three virtual roundtables with Canada's genomics research community, global experts and key partners in the national genomics ecosystem. These roundtables are designed to help identify future opportunities and challenges for Canadian genomics, and to inform Genome Canada's strategic direction and a new mission-driven approach to delivering greater impact.

The third and final of these three roundtables will focus on foundational ecosystem elements required to deliver on potential impacts for Canada and globally. This includes ensuring we have the capacity, talent and data systems in place to support a highly impactful genomics ecosystem that can leverage unique multi- and interdisciplinary genomics across areas of research and innovation. The **first roundtable** explored success factors in national research and innovation strategies and lessons for the Canadian genomics ecosystem, while **the second** examined where Canada's genomics strengths and areas of future focus should be. The roundtables form part of a **wider dialogue** on the future of genomics in Canada, and will be followed by a public townhall hosted by Genome Canada on November 30, and for which **registration is ongoing**.

CONTEXT

We are in the early days of a **Bio Revolution**, where advanced biosciences and biotechnology will fundamentally transform our lives. Driven by the confluence of genomics, big data, artificial intelligence (AI), gene editing and synthetic biology, we have an unparalleled opportunity to deliver homegrown biological solutions to complex problems, drive economic growth and position Canada for global market leadership in key areas of strength and—most fundamentally—protect and improve Canadians' lives.

To harness this transformative potential, Genome Canada is moving to a mission-driven approach to address major challenges where genomics can make a real difference and ensure that promising concepts can be taken through the research and innovation ecosystem to deliver equitable impacts that benefit communities across the country. This was recognized in Budget 2021, where Genome Canada's mission-driven programming was highlighted in initiating the development of a new **$400 million Pan-Canadian Genomics**

Strategy (PCGS). Delivering on this transformation will require a clear understanding of the foundational elements that can support Canada's genomics ecosystem to deliver on its promise—leveraging its strengths, opportunities and competitive advantage.

FRAMING

This roundtable provides an opportunity for Canada's genomics stakeholders—with a particular emphasis on hearing from the users of genomics in industry, communities and the public sector—to bring their expertise and insight to framing a key question. **"What would we need to have in place in Canada to support delivering genomics impacts, and how could we go about delivering those supports?"** In addition, it will foster discussion on the intersections across genomics and related research and innovation sectors that should form part of the future of supporting genomics.

While cutting edge discoveries in genomics science can open up new opportunities for future impacts on society, it is clear that this future can't be achieved through knowledge creation alone. We will need to ensure that Canada has the right mix of supports in place to create new genomics knowledge, organize that knowledge, drive it to innovation, and connect it to the needs of society. This means that to deliver an impactful future for genomics, we need to consider how to provide a portfolio of supports that range from data to talent to capacity for genomics research and innovation, and to understand the needs of genomics users.

The OECD has been a strong advocate of linking research activity to necessary research **capacity/infrastructure**. It has issued multiple publications on how to **optimize national research infrastructure** (including strategic management of infrastructure portfolios) and how to link research infrastructure to **broader impact** (such as developing frameworks that allow for long-term tracking of infrastructure impacts). **Data** considerations for the future of genomics bring **multiple issues** into frame; these include understanding privacy considerations, volumes of data collated, and data ownership, sovereignty and justice. Ensuring that **talent** is in place to deliver on genomics promise requires understanding and addressing the opportunities and barriers through the pipeline from early research to innovation to implementing findings. This was highlighted recently in Genome Canada's **CanCOGeN** mission, where it became clear that there was a specific need to develop and expand the pool of trained personnel capable of sequencing viral genomes in the public health system, as well as build analytical capacity to use genomic information in those delivering public health responses to COVID-19. In addition to developing the talent pipeline, genomics has a responsibility to broaden and diversify its talent pool to redress historic inequities both within Canada (with **equity-seeking groups** and **Indigenous communities** specifically) and to support genomics capacity and technology **uptake in developing countries**.

In this third roundtable, we will discuss the optimal mix of supports to allow the genomics ecosystem to realize the impacts of Canada's future genomics research and innovation. This will include reflecting on user needs and the required supports in data, talent and capacity to maximize our genomics impacts. It will also include how we support genomics research and innovation in Canada with the most appropriate structures, systems and human resources to ensure all parts of Canadian society have equity in access and benefits.

To frame the discussion, and set out an industry perspective on genomics ecosystem supports needed to get genomics out of the lab and drive to impact, the roundtable will

feature a keynote from **Dr. Brendan Frey**, Founder and CEO of **Deep Genomics**. Dr. Frey is an internationally recognized scientist, engineer and entrepreneur, whose work with Geoffrey Hinton on the 'wake-sleep algorithm' helped to launch the field of deep learning. He was a pioneer in developing AI systems that could accurately predict cell and genome biology, facilitating biomedical breakthroughs. This work led to the discovery of new biology, the founding of Deep Genomics in 2015, the first AI system for predicting pathogenic mutations and identifying therapeutic targets, and the development of new therapeutic candidates for patients with genetic disorders.

Deep Genomics builds proprietary AI and uses it to discover new ways to correct the effects of genetic mutations and develop personalized therapies for individuals with rare Mendelian and complex disease. The company has a **broad pipeline** of therapeutic areas in which it enables the discovery of novel therapeutics, ranging from central nervous system to metabolic conditions. It recently raised **$180 million in Series C funding** to expand its work through building capacity, enriching talent and expanding its data and AI capacity.

QUESTIONS

The roundtable sessions seek to produce generative insights that will help shape Genome Canada's mission-based strategy and inform broader thinking including the Pan-Canadian Genomics Strategy. To deliver on this goal, roundtable participants are asked to consider the following questions:

- What are the ecosystem foundational elements Canada should consider as vital supports for delivering future genomics impacts in Canada and internationally? Where are the unique opportunities for supporting cross-sectoral (both public-private and multi-sector) benefits from genomics research and innovation?
- Within broad areas of data, talent and capacity, how do we need to manage our portfolio of supports in order to strengthen Canada's competitive genomics advantage?
- How can we ensure supports for Canada's future genomics research and innovation address diverse needs across society, and drive to health, social and economic benefit?

KEY DOCUMENTS

For those interested in further information on the topics identified above, the following provide useful primers to the subject area.

- Bonham, V. & Green, E., 2021, **The genomics workforce must become more diverse: a strategic imperative**, *The American Journal of Human Genetics*, **108**, 3–7.
- Claw, K.G., Anderson, M.Z., Begay, R.L. et al., 2018, **A framework for enhancing ethical genomic research with Indigenous communities**. *Nat Commun* **9**, 2957.
- Hetu, M., Koutouki, K., & Joly, Y., 2019, **Genomics for All: International Open Science Genomics Projects and Capacity Building in the Developing World**. *Frontiers in genetics*, **10**, 95.
- Navarro, F.C.P., Mohsen, H., Yan, C. et al., 2019, **Genomics and data science: an application within an umbrella**, *Genome Biol* **20**, 109
- OECD, 2020, ***Optimizing the Operation and Use of National Research Infrastructures***, OECD Science, Technology and Industry Papers, No. 91