



New horizon for Canadian research: McGill University and EU collaboration

With Canada's inclusion in the EU's Horizon Europe Programme, McGill University discusses their work and what the future of research looks like with this new tie between the EU and Canada

IN 2024, Horizon Europe is officially extending its funding to Canadian researchers. As the biggest funding for scientific research and engineering in the world, this will be a boost for many Canadian institutes and facilities. We asked one such institute, McGill University, some questions about what this will mean moving forward.

In what ways does research at McGill University adopt an international focus? How has this affected your global rankings?

World-leading universities like McGill must engage globally to attract researchers from across the world to support synergies in research, and to accelerate innovation. That is why international partnerships are an integral part of McGill's DNA.

For example, among the international partnerships forged by McGill is the Helmholtz International BigBrain Analytics and Learning Laboratory (HIBALL), which unites McGill with the Helmholtz Forschungszentrum

Jülich as one of nine prestigious Helmholtz International Labs. Funded jointly by the Helmholtz Association and by Healthy Brains, Healthy Lives (HBHL) (a marquee, McGill-led research initiative funded by Canada's most prestigious research grant program, the Canada First Research Excellence Fund – CFREF) HIBALL explores big data applications, notably AI, in neuroscience. HIBALL is, therefore, combining brain data to build an ultra-high-resolution atlas of the brain's anatomy; in other words, its 'wiring' and its functional organisation.

In terms of the impact of such a partnership on McGill's standings in global academic rankings, I would argue that in recent years, organisations that produce these academic rankings, such as Quacquarelli Symonds (QS), have tuned in to the importance of international research partnerships.

For example, in 2023, QS introduced three new metrics: sustainability, employment outcomes, and international research network – and McGill ranked among the top 30



global universities. McGill was also ranked 13th in the world in the QS Sustainability Index, which considers our environmental and social impact, including the impact of the research aligned to specific UN Sustainable Development Goals. McGill performed well in the Environmental Impact Indicator (eighth in the world), the Environmental Education Indicator (third in the world), and the Impact of Education Indicator (11th in the world).

In Canada, McGill has consistently come out on top, rated as Canada's best medical doctoral university by Maclean's Magazine for nineteen years running. The strength of the university's reputation for excellence is therefore recognised at home and abroad.

Can you share some of the success stories that have resulted from McGill University's international collaborations in science and innovation?

The city of Montreal has been McGill's home for over 200 years, and is a burgeoning Artificial Intelligence (AI) hub which has attracted major investments from government

and business for the past several years. There are an estimated 27,000 workers in AI-related technologies and over 14,000 post-secondary students enrolled in AI-related study programmes. McGill researchers and students are key players in this AI ecosystem.

Recently, a consortium of research organisations has formed a new International Research Laboratory (IRL) focused on AI in Montreal, comprised of McGill University, Quebec's École de technologie supérieure (ÉTS), Mila – Quebec's AI Institute, France's Centre Nationale de la Recherche Scientifique (CNRS), Université Paris-Saclay, and the École CentraleSupélec.

The ILLS is focused on five main themes of research: Fundamental aspects of Artificial Intelligence, sequential (real-time) Machine Learning (ML), robust autonomous systems, natural language and speech processing, and applications to computer vision, signals, and information processing. In addition, the new centre emphasises interdisciplinary collaborations with an aim to develop new methodologies and integrate these techniques into learning systems.

I think it is important to underline that such international collaborations do not materialise out of thin air. It takes commitment and sustained engagement on the part of the researchers, as well as the tangible support of their academic institutions, to get these collaborations off the ground. While it may seem trivial, researchers must be willing to work across time zones, and that means taking calls late at night and early in the morning! Beyond that, it takes vision, and the ability to set bold research aspirations.

Another great example of international innovation-in-action is McGill's relationship with industry partner Moderna, which has led to two research projects in the burgeoning field of lipid nanoparticles. McGill was also the first Canadian university to join Moderna's mRNA Access program during its international rollout. The program is accelerating innovation and enabling new vaccines and medicines for emerging and neglected infectious diseases through collaborative research and preclinical development.

Finally, I want to point to an initiative that is in the works, the upcoming Tokyo Symposium & Workshop on Genomic Medicine, which will take place on 8-10 April 2024 in Tokyo. The symposium will bring together academic and industry representatives from Japan, South-East Asia, Europe, and North America to discuss the future of biomedicine, and to promote international collaboration and partnership. Organised in partnership with the RIKEN Center of Integrated Medical Sciences, and McGill's Victor Phillip Dahdaleh Institute of Genomic Medicine, as well as with the newly founded Pasteur Institute-Japan and the UK Biobank, this symposium will be a fantastic opportunity for international collaborations to deepen and take flight.



Students from McGill University's joint PhD in Genomic Medicine with Kyoto University, which is supported by the Japanese Ministry of Education, Culture, Sport, Science and Technology's Top Global University Programme, and the Fonds de Recherche du Québec, will also participate, further enhancing their training in international collaboration.

What are the global challenges the university intends to address through the opportunity presented by the Horizon Europe programme?

The news that Canada is now an associate country participant in Horizon Europe (the EU's and world's largest research and innovation funding programme) was met with great excitement at McGill. We are already working across the themes defined by Pillar 2, which include health and inclusivity, climate, energy, and mobility, as well as advancement in digital technologies, industry development, and space.

As I have discussed, McGill's biomedical and health researchers, including those in global health, are among the world's best. We are also a research hub in Arctic and polar research and a growing force of research excellence in sustainability and climate science.

One of the global challenges our researchers seek to overcome are barriers to electrification. A key player in this mission is the McGill Centre for Innovation in Storage and Conversion of Energy (McISCE). Established in 2021, the McISCE brings together some 50 researchers and more than 150 graduate students to explore solutions related to large-scale energy storage, both for electricity grids and large industrial processes. Roughly a third of the researchers at McISCE are investigating new materials to make anodes and cathodes and to develop solid electrolytes, which would have the advantage of not being flammable. McGill's researchers are also exploring different ways to store and convert energy.

McGill University is also home to the secretariat of the Group on Earth Observations – Biodiversity Observation Network (GEO BON), a global research network, and community of practice dedicated to monitoring Earth's biodiversity. GEO BON's mission is to prevent unsustainable biodiversity loss and to support international and national actions to meet biodiversity targets and Sustainable Development Goals. McGill is proud of this international effort, which is jointly chaired by McGill's Andy Gonzalez and Maria Cecilia Londoño of the Alexander von Humboldt Institute in Bogota.

What is the impact of the Horizon Europe programme for researchers in Canada and the EU? How can they leverage the programme to advance their work?

Canada and the EU are like-minded partners, dating to the 1996 Canada-EU Agreement for Scientific and Technological Cooperation. And while academic institutions have benefitted from the flow of information and expertise across borders, there have been no dedicated funds for large-scale, collaborative research endeavours between the EU and Canada.

Horizon Europe is a game changer in that regard, and McGill has been hard at work educating our research community about how to engage in this opportunity. We seek to build on what we've learned through participation in Horizon 2020. McGill participated in 38 Horizon 2020 projects, making us the top collaborator in Canada, together with the University of Toronto.

I hope that by participating in the Horizon Europe Programme, Canadian research will be on the European map and Canada will begin leading on the international stage, showcasing its national strengths in research, science, and innovation, thus doing even more to address global challenges.

At McGill, I anticipate that our involvement will open new avenues for collaboration, new research initiatives, joint publications, cross-fertilisation between research labs in Canada and Europe, and attract students and researchers from the EU and Canada.

McGill University also has ambitious research goals in the areas of Artificial Intelligence, RNA and Genomics. What impact has the alignment with Horizon Pillar Two had on the University's research in these areas?

McGill is home to some of the world's leading AI experts in ML and reinforcement learning (RL), as well as natural language processing (NLP), including experts such as Canada CIFAR AI chairholder, Professor Joëlle Pineau, who is a core academic member of Mila, Quebec's AI institute, as well as the Vice-President of AI research at Meta. As I mentioned, McGill is a key player in the exciting AI ecosystem in the city of Montreal, and we are involved in all phases of the innovation process, from academic research to early-stage projects, to start-ups,



and companies that commercialise their applications or products.

For the development of novel RNA therapeutics, McGill has long been a world-leading research institution. Our researchers have been uncovering the mechanisms and potential of RNA for over 50 years. And in the social sciences, our researchers are working to ensure that developments in RNA medicine benefit all communities, including the vulnerable and medically underserved.

The University launched the McGill Centre for RNA Sciences (MCRS) in 2022 to pursue these research focuses in tandem. In 2023, McGill was awarded \$165m from the Canada Research Excellence Fund to launch DNA to RNA: An Inclusive Canadian Approach to Genomic-based RNA Therapeutics (D2R), a first-of-its-kind global research effort specialising in the development and delivery of more inclusive genomic-based RNA therapeutics that are relevant to the health needs of medically underserved groups, including Canada's Indigenous communities and the elderly. D2R is bolstered by \$191m from industry, academic, government, community, and non-profit partners on four continents.

McGill University has also recently inaugurated the Victor Phillip Dahdaleh Institute of Genomic Medicine, which is leading breakthrough research aimed at developing novel diagnostic tools, targeted treatments,

and new pharmaceuticals, as well as vaccines, and the data-sharing policy tools and frameworks to implement these innovations. Genomics research is an area of incredible promise, not only in combatting viruses but also in rare diseases, cancer, chronic inflammatory diseases, and infection.

In 2025, McGill will launch its new Strategic Research Plan, at which time we may identify additional opportunities to align our priorities with international partners and the Horizon Europe programme. McGill has demonstrated excellent co-operation in all these research strength areas, and with the prospect of partnerships under the Horizon Europe programme, the future for impactful international collaborations looks very bright indeed.



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