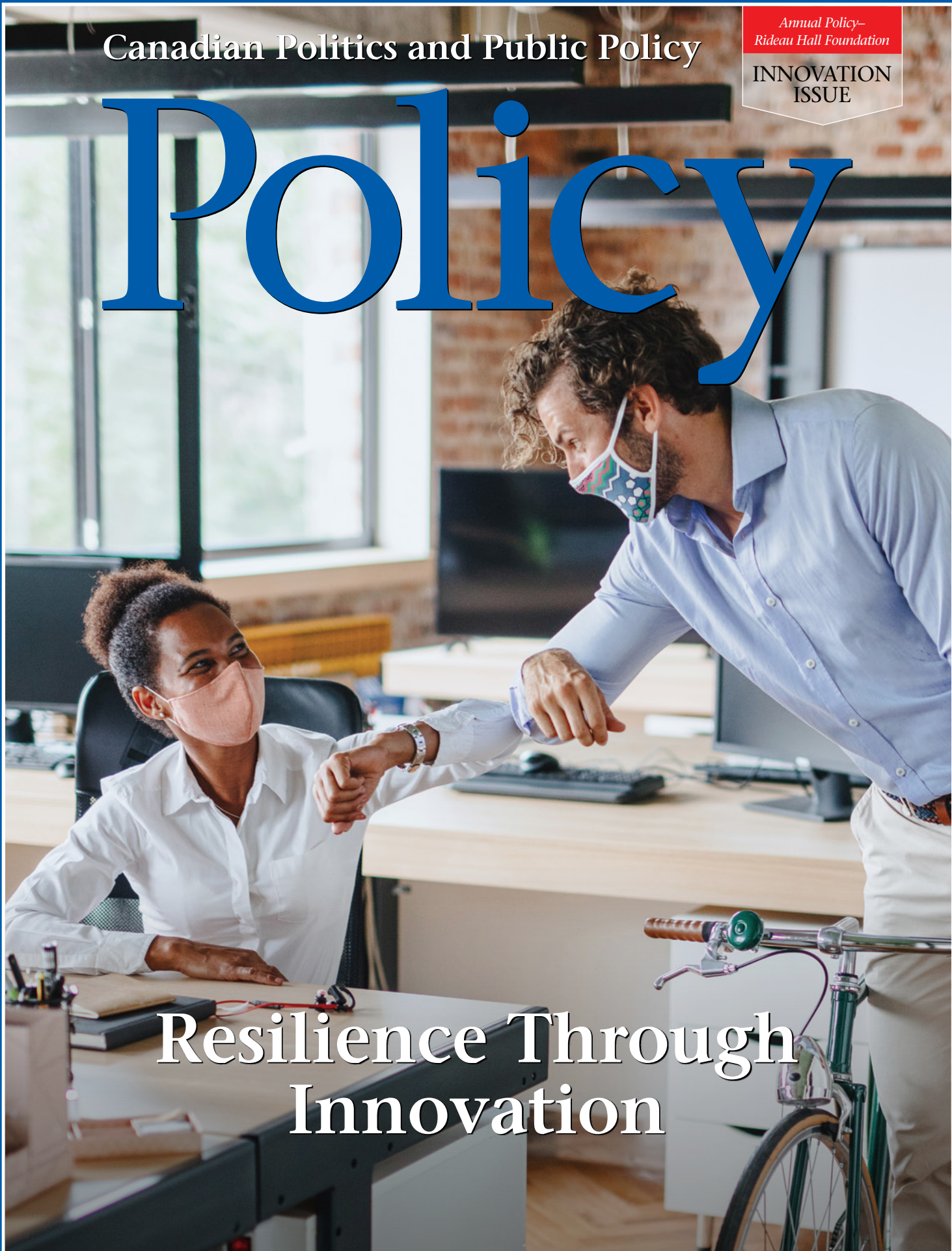


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INNOVATION
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Policy

Canadian Politics and
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Policy

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Price: \$6.95 per issue

Annual Subscription: \$39.95

PRINTED AND DISTRIBUTED BY

St. Joseph Communications,
1165 Kenaston Street,
Ottawa, Ontario, K1A 1A4

Available in Air Canada Maple Leaf Lounges across Canada, as well as VIA Rail Lounges in Montreal, Ottawa and Toronto.

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In This Issue

- 1 **From the Editor / Lisa Van Dusen**
Resilience Through Innovation
- 2 **David Johnston**
Canadians Need to Keep Making Noise
- 5 **Guest Column / Teresa Marques**
Redefining Community in a Time of Crisis
- 6 **Navdeep Bains**
Canada's COVID Response: Necessity as the Driver of Innovation
- 9 **Jacqueline Milczarek**
Celebrating Canadian Innovators, Now More Than Ever
- 13 **Paul Davidson**
When the World Shut Down, Our Universities Reached Out
- 16 **Lori Turnbull**
The Pandemic Innovation Test for Universities
- 18 **JJ Ruest**
Supporting Canada's Supply Chains by Investing in Innovation
- 20 **Jean-Jacques Ruest**
Soutenir les chaînes d'approvisionnement du Canada en investissant dans l'innovation
- 22 **Clark Rabbior**
2030 Today: COVID and the Online Economy
- 24 **Gillian Bartlett and Laurette Dube**
Primary Care as the Nexus of Post-COVID Health and Economic Convergence
- 28 **Bonnie Schmidt**
Innovating Through Crisis
- 31 **Anthony Wilson-Smith and Bronwyn Graves**
The Infinite Dance of History and Innovation
- 33 **Michel Bergeron**
A Case Study in Crisis Response
- 36 **Kevin Lynch and Paul Deegan**
How to Regulate Big Tech Without Stifling Innovation
- 38 **Pierre Asselin**
Opportunity in Crisis: How a Spike in News Demand is Redoubling Media Innovation

Book Reviews

- 41 Review by **Anthony Wilson-Smith**
A Journey of the Heart
Peter Mansbridge with Mark Bulgutch
- 42 Review by **James Baxter**
A Blue-Chip Investment
Laurence B. Mussio, with foreword by Niall Ferguson

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From the Editor / Lisa Van Dusen

Resilience Through Innovation

Welcome to our fourth annual *Policy-Rideau Hall Foundation Innovation Issue*. Due to the health and economic crisis that informs the theme of this issue, *Resilience Through Innovation*, we were delayed from spring to late fall this year. In the spirit of innovation, we used that delay to focus on the invaluable lessons learned during the first few months of the COVID-19 pandemic.

On behalf of everyone at *Policy* and at the RHF, we extend our heartfelt condolences to all who have lost loved ones and face greater economic insecurity as a result of COVID-19. With those lives in mind, we've emphasized adaptation lessons and solutions that will help Canada and the world move forward. We thank the entire RHF team, including President and CEO Teresa Marques, Director of Innovation and Skills Amy Mifflin-Sills and Manager of Innovation Mila Pavlovic for their professionalism and collegiality. The RHF—an independent, apolitical charitable organization established to mobilize ideas, people and resources across Canada to spotlight and reward innovation—is part of the legacy of former Governor General David Johnston.

We open this year with the former GG's own piece, *Canadians Need to Keep Making Noise*, about how Canada's culture of innovation responded to the unprecedented challenge of COVID-19. RHF president Teresa Marques has a personal paean to our national resilience, *Redefining Community in a Time of Crisis*. From the political and policy front line of the fight against COVID, Innovation Minister Navdeep Bains, who contributes to every Innovation Issue, filed *Canada's*

COVID Response: Necessity as the Driver of Innovation, on how the government of Canada responded to the crisis, and how Canadian companies contributed to one of the largest re-tooling and procurement projects in Canadian history.

A popular feature of every *Policy-RHF Innovation Issue*, our profiles of the annual Governor General's Innovation Award winners are compiled again this year by Jacqueline Milczarek. They always offer an early glimpse into the visionaries you'll soon be reading about in the business headlines. In *When the World Shut Down, Our Universities Reached Out*, Universities Canada CEO Paul Davidson explains how Canada's post-secondary institutions have responded to an unprecedented challenge. And Dalhousie University's Lori Turnbull reports from the front lines of that challenge in *The Pandemic Innovation Test for Universities*.

At CN, one of Canada's premier legacy companies, adaptation has meant leveraging data and accelerating digitization. In *Supporting Canada's Supply Chains by Investing in Innovation*, CN President and CEO Jean-Jacques Ruest describes that process. At Shopify, Canada's leading digital economy company, the lockdown has driven home a reality: the future is now. Shopify's head of government relations, Clark Rabbior, offers the must-read *2030 Today: COVID and the Online Economy*.

From Chair of the McGill Centre for the Convergence of Health and Economics Laurette Dubé, whose deep expertise on the interdependence of public health and economics is suddenly in great demand, and colleague Gillian Bartlett, we have *Primary Care as the*

Nexus of Post-COVID Health and Economic Convergence. Let's Talk Science founder and Royal Society of Canada fellow Bonnie Schmidt, filed the excellent anatomy of adaptation, *Innovating Through Crisis*. Also in dispatches from the front of innovation and resilience, Michel Bergeron, chief strategy officer at Business Development Bank of Canada, provides *A Case Study in Crisis Response*—a window on the human element behind the \$2.5 billion in COVID loans that helped save thousands of Canadian businesses.

From our friends at *Historica Canada*, Anthony Wilson-Smith and Bronwyn Graves, *The Infinite Dance of History and Innovation*, a look behind the latest Heritage Minute as well as their new collaboration with the RHF, the documentary series *Inspiring Innovators*. In *How to Regulate Big Tech Without Stifling Innovation*, former BMO Vice Chair and Privy Council Clerk Kevin Lynch and former BMO and CN executive Paul Deegan examine how the FAANGs have fared during the pandemic. While the economic impact of the pandemic has further culled print newspapers, demand for news and information has boomed. Former *Le Soleil* editorialist Pierre Asselin reports on that confluence of factors in *Opportunity in Crisis: How a Spike in News Demand is Redoubling Media Innovation*.

Finally, in our book reviews section, Anthony Wilson-Smith has a rave review of the new book from Peter Mansbridge, *Extraordinary Canadians: Stories from the Heart of Our Nation*, and James Baxter looks at *Whom Fortune Favours: The Bank of Montreal and the Rise of North American Finance* by Lawrence B. Mussio.

Enjoy the issue. **P**



Making masks and creating jobs: Bob Spence and Breanne Everett of Orpyx with Jeff Lister of Fidelity Medical Manufacturing (right). *Orpyx photo*

Canadians Need to Keep Making Noise

Amid the suffering, isolation and uncertainty of the COVID-19 pandemic and the economic lockdown it has necessitated, there are many stories of Canadian ingenuity to celebrate. Former Governor General David Johnston salutes just some of those innovators, the spirit of resilience they embody and the positive noise they've made.

David Johnston

“Let’s make sure innovation is as noisy a word as it can be.” Those are the words I used to end a letter to Kevin Lynch that was in my 2016 book *The Idea of Canada: Letters to a Nation*. Because, by its very nature, innovation is noisy. Innovators propose new ways of doing things and they are eager to say, “Look what I’ve done/created/made better.” Innovators are quick to seek out collaboration and to discuss (maybe even debate) the best way forward. It’s a noisy endeavour.

That noisiness is not always in line with our Canadian politeness; with our reluctance to make ourselves the centre of attention. Canadians are innovative; we just tend to keep quiet about our innovation. At least that was true before—before COVID-19, before we had to face the fact that many of our ways of doing things were no longer viable.

In February 2020, together with Edelman Canada, the Rideau Hall Foundation launched the second Culture of Innovation Index. The survey results painted a picture of a nation that valued innovation and that saw innovation as a driver that can improve our everyday lives. However, Canadians didn't necessarily see themselves as being involved in innovation, nor did they include Canada among the top countries for creating a culture of innovation. In fact, 65 percent of respondents believed that Canadians were risk-averse.

Will those results hold true when we repeat the survey in 2021? Are we still a quiet nation, or have we collectively overcome our aversion to making noise and embraced innovation? I hope, and truly believe, that it is the latter.

When the pandemic forced us all inside, our usually quiet country got even quieter for a while. People retreated to take stock. But that silence didn't last very long. Within days, individuals and companies across the country started to ask what they could do to help their loved ones, their communities, their nation.

Age and technological savvy weren't barriers as we embraced virtual ways to connect with and support our loved ones and neighbours. Communities found novel ways to make sure that people were not being left behind. When they could, small businesses and offices rapidly transitioned their operations online. Industry scaled-up production or re-tooled manufacturing lines to produce goods to help in the fight against COVID-19.

“ When the pandemic forced us all inside, our usually quiet country got even quieter for a while. People retreated to take stock. But that silence didn't last very long. Within days, individuals and companies across the country started to ask what they could do to help. ”

Beer and hockey—two Canadian stalwarts—were among many industries that answered the call to innovate. Breweries and distilleries, large and small, pivoted their operations on a dime (or perhaps on a loonie) to begin to produce hand sanitizer. Bauer shifted its manufacturing from hockey masks to medical face shields for our frontline workers.

“ Montreal-based civil aviation company CAE also generated a lot of noise in the spring when it shifted its operations from flight simulators to ventilators. In the space of 11 days, CAE engineers and scientists designed a ventilator prototype that could be used in intensive care units. ”

There are so many examples of Canadian innovation in response to the pandemic, but one that has served as a model and inspiration for many across the country is the story of the Canadian Shield. Responding to news of a shortage of personal protective equipment for frontline workers in Waterloo, InkSmith transitioned overnight from selling 3D printers and laser cutters to manufacturing face shields, and they put out a call to others in the area with 3D printers to join them.

Like the truly innovative, however, they didn't stop there. Not content with the status quo, the company developed a prototype for a face shield that could be manufactured quickly and, so important within the COVID context, be disinfected and reused. The Canadian Shield was born. Months later, with a growing workforce and a new larger production facility, the company can produce 200,000 face shields per day. A truly remarkable (and noise-worthy) story!

Montreal-based civil aviation company CAE also generated a lot of noise in the spring when it shifted its operations from flight simulators to ventilators. In the space of 11 days, CAE engineers and scientists designed a ventilator prototype that could be used in intensive care units. After receiving Health Canada certification a few months later, CAE is now contracted to supply 10,000 ventilators to Canadian hospitals.

My final example of Canadian innovation is one that brings a smile to my face because it involves a recipient of an inaugural Governor General's Innovation Award (GGIA). I had the pleasure of awarding Dr. Breanne Everett, President and CEO of Orpyx, a GGIA in 2016 for her work developing shoe insoles to help patients with diabetes.

In the spring, when it became known that we were facing shortages of personal protective equipment for people working on the frontlines of the pandemic, Breanne Everett and Melissa Lamothe started a charitable group called Helping Alberta. This was a volunteer-driven, community-based



David Johnston, Canada's 28th Governor General from 2010-2017, and Founding Chair of the Rideau Hall Foundation. *Sgt. Vincent Carboneau, Rideau Hall photo*

organization that raised funds to buy N95 and surgical masks for frontline workers in Alberta. Breanne didn't stop there. Orpyx partnered with Fidelity Machine and Mould to begin producing masks in Alberta and, in October, announced an agreement with Alberta Health Services to provide millions of made-in-Calgary masks for Alberta healthcare workers, as well as for patients and their visitors and families. This endeavour will create up to 100 jobs in the region. I'm sure that I'm applauding loudly enough in Ottawa to be heard all the way in Calgary.

And it wasn't just individuals and industry that innovated. In record time, governments—often seen as slow to embrace change—developed, implemented and adapted policies and programs to help Canadians navigate the uncertainty. Schools rolled out online learning in a matter of weeks so that our kids could keep learning and they re-envisioned the school day (whether in person or online) so our kids could start a new school year in September.

Through it all, we made a lot of noise. We shared what we were do-

ing and how we were doing it. The media highlighted stories of ordinary Canadians making extraordinary contributions. People read or heard about a good idea from one part of the country and brought it to life in their hometowns. Innovation became a word that we used in our everyday conversations. Collectively, we truly embraced a culture of innovation.

“ A culture of innovation is an essential element of the better, noisier future that we must commit to building together. Our country depends on it. Our future depends on it. ”

When we emerge from under the spectre of the pandemic, we will truly be at a crossroads, faced with a decision that will have an impact on our country's

future. Do we return to the safe? To the tried and true? Or do we push forward boldly, building on what we've learned about ourselves and our ability to face challenges head on? Do we continue to innovate and to collaborate? Do we continue to identify a need and then rush in to fill it?

It will be natural for all of us to take some time to reflect on our experiences. To take a moment to pause and think about how life has changed for us and for those around us. But we can't afford to let that quiet last too long.

That will not be the time for any of us to stop embracing innovation in all its forms. It will not be the time to stop making noise. We will have come too far. And there will still be so many challenges left for us to face.

We will have to work together to reconstruct our economy post-COVID. It will not be an easy task. While the pandemic has affected all sectors of our economy, some have been affected more profoundly than others, and, for many, it will be a long road back to “normal”. The pandemic has also amplified social inequalities in our country. Inequalities that we must address head-on and not paper over for them only to be exposed anew the next time we face a crisis.

But when our country is back on its feet—and we will get there—we will have to remember all that we accomplished together to get to that point. That will not be the time to sit back and relax. Imagine what we could do if we put this same spirit of innovation to work to combat other threats. Threats like the climate crisis, food insecurity or the cracks in our healthcare system that have been laid bare by the pandemic.

A culture of innovation is an essential element of the better, noisier future that we must commit to building together. Our country depends on it. Our future depends on it. **P**

David Johnston, 28th Governor General of Canada, is Chair of the Rideau Hall Foundation.



Guest Column / Teresa Marques

Redefining Community in a Time of Crisis

As I'm writing this, the autumn colours are on full display, COVID-19 numbers are increasing, and more restrictions are being imposed in some parts of the country. For many of us, uncertainty and anxiety are on the rise.

We should take some solace in the fact that we've been here before. And while familiarity should not breed complacency, it helps renew a sense of purpose. We know what we need to do. We know we need to rely on each other in order to get through this second wave. That's what we did in the spring as the trees were budding, and that's what we'll do again now as the leaves are falling.

In the first wave, we relied on families and friends—the people who were in close physical proximity and could be called upon to deliver groceries and maybe even a loaf of the sourdough bread that we were all baking. Local organizations stepped up to connect neighbours, seemingly overnight, creating networks of people who volunteered to help the more vulnerable residents in their areas. A myriad of videoconferencing and social networking platforms enabled all of us to stay connected.

We also proved to ourselves that we could find creative, innovative solutions that allowed us to support each other at a distance—whether that distance was 2 metres or 2,000 kilometres.

We, whether as individuals, community organizations or businesses, responded quickly. We identified the needs and we brainstormed to find ways to start to address them without delay. And then we shared: our stories, our ideas, our successes and our

failures. So, a small idea in one corner of the country could be seized on by others.

In Vancouver, a group of volunteers came together to brainstorm ways of helping their neighbours who required assistance. Within the first half hour of launching an online fundraising campaign, Coming Together Vancouver had raised more than \$11,000 to address ongoing inequalities in their neighbourhoods, and over 20,000 people had joined their online group. By early June, the group had distributed the \$25-\$100 survival funds to 380 individuals and families facing immediate financial needs. The group also matched needs for other types of assistance with offers of help at the local level, and they launched a website that contains lists of pandemic-related resources, including links to free online classes and services.

Their efforts went far beyond Vancouver. The group brought together technology professionals and community leaders to create an app that can be used by communities to manage volunteer connections in times of crisis (not just during the pandemic).

This is just one example of a small group of creative, innovative, compassionate people making a big impact in their community and beyond.

Conquer COVID is one of the most successful examples of Canadians coming together to collect PPE for frontline workers. Started in mid-March by six friends, this endeavour grew to 120 volunteers at its peak of operations, and it benefited from the contributions of some famous Canadians, including hockey

Olympian Hayley Wickenheiser, actor Ryan Reynolds and NHL players.

By the time the group concluded its fundraising on September 2nd, it had raised \$2.3 million and distributed three million items of PPE at 410 sites in eight provinces and one territory. Collection drives in six cities accounted for 773,000 items. In these cities, Conquer COVID partnered with local organizations, including Helping Alberta in Calgary, to distribute the collected items.

Conquer COVID also created a legacy that communities can access to help them prepare for the second wave of COVID and manage during other times of crisis. The Conquer COVID-19 Playbook provides guidance on how to establish a citizen-led response to a crisis and contains resources and tip sheets on everything from planning a funding drive to strategies for effective communications.

These are just some examples of Canadians coming together and leveraging their talents, ingenuity, knowledge and skills to help their neighbours. What did they have in common? They identified an immediate community need. They brought together a group of like-minded individuals with diverse strengths and skills. They had unwavering commitment to their cause. They were passionate about sharing their knowledge.

We can build on their examples and their legacy to help us through the months to come. We will not have to start from scratch. These community leaders, and so many others, have left us a roadmap. **P**

Teresa Marques is the President and CEO of the Rideau Hall Foundation.



Navdeep Bains, Minister of Innovation, Science and Industry visits GM Canada's Oshawa Operations on July 10, 2020 to help celebrate the one millionth mask produced out of the Canadian Mask Making (CMM) room for the government of Canada. *GM Canada photo*

Canada's COVID Response: NECESSITY AS THE DRIVER OF INNOVATION

Canadians' capacity for adaptation has been tested by the COVID-19 pandemic, as the country has mourned the loss of life, adjusted to the economic disruptions and internalized the uncertainty inherent in living amid a deadly pandemic while the scientific community pursues the quest for a vaccine. For governments at all levels, this period has presented an unprecedented combination of challenges to both crisis management and long-term policy solutions. It has also presented an occasion to accelerate innovation, one to which Canadians have risen impressively.

Navdeep Bains

Through my contributions over the years in these pages, I have tried to give a sense of the strategy behind the federal government's ongoing efforts to grow Canada's innovation capacity. As the accelerated pace of technological change disrupts industries, transcends traditional boundaries and even creates entirely new industries, we have been systematically modernizing and adapting our policy approach to encourage business and research innovation.

The realities of today dictate the need for new policy approaches—and that’s exactly what we have been delivering through our Innovation and Skills Plan. The Plan is a whole-of government approach, supporting firms at all points along their development and Canadians through each stage of their lives. It emphasizes partnerships, brings together industry and academia, and embraces diversity and inclusion, which is our Canadian strength. The Innovation and Skills Plan’s flagship programs, including the Industrial Research Assistance Program, the Strategic Innovation Fund, Innovation Superclusters, Canada’s first national IP Strategy and Innovative Solutions Canada, have all been developed to address specific parts of the innovation ecosystem.

If ever there was a test for the effectiveness of our approach to innovation policy, it is surely our response to the COVID-19 pandemic. In this context, we have seen these flagship programs step up and move quickly to support Canadian innovation.

Canada’s Advanced Manufacturing Supercluster has invested \$4.1 million to accelerate the development of COVID-19 point-of-care tests. The project, led by Sona Nanotech Inc, uses nanotechnology to develop point-of-care test kits that will improve the accuracy of virus detection and provide results in 5-10 minutes.

With the unprecedented demand for COVID-19 diagnostic testing, there is still a limited supply of tests. Scale.ai is investing \$500,000 in a project that will optimize the distribution of diagnostic tests for COVID-19. Led by Roche Diagnostics, this artificial intelligence (AI) solution will power a robust forecasting model that takes into account constraints in global supply, and allocates tests where they are needed most.

To strengthen diagnostics, the Digital Technology Supercluster has invested \$2 million in XrAI, an AI-driven chest X-ray tool developed by 1QBit

“ If ever there was a test for the effectiveness of our approach to innovation policy, it is surely our response to the COVID-19 pandemic. In this context, we have seen these flagship programs step up and move quickly to support Canadian innovation. ”

in close partnership with Canadian health care organizations and physicians. It will empower clinicians to more accurately diagnose and effectively treat patients with COVID-19 infections and other respiratory complications. Recently approved by Health Canada as a Class III medical device, it is ready to be deployed across Canada to support Canadian health providers in the fight against COVID-19.

“ In response to our call, thousands of companies, large and small, reached out to offer help. The result has been one of the largest retooling and procurement projects in Canadian history. ”

When COVID-19 hit, we put out a Made-in-Canada call to action to Canadian companies able to retool and source the materials and goods we needed. Our most immediate need was for a secure domestic supply of Personal Protective Equipment (PPE) for our frontline health-care workers.

In response to our call, thousands of companies, large and small, reached out to offer help. The result has been one of the largest retooling and procurement projects in Canadian history. We went from sourcing next-to-none of our PPE domestically pre-pandemic, to sourcing nearly

half of the dollar value of our PPE in Canada today.

This pivot has seen new partnerships and synergies emerge: a house-wrap-producer collaborating with a garment manufacturer to make medical gowns; whiskey distilleries pivoting to hand-sanitizer production, hockey gear companies making medical-grade face shields, and the list goes on. These partnerships are a testament to the creativity and resiliency of Canadian innovation.

This Made-in-Canada approach to combat COVID-19 has not only allowed us to respond to the need for PPE, it has helped keep many Canadians employed throughout this difficult period.

An example: in early April, the Next Generation Manufacturing Supercluster announced an agreement with a consortium led by Molded Precision Components, with partner Sterling Industries, to produce face shields.

Today, Molded Precision Components is producing more than three million face shields a week. This has allowed the company to maintain all existing positions, while adding over a hundred new jobs. They are also now in the process of opening a second manufacturing site in Oro-Medonte, Ontario. And in true Canadian fashion, the group has also donated shields to community organizations such as the local fire department and health care facilities.

We are leveraging these same programs to pursue technologies to improve testing capacity for Canadians from coast to coast to coast.

In the long run, the best chance to return to normal is a safe and effective vaccine. Here again, we are benefiting from the programs we had put in place before the pandemic. Since 2015, our major investments to position Canada as a world-leading centre for science and research mean we are facing this crisis equipped with a strong and dynamic Canadian scientific community. We were able to focus our considerable existing expertise and capacity to contribute to the global race to create an effective and safe vaccine, and new therapeutics for COVID-19.

Since mid-March, more than \$1.2 billion in federal support has been committed to a national medical research strategy to fight COVID-19. This package includes new funding for vaccine development, treatments and new measures to track the virus. It provides more funding for vaccine development to VIDO-InterVac and the National Research Council of Canada's Human Health Therapeutics Research Centre, as well as funding for genome sequencing efforts through the Canadian COVID Genomics Network (CanCOGeN), led by Genome Canada. It includes \$600 million through the Strategic Innovation Fund to support vaccine and therapy clinical trials projects and create biomanufacturing capacity. The new funding also includes nearly \$115 million for the Canadian Institutes of Health Research to help create better medical and social countermeasures.

Our progress has relied on the hard work of the members of the COVID-19 Vaccine Task Force and the COVID-19 Therapeutics Task Force. We created these task forces to provide advice on promising vaccines, therapeutics and biomanufacturing projects and opportunities. They have been providing advice on how best to focus on projects with the greatest chance of success. These Task Forces are comprised of leaders in vaccines and therapeutics from academia, research organizations and the private sector, and

they have volunteered hundreds of hours of their time to assist their fellow Canadians in this fight.

In addition to the advice of the Task Forces, we are working closely with Canada's Chief Science Advisor, Dr. Mona Nemer. She has assembled a multidisciplinary expert panel to advise her on the latest scientific developments related to COVID-19 to ensure that our response is directed by the best available science, while recognizing that the evidence-base is evolving.

“ It has been quite a year, yet despite all of the challenges we faced, I have been consistently impressed and moved by the effort and compassion shown by Canadians in light of this major disruption to our lives. ”

As we adapt to the realities of the pandemic, we know that we will need to be coordinated on principles and approaches across the country and across all levels of government—while recognizing the unique situations and circumstances in each region. This will include supporting sectors with particular challenges and needs. That is why I established the Industry Strategy Council, tasked with providing expert insight from Canadian business leaders to set the stage for the recovery of Canada's key economic sectors. This collaborative, common approach will allow us to make best use of the incredible expertise available across sectors and industries.

Our Made-in-Canada response has involved strong collaboration among researchers, industry and the health care system. Throughout, we have

kept in mind that the health of Canadians is at the centre of a healthy economy. Thanks to everyone doing their part, our country is now better prepared to deal with the second wave and work toward a sustainable economic recovery.

We now know how much Canadian companies and researchers are capable of taking on when they are asked to step up. We see where our investments, and our big ideas, can take us as we focus on our economic recovery and our future as a nation. We understand that those big ideas will be vital to our long-term success in today's changing world.

It has been quite a year, yet despite all of the challenges we faced, I have been consistently impressed and moved by the effort and compassion shown by Canadians in light of this major disruption to our lives. I have watched Canadians step up, retool, research and design our way out of this crisis. Canadians have shown just how far they are willing to go for their neighbours, and for that, I applaud the innovators across our country.

As we look forward, we will continue to refine our approach, working with and learning from partners to realize the potential that innovation holds for our common future. **P**

Navdeep Bains is the Minister of Innovation, Science and Industry.

Celebrating Canadian Innovators, Now More Than Ever

The recipients of the 2020 Governor General's Innovation Awards are six outstanding scientific, civic and social-impact pioneers, exemplifying the kind of innovation that will not only help Canada build back better, but also help position the country as a global driver of inclusive innovation across all fields and industries. They personify the ingenuity, grit and perseverance needed to fight our toughest challenges.

Jacqueline Milczarek

The Governor General's Innovation Awards (GGIAs) inspire Canadians to embrace innovation and emulate those who are having a meaningful impact on our quality of life. The awards celebrate trailblazers who help shape our society and our future, and who inspire the next generation of innovators.

The GGIAs are managed by the Rideau Hall Foundation (RHF). You can learn more about the 2020 GGIA Laureates at: innovation.gg.ca.

ACCESSNOW—Maayan Ziv

When economic development is not inclusive, disability advocate and tech entrepreneur Maayan Ziv believes in breaking the door down (albeit gently). At a time when the COVID-19 pandemic has been impacting minorities and those with disabilities more severely than the rest of the population, Ziv's inclusive approach is exactly what's needed to ensure all

voices are not only heard, but truly listened to.

Ziv's call to innovate was born out of sheer frustration—a fateful incident that had her squishing through garbage bins in a back alley just to be able to join her friends at a restaurant. Ziv, who has been using a wheelchair since she was a young child due to muscular dystrophy, had no way to navigate the stairs at the restaurant's main entrance. "That experience was kind of one more moment where I realized—this shouldn't be like this," she says. "I needed to do something about it."

As Ziv explains: "I had no experience building apps, wasn't a coder. I just started." A week before she graduated from Ryerson with her master's degree and while still in her 20s, Ziv launched AccessNow—a mobile app that now features accessibility reviews on more than 10,000 business in more than 50 countries.

The real power of the AccessNow platform is its main crowdsourcing feature. Users can click on a pin to find how accessible a location is be-

fore they head out, and can also contribute reviews.

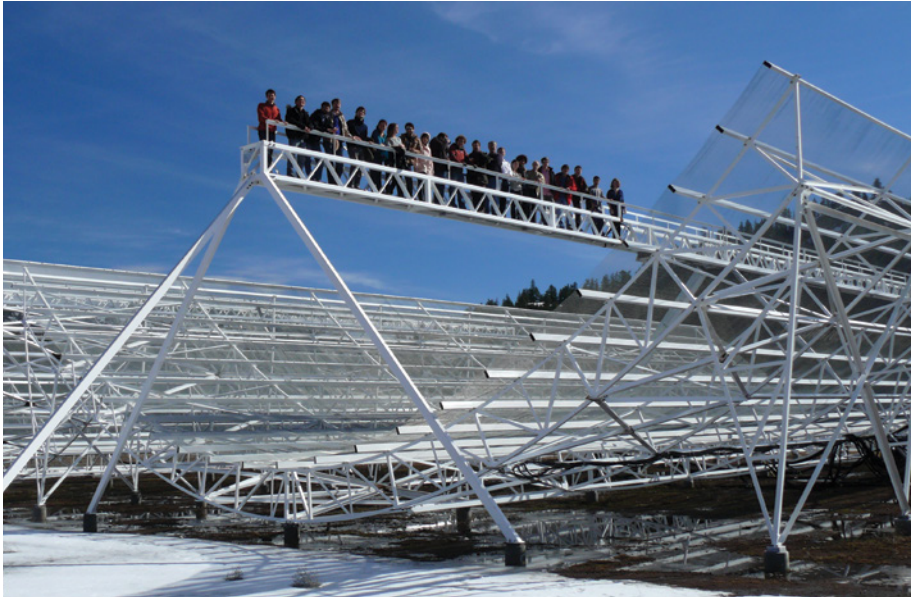
With an estimated one billion people in the world dealing with disability and over 5.3 million in Canada alone, Ziv has created a tool to unite a vast and powerful community of users—one that businesses are paying close attention to. The company recently secured more than 2.7 million dollars from the federal government—money that will go a long way toward breaking down accessibility barriers and allowing more Canadians to participate in the economy.



Maayan Ziv, Founder of the AccessNow crowdsourcing mapping app. *National Content Solutions photo*

“ I wanted to kind of flip the model on its head. I wanted to build something that was about creating action in order to generate awareness as opposed to awareness hoping to stimulate some action. ”

Maayan Ziv



The team behind the CHIME/FRB Collaboration, Canada's Largest Radio Telescope now includes more than 60 scientists across Canada and the US. *Mark Halpern / The CHIME collaboration photo*

CHIME

There are lessons to be learned through grit and perseverance, but also through the power of partnerships. When University of British Columbia physics and astronomy professor Mark Halpern and the inter-disciplinary, pan-Canadian team behind the CHIME radio telescope project were able to leverage both, the distant universe opened up. CHIME (the Canadian Hydrogen Intensity Mapping Experiment) is a novel, highly sensitive radio telescope that has no moving parts. It consists of only four cylindrical curved reflectors (each 20 x 100 metres) built at a relatively low cost, using the same kinds of components found in mobile phones or most computer gaming systems. Its mission is to collect digitized signals from across the sky to eventually produce the largest map of hydrogen ever made to help track the expansion history of the universe.

Canada's largest radio telescope (expected to teach us more about a mysterious cosmic force called dark energy) quickly proved it had another capability as well—to detect a phenomenon called Fast Radio Bursts (FRBs). FRBs are millisecond high intensity radio signals that come from billions of light years away.

“ This is, for all of us, the first time in our careers that a major instrument is addressing a bunch of very, very important questions that's Canadian-funded, Canadian-built, here at home. ”

Mark Halpern



The team behind EMBERS Staffing Solutions, Canada's first non-profit staffing agency (Frank Salanson, Doug Aason, Marcia Nozick and Gavin Jones). *Bethany Terracina photo*

CHIME managed to detect the second-ever repeating FRBs ever recorded and is now actively recording FRBs on a daily basis. This work is now being led by Vicky Kaspi, Canada Research Chair in observational astrophysics.

Conceived, funded, and built by Canadians (the project is led by physicists at UBC, McGill, University of Toronto and the National Research Council's (NRC) Dominion Radio Astrophysical Observatory (DRAO) with collaborating institutions across America), CHIME has become a global model of how scientific teams can find cost-effective ways of contributing robust data to answer some of the biggest scientific questions of our time.

EMBERS—Marcia Nozick

With the Organisation for Economic Cooperation and Development estimating that this second wave of coronavirus may leave as many as 80 million people out of work, the kind of innovative, out-of-the-box, community-building approach that Marcia Nozick has been engaged in may now be more important than ever. Nozick was a community economic development researcher when she first arrived in B.C. and was imme-

diately struck by the poverty she witnessed in Vancouver's Downtown east side. "What I saw was a lot of people who didn't work. But they had the capacity and ability to work," recalls Nozick.

“ This is good for people who need a second chance. This is great for the companies that need temporary workers. And it's great for society. I think it's the way of the future...doing business for good. ”

Marcia Nozick

After more than a year of research, working together with community leaders, residents and businesses, Nozick founded EMBERS (Eastside Movement for Business and Economic Renewal Society), a charity that ran a micro-business development program to help those living on low incomes discover skills to launch their own self-sustaining businesses. The model worked well, but financing the program was a struggle. Nozick tried a new idea put forward by a community member. The suggestion was to pivot EMBERS into a company that could provide flexible, short-term work placements for vulnerable workers battling back from drug addiction or disability.

The new model took years of convincing at the board level, but Nozick persevered and in 2008 launched EMBERS Staffing Solutions (ESS)—Canada's first not-for-profit temporary labour company. As a social enterprise, ESS invests 100 percent of its profits back into the community, offering workers higher hourly wages, equipment, and training.

What Nozick started as a small non-profit has now transformed into an \$11.9 M award-winning social enterprise, employing almost 2,000

people, proving that it is possible for community-led initiatives to build inclusive economic development models that are self-sustaining now and well into the future.

New Frontiers in Lung Transplant Medicine— Dr. Shaf Keshavjee

Shaf Keshavjee is another Canadian garnering world-wide attention at this crucial time. The world-renowned thoracic surgeon, director of the Toronto Lung Transplant program and surgeon-in-chief at Toronto's University Health Network has been actively working through this COVID crisis developing a new diagnostic test called the Toronto Lung Score. The 40-minute test can identify patients at the highest risk of lung failure due to COVID-19, so health care teams can connect those patients to the most appropriate treatment pathways, directing valuable resources to where they're most needed.

As important as this new diagnostic tool is, it is merely an offshoot of Keshavjee's main innovation—one that has absolutely changed the game on lung transplantation. Sadly, lung transplantation is the only life-saving therapy for patients with end-stage lung disease and up to 80 percent of donor lungs are discarded because of existing damage.

Keshavjee and his team found a way to fully double the number of lung transplants done at Toronto's University Health Network through an innovation called Ex-Vivo. The landmark lung perfusion system allows transplant surgeons to assess donor lung function outside of the body for extended periods and then confidently decide whether to use a donor lung for transplant. What Ex-Vivo gives doctors is time. Donated lungs are safely placed in a sterile chamber, oxygenated and provided nutrition, until transplant teams can assess how they can repair the damaged organ with medications, gene therapy or cell therapy.



Dr. Shaf Keshavjee, developer of the Ex Vivo Lung Perfusion (EVLP) System. *National Content Solutions photo*

“ When we did it ... people didn't believe it. You know, it is science fiction and even now when you see it—you think...this is crazy. ”

Dr. Shaf Keshavjee

Since the first clinical trial in 2008, EVLP has been adopted around the world, saving hundreds of lives of patients with end-stage lung disease. Costs associated with chronic obstructive pulmonary disease alone are \$12 billion in Canada and the use of EVLP significantly reduces these health care costs while saving thousands of lives.

Reconciliation Through Indigenous Law— John Borrows

Professor John Borrows is proving that new approaches to law can help heal long-standing cultural divides. Canada Research Chair in Indigenous Law at University of Victoria, Borrows is Anishinaabe/Ojibwe and a member of the Chippewas of Nawash First Nation in Ontario. He is the co-creator of the world's first dual-degree program in Indigenous law and common law. Students in the program study en-

environmental protection, indigenous governance, economic development, and graduate with two degrees a Juris Doctor (JD) and Juris Indigenarum Doctor (JID).

The hope is that graduates of the new program will be able to help build productive partnerships across the two legal systems, transforming our understanding of how Indigenous and non-Indigenous law can co-exist harmoniously.



Professor John Borrows, Co-founder of the world's first dual degree program in Indigenous and common law. *National Content Solutions photo*

“ I hope that what people see is that this is a democratization of law...that we ourselves are legal practitioners. We have to deliberate, persuade one another. ”

Dr. John Borrows

Borrows' innovative approach, spiritual leadership and legal scholarship are contributing to profoundly transformative projects in communities across Canada. He continues to guide communities on how to revive traditional Indigenous legal practices and work through modern day legal challenges, such as environmental assessments or

developing land or pipelines—work that is already leading to greater empowerment for first nations, better health and renewed cultural vibrancy.

At a time when the international community has recognized the importance of the rule of law as part of Agenda 2030 (Sustainable Development goal 16 aims to promote justice for all), Borrows innovations in law are a uniquely Canadian solution.

Sheertex— Katherine Homouth

For female tech entrepreneur Katherine Homouth, creating another digital platform was the last thing on her mind. Despite founding two highly successful tech ventures—she started a pre-order platform called ShopLocket acquired by PCH International in 2014, then Female Funders, acquired by Highline Beta in 2017—Homouth decided enough was enough.

Setting her sights on a making a more impactful innovation, Homouth decided that creating a pair of sustainable pantyhose was the place to start. “I couldn't understand how something as simple as a pair of pantyhose that could make it through the day, hadn't been invented,” she recalls.

Homouth began by ordering and testing some of the strongest fibres, knits and yarns available, initially working with manufacturers overseas until the super strong ballistic-grade fibres she was using broke all the machines, forcing her to produce the product here at home. After months of trial and error she succeeded in what once seemed impossible—miniaturizing ballistic-grade fibres (similar to those found in bullet-proof vests) to produce a version of the world's strongest polymer in a new ultra-thin, super stretchy and incredibly strong form.

In less than a year, her new company, Sheertex, emerged as a leader in the hosiery category. The Montreal com-

pany is now also producing shape-wear while helping to reduce the number of disposable pantyhose in circulation (there are over two billion pairs thrown in landfills each year).



Katherine Homouth, Founder of Sheertex, 'The world's toughest pantyhose'. *Farid Salamé photo*

“ Sometimes entrepreneurs end up creating what I call 'technology for technology's sake,' but we really should be producing products that actually solve a problem in the world. ”

Katherine Homouth

Homouth's company has raised more than \$14 million in funding to fuel a recent expansion and is now one of the fastest-growing companies in North America, proving that sustainable manufacturing in Canada can not only grow but thrive. **P**

Jacqueline Milczarek is a longtime national network broadcast journalist, currently President of National Content Solutions based in Toronto.



Students at work in a lab at Ryerson University in Toronto in 2017. *Universities Canada photo*

When the World Shut Down, Our Universities Reached Out

When the COVID-19 pandemic hit, a sudden realignment happened both socially and economically whereby essential services were redefined by a combination of necessity and virtual viability. In that new context, Canada's universities became an essential public service based on knowledge, information and solutions. Our scholars have provided context, our experts have enlightened the perils and stakes, and our researchers are at the forefront of the global quest for a vaccine.

Paul Davidson

When the impact of COVID-19 spread and the world turned inward, Canada's universities reached out. From makeshift workspaces our undaunted faculty, researchers and students bolstered connections with contacts and research partners around the world. We concentrated our best minds on the world's toughest problem.

It's what we do. We create alliances and partnerships of shared purpose to address the challenges facing the world. Given our international links, universities were among the first to anticipate the pandemic's potential impacts. As early as January, many of Canada's universities had response teams in place.

The results show that, compared to our international peers, Canada is uniquely positioned. Our universities have taken strong safety measures to prevent and minimize campus outbreaks and have been able to welcome international students and researchers back to their work and studies. Our research and higher education systems are maintaining forward momentum at a time when counterparts in Australia, the United States and the United Kingdom are being derailed by outbreaks and political tension.

In mid-March, when we first began to understand the scale and severity of COVID-19, universities quickly transitioned 1.4 million students to online classes in a matter of 10 days. Administrators moved as many students as possible out of residences to stop the virus's spread, while continuing to provide accommodation for those with no alternative. As students headed home, universities made vacant rooms available to front-line workers who had to live away from their parents, partners and children to protect their families from illness.

All but the most essential on-campus activities stopped, but the work continued. Universities stepped up to embark on wide-ranging, interdisciplinary projects to inform the clinical and public health response under the federal government's \$1.1 billion pan-Canadian Medical and Research Strategy.

Research and innovation are the foundation of Canadian universities' strength in times of turmoil and that strength is an essential pillar of Canada's pandemic response. At the heart of the federal government's CanCOVID research network are 2,300 members—researchers, policy makers and front-line technicians—working in partnership to tackle this massive societal challenge. This transdisciplinary network is a shining example of how Canadian research can underpin a holistic, swift and effective response to a long-term public crisis.

“ In just months, we have seen tremendous changes and advancements in online and distance education—changes that were quietly spreading across institutions but were then accelerated by the realities of the pandemic. ”

Across Canada, university research teams are hard at work to inform clinical and public health responses, develop and evaluate diagnostic tools and vaccines, and tackle misinformation.

Université Laval's Infectious Disease Research Centre is developing experimental COVID-19 vaccine candidates. The Centre is led by Dr. Gary Kobinger, who received a Governor General's Innovation Award in 2018 for helping to discover a treatment and vaccine for Ebola. A University of Saskatchewan study may shed light on how coronaviruses jump to humans and other animals. Researchers at the University of British Columbia, with partners in France, are examining how public health measures, such as social distancing, affect the longer-term social and mental health of those under 30. The results could help with policy and program responses to improve the lives of youth in both countries.

Canadian universities are also mindful of their responsibilities and commitments in their home communities. The University of New Brunswick has launched Catalyst, through which local businesses submit COVID-19 recovery projects and UNB students work with faculty and researchers to respond. In Ontario, Queen's University's Smith School of Business has partnered with the City of Kingston to create a support network to help local businesses, not-for-profits, and social enterprises navigate the new economic environment.

In the early days of the pandemic, as labs closed, campus researchers do-

nated and sourced critical PPE and medical supplies. Trent University, for example, donated several thousand pairs of gloves, coveralls, boot covers, surgical and N-95 masks and hospital gowns to the Peterborough Regional Health Centre. University of Manitoba scientists did the same, delivering much-needed supplies to the Winnipeg Regional Health Authority.

“ In just months, we have seen tremendous changes and advancements in online and distance education—changes that were quietly spreading across institutions but were then accelerated by the realities of the pandemic. ”

Through this, universities' commitment to deliver high-quality education to all learners was unwavering. Faculty and staff have been exceptionally adaptable in the face of a public health crisis when the most natural, human part of their work—teaching and engaging in person—has suddenly become the exception. In just months, we have seen tremendous changes and advancements in online and distance education—changes that were quietly spreading across institutions but were then accelerated by the realities of the pandemic. Faculty mem-

bers have accounted for multiple time zones, sometimes limited Wi-Fi connections and increased mental health concerns among students, who now form learning communities from across the country and around the world.

They've found ways to create enriched experiences from home. For example, McMaster University's Faculty of Engineering collaborated with Quanser, an educational innovation company, to develop software that could bring interactive lab experiences to students through virtual reality and gaming platforms. First-year engineering students are now learning technical skills in virtual labs. The platforms allow for student collaboration to address challenges in areas such as autonomous vehicle design.

“ At a time when Canada must marshal all its resources for recovery, we cannot afford to let the innovative ideas and intellectual property produced by universities sit on the shelf. ”

Other campus supports, such as mental health services and student employment counselling, have also been moved online. The early signs of this digital transition are promising and stand in contrast to experiences elsewhere. Continuing to support students and continuing to gauge their digital experience will be important to ensure the success of the next generation. It's clear that the pandemic will be with us for some time, and universities will continue to put the health and safety of students, staff and faculty first.

In a labour market that demands on-the-job skills from even new graduates, universities are working with

partners to provide innovative opportunities. At Athabasca University, the Faculty of Business now offers a virtual work-integrated learning experience, powered by artificial intelligence, to provide learners with exposure to practical business projects in a virtual setting.

Still, we can't pretend the situation is normal—not for anyone. Our system is strong, but the resilience of individuals, institutions and communities is at stake.

Before COVID-19, Canada's innovation ecosystem faced some key challenges. We had been doing well on research and education but falling behind in the corresponding industrial R&D, innovation and economic development. We are under-leveraging academic knowledge in Canada, particularly in the private sector. At a time when Canada must marshal all its resources for recovery, we cannot afford to let the innovative ideas and intellectual property produced by universities sit on the shelf. We can avoid that either by introducing new mechanisms and networks, or by scaling existing approaches that are proven to work well.

For example, we could scale up the Lab2Market project, delivered through Dalhousie University, Memorial University and Ryerson University. With the support of industry mentors and funding, it helps researchers commercialize their technology. A new project cohort, focused on the pressing needs of health, is providing tools and expertise to researchers so they can get vaccines, therapeutics, devices, virtual and digital care tools and diagnostic tools to market faster than previously possible. Lab2Market is supported by a patchwork of funders across the country but could be scaled nationally to great effect.

We could also establish new university innovation hubs, recognizing the important role of universities as anchor institutions in their communities—especially in smaller, rural communities. Hubs like these

accelerate technological advances, thereby promoting the growth of small and medium enterprises in surrounding regions.

We know that investing in university innovation pays dividends for Canadian prosperity. Take the work of University of Toronto researchers James Till and Ernest McCulloch, who in the 1960s demonstrated the existence of stem cells. With subsequent rounds of major investment in regenerative medicine, Toronto's swiftly expanding biomedical industry has become a magnet for global talent and business, thanks in large part to consistent investment in the research foundations of this sector.

We see today how investment in stem cell research has fueled job growth and innovation in Canada. Similar advances in genomics, artificial intelligence and machine learning trace their roots to discovery research. The cycle times from discovery to adoption are telescoping to speeds of which Till and McCulloch could only dream.

The pandemic has made it abundantly clear that investment in research and innovation matters: medical research will find a vaccine, social research will impact human behaviour, and history and economics will teach lessons from the past and chart a course for the future. We can't know what today's discovery research will yield for the challenges of tomorrow.

Canada can't afford to allow COVID-19 to disrupt higher education and research. We need the students who will graduate in 2021 and beyond ready to tackle the challenges we face well past the pandemic—climate change, inequality and the many future problems we can't even imagine today.

The work must be done. The new innovators must have room to learn with the best. We'll need them ready when the world reopens, so that Canada emerges stronger than ever. **P**

Paul Davidson is President and CEO, Universities Canada.

The Pandemic Innovation Test for Universities

As anyone who has ever studied at one, taught at one or worked in administration or support staff at one knows, a university is both a bustling, humanist business model and a community. The health and economic risks of the COVID-19 pandemic have presented a unique set of challenges on bricks-and-mortar campuses, as the longstanding debate about online education has suddenly become less academic.

Lori Turnbull

Like all other institutions and industries, universities in Canada and around the world have been jolted by the realities of COVID-19. Professors, students, and staff have all had to cope with the challenges of teaching and learning online.

Efforts to develop proficiency in online teaching have required significant investments from universities and faculty in terms of time, money, and patience. Meanwhile, the heaviest burden is on the students. As readings, recorded videos, and assignments pile up, students are under tremendous pressure to perform without the usual social supports around them.

Many sports programs and other extra-curriculars, which provide opportunities for bonding, exercise, and downtime, have been cancelled for the season. The fact is, most university campuses are not designed for physical distancing. Residences, libraries, gyms, and dining halls are packed with people and, when it is time for everyone to switch classes, so are the sidewalks and streets.

Changes in workload have fueled tension between university boards and labour unions and, at some universities, negotiations are happening

(and/or breaking down) in the first full term of online learning. Both faculty and staff have had significant adjustments to their workloads as a result of the changes to teaching and learning necessitated by pandemic restrictions on gathering.

“What if students decided to take a year off, rather than pay full tuition for a year of Zoom lectures? What if restrictions on global travel were to severely curtail the enrolment of foreign students, whose tuition fees are even higher?”

Traditional approaches to calculating workload are not as effective when people are working from home. Screen fatigue is a real thing. And when we are all working in separate spaces, it is much harder to tell when a colleague needs a laugh or a shoulder. People with children at home are navigating work/life balance every minute of the day.

Over the spring and summer, the big fear for universities was around enrolment for the fall. What if students decided to take a year off, rather than pay full tuition for a year of Zoom lectures? What if restrictions on global travel were to severely curtail the enrolment of foreign students, whose tuition fees are even higher (and often drastically so) than those for domestic students? Furthermore, tuition dollars are not the only source of revenue for universities. User fees, gym memberships, summer camps for kids, and ticket sales usually provide some cash flow, but much of that has dried up during the pandemic.

This all sounds pretty doom and gloom, but it is not all bad news. Universities are and ought to be especially suited to innovation, and so the realities of COVID-19 have given birth to a wide range of tests and strategies for universities.

Key to this innovation is the very real competition among universities. Now that learning has largely been moved online, and the on-campus experience is either not applicable or very different than last year, universities need to develop new strategies to distinguish themselves from one another. In some cases, this has taken the form of bold initiatives in branding that reinforce a university's identity. But universities are also focusing on their competitive advantages. Institutions that offer a diverse suite of graduate programs have a competitive advantage in that they offer unique programs that are not duplicated elsewhere.

Prior to COVID, there was already a proliferation of specialized graduate degrees that go beyond the typical Master of Arts or Master of Sci-



Studley Campus at Dalhousie University in Halifax. “Universities are communities,” as Lori Turnbull writes, where the way of life has been profoundly affected by the pandemic. *DiAnn L’Roy Flickr photo*

ence to build credentials in specific areas of study or to bring disciplines together in what Western University calls “Collaborative Specializations.” These unique educational “products”, to put it in crass terms, help universities to differentiate themselves in a sea of online programs.

The pandemic timeline has been too short for academic units to develop new degrees on the fly, but innovation has occurred in the offering of “micro-credentials.” These are certificates, diplomas, workshops or even single courses that are designed to draw students with an interest or curiosity in the subject matter who, for their own reasons, do not want or need an entire degree.

Micro-credentials are much quicker and easier to design and work through the approvals chain than are full degrees, and so are relatively easy to lift off the ground. What is more, the entry requirements for these programs can be modified from what is normally expected for degree entry, which can expand the applicant pool and therefore grow the university environment, which can be a very attractive prospect for mid-career individuals seeking to build credentials or simply explore a curiosity.

The fees charged for these offerings can help to offset what has been lost in other areas. Many universi-

ties have recognized the opportunity that the pandemic presents for learning and is offering courses specifically designed to build skills in pandemic planning, risk management, trauma support, and teamwork.

Universities are communities. The key challenge for all universities during this time has been to maintain that sense of belonging, even as offices, classrooms, labs, and university pubs are largely empty. Universities have risen to this challenge by finding new ways of creating and connecting with people.

Online panels that are open to the public have become commonplace, which will help universities to stay more present in the larger community even as pandemic restrictions become a thing of the past. This requires academics and universities to think differently about how they disseminate research and knowledge.

Universities have always played leading roles in local and regional economies in Canada, and partnerships with governments and private entities are more important now than perhaps ever before. University researchers are indispensable to Canada’s response to COVID-19. In university labs, researchers are searching for a vaccine; in virtual meeting rooms, professors are meeting with public health officials to develop guidelines for deal-

ing with trauma, isolation, and loss of loved ones; others are consulting with government officials about how to design relief programs and to plan for economic recovery down the road. The pandemic has reiterated and emphasized the pivotal role for universities as public institutions.

COVID-19 is still with us and so the overall effect on Canada’s universities is still impossible to know for certain. It is possible that not all universities will be able to stay afloat and that dreaded conversations around potential amalgamations will become necessary.

What’s certain is that no university will be able to return to business as usual. Students will have different needs going forward, as the new post-pandemic economy will require new skills and competencies.

Universities will need to continue to innovate to respond to those needs and to make transformative contributions to public dialogues that are taking place regarding the legacies of racism and colonialism. The pandemic has challenged Canada’s universities, but has reinforced their public value as well. **P**

Contributing Writer Lori Turnbull is an Associate Professor and Director of the School of Public Administration at Dalhousie University and a co-winner of the Donner Prize.

Supporting Canada's Supply Chains by Investing in Innovation

CN has a long history of innovation that reached another level with its privatization 25 years ago. Thanks to a predictable and supportive regulatory environment, the company has tapped into its own capital to innovate and improve its infrastructure for the benefit of its customers and, as North America's largest railroad, for Canadians as a whole. That culture of innovation has helped enormously in responding to the extraordinary circumstance of the pandemic.

JJ Ruest

Some may find it counterintuitive that a company that has been around for more than a century can be innovative. However, CN has long been the main agent of change in our industry—always at the forefront of innovation. Through privatization, the advent of the North American Free Trade Agreement (NAFTA) and the onset of the data age, CN expanded in North America, pioneering a new model of railroading that raised doubts among many in the industry.

The model calls for a data-driven approach to railroading, something that was revolutionary at the time. Today, this Precision Scheduled Railroading (PSR) model has proven its foresight to the extent that our industry peers are all implementing some variation of it. While they continue to lay the foundation of PSR, CN is now leading the way to modernize railroading technology to create more value for our customers, the communities we serve and our supply chain partners.

Canada is a trading nation and without a strong rail supply chain infrastructure, of which CN is an essential component and leader, those global



President and CEO JJ Ruest has been with CN since 1996. He was selected Railroader of the Year in 2019 by *Railway Age* magazine. *CN photo*

connections would not be possible. Government investments in ports, as well as in trade-enabling infrastructure, coupled with a supportive regulatory regime, encourage private sector investments, which, in turn, play a crucial role to stimulate the economy.

Our safe, efficient and environmentally sustainable transportation services are essen-

tial to the economy, for customers to reach their markets and to be well-positioned against competitors, and to the public for the goods they rely on every day. This indispensable place in the Canadian economy was clearly demonstrated by the severe supply chain disruptions caused by last year's work stoppage and last February's illegal rail blockades. However, nothing has highlighted this more than the COVID-19 pandemic. Thanks to our strategic investments of \$10 billion over the last three years and the can-do attitude of our people, we came out of these difficult times strong and ready to take on the future.

Our response to COVID-19, which is currently impacting the entire global supply chain, is another example of how strategic investments help industries face challenges. With the investments we made in our network over the last few years, we were able to adapt quickly to keep consumers stocked with basic goods like food, fuel and toilet paper as well as to get critical supplies to the frontline workers battling the pandemic. People and technology were central to this swift response, as they are to our growth and safe operations.

CN's in-house medical team quickly created a series of webinars and other electronic communications tools to explain the protocols we all need to follow to combat COVID-19. The team also made free telemedicine services available to all CN employees and their immediate families. When our traffic volumes were drastically reduced in late March and April, we strategically stored idle equipment in sites where they would be needed most as the economy reopened.

CN's modernization strategy in recent years—namely automation, dig-



Automated inspection portals with ultra-high-definition panoramic cameras and infrared lighting capture a 360° view of a train as it travels at track speed, allowing the detection of many defects not visible to the human eye. *CN photo*

italization and remote sensing technology to inspect cars and tracks—is paying huge dividends. Our employees can “walk the rails” from an office and send out teams to make needed repairs and perform maintenance. We need well-developed and timely regulations to allow all this to accelerate in the future, especially as the pandemic reaffirmed our modernization vision to evolve toward a digital ecosystem to deliver new capabilities for the country, and greater safety and resilience for our customers.

Data is the new currency and one of our most important strategic assets. New operational technology platforms harness real-time data, empowering the whole supply chain to make quicker, better-informed decisions. In March, we launched our first suite of five digital application programming interfaces (APIs), allowing customers to connect seamlessly with CN for “track and trace” shipment information, including ETA and GPS location—a rail industry first. In August, over 12 million API messages were exchanged, signaling a new era of business transparency and simplicity that will be critical for CN as we continue to innovate.

Innovation not only serves growth, but safety as well, a core value at CN. We are putting powerful sensor and

AI technology into specially equipped automated track inspection cars, positioned in our regular trains so they can inspect our tracks at normal speed. For example, in the US, we inspected 79,300 miles of track in the first seven months of 2020 compared to 4,800 miles in the same period of 2019, almost 17 times more.

“ Data is the new currency and one of our most important strategic assets. New operational technology platforms harness real-time data, empowering the whole supply chain to make quicker, better-informed decisions. ”

AI technology is also changing how we inspect our railcar fleet. Our new automated inspection portals feature ultra-high-definition panoramic cameras and infrared lighting that capture a 360° view of 102 components of a train as it travels at track speed through the portal. Algorithms allow

detection of many defects that are not visible to the human eye.

Both these innovations increase inspection frequency and quality, and provide more accurate and predictive preventative maintenance data. We believe these technologies play an important role in preventing incidents, leading to increased safety and improved service capacity. The regulatory regime of the country must be adapted accordingly to allow these technologies to be used to their full potential.

Today, as the economy continues to reopen, CN will keep playing an essential role in the recovery. CN has been delivering goods for over 100 years and we are well positioned to keep on delivering for another century. Under a favourable and predictable regulatory regime, we will continue to embrace technological infrastructure as a strategic pillar for growth, in support of safe, efficient and environmentally sustainable rail operations.

The pandemic has proven that our investments in capacity and technology are the key to Canada keeping its seat as an essential player in international trade. **P**

JJ Ruest is the President and Chief Executive Officer of the Canadian National Railway Company.

Soutenir les chaînes d'approvisionnement du Canada en investissant dans l'innovation

Le CN a une longue histoire d'innovation qui jouit d'un nouvel élan depuis sa privatisation il y a 25 ans. Grâce à un cadre réglementaire prévisible et favorable, la compagnie a utilisé son capital pour innover et améliorer son infrastructure et son service au profit de ses clients et, étant le plus grand chemin de fer de l'Amérique du Nord, des Canadiens dans leur ensemble. Cette culture de l'innovation s'est avérée très utile pour répondre à l'extraordinaire contexte de la pandémie.

Jean-Jacques Ruest

Il peut être difficile de croire qu'une entreprise vieille de plus d'un siècle puisse être innovatrice. Pourtant, toujours à l'avant-garde des innovations, le CN a longtemps été le principal agent de changement du secteur. Grâce à sa privatisation, à l'avènement de l'Accord de libre-échange nord-américain (ALENA) et au début de l'ère des données, le CN a pris de l'expansion en Amérique du Nord en faisant œuvre de pionnier avec un nouveau modèle d'exploitation qui a rendu perplexes plusieurs acteurs du secteur.

Ce modèle est fondé sur les données, ce qui était révolutionnaire à l'époque. Aujourd'hui, ce modèle d'exploitation ferroviaire précise à horaires fixes (PSR) a fait ses preuves à un point tel que nos pairs du secteur l'ont adopté à leur façon. Alors que ceux-ci en sont encore à en jeter les bases, le CN ouvre maintenant la voie à la modernisation des technologies ferroviaires afin de créer une plus grande valeur pour nos clients, les collectivités que nous desservons, et nos partenaires de la chaîne d'approvisionnement.

Le Canada est une nation commerçante et sans une solide infrastruc-



Le président-directeur général, Jean-Jacques Ruest, est au CN depuis 1996. Le magazine *Railway Age* lui a décerné le prix du Cheminot de l'année en 2019. Photo du CN

ture de chaîne d'approvisionnement ferroviaire, dont le CN est un rouage essentiel et un pilier, ces échanges commerciaux mondiaux seraient inexistants. Les investissements gouvernementaux dans les ports et dans les infrastructures favorisant les échanges commerciaux, jumelés à un cadre réglementaire favorable, encouragent les investissements du secteur privé qui, à leur tour, jouent un rôle crucial pour stimuler l'économie.

Nos services de transport sécuritaires, efficaces et durables sur le plan environnemental sont essentiels pour l'économie, pour permettre aux clients d'atteindre les marchés et de bien se positionner par rapport aux concurrents et pour approvisionner les gens au quotidien. Les importantes perturbations de la chaîne d'approvisionnement causées par l'arrêt de travail de l'an dernier et par les barricades illégales de février ont en effet mis en lumière le rôle crucial que nous jouons dans l'économie canadienne. Ce rôle n'a toutefois jamais été aussi évident que pendant la pandémie de COVID-19. Grâce à nos investissements stratégiques de 10 G\$ au cours des trois dernières années et à l'attitude positive de notre personnel, nous avons surmonté cette période difficile avec force, prêts à affronter l'avenir.

Notre réponse à la COVID-19, qui se répercute actuellement sur l'ensemble de la chaîne d'approvisionnement mondiale, a, elle aussi, montré que les investissements stratégiques aident les entreprises à surmonter les difficultés. Grâce aux investissements que nous avons faits dans notre réseau au cours des dernières années, nous avons pu nous adapter rapidement pour que les consommateurs puissent disposer de produits de base (nourriture, carburant, papier hygiénique, etc.) et pour approvisionner en fournitures essentielles le personnel de première ligne luttant contre la pandémie. Nos effectifs et la technologie ont joué un rôle central dans cette réponse, tout comme dans notre croissance et la sécurité entourant nos activités.

L'équipe médicale du CN a rapidement créé une série de webinaires et d'autres outils de communication pour expliquer les protocoles servant



Les portails d'inspection automatisée sont dotés de caméras panoramiques à ultra-haute résolution et d'un éclairage infrarouge qui permettent d'obtenir une vue à 360 degrés du train pendant qu'il y passe à vitesse normale, et de détecter de nombreux défauts invisibles à l'œil nu. Photo du CN

à lutter contre la propagation de la COVID-19. L'équipe a aussi déployé un service de télémédecine gratuit destiné à nos cheminots et à leur famille immédiate. Quand les volumes ont chuté à la fin mars et en avril, nous avons entreposé le matériel roulant inutilisé aux endroits stratégiques où il sera le plus en demande au moment de la reprise de l'économie.

La stratégie de modernisation du CN—soit l'automatisation, la numérisation et la technologie de télé-détection pour l'inspection des wagons et de la voie—a porté fruit. Nos cheminots peuvent « parcourir la voie » à partir du bureau et envoyer des équipes pour effectuer les réparations et les travaux d'entretien nécessaires. Nous avons besoin d'une réglementation bien structurée et opportune afin que ceci prenne de l'ampleur, d'autant plus que la pandémie a renforcé notre vision de la modernisation, laquelle consiste à évoluer vers un écosystème numérique offrant de nouvelles capacités pour le pays et davantage de sécurité et de résilience pour nos clients.

Les données sont la nouvelle « monnaie » et notre plus important atout stratégique. Nos nouvelles plateformes technologiques utilisent des données en temps réel, ce qui permet à toute la chaîne d'approvisionnement de prendre des décisions éclairées plus rapidement. En mars, nous avons lancé notre première

gamme de cinq interfaces de programmation d'applications (API). Ces API permettent la transmission simplifiée de renseignements de traçage entre le CN et ses clients, comme la position GPS et l'heure d'arrivée prévue, une première dans le secteur ferroviaire. En août, plus de 12 millions de messages ont été échangés à l'aide des API, ouvrant la voie à une nouvelle ère en matière de transparence et de simplicité, deux aspects essentiels pour le CN qui continue d'innover.

L'innovation favorise non seulement la croissance, mais aussi la sécurité, une valeur fondamentale au CN. Nous installons de puissantes technologies de capteurs et d'intelligence artificielle (IA) sur des wagons équipés spécialement pour l'inspection automatisée de la voie à vitesse normale. Aux États-Unis, par exemple, nous avons inspecté 79 300 milles de voie dans les sept premiers mois de 2020 comparativement à 4 800 milles pendant la même période en 2019, soit une distance environ 17 fois plus grande.

L'IA transforme aussi notre façon d'inspecter notre parc de wagons. Nos nouveaux portails d'inspection automatisée sont dotés de caméras panoramiques à ultra-haute résolution et d'un éclairage infrarouge qui permettent d'obtenir une vue à 360 degrés des 102 composantes du train pendant qu'il y passe à vitesse normale. Les algorithmes permettent de dé-

tecter de nombreux défauts invisibles à l'œil nu.

Grâce à ces innovations, nous pouvons augmenter la fréquence et la qualité des inspections et obtenir des données prédictives plus exactes aux fins d'entretien préventif. Nous croyons que ces technologies jouent un rôle important dans la prévention des incidents et contribuent à améliorer la sécurité et la capacité de nos services. Le cadre réglementaire du pays doit être adapté en conséquence pour faciliter l'exploitation optimale de ces technologies.

L'économie se remet en marche et le CN continuera de jouer un rôle essentiel dans la reprise. Le CN achemine des marchandises depuis plus de 100 ans et est bien placé pour continuer pendant encore un siècle. Dans un cadre réglementaire favorable et prévisible, nous continuerons à considérer l'infrastructure technologique comme pilier stratégique pour nos objectifs de croissance et d'exploitation ferroviaire sûre, efficace et durable sur le plan environnemental.

La pandémie a prouvé que nos investissements dans la capacité et la technologie sont essentiels pour que le Canada puisse demeurer un joueur incontournable dans le commerce international. **P**

Jean-Jacques Ruest est le président-directeur général de la Compagnie des chemins de fer nationaux du Canada.

2030 Today: COVID and the Online Economy

If anyone knows how to adapt and innovate amid dizzying change, Shopify does. The Ottawa-based e-commerce platform has been at the forefront of the lockdown migration to the digital economy, massively expanding its online merchant base, helping entrepreneurs “future-proof” their businesses and becoming the most valuable publicly-traded company in Canada. Shopify’s Clark Rabbior looks at how the pandemic has acted as a force multiplier for innovation, and what a suddenly telescoped future may hold.

Clark Rabbior

The COVID-19 pandemic has revealed two very different entrepreneurial experiences in Canada. Businesses with access to high-quality digital infrastructure and technological expertise have weathered the worst of the crisis. By contrast, businesses that have not made the shift to digital commerce are suffering. The gap between connected and disconnected entrepreneurs is wide, and prevents many from generating prosperity for themselves and their communities.

Canada’s future competitiveness depends on entrepreneurs and a robust digital infrastructure to support them. The pandemic has put that infrastructure to the test and revealed substantial inequities in entrepreneurial opportunity. Entrepreneurs in rural and remote areas, as well as Indigenous peoples, racialized minorities, women and people in lower income households have less access to critical resources than others. We have an entrepreneurial ecosystem that works for

some, but requires others to compete with one arm tied behind their back.

Expanding digital infrastructure, and enhancing digital skills, will ensure entrepreneurs have the financial resources they need to survive the current economic crisis, and well into the post-COVID future.

The economic crisis sparked by COVID-19 accelerated and exacerbated trends in entrepreneurship in Canada—good and bad.

Many entrepreneurs have been resilient, quickly embracing e-commerce and digitization to serve customers online. Prior to the pandemic fewer than one in five Canadian businesses

“ While retail sales overall declined by nearly 18 percent from February to May, e-commerce sales nearly doubled, according to Statistics Canada. Many entrepreneurs who have embraced and prepared for the digital age are not just surviving, they are thriving. ”

E-Commerce and In-Store Retail Sales (Indexed monthly, January 2016=100)



Source: Statistics Canada, *Retail E-Commerce and COVID-19*.

were set-up for e-commerce, but that accelerated dramatically over the last six months. While retail sales overall declined by nearly 18 percent from February to May, e-commerce sales nearly doubled, according to Statistics Canada. Many entrepreneurs who have embraced and prepared for the digital age are not just surviving, they are thriving.

While some businesses and consumers are thriving in the age of digital entrepreneurship, many are locked out of opportunities to succeed. Insufficient access to reliable, high-speed internet is a key driver, one in 10 Canadian households remains unconnected, according to the Canadian Radio-Television and Telecommunications Commission (CRTC). This impacts rural and lower-income households, Indigenous communities and many racialized minorities, limiting opportunities for people to participate as equals and entrepreneurs in the digital age.

In rural and remote locations in Canada, whole communities are left behind. While nearly 85 percent of Canadian households have access to minimum speed targets set by Canada's Connectivity Strategy (50 Mbps download/10 Mbps upload), only 37 percent of those in rural communities and 28 percent of First Nations reserves have access to those speeds,

according to a 2019 CRTC report. These structural barriers are limiting not only the social and economic well-being of those communities most affected, but all of Canada.

Recognizing the pressing need to adapt business sales platforms and strategies to the lockdown economy and beyond has resulted in federal and provincial governments in Canada, along with private sector partners, launching a number of support programs. Initiatives to help businesses establish an online presence—including support both on the technical and managerial side of transformation—have been among a suite of highly subscribed programs, according to the *Toronto Star*.

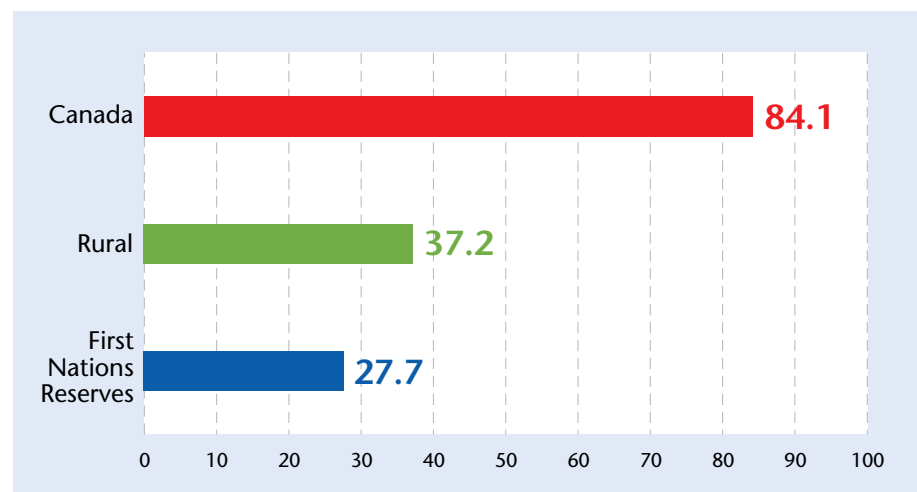
The federal government has also renewed its promise to ensure that rural and remote communities will have better connectivity and signalled that, as CBC Radio has reported, it's considering making high-speed internet an "essential service." Both initiatives are critical if rural businesses and consumers are to participate equally in the digital economy.

While governments across Canada have quickly developed and deployed a range of measures to address the health and economic crisis, longer-term initiatives to support equi-

table entrepreneurship in the digital age are still needed. Visions of an online economy by 2030 have been pulled forward to 2021 by our pandemic realities. Previous connectivity recommendations that used a five-to-10-year horizon for implementation need to shift to a 5-to-10 month horizon-or sooner. Securing opportunities for all Canadians to be successful entrepreneurs, and building an economy in which entrepreneurship effectively underpins Canadian competitiveness and prosperity, depends on accelerating connectivity, digital skills, and financial investments.

“ The gap between these two experiences in Canada must be closed. We not only need Canadians to be more entrepreneurial, we need to ensure that entrepreneurial Canadians have the digital and financial resources to succeed. ”

Internet Access at 50/10 Mbps (percent of households)



Source: CRTC, *Communications Monitoring Report 2019*.

COVID-19 was a wake-up call for Canada's entrepreneurial economy. It showed us that some entrepreneurs have resources to be resilient and thrive, while others have seen their existing challenges and barriers accelerate, further limiting chances of success.

The gap between these two experiences in Canada must be closed. We not only need Canadians to be more entrepreneurial, we need to ensure that entrepreneurial Canadians have the digital and financial resources to succeed. To compete for gold in the global digital economy, Canadians will need gold standard resources, talent and connectivity. **P**

Clark Rabbior is Head of Government Relations for Shopify.

Primary Care as the Nexus of Post-COVID Health and Economic Convergence

Nearly a year into the societal transformations of the COVID-19 pandemic, it is now inarguable that health and economics are not only connected but that they are existentially interdependent. More than four decades ago, a global blueprint was drafted for a future in which primary care would act as the front line and beating heart of that interdependence. The current crisis could provide the catalyst for that transformation.

**Gillian Bartlett
and Laurette Dube**

In September 1978, the International Conference on Primary Health Care in Kazakhstan adopted the Declaration of Alma-Ata, arguably one of the most important milestones for public health of the 20th century. With the current global pandemic, economic crisis, and daily headlines highlighting the strains and deficits of health care systems, it is worth revisiting the Alma-Ata, over 40 years later, as a basis for much-needed health system innovation. The major tenet of the Alma-Ata, adopted by the World Health Organization (WHO) as key to achieving “health for all”, was the critical role of primary care. Section IX of the Declaration stated:

Primary health care is essential health care based on practical, scientifically sound and socially acceptable methods and technology made universally accessible to individuals and families in the community through their full participation and at a cost that the community and country

can afford to maintain at every stage of their development in the spirit of self-reliance and self-determination. It forms an integral part both of the country’s health system, of which it is the central function and main focus, and of the overall social and economic development of the community. It is the first level of contact of individuals, the family and community with the national health system, bringing health care as close as possible to where people live and work, and constitutes the first element of a continuing health care process.

Primary care in the Canadian context is provided predominantly by family physicians who often work with other health and social service professionals to provide health care services. This approach does not differentiate by age, gender, disease or organ system, and by doing so, develops long-term therapeutic relationships. Primary care puts into practice the notion that a person is greater than the sum of their parts. The primary care providers’ distinct advantage for contributing new information related to patient-level care has

its locus in their direct experience with both healthy and ill people in every stage of disease, long-term follow-up, and the obligation to adopt a multidisciplinary approach to care.

Currently, primary care is situated as an extension of our hospital-oriented health care system with fragmentation of information and challenges with sufficient and equitable access. The COVID-19 pandemic and ensuing crisis in care has provided an opportunity to flip the orientation of our health care system to ensure that primary care is at the hub as an anchoring point for provision of care as originally envisioned by the Alma-Ata.

Much like an engineering stress test, the COVID-19 pandemic has pushed health care systems to the limit and clearly identified areas of failure. The current model of health care is still—more than 50 years after introduction of universal health care in Canada in 1966—fundamentally organized around hospital care with a focus on disease diagnosis and treatment. While health promotion and disease prevention receive some attention, only a small fraction of funding for research and care has ever been attributed to these areas. Most funds and efforts have been concentrated in university teaching hospitals. That is not to diminish the important work being done in these institutes—we have had many impressive successes in cancer, cardiometabolic disease, respiratory, neurological and other areas where certain diagnoses are no longer the death sentences they would have been even

10 years ago. Given that great deal of research published in high-impact journals supports the tenets of the Alma-Ata Declaration on the key role of primary care in improving the performance and sustainability of a health care system and the health of the population, primary care must be more centrally located and emphasized. As noted in the concluding statement of the Alma-Ata, there is a need for an “urgent and effective national and international action to develop and implement primary health care throughout the world.”

This is particularly critical as early research indicates that people with stronger immune systems and no underlying conditions are less likely to get COVID-19, and if they do, they suffer a milder version with a lower likelihood of being hospitalized and intubated. Keeping the population as healthy as possible as long as possible is the essence of primary care. Primary care providers serve as partners in managing chronic disease, as gatekeepers to successive tiers in the health care system, and as health educators. Importantly for our current situation, primary care is often a critical intermediary between medicine and public health, thereby contextualizing patient needs against the sociocultural backdrop of the world in which they live. This degree of personalization—unique to primary care—rests on an intimate understanding of a community’s social and cultural fabric. Given that COVID-19 is impacting people and communities differently, these defining characteristics of primary care need to be supported and strengthened.

Some of the technology-enabled care that the pandemic has forced to the forefront can help manage access and routine care through embedding innovations into everyday life as we have seen with virtual clinical visits. The instant uptake in rates of telehealth both by phone and video, however, has highlighted deficits in our digital infrastructure. There is an urgent need to increase accessibility to hardware, software

and Wifi so that this does not become another contributor to increasing health inequities.

Far in advance of its time, the Alma-Ata stated that primary health care needs to focus on all the dimensions of a person’s well-being, including access to affordable healthy water, air, and food, decent housing, and other facets of the surrounding environment. Clearly, this transcends health system boundaries, even primary care, at least with its still prevailing clinical focus. In a full convergence economy, health, social, and commercial sectors all partake in creating resilience for individuals, economies and society. We would argue that a key post-COVID-19 health system innovation is for primary care (and not just the medical doctor on the team) to move beyond what have become fairly restrictive health domains to serve as catalyst in key areas such as climate, environment, food distribution and technology to create a human-centered, digitally powered approach to health and economics. This will more closely embrace the WHO statement that, “Health is a state of complete physical, mental and social well-being and not merely the absence of disease or infirmity.” In fact, the large-scale application of smart digital technology that has accelerated telehealth in response to the pandemic may play a vital role in giving Alma-Ata the full wings that it has not achieved to-date.

This approach incorporates health and economic convergence as the overriding principle at the centre of the evolution of preventive health care. While nobody would have wished for the COVID-19 pandemic, its role in revealing the existential importance of convergence has helped focus public policy attention and private intellectual capital on the need for innovation in health and economic policy that better incorporates the relationship between health care—especially primary health care—and economic well-being. We would argue that lens of convergence think-

ing that anchors on primary care but goes outside of typical health domains to combine in a way that strongly aligns with the Alma-Ata is a way to give life to this still-relevant Declaration.

It is now possible to gather, structure, and analyze more significant quantities of data with greater efficiency than ever to support solution-oriented health care systems strongly grounded in primary care, thereby enabling performance and resilience for individuals and populations as well as for our economy and society. Keeping the ‘past’ of the Alma-Ata firmly in mind, we need to re-imagine the connections among all of the industrial inputs that affect health outcomes, from agriculture to transportation to urban planning to the definition of work—so that innovation better serves our transforming world.

This is where we move beyond the typical focus of health systems to provide a much-needed update and re-integration of the principles of the Alma-Ata to a digitally-adapted convergence approach that is moored in complexity science and societal transformation. The impact would be a robust system of economically, environmentally and culturally integrated solutions to support the sustainability and resilience of the individuals, institutions and organizations that make up our society, including our interdependent health and economic systems—an Alma-Ata blueprint for the 21st century. **P**

Gillian Bartlett was the Research and Graduate Program Director in Family Medicine at McGill University and is now a Professor of Family and Community Medicine and the Associate Dean for Population Health and Outcomes Research at the School of Medicine, University of Missouri.

Laurette Dubé is the James McGill Chair in Consumer and Lifestyle Psychology at the Desautels Faculty of Management; Chair and Scientific Director, McGill Centre for the Convergence of Health and Economics (MCCHE).



Life-Saving Cancer Testing

Delayed diagnosis and treatment have created a crisis for thousands of cancer patients during the COVID-19 pandemic.

New, Quick, and Non-Invasive Testing

A new test, based on a minimally-invasive blood draw – known as circulating tumour DNA (ctDNA) testing – is now possible for three major types of cancer: lung, colorectal and breast cancer. This can spare thousands of Canadians annually from having to undergo biopsies to determine their oncology treatment programme.

Through the support of the Canadian Digital Technology Supercluster, Canexia Health is leading an initiative called Project ACTT (Access to Cancer Testing & Treatment in Response to COVID-19) to speed up testing for cancer treatment selection in Canada. We are making 2,000 minimally invasive blood tests available to patients with recurrent or metastatic breast, lung, or colorectal cancers across Canada as a first-line alternative to surgical tissue biopsies.

The future of health care delivery

Canexia's oncology diagnostic tools can pull thousands of Canadians out of biopsy queues, take thousands of Canadians out of hospital or clinic waiting rooms, and give new insights into the most effective treatment options – all while saving the health system millions of dollars.





About Canexia Health

Founded and headquartered in Vancouver, Canexia Health offers cost-effective and clinically actionable tests to guide treatment and monitoring of cancer.

Our vision is to make cancer testing accessible to all Canadian cancer patients via minimally invasive tests that can be run locally in urban and rural settings.

We are led by a Canadian team of experts in the fields of cancer genomics, molecular diagnostics, and bioinformatics.



“COVID-19 has made liquid biopsy into a viable and desirable first-line alternative to surgical biopsy for many patients with metastatic and relapsed cancers. What’s more, beyond the pandemic, this type of testing can expedite treatment decisions for many patients and remove geographic and economic barriers to care. We hope it will be made available to any cancer patient whose oncologist or care team needs the information it can provide. Improving the equity of cancer care is a major driver of everything we do.”

Dr. David Huntsman, Chief Medical Officer of Canexia Health.

For more information, visit www.canexiahealth.com



For more than 25 years, Let's Talk Science has provided engaging, evidence-based STEM programs at no cost for Canadian youth and educators. The COVID-19 pandemic inspired LTS to innovate around isolation and lockdown restrictions to maintain that mission. *Let's Talk Science photo*

Innovating Through Crisis

When the COVID-19 pandemic lockdown hit, Let's Talk Science possessed all the innovation ingredients to rise to the occasion. A national charitable organization that helps children and youth by supporting their engagement with science, technology, engineering and mathematics (STEM), Let's Talk Science leveraged its own science and tech strengths to adapt to the crisis and learn from its challenges.

Bonnie Schmidt

Let's Talk Science is a national charitable organization that mobilizes thousands of volunteers at more than 50 post-secondary sites across Canada and offers a comprehensive suite of blended (i.e. online and in-person) STEM-based programming in English and French for educators from early years through Grade 12.

The COVID-19 pandemic has underscored the critical need for our work to help youth prepare for future career and citizenship roles through STEM engagement. Let's Talk Science's response to the massive school disruption caused by COVID-19 was guided by the principles that 'culture eats strategy for breakfast' and 'a good crisis should never go to waste', made famous by Peter Drucker and Winston Chur-

chill, respectively. Let's Talk Science responded in both conventional and unconventional ways to maximize our support for youth, educators, parents and volunteers with online and offline initiatives.

The pandemic has laid bare the importance of science literacy and public trust in science. STEM engagement builds those attributes and develops critical thinking, problem-solving, evidence-based decision-making skills, and much more.

Once we ensured our people were healthy and could work safely, Let's Talk Science moved quickly to support the rapid shift to distance learning. At the same time, we launched several inclusion initiatives, including an ambitious 'unplugged' project to address the growing equity gap experienced by youth without access to technology. Key learnings include: i) our 'innovative family' culture that believes in collaboration, continuous learning and enabling others was critical to our robust and successful response; and, ii) educators and parents are adapting and innovating to support youth.

“ Teachers demonstrated their deep commitment by registering by the thousands for these opportunities. One participant commented that they attended because ‘when they have a passionate teacher, then students become passionate too. It’s contagious.’ ”

As learning shifted online, Let's Talk Science stepped up quickly to provide new programming, asking educators what they needed. We expanded our resources to include pandemic-relat-

“ The pandemic has laid bare the importance of science literacy and public trust in science. STEM engagement builds those attributes and develops critical thinking, problem-solving, evidence-based decision-making skills, and much more. ”

ed material. We ramped up professional learning to help educators use technology in meaningful and relevant ways to support their students. Teachers demonstrated their deep commitment by registering by the thousands for these opportunities. One participant commented that they attended because “when they have a passionate teacher, then students become passionate too. It’s contagious.” We also expanded our national network of Teacher Leaders, classroom educators (including several in Indigenous schools) who are trained in our programs, so this school year they can support their colleagues locally.

We developed new online programming for parents and caregivers called ‘STEM at Home’, which was promoted and shared by more than 50 education partners including six provincial/territorial governments, 21 school boards, four teachers’ associations, and more than 20 community and post-secondary partners.

Our Let's Talk Science Outreach program was hit especially hard by the pandemic. More than 80 percent of our volunteers are post-secondary students, most of whom, themselves, had to adapt to online studies. Their own stress was undeniable and yet they maintained their commitment to Let's Talk Science. After canceling hundreds of in-person events, they moved online. The Let's Talk Science Challenge Online welcomed more than 500 Grades 6-8 students every week for eight weeks. While we had a smaller number of participants than the traditional in-person competitions held at more than 25 locations across Canada, more than

half were youth who could never have attended those events. They asked us to maintain weekly challenges throughout the summer, so we did. Our annual weeklong training conference moved online for volunteer leaders, resulting in the largest multi-day training event in the program's history. With national support, local Outreach sites experimented with virtual outreach, including hosting symposia for high school students, career panels, interactive sessions with classrooms, science story-time and more. Virtual outreach continues to grow rapidly and is now a permanent pillar of our ongoing programming.

We inspired youth to think about their future by offering two new career exploration challenges. First, we expanded the *Let's Talk Careers: Canada's Most Informed School Competition* offered with ChatterHigh by adding an individual prize stream. More than 2,500 Canadian youth from 200 schools (cumulatively) *correctly* answered 112,633 career questions! The success of this initiative inspired Skills Compétences Canada to join us this year. Second, we ran *That's a Real Job! Contest*, challenging Grades 5-12 students to propose a winning ‘future career’ concept, which we'll use in an upcoming campaign. The promotional video showcasing our existing career content was viewed to completion more than 2 million times.

Far too many children will remember the pandemic as the scariest time of their lives. The use of food banks skyrocketed and the lack of access to devices and the internet fostered isolation for many youth. In response, Let's Talk Sci-



Priya, Dan and Alex from Partners in Mission Food Bank in Kingston receiving their shipment of Let's Talk Science Horizon kits. *Let's Talk Science photo*

ence coordinated an ambitious initiative that engaged nearly 300 organizations to provide a gift of learning to vulnerable children in Grades 4-6 across Canada. The Horizon project aimed to send a caring signal to children that learning is the key foundation for their future. We wanted to inspire hope by engaging them in meaningful and fun STEM-based learning that did not require computer technology, internet access or adult supervision. At a time when all organizations were being challenged, the Horizon project offered an unexpected gift to our partners; every organization approached said 'yes'—and Canadian astronaut Chris Hadfield included an inspiring message. All partners are named on the Let's Talk Science Horizon page.

In association with Food Banks Canada and many organizations, we have distributed nearly 75,000 Horizon kits (English and French) to vulnerable children (including more than 13,000 Indigenous youth) across Canada. Every Horizon kit includes hands-on STEM and literacy activities; supplies to do the activities; an age-appropriate book and more. What sounds like a simple project was affected by global supply chain issues in the sourcing of more than 113,000 kg of learning resources (including 4.5 million beads for

'unplugged' coding activities, 75,000 rolls of tape and more), as well as complex logistics related to assembly and shipping as online consumer shopping escalated during the pandemic, challenging our partners in those industries. It became an extensive friend-building opportunity as we located over 250 community organizations in all jurisdictions to distribute Horizon kits locally. While jurisdictions and school districts are working hard to provide necessary technology to vulnerable students, we believe these children will also benefit from receiving a surprise gift of learning, offered from an unexpected coalition.

Disruption caused by the COVID-19 crisis is transforming education and underscoring the importance of STEM. Hopefully, it will also result in the adoption of recommendations recently made by an international expert panel convened to reimagine the Organisation for Economic Co-operation and Development (OECD) PISA science test, which will be administered in 2024 to 15-year-olds in more than 80 countries. I was honoured to be a member of that panel, which made bold recommendations to the OECD. PISA is a bellwether for science education; the report, coupled with the evolution underway because of COVID, could lead to sig-

nificant and sustained transformation in education.

This transformation is critical to how we respond to COVID-19, a growing climate crisis, and the ongoing inequities and racial discrimination that are resulting in barriers for many youth to reaching their full potential. With a newly launched partnership with the Royal Society of Canada, we are considering all we have learned during the pandemic to inform the development of innovative programming that supports evidence-based decision-making, fosters hope and inspires climate action among all youth. In doing so, Let's Talk Science is committed to tackling barriers and inequities, and providing accessible, free programming that promotes diversity and inclusion.

Following Churchill's advice, Let's Talk Science has not wasted this crisis. Our culture has prevailed during this unprecedented and difficult time. We have innovated, learned and adapted in service to Canadian youth, educators, parents and volunteers. We are deeply thankful to our funding partners who encouraged us to be responsive. The impact of our response is yet to be fully determined but one key result has been the considerable expansion of our alliances. "Life is a contact sport" was the mantra of Let's Talk Science's founding Chair, Mitchell Baran. My mentor for 20 years, Mitch was profoundly committed to innovation, and to Canada. The irony of the statement in the midst of a global health pandemic is not lost on me; however, it remains appropriate as we navigate through complex and uncertain times. Let's Talk Science can be counted on to build and support an innovative team of talented and diverse staff, volunteers, educators and partners who share the common purpose of developing all Canadian youth and nurturing a scientifically literate society. **P**

Bonnie Schmidt is the founder and President of Let's Talk Science.

The Infinite Dance of History and Innovation

As any inventor knows, it's impossible to create something truly new without knowing what's come before. And as any historian will tell you, the past—among its many definitions—is a trail blazed by visionaries to future after future. Nobody brings history to life better than Historica Canada, and nobody knows Canadian innovators like the Rideau Hall Foundation. Hence, a great Canadian collaboration.

Anthony Wilson-Smith and Bronwyn Graves

A small, fine-boned woman moves briskly across a 1940s-era factory floor, her pace barely affected by the cane she occasionally relies upon for balance. Several steps behind, a longer-limbed male journalist struggles to keep up, scribbling notes as the woman reels off a barrage of facts about the project he's reporting on. The tour complete, they step out of the building into sunlight. The woman smiles delightedly as one of the products she oversees—a Second World War Hawker Hurricane fighter plane—glides smoothly overhead.

If that scene seems familiar, it places you among the millions who have seen the new Heritage Minute released Oct. 1 by Historica Canada, the non-profit organization where the authors of this piece work. It is about the remarkable Elsie MacGill—polio survivor, feminist, the world's first female aeronautical engineer, and the person in charge of production of all RCAF Hurricanes during the war.

MacGill, who died in 1980 at age 75, was by any measure an innovator. She did new things in new ways. When others told her what 'couldn't' be done—because she was

a woman, or just *because*—she went ahead and did them. Time and again, she proved the doubters wrong. But MacGill has remained relatively unknown in the 40 years since her passing. Historica Canada is seeking to change that, by telling her story and those of other innovators and all-around remarkable Canadians who have made this world a better, safer and more enjoyable place.

“ *The mini-documentary series Inspiring Innovators, produced in partnership with The Rideau Hall Foundation, explores some innovations and the inventors behind them, with stories told in short animated videos.* ”

Those innovation stories include everything from the invention of insulin by University of Toronto's Frederick Banting and Charles Best to the invention of basketball by James Naismith of Almonte, Ontario). The

mini-documentary series Inspiring Innovators, produced in partnership with The Rideau Hall Foundation, explores some innovations and the inventors behind them, with stories told in short animated videos. The first videos, launched in May, cover Robert Foulis and his invention of the foghorn (which has seen online almost 1.4 million times) and Maude Abbott's *Atlas of Congenital Cardiac Disease*, which revolutionized the diagnosis of heart defects and paved the way for more women to practice medicine (965,000 views.) Two more are coming in November—Olivia Poole's invention of a baby jumper accessory based on the cradleboards of her Ojibwe heritage, and Roland Galarneau's invention of an automatic Braille translator to make Braille texts more accessible.

In order to tell stories like these, we've learned to innovate ourselves. Eight years ago, we began switching our focus from 'live' face-to-face programs to online offerings. At the time, we had about seven million users of our combined programs. Last year, we had slightly more than 27 million users. When we brought back our Heritage Minutes from a five-year hiatus in 2012, the early ones had about 50,000 viewers in their first month of release. Three weeks after its release, the MacGill Minute had been viewed 4.6 million times online—the highest number for any of the almost 100 Minutes produced to date, breaking the previous record of 4.3 million views and on track to surpass five million views in a single month. (That was the case for the Minute earlier this year on the role Canada and its soldiers played in the liberation of the Netherlands in the Second World War.) We have more than 300,000 followers on social media platforms



In a new Heritage Minute that has quickly set all-time viewership records, Elsie MacGill presides over a test flight of RCAF Hurricanes in the Second World War. A polio survivor and a strong feminist, she was the world's first woman aeronautical engineer, and iconic leader of Canada's fighter plane production program. *Historica Canada photo*

that include Twitter, Facebook, Instagram and, most recently, TikTok.

To tell these stories, we have to be innovative in our approaches. The ways in which historical events are interpreted are a moving target, and so are our efforts to engage Canadians in our shared past. An event happens only once, but can be interpreted countless different ways, depending on the perspective of the person telling the story, and the information at hand. Our *Think Like a Historian* video series, introduced three years ago, examines key events in Canadian history by analyzing primary source material. Such material is required in history classrooms across the country, but access to source documents can be challenging—and the analysis daunting. Our series explores century-old letters and newspaper headlines through a digital series. The videos provide a framework for analysis of specific documents and explains the context in which they were produced. For example, the federal government and military kept a tight control on wartime information; this, inevitably, contributed to the boosterish tone of headlines and letters home from the front, which were read and censored. In short, just because something was written at the time an event occurred doesn't ensure its accuracy.

Our material always has to be presented in formats that interest our

audience, and we have to help them find those materials rather than wait for them to discover us. We provide teachers with classroom resources for notable anniversaries, history months and significant events. We reach more than 100,000 teachers annually through e-blasts, conferences, school mailings, social media and digital content distribution. We use uniquely targeted campaigns and content to reach teachers on LinkedIn, Reddit, TikTok and Pinterest. Each year, we receive over 150,000 visits to our learning tools designed specifically for Canadian teachers.

Our biggest draw (separate from the Minutes) is the online-only Canadian Encyclopedia which, like all our offerings, is offered free-of-charge in both official languages. We have six full-time editors and a nationwide network of writers and fact-checkers. In all, the Canadian Encyclopedia offers more than 20,000 entries on people and things Canadian. They include events and people that make us proud to be Canadian as well as others that definitely do not. In the latter category, we have, for example, entries on the history of pre-Confederation slavery, and the residential schools in which tens of thousands of Indigenous youth were forcibly placed after being wrested from their families.

To better meet the needs of our readers, we've also found new ways to deliver our content. This year, we began

publishing plain-language summaries of content directly tied to curricula across the country. That includes broad, difficult topics distilled to their essential points—including residential schools and Black enslavement. Difficult aspects of our history are increasingly included in elementary curricula, and many learners—of all ages—approach the study of Canadian history in their second language. These short, accessible entries are written in an easily understandable style. Since we began publishing them this year, these entries have been read more than 55,000 times.

When we ignore our past, we overlook all the aspects of life that once seemed impossible and now are commonplace—and the people who made them possible. When Elsie MacGill was growing up, the presumption was that women couldn't manage the mental heavy lifting of applied mathematics and other complex skills required for aeronautics. Along with MacGill in Canada, another pioneer who put the lie to that was Katherine Johnson, the Black American mathematician without whose calculations the early NASA space flights would not have happened. Or, for that matter, consider the direct line of sorts between MacGill and Dr. Donna Strickland, the University of Waterloo-based optical physicist who was a 2018 recipient of the Nobel Prize in Physics for her work. In fact, there is a *very* direct line between the two: Strickland narrates the voiceover at the end of the MacGill Heritage Minute. Innovators are people who find unexpected or unforeseen paths toward making our future a better one. As many of them understand, the beginnings of that process are often found in our past. **P**

Contributing Writer Anthony Wilson-Smith is President and CEO of Historica Canada, and a former Editor of Maclean's.

A graduate of University of Toronto and Oxford, Bronwyn Graves is Director of Education and Programs at Historica Canada and Editor-in-Chief at The Canadian Encyclopedia.



A restaurateur posts a sign that says she is open for business again—coping with the pandemic. *IStock photo*

A Case Study in Crisis Response

The Business Development Bank of Canada—a Crown corporation that operates at arm's length from the federal government—has directly provided more than \$2.5 billion in COVID working capital loans and more than 40,000 postponements to clients since the pandemic lockdown hit. It has also been a key player in Canada's whole-of-government COVID-19 response. Here's how the bank's leadership and employees responded, adapted and rallied to meet a sudden upsurge in demand for service and capital while themselves adjusting to the new demands of working in a pandemic.

Michel Bergeron

When the COVID-19 pandemic swept through Canada in early March, shock waves of worry rippled through the country's small businesses. Many of them looked to the Business Development Bank of Canada (BDC)—as the first place to get help. Having served small and medium-sized businesses for more than 75 years, through the credit crisis of 2008-2009 and the 2015 oil crash, BDC was ready to respond.

Within the first three weeks, BDC received more loan applications than it normally gets in a year. Within two months, its staff had fielded more than 20,000 telephone calls from business owners, and more than a million people visited the

bank's website. By mid-June, BDC's 30-day direct lending volume for working capital loans peaked at more than 14 times above baseline, in dollar terms. At a time when BDC's mission was critical to support entrepreneurs and the Canadian economy, the bank also faced logistical, technological and human resources challenges of its own. "We weren't scaled or staffed to handle that unprecedented volume," recalls Christopher Rankin, Executive Vice-President and Chief Risk Officer at BDC. "We had to adapt quickly."

In a few short weeks, BDC implemented a strategy to develop and deliver COVID-specific product enhancements, redeployed hundreds of employees to address demand and improved and accelerated its processes to broaden its reach. As well, the bank had already begun a digital transformation to better support clients and employees, but the pandemic and the volume of loan requests put the project on the front burner. Today, more than six months after the first days of the crisis, BDC—a financially sustainable Crown corporation that operates at arm's length from the federal government, its sole shareholder—has directly provided more than \$2.5 billion in COVID working capital loans and more than 40,000 postponements to clients. It now directly supports 62,000-plus entrepreneurs, an increase of more than 8,000 business owners. And it has been a key player in Canada's whole-of-government COVID-19 response, leading the way in the delivery of two new programs under the Business Credit Availability Program umbrella to help entrepreneurs meet their operational cash flow requirements.

For BDC internally, fulfilling its mandate in the time of COVID-19 involved much more than adapting to a short-term surge in applications and requests. It also meant leveraging its technology and HR programs to ensure its 2,400 staff could work seamlessly from home and best serve entrepreneurs; collab-

“ In a few short weeks, BDC implemented a strategy to develop and deliver COVID-specific product enhancements, redeployed hundreds of employees to address demand and improved and accelerated its processes to broaden its reach. ”

orate on relief programs with government and private-sector partners; and maintain the morale and the health of its team. The story of how it did that provides something of a case study in organizational response to crisis—a response that could put the bank and its clients in a stronger position well into the future.

Of course, early in the pandemic, meeting the immediate needs of clients came first. In response, BDC further expanded its risk tolerance for loans and streamlined its application review processes. The crisis, says Rankin, "forced us to make even quicker decisions." Meanwhile, the bank retrained and redeployed about 500 staff to help address the surge in customer requests and loan application processing. "Some IT people, employees on the marketing team and others were retrained and processing loans, talking to clients about the status of requests, and taking on other tasks above and beyond their normal duties," says Dominic Vaillancourt, Assistant Vice-President, Business Solutions.

Dwayne Dulmage, BDC's Lead Digital Transformation Officer, was vacationing in Florida in early March, but cut his family trip short when the crisis hit. "We all rallied to the cause," he recalls. "We stopped what we were doing to focus on what we could do to help." Before COVID, Dulmage's team was executing on an ambitious strategy to transform BDC's digital capabilities, but the crisis sped up their efforts. One key initiative already in the works was the automation of small (under \$100,000) loan processing, whereby entrepreneurs could apply for a loan

and have it authorized in real-time. Today, BDC's online lending experience enables accelerated loan processing, and almost every step—from verifying eligibility to adjudicating credit and exchanging e-signatures, is now automated—the first digital offering of its kind to market in Canada. "We can now authorize small loans more quickly and efficiently, better supporting our clients," Dulmage notes.

Such innovations, along with other projects BDC's IT team is working on, point to something of a silver lining in the COVID cloud: the crisis has underscored the need for digital transformation not just as process improvement, but as risk mitigation. "The crisis made it obvious that we needed to accelerate our efforts," says Dulmage. "We are all cognizant of the risk of a second wave and the need for a more responsive reaction than financial institutions were capable of during the first wave. Before the pandemic, digital transformation might have seemed conceptual to some people, but we have seen how it can improve the process for our clients—and why investments in it are so important."

While BDC put "all hands-on-deck" to meet the needs of clients, it soon had another task: helping the federal government fulfill its commitment to support businesses. As a participant in Canada's COVID-19 Economic Response Plan, BDC worked with public- and private-sector partners to develop and deliver several new programs under the Business Credit Availability Program, including the Co-Lending Program for

small and medium-sized businesses and the Mid-Market Financing Program for medium-sized and larger businesses. And it had to do so in short order. “We had just started to find our footing and now we had to work with partners to create these new programs,” recalls Rankin. “Historically, it can take up to nine to 12 months to develop a new lending program. From design to implementation, we and our partners negotiated and built them in approximately 30 days.”

In administering these programs, BDC worked closely with other financial institutions, through whom entrepreneurs apply for and receive loans. In normal times, ironing out the terms of such relationships could take several months, but BDC and its partners had to manage it in a matter of weeks. BDC’s approach was straightforward: clear away the red tape and get it done. A standing working group kept the negotiation process streamlined, the partners quickly defined common goals, and they committed to being transparent about what they could—and couldn’t—do throughout the process. “It worked well because we stuck to those three things,” Rankin says.

“*The crisis had another unforeseen impact: it strengthened an already strong esprit de corps. Internal surveys have repeatedly shown the bank’s mission is a prime motivator for employees, and during COVID that motivation only seemed to increase.*”

Such rapid response also put new demands on employees’ time and expertise, all while they immediately started to work



BDC headquarters in Montreal—people responding to the needs of small and medium-sized businesses in Canada. BDC photo

from home. BDC leadership recognized that maintaining staff morale—and their ability to work—would be vital. Using internal communications tools, senior leaders regularly provided updates and emphasized that the health of team members was their top priority. They took a flexible approach to work hours to accommodate staff with children and other care needs. The bank also ensured employees had access to home office equipment, reinforced available virtual health and mental health care supports, and expanded the availability of digital tools to keep in touch.

For Vaillancourt and the Business Solutions team, those proactive moves proved vital to helping them adapt to a different way of working—even as they had more work to do. Prior to COVID, most team members came to the main office every day, because they work in close collaboration; when COVID hit, Vaillan-

court was concerned remote work would adversely impact productivity, especially for special projects. But the opposite occurred. “People did more than they usually did, because they care about our mission,” he says. “We actually saw our productivity, in many cases, increase, delivering bank-prioritized initiatives.”

The crisis had another unforeseen impact: it strengthened an already strong *esprit de corps*. Internal surveys have repeatedly shown the bank’s mission is a prime motivator for employees, and during COVID that motivation only seemed to increase. Employees worked long hours to help with backlogs, delayed retirement to pitch in, and continually looked for ways to improve the client experience. “It’s been unbelievable how committed people are to the success of our clients,” says Vaillancourt.

Rankin agrees. “The team realized the impact they could have on the economy and on our clients’ bottom line,” he says. “Coupled with adrenaline, this belief in our mission carried us through the first 90 days, and helped us accomplish things in a month or two that would normally take a year.” As difficult as the past few months have been, Rankin adds, the crisis has also driven home how important the BDC mission is. “We have to keep the purpose of what we do in clear focus,” he explains. “We are here not to focus exclusively on maximizing profits, but to support Canadian entrepreneurs. We responded to support Canadian entrepreneurs—and the economy—in a way a development bank should, and we will continue to do so no matter what’s thrown at us.” **P**

Michel Bergeron is the Chief Strategy Officer at the Business Development Bank of Canada (BDC).

How to Regulate Big Tech Without Stifling Innovation

The world's borderless tech titans find themselves at a reputational inflection point. A contentious US presidential election has again focused attention on the role of social media in democracy. Meanwhile, the COVID-19 pandemic has underscored our dependence on Big Tech. Both aspects of their role in society will inform how governments move forward on regulatory approaches.

**Kevin Lynch
and Paul Deegan**

In our focus on innovation as a driver of new products and services, better productivity, higher growth, and better paying jobs, we tend to zero in on encouraging advanced technologies, attracting world class talent, building superclusters and promoting a culture of innovation and entrepreneurship. Less attention is paid to business framework policies and their impacts on innovation, and few tangible actions have yet to materialize on that front.

It is time for Canada to broaden its tech approach to include framework policies such as competition policy, regulatory systems and intellectual property regimes and how they can encourage or impede innovative firms.

The United States provides a salutary example of this. The CEOs of the tech giants Amazon, Google, Facebook and Apple were hauled before a congressional committee at the end of July in a “virtual perp walk” to face a slew of accusations ranging from stifling competition, to misusing customer data, to lax data privacy protections, to enabling foreign interference in elections. Democrats are adamant that the info-tech titans

have failed to police disinformation on their sites, thereby undermining social cohesion. Republicans accuse them of unwarranted censorship, thereby attacking free speech.

Yet, despite this political tempest, it would be premature to conclude that this will lead to anti-trust actions in the US. Big Tech is more likely to be viewed as both saint and sinner: too essential to the digital economy and society to break up and too dominant to leave unconstrained. In these conflicting circumstances, expect more of a shake-up than a break-up of the American digital titans.

Digital technologies are the main drivers of economic and social disruption today, and key contributors to innovation and economic growth. This new ecosystem is being propelled by a handful of digital tech titans, primarily the so-called FAANGs (Facebook, Apple, Amazon, Netflix and Google) in the West, and a comparable group of digital dragons in China (Alibaba, Tencent, Baidu, and Xiaomi).

Their size, valuation, market share and power are large by any measure. These five American firms alone account for more than 20 percent of the S&P 500 and over \$6 trillion in

market value at their early September peak. Are they the “new monopolists” of the digital age?

Perhaps, but spotting a digital monopolist may be easier than confirming the identification. For example, US Department of Justice anti-trust guidelines indicate that a company must have used its market dominance to harm society through lower output, higher prices and less innovation. This is challenging as the tech titans have lowered prices to consumers (sometimes to zero), spent prodigiously on organic and acquired R&D and expanded their service offerings massively.

Critics argue that this test is designed for an analog—not digital—economy, and that consumer harm emanates from poor data handling: inadequate data privacy, data security, data integrity and data rights. They also argue that the tech titans dynamically reinforce market dominance by buying large numbers of innovative startups for their intangible assets such as IP and talent, rather than through acquisitions of large competitors in other sectors of the economy.

While policy thinking around what constitutes a digital monopoly is evolving for the reasons above, it is also getting caught up in geopolitics, particularly between the US and China.

The US has expanded its trade disputes with China to include, indeed focus on, technology. Early battles over 5G and network security (Huawei) have grown to include data security (TikTok and WeChat) and the enabling digital ecosystem (AI and predictive analytics). The US has labelled China a “strategic competitor”. China has

countered with its own digital firewall and new export restrictions on data-intensive Chinese firms.

One consequence of this geopolitical tension is that strategic tech supremacy could become a higher priority than concerns about tech market dominance for countries like the United States and China.

Public concerns with the sins of big tech on data privacy, data security and data rights fronts, however, have not dissipated. Indeed, if anything, concerns have increased, as evidence mounts of social media-enabled misinformation campaigns on a variety of issues, including race, pandemic health and vaccines to name a few.

In contrast, the pandemic has highlighted the saintly side of these digital titans in helping individuals and businesses to navigate the COVID-19 lockdowns. Who hasn't used Amazon to order products for home delivery as retail stores were shuttered? Who hasn't counted on Netflix to provide home entertainment through months of shutdowns? Who hasn't used Microsoft Teams to work from home as offices closed but work remained? What small business hasn't shifted to online commerce to survive, often with the help of Shopify? The digital economy has certainly delivered support to an anxious public at a time of unprecedented disruption.

So, faced with these competing concerns and realities, what does the toolkit of policymakers contain besides conventional anti-trust remedies?

First, it is extremely unlikely the US will use anti-trust laws to break up the tech titans, and the rest of us have limited (European Union) to no capacity (Canada) to take a different path. But the market framework toolkit also contains regulatory policy, taxation policy, competition policy (acquisitions) and fines, and here there is more scope for surgical actions, and more likelihood of differential policy choices across countries.

Second, regulation will be the likely digital policy of choice, with data

handling—privacy, security and rights—and misinformation carried over social media as the primary targets. However, regulation can be either principles-based or prescriptive, with the US tending to the latter and the EU and Canada more to the former. A smart, principles-based approach is more resilient given how rapidly technologies and markets are changing. Canada will have to decide what regulatory alignment is in the best interests of Canadians.

Third, coming out of any recession, there is typically a pick-up in merger activity as financially strong firms seek out acquisition opportunities to consolidate their positions. With the sky-high stock valuations of the US (and Chinese) tech titans, we should expect them to be particularly active, scooping up numerous innovative start-ups with their technologies and talent. This will reinforce their market dominance, and Canadian competition policy should consider looking at the aggregation of acquisition activity by digital firms over a specific time horizon rather than just on the current minimum size, transaction-by-transaction, basis.

Fourth, Canadian governments should be digital exemplars in their operations. COVID-19 is creating the need for better digital health delivery, and it is highlighting how slow we have been to digitize the health system. Education is going online too, but with an analog mindset. Rapid digitization improves health and education outcomes and creates opportunities for innovative Canadian firms. Governments can play a role in validating digital identity systems to protect citizens' data which, in turn, could be leveraged to grow the Canadian fintech sector. Canada can play a greater role in establishing global digital standards.

Fifth, in a world where industrial policy is making a comeback, we should focus on enabling winning conditions to create digital champions, not on trying to pick specific winners. Canada can do so through smart education, skills training, immigration, procurement, regulation and taxation policies.

Governments should dramatically increase the number of spots in engineering schools, help workers displaced by the pandemic upgrade their skills for new jobs in the digital-driven economy, and increase immigration. During the Trump administration's H1-B visa ban, we've had a window to attract the brightest minds to Canada. Government procurement policies implicitly favour Big Tech, and the federal government's \$600 billion procurement budget could better help innovative Canadian companies scale-up to global champions. And, we should maintain competitive tax treatment of the Canadian tech sector to retain talent and IP in Canada. With the right winning conditions, we can enable more Canadian-based innovation champions—firms like Shopify, Constellation Software, CGI, Open Text and Ceridian—not fewer.

Big Tech is neither saint nor sinner in this disruptive world where technology is transforming competitiveness and markets, geopolitics is redefining globalization, and populism is reshaping political discourse. It cannot be a blocker to new digital firms springing up and serving global markets from Canada or elsewhere, nor can it have a seeming monopoly on attracting our country's greatest resource: our talent. We need to ensure level playing fields in key framework policies such as regulation, procurement, taxation, intellectual property, and competition. Smart digital regulation can be an enabler of better consumer outcomes and more producer surplus in Canada. And whatever we do with respect to market frameworks, one objective should always be to encourage innovation—it is in the public interest. **P**

Contributing Writer Kevin Lynch was formerly Clerk of the Privy Council and Vice Chair of BMO Financial Group.

Contributing Writer Paul Deegan, CEO of Deegan Public Strategies, was a public affairs executive at BMO Financial Group and CN, and served in the Clinton White House.

Opportunity in Crisis: HOW A SPIKE IN NEWS DEMAND IS REDOUBLING MEDIA INNOVATION

The saga of how the fourth industrial revolution has impacted the news business is in no way short of its share of ironies. And while the force-multiplying economic contagion of the COVID-19 pandemic has further culled print newspapers, demand for news and information has boomed. That confluence of factors is already producing useful truths and unexpected outcomes.

Pierre Asselin

Newspaper publishers, who had managed to survive the onslaught of advertising losses over the past few years, had good reason to fear that the COVID-19 pandemic—and the resulting shutdowns—would be a final blow.

For some of them, it turned out to be just that, but for many more, it was also something else. It demonstrated that their transition to a different business model, one that didn't rely entirely, if at all, on advertising, could be the key to sustainability.

There will still be a heavy price to pay for this crisis. The local news research project at Ryerson's School of Journalism, the main Canadian source for tracking the changes to the industry, has documented the impact of COVID-19 on a map (link: <https://localnewsresearchproject.ca/covid-19-media-impact-map-for-canada/>).

It finds that 24 community newspapers and two private radio stations closed between March and October. Furthermore, 11 daily newspapers have cut one or more of their print editions. This is not a happy story, but it might be one with more than a silver lining.

"The pandemic has increased the demand for our products when other industries, like travel or restaurants, have seen their markets go up in smoke. It was so much more difficult for them than it was for us," says Brian Myles, publisher of Montreal's *Le Devoir*. "I wouldn't call it a honeymoon, but people have been rediscovering our content and asking for more. It makes it difficult for us to complain."

To John Hinds, CEO of News Media Canada, representing the print and digital media industry, this is somewhat paradoxical: "The real frustration for newspaper publishers is that never has the product been in so much demand, while the economics are so bad. We have all the people reading and sharing the content, but no one paying for it."

Well, not exactly no one. *Le Devoir* is one of the few media businesses that hasn't been eligible for the Canada Emergency Wage Subsidy (CEWS), as it didn't experience a large enough drop in its revenue. "It's either a blessing or a curse," says Myles. "But it demonstrates that our subscriber model sheltered us from the storm."

"We do not depend on advertising

at all. Advertising has never really been central to us since Facebook came in and started selling ads to businesses here," explains Linda Solomon Wood, founder of the *Vancouver Observer*, back in 2009, and now editor-in-chief of the *National Observer*, launched in 2015. Since 2016, the *National Observer* has been funded through its paywall. The trade-off between higher traffic and a loyal subscriber base has proven beneficial in the end, because of a strong connection with the readership. "The relationship with the reader is pivotal. We interact as real people, not hiding behind a voice of authority. We share our vulnerabilities and our challenges, and there is a power in that."

At Quebec City's *Le Soleil* (author's note: where I used to work), the COVID crisis should have been fatal. Capitales Média, a six-newspaper group, had barely survived bankruptcy in August 2019, and transitioned in January to a workers' co-operative right before the pandemic hit.

But the "Coopérative nationale de l'information indépendante" (CN2i) has survived, thanks to government programs at both federal and provincial levels, and thanks to the Quebec government making the decision to publish its COVID ads in local media rather than global platforms. "It precipitated our complete transition to the digital platform, which was not planned to happen before 2021, after testing our market," recounts Gilles Carignan, *Le Soleil's* general manager. *Le Soleil* stopped publishing its print edition on weekdays, keeping only its Saturday paper edition. "We had to reduce costs without eliminating any journalism jobs, because we needed them more than ever. We are now a

fully digital publisher, with a weekly magazine,” he adds.

In Prince Edward Island, closeness to the community is key to survival. “We are lucky to be in business where we are”, says Paul MacNeill, owner of Island Press Limited, publisher of three weekly papers.

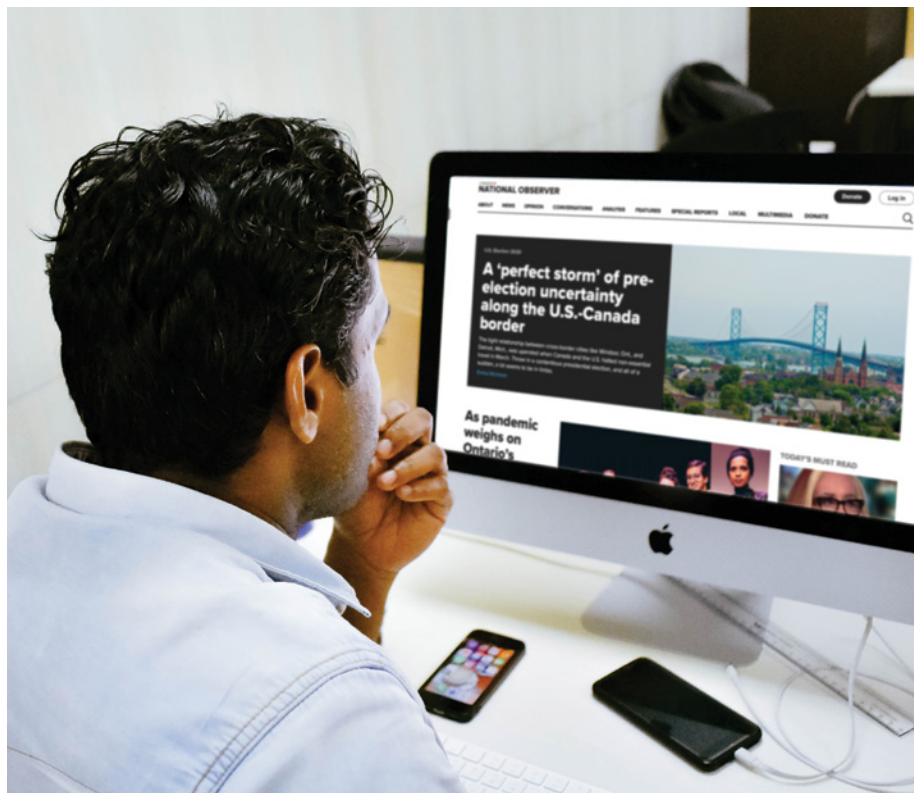
PEI has been relatively spared by the pandemic. “We haven’t laid anyone off, and we hired columnists. Because we’re independent and family-owned, we’re directly accountable only to the community we care about.”

“What we see in this crisis is that people want local news. What they should do, where they can go, what the neighbours are thinking. We’re the only media here, 365 days a year, in Eastern PEI, and in West Prince. Web readership has reached levels we’ve never seen, and remains consistent even this far into the pandemic. The question is, how do you monetize it? Because for us, money is still on the print side...”

“What most media now also understand is that they probably can’t make it alone. They need to work with one another, and partner with other institutions.”

But as he also notes: “We’re competing with Facebook and Google, who don’t collect HST. The government must find a model that allows local independents to be sustainable in the long run.”

John Hinds of News Media Canada also believes it. “Google and Facebook use content to drive their business model and pay nothing for it. They take billions out of the local



With Canadians living online, in lockdown and on constant lookout for public health updates, demand for news has boomed. That increase in demand is forcing new economic approaches by publishers. Rafzin p Unsplash photo

economy. It’s a market failure that needs to be addressed.”

What most media now also understand is that they probably can’t make it alone. They need to work with one another, and partner with other institutions.

This realization is part of what led to the creation of the Institute for Investigative Journalism (IJ) in 2018, at Concordia University. Its director, Patti Sonntag, wanted to help local media undertake investigative work. Data journalism, she believes, is the ideal tool. “We are putting data in the hands of journalists, and offering practical experience for students before entering into the workforce.”

Canada is lucky to have a vibrant educational system, she adds. “Lots of centres from different universities have been reaching out to media for quite some time. But we’ve also started working together, and it has a tremendous effect. Canadians are really talented at cooperation, right?

This kind of partnership allowed the IJ to set up Project Pandemic, a Canada-wide COVID-19 data resource for small and large news organizations, and in particular for local outlets in rural, remote and Indigenous communities.

“If you strip away all the old industrial costs, running a newsroom isn’t that expensive,” says John Hinds. “Maybe 15 or 20 percent of an old newspaper’s total cost. Everybody sees the future as this lean low-cost operation, but as someone told me, the future is not our problem, it’s the present. How do we get there? We have to get people to pay for news.”

At *Le Devoir*, Brian Myles insists on relying on the necessity of a digital subscription, the only French daily newspaper in Quebec to do so. “Elsewhere in the world, the most credible and respected media have relied on this model. These are the ones we want to compare ourselves to.” **P**

Pierre Asselin is a former reporter and editorialist at Le Soleil. He sits on the jury for the Michener Award.

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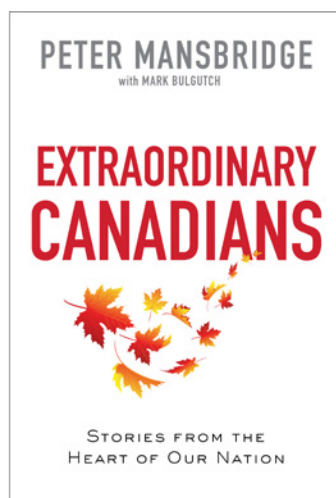
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Book Reviews



A Journey of the Heart

Peter Mansbridge
with Mark Bulgutch

Extraordinary Canadians: Stories from the Heart of our Nation.
Toronto: Simon & Schuster, 2020

Review by
Anthony Wilson-Smith

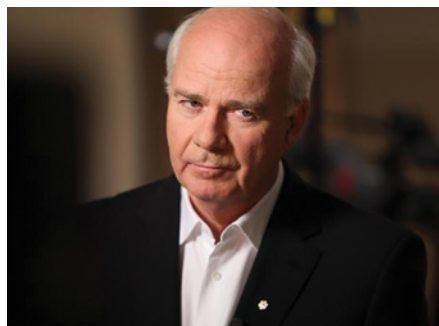
Peter Mansbridge is one of Canada's best-known figures—not only of this but of any era. He earned that distinction over half a century as one of the country's leading journalists, including during more than three decades as anchor of CBC's *The National*, until he stepped away on Canada Day in 2017.

By then, he had spoken nightly to generations of Canadians, won every major award in his craft (and, alongside those honours, was cast affectionately in Disney's full-length 2016 animated feature, *Zootopia*, as the voice of the character "Peter Moosebridge".)

Those distinctions make it easy to overlook the flipside of that equation: few Canadians know this country and its people better than Peter, who began his career as a fill-in radio

announcer in Churchill, Manitoba. In "retirement", that hasn't changed: he's still out there engaging with people daily via his podcast, documentaries for the CBC, frequent speeches, writing and charity work (which includes the very active role he plays as a member of the Board of Directors of my organization, Historica Canada.)

His favourite subjects, by his own admission, aren't traditional newsmakers, but instead the so-called "ordinary" Canadians that he met by the thousands as he criss-crossed the country. As his new book *Extraordinary Canadians: Stories from the Heart of Our Nation* makes clear, he hasn't lost his enthusiasm for seeking out little-known but remarkable people whose exploits deserve to be told. Co-authored with friend and long-time producer Mark Bulgutch, the book looks at the lives and achievements of 17 Canadians, each of whom describes in first-person form how they have met and overcome exceptional personal challenges for the betterment of many.



Peter Mansbridge—a love story on Canada.
CBC photo

The sweep and scope of those people and what they have done is startling at times. The most breathtaking chapter—which will surely get the most attention—is that of "Levon Johnson", the pseudonym for a warrant officer in Canada's elite and shadowy-by-design Joint Task Force (JTF) commandos.

His account of taking part in a night raid against a large force of Taliban warriors during the conflict in Afghanistan is unlike anything

Canadians will have heard of our modern-day forces. The reason: the identities of the soldiers and their activities are so secret that even prime ministers are not always privy to detailed information. It's a measure of the degree of trust in which Peter is held that he was given this access—and also the result of more than 20 years of trying to do so.

“*The identities of the soldiers and their activities are so secret that even prime ministers are not always privy to detailed information. It's a measure of the degree of trust in which Peter is held that he was given this access.*”

While the other stories are less dramatic by comparison, they're no less moving in different ways. To Canadians who follow the news closely, some protagonists will be familiar, including Indigenous activist Cindy Blackstock and long-time military chaplain Rabbi Reuven Bulka, a fixture at Remembrance Day services in Ottawa for many years.

Others are less known outside their communities or home provinces but their influence, like the stones tossed in water famously described by the late Robert Kennedy, ripples far beyond. Manitoba's Robb Nash overcame brain injuries in a car crash that almost killed him—and after battling depression in the aftermath, now devotes his life to dealing with troubled teens considering suicide. Susan Rose grew up in small town Newfoundland as a lesbian painfully aware first-hand of discrimination against LGBTQ people, so she led a long and successful fight to increase understanding and acceptance within schools and the broader community.

One of the book's many strengths is the way the authors let their subjects discuss their achievements

within the full context of their lives, alongside failures, frustrations and disappointments of all sorts. The achievements are diverse in nature, but share a theme: they found their strength, and calling, in fighting conditions that initially seemed insurmountable.

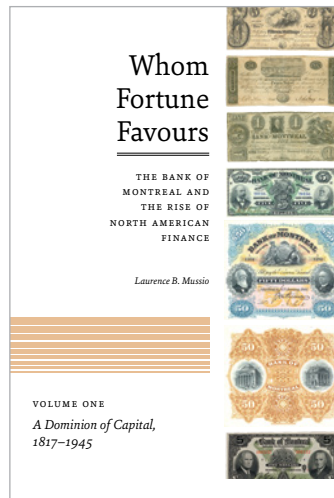
This is a reporters' book; the authors deliberately subverted their own voices to let their subjects speak for themselves. (Bulgutch, now retired but long one of the CBC's most senior news executives, was known among colleagues for his almost preternatural calm in breaking-news situations, and for his insistence that "the story must always come first.")

The range and diversity of the subjects is a tribute to their legwork—and the composition and diversity of this country. The hardships and discrimination some of the subjects face remind us of two valuable lessons: we still have a lot of work to do to make Canada a comfortable place for all, and we have some remarkable people among us who are prepared to take on that work.

All of which reminds us of a part of Peter's own background that many Canadians don't know, or have forgotten. In 1987, he was wooed by CBS News President Howard Stringer to move to New York to anchor the network's morning show. Implicit in that offer was the likelihood that if it worked well, he would take over the nightly news at a time when network anchors earned \$10-15 million (US) a year and had average audiences of some 20 million viewers a night. The CBC's then-anchor, Knowlton Nash, offered to step aside to give Peter the job if he would stay here. He accepted, at a salary enviable to most Canadians, but less than 10 per cent of what he might have made in New York.

Thirty-three years later, we have this book. It is in essence a love letter to his country. It helps explain what matters to him, and why he stayed. And why, at such a difficult time not only in Canada but around the world, "ordinary" people are the ones who ultimately bring us hope. **P**

Contributing Writer Anthony Wilson-Smith, President and CEO of Historica Canada, is a former Editor of Maclean's.



A Blue-Chip Investment

Laurence B. Mussio, with foreword by Niall Ferguson

Whom Fortune Favours: The Bank of Montreal and the Rise of North American Finance. Montreal and Kingston: McGill-Queen's University Press, 2020.

Volume 1—A Dominion of Capital 1817-1945

Volume 2—Territories of Transformation 1946-2017

Review by James Baxter

Historian Laurence Mussio's latest work, *Whom Fortune Favours*, is not for everyone. Indeed, one must be passionate about banking or Canadian history—ideally both—to want to devour the roughly 600 pages contained in this two-volume set. But for those who are so passionate, *Whom Fortune Favours* is a richly rewarding experience.

Before going further, it is worth noting that this book is visually stunning, elegantly packaged and filled with wonderful old photos and illustrations from the first 200 years of the Bank of Montreal. From the colourful banknotes on the cover to the drawings of founders John Richardson and Augustin Cuvillier in 1817, to the news photos of the BMO's failed merger with the Royal Bank of Canada in the late 1990s, Mussio offers a brilliantly curated visual history of Canada's first major bank and the outsized role it played in the birth of this country.

Mussio's accessible writing style turns the relatively dry topics

of banking and finance into a ripping yarn that spans 10 generations of underexplored Canadian history. It is clear from the narrative that the book is based on thousands of hours of research and troves of documents and letters from the times when clear, succinct writing was valued.

It is this research that drives Volume One, which covers the bank's history from its first charter in 1817 through to the end of the Second World War in 1945. Mussio easily weaves the chronology and the many personalities who served as officers and directors to show how the Canada we know today would be fundamentally different had it not been for BMO and the men who built it. Names like McGill, Gray, Gates, Gerrard, Fleming and Molson are synonymous with the era in which BMO garnered much of its "reputational capital" and gave Montreal its status as an economic powerhouse in the new world.

The mid-1800s were a fascinating time as Loyalists fled the

United States and the waves of European immigrants arrived to find their fortunes, and Mussio details how BMO played a pivotal role in the development of Lower Canada and the expansion westward.

Of course, with growth comes competitors and BMO had many. From 1850 to 1925, dozens of banks came and went, but eventually, the most successful of these came together in the wake of the revised Bank Act in 1901. By 1925, BMO was among the strongest banks in North America, which proved critical to its ability to weather the ravages of the Great Depression and help lead Canada into the Second World War, then into its second century as a country.

In capping this early period, Mussio devotes a chapter to the creation of the Bank of Canada in 1935 and how it enabled the ascension of Canadian banking to the global stage.

With Volume 2, Mussio transitions from the bank's ancient history to its living history, which led



The neo-classical BMO Main Branch on rue St. Jacques in Old Montreal, head office of BMO since 1847. Wikipedia photo

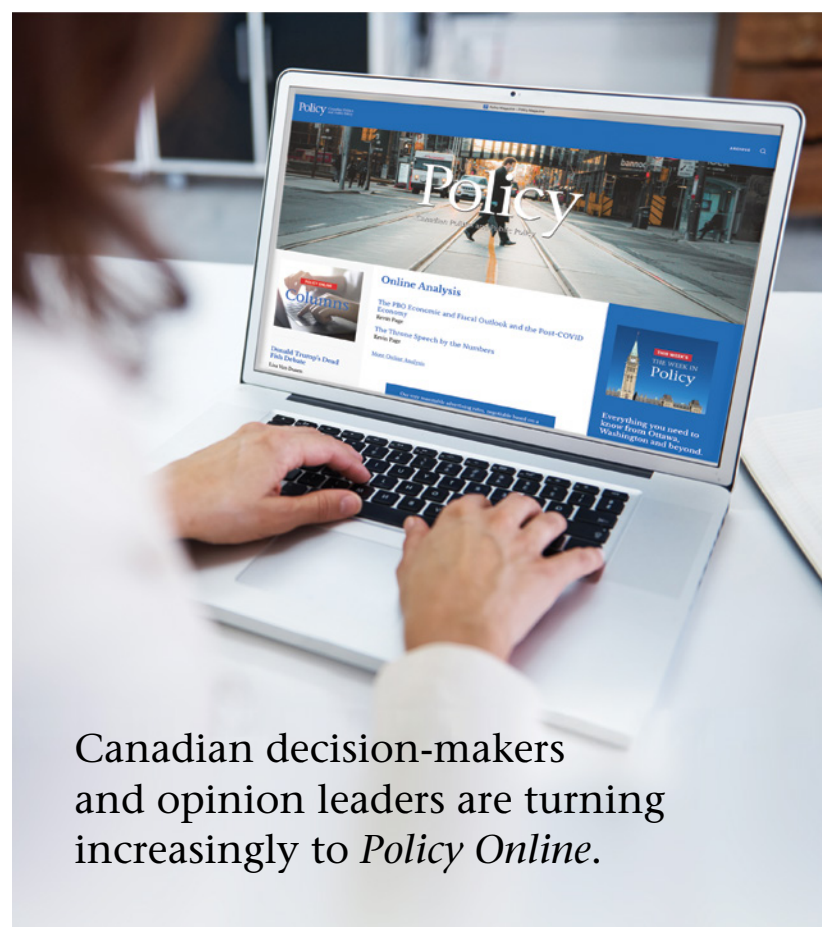
to both the BMO and the country we know today. Whereas his account of the bank's first century seemed largely to jump from strength to strength, Mussio's coverage of the post-war era is able to draw on more contemporary records and interviews to detail the bank's successes and failures, as well as its triumphs and struggles

through numerous periods of national and international upheaval.

Niall Ferguson provided the foreword to the book and took the opportunity to show how BMO's Scottish founders instilled a cautious but deliberate culture that served the company very well for most of its history. Indeed, it was only when the bank's leadership deviated from its inherent conservatism that big mistakes happen (remember "mbanx"). Ferguson clearly enjoyed Mussio's book and the tale it tells about how his countrymen conquered the new frontier one bank branch at a time.

At almost \$80 and more than 600 pages of tight prose, *Whom Fortune Favours* is an investment in many ways. But for anyone with a strong appreciation of North American economic history, this book will be a blue-chip addition to any library. **P**

Contributing Writer James Baxter is a veteran journalist with deep ties to Montreal and the bank that bears its name. He was the founding Editor and Publisher of iPolitics.



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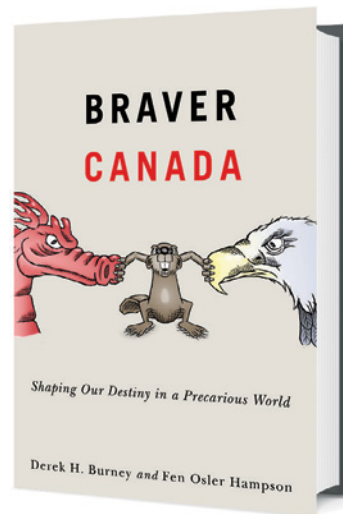
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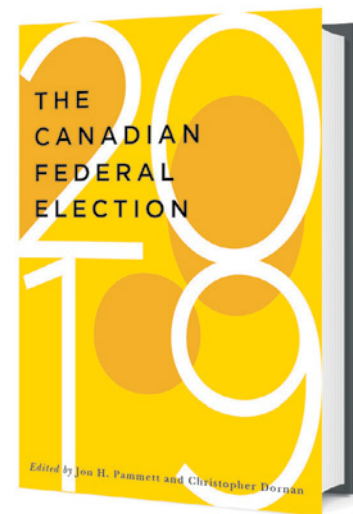
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An Open Letter to All Members of Parliament

Re: Support for Canada's Charities

Dear Members of Parliament,

I'm writing to encourage you and members of your party in the House and Senate to support the elimination of the capital gains tax on donations of private company shares and real estate to a registered charity which would provide additional funding for thousands of charities across the country and the millions of Canadians whom they serve.

Eliminating this capital gains tax, long advocated by the charitable sector, would cost the government only an incremental \$50 million a year, while stimulating at least \$200 million a year in donations to healthcare, educational, arts and cultural, religious and community organizations, creating hope and help where it is much needed and, not least, creating many new jobs along the way.

The fiscal update during the fall sitting and the 2021 budget expected next spring are ideal occasions for including such a measure among the pandemic relief and recovery programs widely supported across party lines.

Your own participation in the late September vote is a case in point. Thanks to all Members putting the public interest first, Parliament unanimously voted in favour of transferring billions of dollars of relief to Canadians who had lost their jobs due to the pandemic and were left with no means to support their families in this time of crisis.

As you know, some 8.4 million Canadians who were recipients of the Canada Emergency Response Benefit saw their \$500 per week CERB payments transferred either to Employment Insurance or the new CRB, the Canada Response Benefit. It is thanks to Members that the legislation was fast tracked and adopted unanimously in the national interest.

The continuing annual cost of this is in the tens of billions of dollars, as part of total pandemic economic and health funding estimated at \$350 billion a year, with a federal deficit for the current fiscal year approaching \$400 billion in the circumstances.

When a normal fiscal framework returns, most of those benefits will obviously be discontinued.

But the removal of the capital gains tax on these donations to charity would create continuous benefits. The cost to the federal treasury would be literally a drop in the bucket, and the benefits would be positive many times over.

This is not a new conversation. We have been down this road before, as recently as 2015, when the previous government's budget included a provision to eliminate the capital gains tax on charitable donations of this nature, but the election intervened and the new government indicated it would not proceed.

In the present context, in the circumstances of a minority House, another opportunity has arisen to deal positively with this issue.

Good work and good works would be the result; good work being the jobs created and good works being the social and economic benefits to Canadians in need of help.

I hope this letter is helpful in encouraging you to support the removal of the capital gains tax on such gifts. It would be good public policy for an entirely non-partisan purpose, and good for all Canadians.

Thank you for taking the time to consider this.

And many thanks for your service to your province and our country.

Yours sincerely,



Donald K. Johnson, O.C., LL.D.

Director, Toronto General & Western Hospital Foundation
Chair, Vision Campaign, Toronto Western Hospital
Member, Advisory Board, Ivey Business School, Western University
Chairman Emeritus & Director, Business / Arts
Member, 2020 Major Individual Giving Cabinet, United Way Greater Toronto

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