Canadian Innovation News

Connecting the world to Canadian Innovation

Big Science in a Big Country

Clean Tech Comes of Age

IBM Gets "Disruptive"

Meet Tesla's New Weapon

Canada Ups Innovation Game

Issue I — Spring 2016

Menu

What is CIN?

Canadian Innovation News reports on Canadian innovation and international collaboration opportunities.

Our mission is to provide actionable information, promote engaged communities and facilitate new linkages between the private sector, academia and government within Canada and internationally. We keep our readers up to date on the latest opportunities to collaborate and develop cutting-edge innovations in today's rapidly evolving, globally-connected world.

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Pilot Survey

We want to hear from you!

Please take a few minutes to complete our Reader Survey. This is our pilot edition, and we would greatly value your feedback on how to make CIN work for you. Tell us what you liked, what you didn't and what topics you want to know more about. We're listening.

Please follow link

Take Survey

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Cover photo: TRIUMF lab, Vancouver: The DESCANT neutron detector array consists of 70 hexagonal detectors, and is used to better understand the properties of rare isotopes. Photo by Pamela Joe McFarlane

Currencies in CAD $
unless otherwise indicated

Message from the Publisher

Welcome to Canadian Innovation News.

Our mission is to connect the world to Canadian innovators and forge partnerships that develop cutting-edge innovations for the benefit of all.

Collaboration and partnerships are at the heart of innovation. Our flagship publication, RE$EARCH MONEY, has been reporting on these collaborations for nearly 30 years. It's time we shared those opportunities with the rest of the world.

Why Canada? For starters, we boast one of the world's leading educational systems with 13 of our universities ranked in the top 250 and three in the top 50 in the 2016 Times Higher Education World University Rankings.

Our banking system is one of the safest. For six years running, we've taken the top spot as the world's soundest banking system, according to the World Economic Forum. We were also named the 13th most competitive country internationally.

Canadian governments offer among the most generous supports to business research and development; and we are global leaders in sectors such as aerospace, information and communications technologies and emerging industries such as clean tech—now Canada's fastest growing technology sector.

Canada also shines when it comes to collaboration. Think of it as a consequence of our geography: 35 million people spread across the globe's second largest country. Geography has defined our history, our society and our economy. It has required us to come up with creative ways to overcome the barriers of distance to unite our country's social and economic fabric.

Canada is one of the most open and multicultural countries on the planet. Over a fifth of our population comes from outside our borders, representing the largest percentage in the OECD. This diversity is one of our strengths. With many immigrants still connected to family, academic and business associates in their home countries, it's no wonder Canada has emerged as an international partner of choice when it comes to research, technology development and business.

In today's hyper-connected world, collaboration and partnerships are expanding the world's capacity to innovate, addressing greater challenges and exploiting new opportunities. By connecting people from different disciplines, sectors, geographies and cultures, we all benefit from a diversity of expertise, experience and perspective. That is what Canadian Innovation News is all about.

In each issue you will meet people, institutions and companies at the leading edge of science, technology and innovation. We encourage you to connect with them and explore opportunities for collaboration. Only by working together, can we solve the challenges of today and build a safer, more prosperous and sustainable world.

Jeffrey Crelinsten

Innovation takes centre stage with new Trudeau government

By Debbie Lawes

Canada has a new federal government, a new Prime Minister and a renewed commitment to science, technology and innovation. STI as an engine for job creation and economic growth emerged as a key plank in the election platform of the Liberal Party and its leader Justin Trudeau, and at several international meetings since winning a majority government last October.

At the World Economic Forum in January in Davos, Switzerland, Prime Minister Trudeau met with the who's who of multinationals as part of a government-wide effort to rebrand Canada on the world stage and attract global investors. His message: Know Canadians for our resourcefulness, not only for our natural resources.

"We have a diverse and creative population, outstanding education and health care systems, and advanced infrastructure," said Trudeau. "We have social stability, financial stability and a government willing to invest in the future."

Prime Minister Justin Trudeau during a visit with U.S. President Barack Obama in Washington in March. Photo Credit: Adam Scotti, Prime Minister's Office

At the Paris climate summit (COP21) last November, Trudeau joined French President François Hollande, U.S. President Barack Obama and Microsoft co-founder Bill Gates in announcing the launch of Mission Innovation, an international effort to dramatically accelerate public and private global clean energy innovation to address global climate change, provide affordable clean energy to consumers, including in the developing world, and create additional commercial opportunities in clean energy. Through the initiative, 20 countries are committing to double their respective clean energy research and development (R&D) investment over five years.

In Washington in March, Trudeau and Obama reaffirmed their commitment to the environment, issuing a joint statement on climate change that includes a new science partnership on the Arctic. They also pledged to reduce future hydrofluorocarbon use and invest in clean energy.

In one of its first moves since being elected, the new government has said it will invest $100 million annually in clean technology producers and an additional $200 million each year to support innovation and the use of clean technologies in the natural resources sector. Another commitment includes $200 million annually for technology incubators and an "emerging national network for business innovation and cluster support", research facilities and small-business assistance. Overall, the government has earmarked about $900 million for the country's tech community.

Like other countries, Canada has experimented with several approaches to fast-tracking innovation and translating academic research into solutions that make companies more productive and competitive. In this inaugural issue of Canadian Innovation News, we highlight just a few of the technology successes that are attracting international partners and investors.

"The president and I share a common goal: We want a clean growth economy that continues to provide good jobs and great opportunities for all of our citizens."

Prime Minister Justin Trudeau, March 10, 2016 in Washington DC

Why invest in Canada?

Forbes magazine ranks Canada one of the best countries for business to grow and create jobs.

Canada now has the lowest overall tax rate on new business investment among G7 nations.

Global R&D strengths in many industry sectors, including aerospace, information and communications technologies, oil and gas extraction, and pharmaceuticals.*

Relatively high impact of Canadian industry patents, cited about 20 percent more than the world average.*

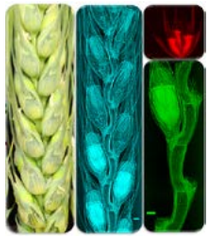
Among the most generous government support to business R&D, including both direct and indirect support.

Canada has the soundest banking system in the world.**

Bloomberg ranks Canada as second in the world in its list of top locations for doing business.

* Council of Canadian Academies, State of Industrial R&D, 2013
** World Economic Forum

Source: Seizing Canada's Moment: Moving Forward in Science, Technology and Innovation 2014



Plant Imaging and Innovation Using Canada's Brightest Light

The Canadian Light Source is the only synchrotron in Canada and one of the brightest light sources in the world, used by thousands of scientists to study everything from cancer and cystic fibrosis to fuel cells and dinosaur bones. Now the CLS is embarking on a new adventure with the creation of the Plant Imaging and Innovation program, a research project with the potential to help solve one of the world's biggest issues: food security and soil management.

By adapting state-of-the art synchrotron techniques already used in novel health research, scientists are looking at plants and our living world in an unprecedented way. These imaging techniques can reveal incredible detail and help scientists understand how diseases spread in plants, breed heartier varieties, and even manage how soils are used in a time of climate change. Researchers from universities and companies around the world are excited about the potential.

"The biggest advantage to using our light source is the ability to image plants, down to the finest detail, while they are living," says Dr. Chithra Karunakaran, CLS Plant Imaging and Innovation Scientist. "Usually in plant research, you must destroy the plant or take pieces of it to examine it and do experiments, but at CLS, we are able to see, in stunning detail, the plants as they move and grow."

Scientists have already used the CLS for hundreds of different experiments. They have identified the cause of "scabs" and how to stop the world's biggest wheat disease. They have discovered the building blocks of quinoa with the hope of creating new, heartier varieties for Canada. They have even predicted how certain crops are going to adapt to fewer days of rain in some parts of the world, or more rain in others.

But these are only a few of the potential projects coming out of the CLS, and Dr. Karunakaran is very excited about the possibilities that have not yet been explored. "In a way, we are seeing synchrotron lights shining on plants in very fine details for the very first time," she says.

Photo Credit: Canadian Light Source

Photo Credit: Canadian Light Source

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Canadian Light Source

Research is a contact sport

How international collaborations are advancing knowledge — and driving innovation

By Dr. Gilles G. Patry

In a world where the biggest challenges facing humanity are global in scale, there is a need, more than ever, for research to be conducted as a global "contact sport." When researchers from different jurisdictions, geographies and cultures team up to generate new ideas and tackle fundamental issues like food security, sustainable energy and climate change, they are better able to reach their goal: to formulate hypotheses, make discoveries and find solutions. By sharing resources, ideas and knowledge, scientists can more effectively advance research that addresses societal needs, and in the process, foster innovations that spark economic development.

After decades of sustained investments in our research institutions, Canada now has the talent, the expertise and the state-of-the-art infrastructure in place to support international research collaborations that can make significant contributions to addressing these kinds of global challenges. Indeed, these kinds of collaborations may be one of the most effective ways to boost innovation and economic growth.

Take the challenge of food security. According to the Food and Agriculture Organization of the United Nations, approximately one billion people, mostly in developing countries, rely on fish as their primary source of protein. And worldwide, seafood production has doubled since the mid-1990s to meet growing demand. Accurately tracking ocean species is critically important for determining how to continue to meet the demand in a sustainable way.

To address this need, scientists at Dalhousie University in Halifax, Nova Scotia, developed the Ocean Tracking Network, a global research platform that traces the movements and monitors the habitats of aquatic animals. Its mission is to foster the conservation and sustainable use of the world's oceans. On Canada's West Coast, the ocean floor is crisscrossed with the high-tech cables and sensors of another ocean monitoring system based at the University of Victoria, Ocean Networks Canada. It provides researchers from around the world images and comprehensive data from the bottom of the sea.

These two ambitious research platforms serve as hubs of collaboration, where national and international researchers are sharing ideas, information, discoveries — and technologies. Due to their complexity, these kinds of projects promote extensive collaborations between researchers, who have advanced equipment needs, and technology engineering companies that have the know-how to provide them. In fact, one of the objectives of the Ocean Tracking Network is to foster technological innovation in marine telemetry systems and to communicate these advances to the global scientific community. It has teamed up with a

number of companies to develop smaller and more powerful telemetry devices. These companies benefit from the collaboration with national and international research teams and, in turn, sell their improved products around the world.

Ocean Networks Canada has also built innovation into its core mission. At its Innovation Centre, researchers and engineers continuously improve the cabled sensors and marine observation systems that were developed for the network. These innovations are then translated into global business opportunities. The centre links commerciatl customers with scientific and engineering teams to install and test similar systems for resource management and natural disaster warning in other regions. The global market for such systems is forecasted to be worth some $6 billion in the next few years.

The next big global challenge facing Canadian and other Arctic researchers is to help determine how to safely explore and exploit abundant natural resources in the Arctic without damaging the fragile ecosystem.

The soon-to-be-built University of Manitoba Churchill Marine Observatory will involve building two giant saltwater pools where oil spills can be simulated in sea ice on demand to investigate how they will impact marine environments. Many of the technologies required are just now being invented. When completed, the facility will be a gathering place for researchers from around the globe and a breeding ground for innovation.

Today, global challenges require global collaboration. Researchers who share knowledge and approach their work as an international contact sport will be well positioned to find solutions that yield both social and economic returns.

Dr. Gilles G. Patry is the President and CEO of the Canada Foundation for Innovation, Canada's only organization dedicated to funding state-of-the-art research infrastructure at universities, colleges and research hospitals.

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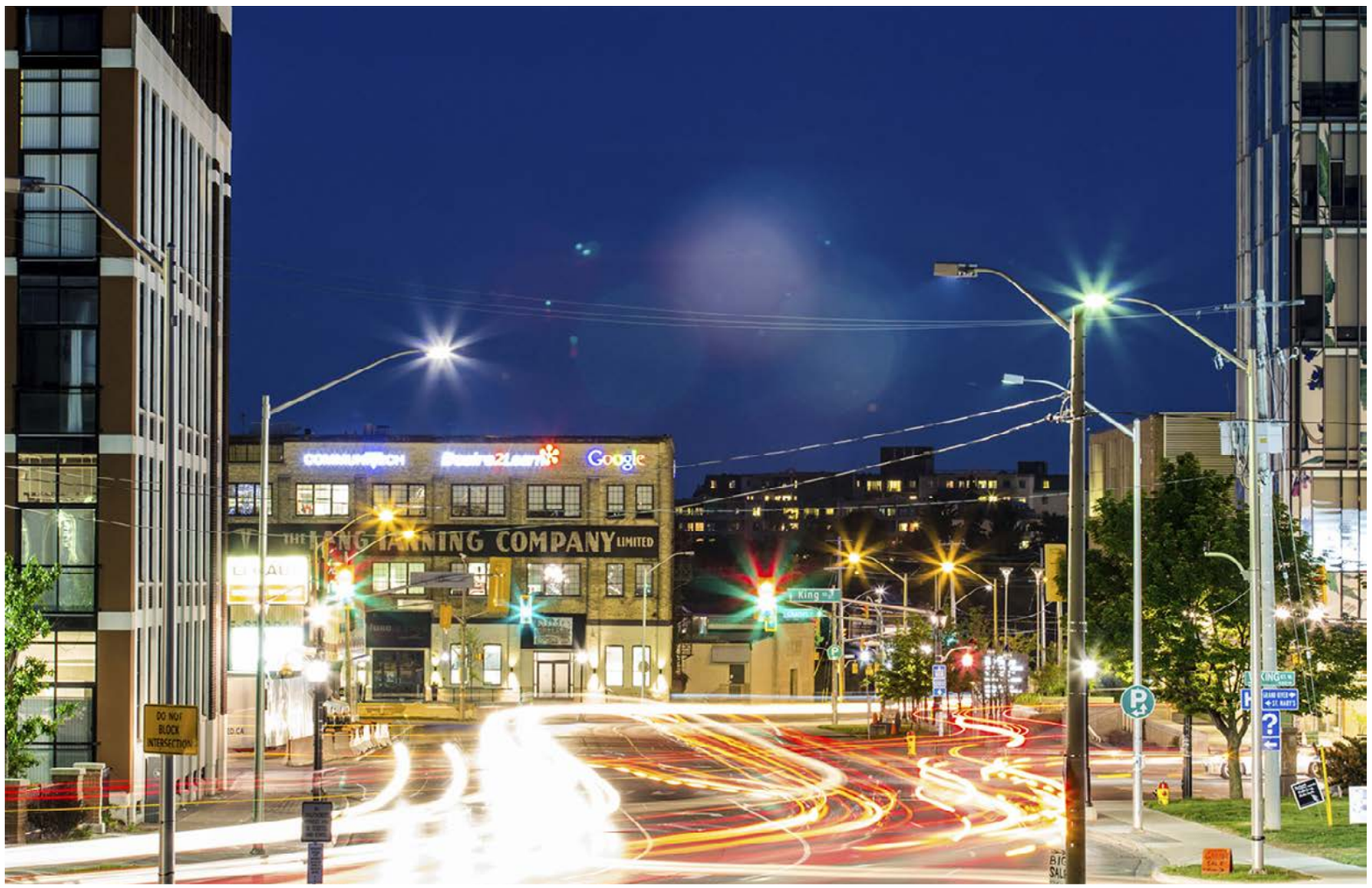
CFI

Lean, agile and engaged: The Communitech corporate innovation model

By Iain Klugman



The Communitech Hub in Waterloo Region, Ontario Photo Credit: Matt Smith

When the Canadian Tire logo was hoisted to the rafters of the Communitech Hub in 2013, more than a few eyebrows were raised along with it.

What would a 91-year-old retail chain – known for its Monopoly-like paper money and the rubbery aroma of its stores – have to gain from a presence in Waterloo Region's startup community?

And speaking of startups, what was in it for them?

These are fair questions, and we've grown accustomed to fielding them as other major corporations, including General Motors, Thomson Reuters, Canon, TD Bank Group, Manulife, Deloitte and Fairfax Holdings, have outposts in

our high-energy facility in downtown Kitchener.

The short answers are innovation and customers: Big companies get to tap into Waterloo's legendary tech talent, develop ideas quickly and tune their workplace cultures to the new economy, while our startups get access to the buying power that big brands represent.

The long answers have yet to be written – corporate innovation is an emerging field with many would-be players – but Communitech intends to hold the pen, and not just read along, as this story unfolds.

The reason is stark and simple. The life expectancy of big companies is dropping as disruptive technologies and processes sweep the planet. In the 1920s, an S&P 500 firm could look forward to a lifespan of about 65 years. Today, it's closer to 15 years.

"Most of the innovation and disruption are coming from new entrants – young, fearless, and not afraid to take on the status quo," Steve Blank, the respected Silicon Valley thinker, has written. "Existing corporate strategy and structures have proven unequal to adapt to this changing economy. . . It is the strategy lessons from startups that will light the way for the massive restructuring of all corporate structures by the middle of this century."

As smart corporate leaders sense this shift, many are looking inside and outside their companies for new ways to ensure long-term survival, and to thrive on the opportunities it presents.

Communitech, situated in the world's second-most dense startup community and next to Canada's corporate and financial capital in Toronto, is ideally positioned to help – not only by providing offsite facilities where big companies can experiment, but by plugging them into Waterloo Region's greatest asset: an entrepreneurial ecosystem teeming with world-class talent, built on a culture of collaboration. In an age when innovation has become a near-meaningless buzzword, it is easy for any company to open an off-site skunk-works, tick the 'innovation' box and call it a day.

The Communitech model goes far beyond what Blank calls "innovation theatre" antd seeks to help each company to meaningfully impact its trajectory, through close examination of its internal culture, market conditions, business goals and readiness to embrace change.

We do this by applying the Three Horizons of Innovation framework (put forward in 1999 by Baghai, Coley and White) in our early discussions with potential partner companies. The Three Horizons enable companies to connect the present with the future by imagining new business models that could eventually disrupt them, and adapting their innovation activities accordingly.

At Horizon 1, the status quo dominates, as a company makes incremental changes to how it operates. At the other extreme, at Horizon 3, all options are on the table as the company seeks to disrupt itself with completely new models.

(From left to right): Brian Tossan, Director, Canadian Engineering, GM Canada; Lindsay Farlow, Activator, 2908 at Communitech; Steve Carlisle, President and Managing Director, GM Canada; Iain Klugman, CEO, Communitech; David W. Paterson, Vice President, Corporate and Environmental Affairs, GM Canada, as they cut the virtual ribbon for 2908 at Communitech. Photo Credit: Anthony Reinhart

Horizon 2 is where things get really interesting, as the company leaves its comfort zone for the messy and unstable world of experimentation, rapid prototyping and iteration, and begins to bet on unproven ideas.

If Horizon 2 sounds familiar, it should – it describes what startups spend most of their time doing. And in Waterloo Region, we have more than 1,000 startups, in a community of just over half a million.

This is what makes the Communitech corporate innovation model unique among those we've studied around the world, which typically involve companies trying to innovate offsite in isolation, or alongside similar companies within industry-specific verticals.

When a large company docks with us, it docks with a community of engaged and creative entrepreneurs working hard – and often, collaboratively – to solve real problems quickly, across all industries.

That is why the spaces we provide to our partners in the Communitech Hub – where dozens of startups are resident – are open to one another.

Each corporate innovation space is typically headed by one or more representatives of the large company overseeing a team of developers, many of whom are co-op students from the University of Waterloo, Canada's most innovative university, and a top producer of talent for Silicon Valley.

In this open, dynamic space, we have created a collider for people and ideas, where spotaneous collaborations – between start-ups and large companies, and between the large companies themselves – have become commonplace.

These activities have already produced results.

Canadian Tire Innovations has opened a "Digital Garage" across the street from the Communitech Hub, where prototypes can be refined. TD Bank Group launched a new 120-employee facility in Waterloo that will focus on technology, following on from its Hub-based innovation lab.

Our startups and SMEs, meanwhile, have been building relationships with these big brands, which would have been far more difficult before our corporate innovation program launched.

Vidyard, a fast-growing video marketing and analytics firm, has found an equipment supplier in Canon Canada, which has in turn become a Vidyard client. Their respective executives met at the launch of Canon's innovation lab in our Hub MappedIn, which builds indoor wayfinding technology, found a customer in Canadian Tire, which has installed MappedIn products in retail stores. Their relationship started with a similar collision..

Our program also ensures corporate partners become active and engaged supporters of our ecosystem – from startup festivals and hackathons to women-in-technology sessions and accelerator programs – that strengthen our entrepreneurial community.

As books go, we're still writing the first chapter – but we're excited to draw on nearly 20 years of working with startups as we drive the narrative forward, guiding our corporate innovators to greater advantage through a leaner, more agile approach to business.

If we raise a few more eyebrows along the way, all the better.

Iain Klugman is President and CEO of Communitech, an innovation centre in Waterloo Region, Ontario.

The Eastern Spruce Budworm is the most damaging insect pest in Canada and the eastern United States.

COMPANY SPOTLIGHT

Canadian conglomerate J.D. Irving brings insect-fighting trees to Eastern Canada

The largest forestry employer in New Brunswick (NB) has planted more than 100 million young softwood trees inoculated with a naturally occurring compound that protects them from the most destructive insect pest in North America. Eastern spruce budworm infestations spread from 50,000 hectares in 2006 to over 4 million hectares by 2014 in the province of Quebec and the insect's populations are on the rise in neighbouring New Brunswick (NB), a province in Eastern Canada. Epidemics are largely managed by large-scale spraying of pesticides.

This Canadian breakthrough in genetics technology began in the 1980s with a discovery that endophytes—a fungus that lives inside tree needles—produce natural toxins that slow the growth of the insect.

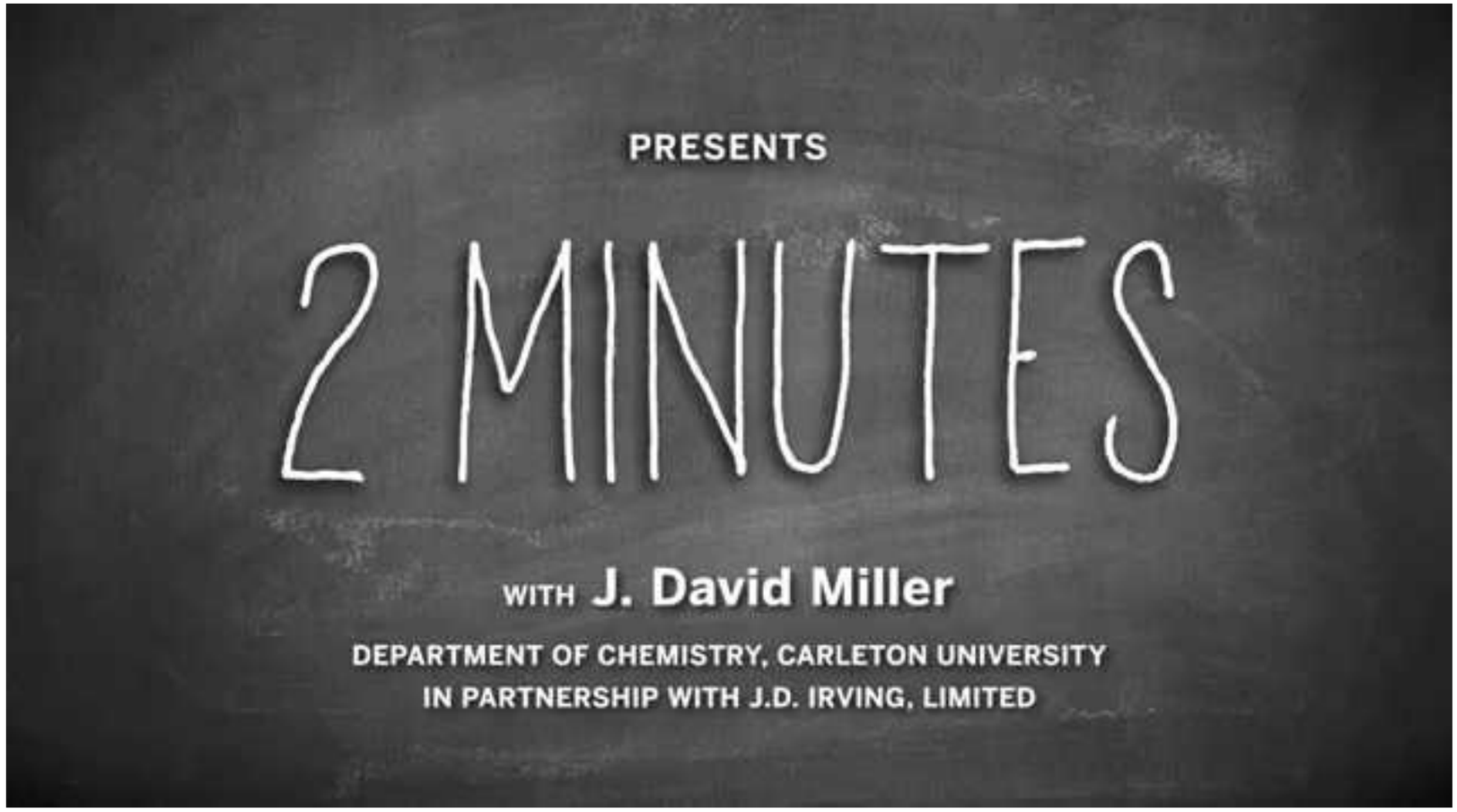
In 1998, Carleton University's Dr. David Miller and his team began collaborating with Canadian conglomerate J.D. Irving Limited (JDI) (see box) to test the hypothesis in a real-world setting. JDI owns and manages 2.4 million hectares of forestland, has a state-of-the-art seedling production program and expertise in tree genetics. Together, they identified the most resilient endophyte strains and developed a rapid and cost-effective way to

inoculate millions of seedlings using standard nursery irrigation systems. The work produced five world-first patents (and others pending) and construction of a $3.2-million large-scale seedling plant in Sussex, NB.

This Canadian-first facility will mass produce inoculum for up to 30 million seedlings a year from nurseries in eastern Canada, resulting in trees that more more tolerant to spruce budworm.

This fruitful collaboration, which recently won a Synergy Award for Innovation from the Natural Sciences & Engineering Research Council (NSERC), has expanded to other applications, including the potential of endophyte strains from white pine to improve tolerance to white pine blister rust, an invasive and highly destructive fungal species with little genetic resistance. The disease affects all five needle pines in North America. (Source: NSERC)

David Miller. Photo Credit: NSERC



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J.D. Irving Limited is a privately owned conglomerate company with a diversified portfolio of business operations including forestry, paper products, agriculture, food processing, transportation and ship-building. It is also the largest forest land owner in Canada and operates the country's largest private tree improvement program, planting as many as 25 million trees a year and nearly 1 billion trees since 1957.

Meet Tesla's new weapon

RESEARCHER SPOTLIGHT

JB Straubel, Co-founder and CTO of Tesla, and Dalhousie University's Dr. Jeff Dahn (right) check out a Tesla Model S that was brought to the Halifax campus in Nova Scotia. Photo Credit: Danny Abriel, Dalhousie University

Dr. Jeffrey Dahn is one of the world's most sought after experts on lithium ion batteries. The Dalhousie University professor and Li-ion battery pioneer begins a new five-year exclusive partnership in June with Tesla Motors, representing the first time the California electric car maker has partnered with a Canadian university.

This year will also mark the end of a 35-year partnership between Dahn and 3M that enabled the Fortune 500 company to hit the market with several patented materials based on technology developed by Dahn, including a nickel-manganese-cobalt positive electrode material found today in most electric vehicles and power tools.

Tesla has its sights on bringing electric vehicles to the mainstream market, but that requires manufacturing Li-ion batteries with longer lifespans that cost less to create and be sourced with more materials from North America.

"Our research group's goal is to increase the energy density and lifetime of Li-ion batteries, so we can drive down costs in automotive and grid energy storage applications," said Dahn, who believes it's possible to store 30 to 40 per cent more energy in Li-ion batteries. "We're talking electric vehicles where the battery outlasts the car."

Dahn has 25 researchers in his lab, including graduate students, postdoctoral researchers and technical staff. (With files from NSERC)

Canadian PM Justin Trudeau speaks to the crowd at the opening of the new Google Kitchener Waterloo office in January. Photo Credit: Google Canada

INNOVATION SPOTLIGHT

Google Canada opens Headquarters in Ontario

Prime Minister Justin Trudeau took centre stage at the official opening in January of the new Canadian engineering headquarters of Google Canada in Kitchener-Waterloo (KW), Ontario.

A handful of Googlers opened the company's first office in Kitchener back in 2005. Since then, Google has steadily expanded its investment in the region. The new 56,388 square meter Google Canada headquarters will be home to over 350 engineers.

Expanding the office in KW has other benefits. The location makes it easy for Google Canada to source engineering talent from nearby University of Waterloo. Currently, the school's graduates make up about 60% of its employees. Sam Sebastian, Google Canada's Country Manager points out that the new headquarters has capacity for 1,000 employees, demonstrating Google's intentions to grow further in Canada.

Kitchener-Waterloo was recently named one of the 10 cities that will be part of Google's North America Tech Hub Network, along with Montréal. The network provides financial support and the best of Google's resources to start-up communities that equip and nurture entrepreneurs.

"Kitchener-Waterloo has an incredible mix of world-leading engineering and science education, feeding into a dynamic young start-up community, and anchored by global tech companies who could spot the incredible talent in the area," says Sebastian. "It's like lightning in a bottle –you could try this in a hundred different places and never achieve the same type of community as what has been created in KW."

Did you know?

- Google Canada employees—known as "Canooglers"— have worked on many of Google's core tools and products, including GMail, Google Fiber, the Chrome browser and Google Ads. The team also led a significant portion of the software development for the new OnHub router.
- Canooglers speak over 20 different languages and hail from more than 20 countries.
- Google Canada was named the best place to work in Canada in 2009, 2011, 2012 and 2013 by the Great Place to Work Institute.

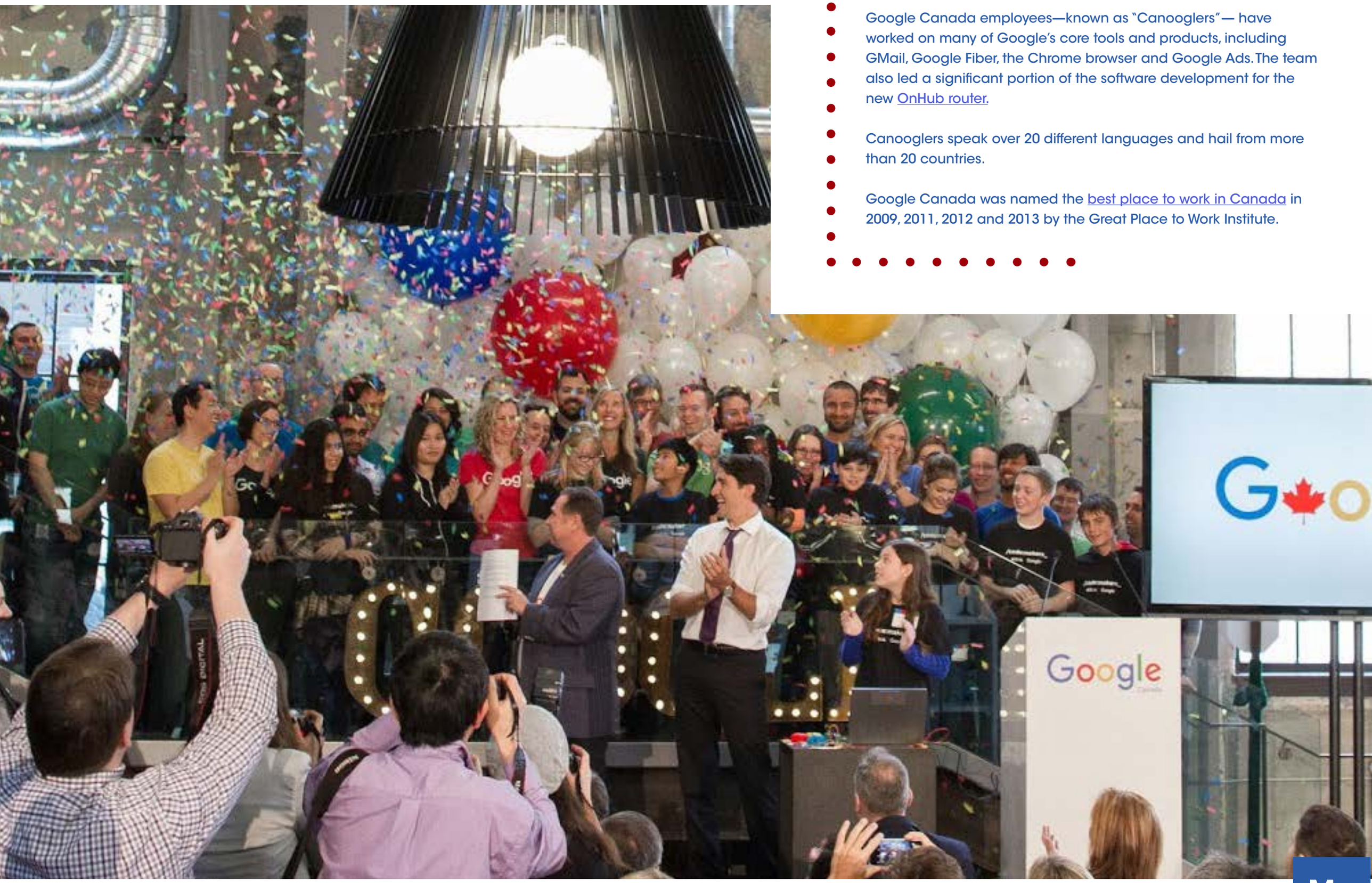


Photo Credit: Google Canada

Roche signs major licensing deal

The University of British Columbia (UBC) has completed its largest licensing agreement to date for a promising treatment for advanced prostate cancer. The agreement with Roche, a Basel, Switzerland-based multinational, was signed by UBC and the Vancouver Coastal Health Research Institute (VCHRI) which co-host the Vancouver Prostate Centre where the new drug technology was developed and is now in pre-clinical development. Under the terms of the agreement, UBC and VCHRI will receive an upfront payment of up to US$141.7 million in pre-clinical, clinical and sales milestone payments. The scientists responsible for the development will share 50% of net revenues. The Vancouver Prostate Centre hosts PC-TRIADD, a Centre of Excellence for Commercialization and Research, which funded the research along with Prostate Centre Canada, Prostate Cancer Foundation, Safeway Canada and the Canadian Institute of Health Research.

Canada and China strengthen innovation ties

Canada's National Research Council has signed a Letter of Intent with the Chinese Ministry of Science and Technology to promote, select and fund innovation-driven collaboration between small- and medium-sized enterprises from both nations. The LOI was signed in February in Ottawa as part of the 6th meeting of the Canada-China Joint Committee on Science, Technology and Innovation Cooperation.

Westport signs US$71 million equity deal

Westport Innovations Inc., a Vancouver-based developer of natural gas engines and vehicles, will receive up to US$71.3 million in financing from New York City-based private equity firm Cartesian Capital Group. The agreement will see US$17.3 million provided immediately, US$17.5 million in convertible debenture notes, US$20 million to support two or more new product ventures and US$16.3 million in asset sales to Cartesian.

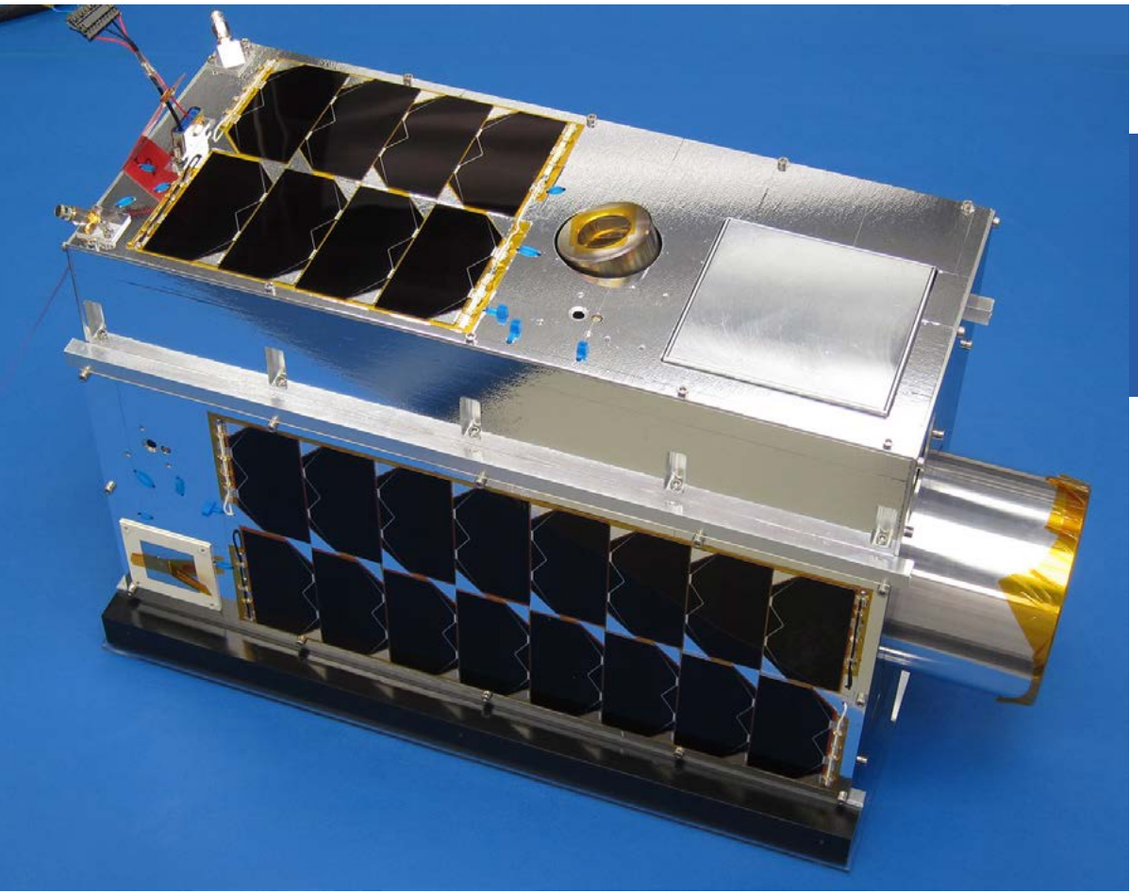
Cisco opens Toronto innovation centre

Cisco Systems Inc. has officially opened its Toronto Innovation Centre in its new Canadian headquarters. The centre will focus on so-called smart technology and the Internet of Things by commercializing promising ideas in the areas of urban and smart city technology, healthcare and financial services. The venture is just the latest expansion of Cisco into Canada and part of a comprehensive agreement with the Government of Ontario. It follows the launch of a $150-million Cisco Canada Innovation Fund, the funding of 12 university research chairs, and an R&D job creation initiative in collaboration with the provincial government. The Toronto centre is one of nine such centres Cisco has opened globally and was originally announced in 2014.

SFU President Andrew Petter is welcomed to Beijing by Hanhai Chairman Hanguang Wang, prior to signing of an agreement to launch C2-CAN. Photo Credit: Simon Fraser University

SFU and China launch accelerator program

Simon Fraser University has launched the Hanhai-SFU Canada-China Commercialization & Acceleration Network (C2-CAN) in partnership with the Beijing Hanhai Zihye Investment Management Group. The network aims to support the commercialization of advanced technologies originating from both countries, providing access to incubator facilities, business training and angel and venture capital.



The first smallsat from GHGSat. Photo Credit: GHGSat

GHGSat to launch emissions monitoring satellite

Montreal's GHGSat, an environmental monitoring firm, has successfully completed testing of its demonstration global emissions monitoring satellite that offers the ability to measure greenhouse gas emissions from industrial facilities anywhere in the world. With a launch scheduled for April, 2016 from India's Satish Dhawan Space Centre, the start-up firm has also launched a Kickstarter crowdfunding campaign to support demonstrations of the satellite's capabilities around the world. Satellite development took two years with GHGSat receiving assistance from Xiphos Technologies, Montreal; the Space Flight Laboratory at the University of Toronto's Institute for Aerospace Studies; MPB Communications and the Boeing Company. Testing of the demonstration satellite included vibration and vacuum testing at the component, subsystem and system levels.

Drone maker secures $60-million investment

Aeryon Labs Inc. has secured $60 million from Boston MA-based Summit Partners, a global growth equity firm with more than US$6.5 billion in equity and fixed income investments. Waterloo, Ontario-based Aeryon will use the funding to build upon its nine-year track record of product development and commercialization in the small unmanned aerial systems (sUAS) market. Commonly referred to as t drones, sUASs are increasingly being used in military, public safety and commercial markets for acquiring mission-critical intelligence. Aeryon has established early market leadership in the field and is poised for rapid growth, fitting Summit Partners' portfolio of founder-led companies with the potential to take dominant positions in high-growth industries.

VC investments, exits bounce back in 2015

Canada's venture capital industry staged a healthy comeback in 2015

$2.3 billion invested in **536 deals** — an increase of **24%** and **12%** respectively. **VC** exits also exploded to **$4.3 billion**, driven by **3 large IPOs** — ProNAi Therapeutics Inc **($158.4 million)**, Shopify **($131 million)**, and David's Tea **(US $75 million)**

A recent **report** shows that **funding** is **shifting** to **early-stage deals,** with **seed stage** investment **increasing 30%**

ICT firms accounted for **2/3** of volume and transaction values **(325/$1.4 billion),** followed by **health** and **life sciences (110/$647 million)** and **clean tech (44/$135 million)**

In 2015, fundraising experienced healthy **gains** with **33** funds raising **$2 billion,** compared to **$1.2 billion** in **2014**

Prime Minister Justin Trudeau speaks with a researcher during a lab tour of the Centre for Commercialization of Regenerative Medicine's development facility in Toronto. The federal government is providing CCRM with $20 million to establish a new Centre for Advanced Therapeutic Cell Technologies. Photo Credit: Johnny Guatto /University of Toronto

Breaking new ground in regenerative medicine

In 2015, the Canadian government invested $114 million for a new initiative in regenerative medicine at the University of Toronto. International partners in the Medicine by Design initiative include Sweden's Karolinska Institute, Germany's REBIRTH Cluster of Excellence, Peking University, Technion Israel Institute of Technology and the UK Regenerative Medicine Platform. Canada is a global leader and pioneer in stem cells, beginning with the discovery of stem cells 65 years ago by University of Toronto scientists James Till and Ernest McCulloch.

Canada is now moving aggressively to become a major international supplier of regenerative medicine technologies and therapeutics a market expected to hit $50 billion by 2019.

Clean Tech Comes of Age

CANADIAN TECH AT THE LEADING EDGE

Clean tech has emerged as Canada's fastest growing technology sector. It is also one of its largest. In 2013, the industry generated $12.5 billion in exports and produced three times more jobs than GM's largest and busiest Canadian plant in Ingersoll, Ontario, according to a 2015 Canadian Clean Technology Industry Report from Analytica Advisors.

More than 800 clean tech firms now employ about 50,000 people. According to the report, Canada's clean tech industry is growing four times faster than the overall national economy and the number of people directly working in the sector has already exceeded employment in pharmaceuticals and medical devices as well as more traditional industries like forestry and logging.

Canada's clean tech sector currently generates nearly $12 billion in annual revenue—an amount Analytica Advisors predicts could grow to a $50-billion by 2022, representing 2.5% of global market share.

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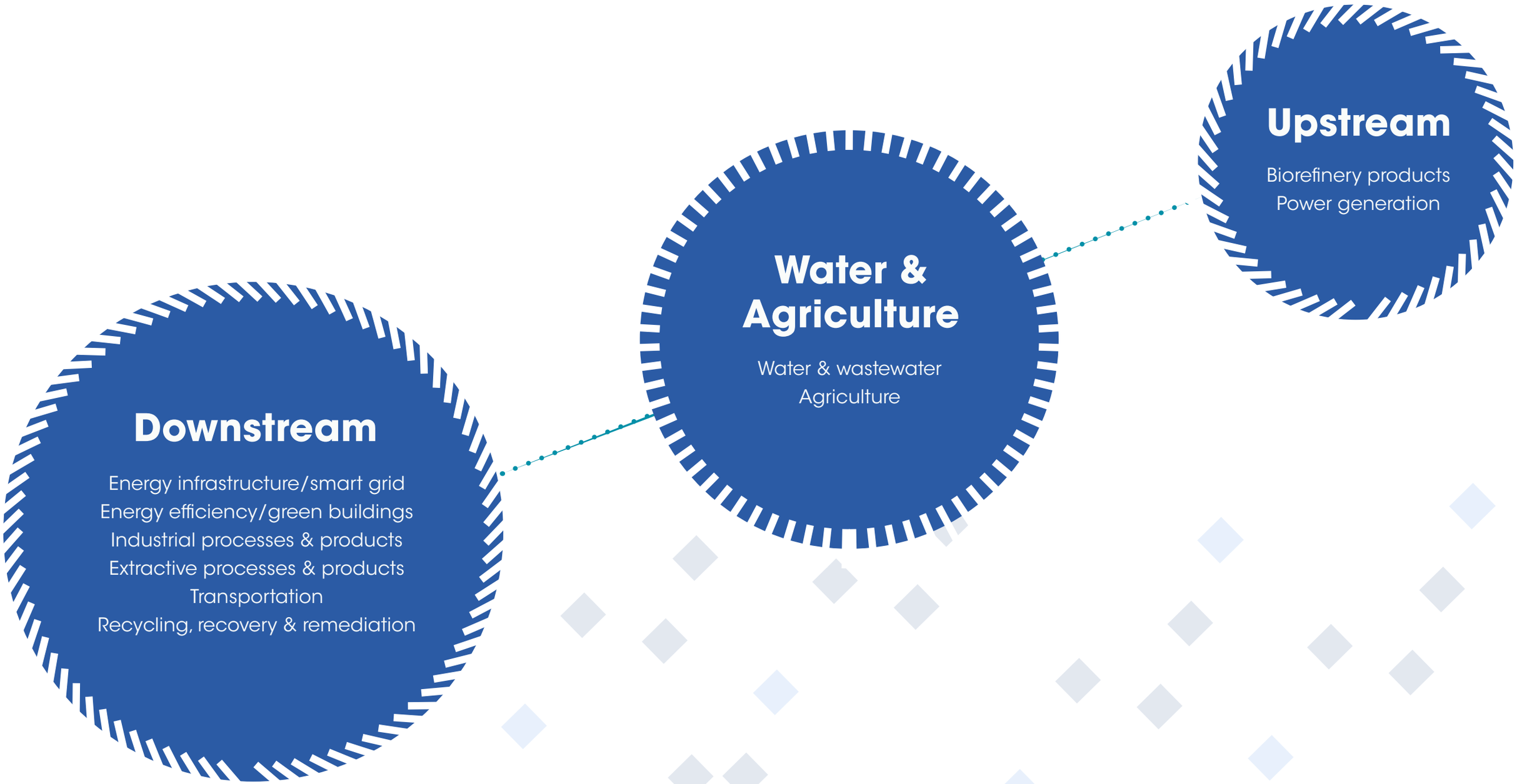
Canadian Clean Tech Sectors



Source: 2015 Canadian Clean Technology Industry Report, Analytica Advisors Inc.

Green energy in one of the planet's coldest cities

If it can work in Manitoba, it can work anywhere. That guiding principle has driven Red River College (RCC) and Manitoba Hydro to develop clean technologies proven to reduce electricity consumption in one of the coldest, hottest and all-around harshest places on Earth.

This decades-long partnership has had many successes: a zero emissions bus, a high-capacity charging system and the most energy-efficient office tower in North America—Manitoba Hydro's headquarters. In February, the partners were awarded one of Canada's top innovation awards from the Natural Sciences and Engineering Research Council (NSERC).

The all-electric battery bus and rapid charging system were developed by an international consortium consisting of Province of Manitoba, Manitoba Hydro, Mitsubishi Heavy Industries (Japan), New Flyer Industries and RRC. Winnipeg Transit is now using five of these buses in daily service as part of a four-year demonstration project. The bus—the first of its kind in Canada—can run for up to four hours on a 30-40 minute charge.

The project has already helped New Flyer Industries win a contract from the Chicago Transit Authority for two battery electric buses.

Another success is Manitoba Hydro's award-winning 21-story headquarters in downtown Winnipeg, which uses 60% less energy than comparable high rises. RCC evaluated new energy-efficient building technologies, including a one-meter wide glass "curtain wall" system that insulates against heat and cold. Manitoba Hydro credits the partnership with helping it to surpass its energy consumption targets and save tens of millions of dollars in construction costs.

RCC has also partnered with the University of Manitoba and Manitoba Hydro to develop a thermal trough system that could one day use concentrated solar power to heat and cool households across the province. (Source: NSERC)

Electric bus at airport charging station. Photo Credit: Winnipeg Transit

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VIEW ONLINE

Canada taps global market for nanomaterial from trees

In the 1990s, Canada supported fundamental research into cellulose nanocrystals (CNC) – a novel form of cellulose, isolated from forest biomass. Today, Montreal-based CelluForce Inc. has become the world leader in the commercial development of this recyclable, nontoxic and renewable nanomaterial.

Backed by Domtar Inc., FPInnovations and Schlumberger Canada Ltd., CelluForce manufactures CNC (also referred to as NanoCrystalline Cellulose) in the world's first demonstration plant of its kind, located in Windsor, Quebec.

The roots of this success began in 1995, when NSERC and an industry research organization (today called FPInnovations) began supporting the work of chemist Dr. Derek Gray and his team at McGill University who developed the initial extraction recipe from wood pulp, and discovered its unique optical properties.

The speed at which this idea has moved from the lab to commercial product has given Canada's forestry industry a significant head start in this promising market.

This natural, biodegradable material has unique characteristics ranging from optical properties to reinforcement when added to other materials. Until recently, no one had produced more than a handful of this bio-based strengthening agent, extracted from the wood fibres of Canada's vast forests. Now, CelluForce has a plant capable of producing 1000 kilograms of CNC per day.

CNC's remarkable properties and wide range of potential applications are creating new markets for fibre-based products that go beyond traditional pulp and paper application. The estimated market of CNC in North America alone is more than $1 billion annually. (Sources: CelluForce and NSERC)

Potential CNC applications

Biocomposites for bone replacement
Pharmaceuticals
Additives for foods and cosmetics
Improved paper and building products
"Intelligent" packaging
High-strength fibres and textiles
Additives for coatings, paints, lacquers and adhesives
Aerospace and transportation structures
Electronic paper printers
Innovative paper coatings
Sunscreens
Cosmetics
Packaging
Coatings

And much more…

Big Science in a Big Country

Canada home to world's largest particle accelerator

Forty years ago, Prime Minister Pierre Trudeau officially commissioned TRIUMF's 520 MeV cyclotron – the heart of Canada's national laboratory for particle and nuclear physics and accelerator-based science. "I don't really know what a cyclotron is, but I am certainly very happy Canada has one!" said the then Prime Minister on the occasion.

This feat of Canadian ingenuity has empowered the national centre to push the frontiers of research even further, from studying the structure and origin of matter to materials and medical science. TRIUMF is also preparing for the future with a new flagship facility that will triple the laboratory's capabilities for producing beams of rare isotopes.

One of TRIUMF's big breakthroughs is a technology that allows hospitals to produce their own medical isotopes. This new process makes it possible to retrofit cyclotrons already installed in major hospitals to routinely produce radioisotope technetium-99m (Tc-99m), the world's most highly used medical isotope and a key component in more than 75,000 imaging procedures a day.

Canada's Minister of Science Kirsty Duncan at TRIUMF's 40th anniversary celebration in February. Photo Credit: TRIUMF Lab

Researchers are working with a Canadian start-up company to license, transfer and sell this technology around the world.

Canada and Japan are also strengthening ties between TRIUMF and KEK, Japan's High Energy Accelerator Research Organization. The agreement will see the centres establish a branch office at each other's institution to boost research collaboration and joint projects. Current areas of collaboration include the Large Hadron Collider at CERN, the T2K particle physics experiment and the proposed International Linear Collider.

IBM fast-tracks 'made in Canada' disruptive technologies

By Mark Henderson

IBM Canada is deepening its commitment to Ontario by providing more small and mid-sized companies with access to Canada's most powerful computing platforms, including IBM's Watson and Extreme Blue.

In February, the Ontario government announced it will invest $22.75-million in IBM's Innovation Incubator (I3) project, part of the Ontario-IBM-backed Southern Ontario Smart Computing Innovation Platform. SOCIP links several high performance computing resources to help smaller firms fast-track the development of new disruptive products and technologies.

IBM will contribute equipment and expertise valued at nearly $25 million, in addition to the $183 million the company has already invested since SOSCIP was established in 2012. The I3 project is expected to leverage over $410 million in private-sector investment and create up to 2,600 jobs.

IBM has established several similar initiatives globally but the I3 project is the first of its kind in Canada.

"It's definitely a large program. There's a need for platforms that are cross-sectoral that support any type of applications," says Dr. Tom Corr, president and CEO of the Ontario Centres of Excellence, which is overseeing the project. "This project will provide access to artificial intelligence technologies and cognitive computing which is growing rapidly. We need to move the sector forward or be left behind."

In the area of commercialization, the I3 projects will provide firms with smart computing resources for products and services development and demonstrations, a data analytics internships program for adopting and implementing technologies and a soft landing program.

The DMZ at Ryerson University is the first announced incubator under I3 with at least four more to be announced in the coming weeks.

Rather than duplicate expensive infrastructure, the SOSCIP platform allows companies and academic researchers to share a distributed network of high performance, cloud and agile computing resources. Since its launch in 2012, SOSCIP has supported more than 60 projects in areas as diverse as agile computing, health, water, energy, cities, mining, advanced manufacturing, digital media and cybersecurity. It has engaged or created 38 small businesses and established a pipeline of nearly $2 billion in revenue for these firms.

IBM Canada At-A-Glance

$500+ million in R&D in 2014

$500 million in new investments since 2012, including R&D cloud computing centre

Canada's 6th largest R&D spender

Canada is home to IBM's 2nd largest software development organization —

- Largest locations in Toronto and Ottawa
- 10 additional satellite hubs, including Montréal and Victoria
- World-class high-tech manufacturing in Bromont, Québec

Moving clean tech closer to market

CANADIAN TECH AT THE LEADING EDGE

NCE RCE
Networks of Centres of Excellence of Canada | Réseaux de centres d'excellence du Canada

Canada has developed several successful models for bridging the gap between research and innovation. Among them are the Networks of Centres of Excellence (NCE), an initiative of the three federal research granting councils that supports some two dozen national commercialization centres, and five business-led networks, as well as five knowledge mobilization networks and 13 academic-led NCE networks. These national networks and centres are drawing on talent from across the country to translate research into new products, markets and jobs.

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From wood waste to bio-coal

Made-in-Canada bio-coal is competing to supplant traditional coal currently used to heat and power the world today. Starting in 2016, Vancouver start-up Global Bio-Coal Energy (GBCE) will begin producing 320,000 tonnes of this eco-friendly fuel each year at a new plant in Lumby, a small community in the province of British Columbia's Okanagan Valley.

A second plant is planned for Watson Island near Prince Rupert. GBCE made it this far, in large part, due to BioFuelNet, a national Network of Centre of Excellence, which provided critical seed funding and support to develop and commercialize a process for producing high-quality bio-coal from wood waste from sawmills and forestry operations. (Source: NCE)

Why Bio-Coal?

Among the advantages: bio-coal is carbon neutral; it's free of mercury, nitrous oxides and sulfur oxides; and it provides the logging industry with a valuable new market for biomass waste, including wood from trees killed by mountain pine beetles.

BioFuelNet bio-coal Photo Credit: BioFuelNet

CLICK TO PLAY
VIEW ONLINE

Meeting European Union deadline for lead-free planes

A Canadian-led research effort is first out of the gate with solutions that will help Canadian suppliers meet new environmental standards restricting the aerospace industry's use of lead in electronic circuit boards. The projects, jointly funded by the Refined Manufacturing Acceleration Process (ReMAP) network and industry partners, have produced patent-pending lead-free alloys that melt at lower temperatures, minimizing the risk of tin whiskers which can short-circuit electronics. The low melting point also allows the metal to be reconditioned to its original properties even after 20+ years in the field. These advantages reduce the risk of field failures which may be catastrophic in high-reliability applications.

Several industry consortia, including AREA Consortia, HdPug, iNEMI, CALCE and NASA, have tested and are investigating the new alloys and processes, aimed to be commercially available in time to meet the European Union's 2019 lead-free deadline. (Read the White Paper). (Source: NCE)

Dr. Polina Snugovsky, Principal Engineer and Chief Metallurgist of Global Technology and Innovation at Celestica, the lead industry partner in ReMAP. Photo Credit: Celestica

Turning wastewater into clean water

[Forward Water Technologies](#) Inc. (FWT) is taking advantage of a novel commercialization approach pioneered by GreenCentre Canada that has cut two years off its development cycle and saved at least $2.5 million in research costs. GCC's partnership with the Xerox Research Centre of Canada in Mississauga provided FWT with support beyond the reach of most start-ups, from process engineering to scale-up, pilot testing and developmental support. FWT is currently building a mini-plant in Kingston, Ontario to demonstrate to investors that its technology is viable from both an operational and cost perspective. FWT has pioneered an inexpensive, low-energy de-ionization process that uses "switchable" salt – a green chemistry breakthrough – to purify water from difficult-to-treat wastewaters from power generation and manufacturing. (Source: NCE)

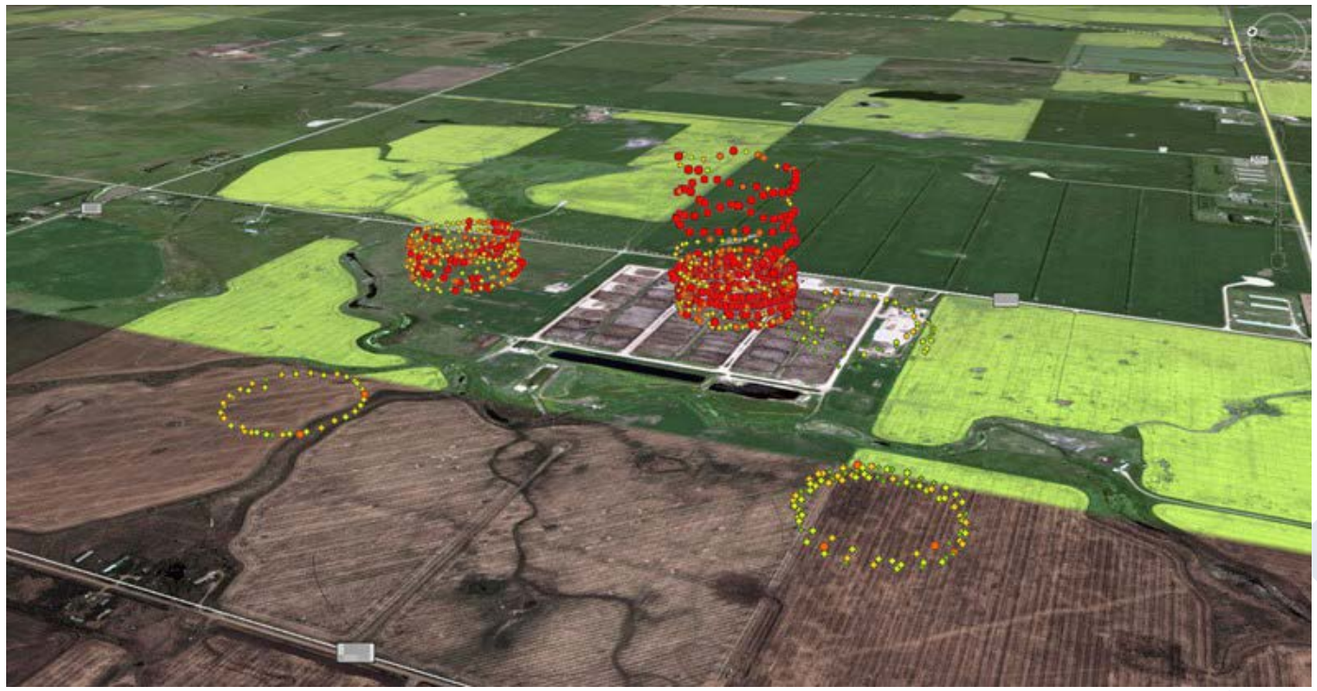
Amy Holland, Product Development Scientist at GreenCentre Canada and Forward Water Technologies, shows how water recovered from a hydraulic fracturing operation—called flowback water—can be turned into clean water using a made-in-Canada green treatment process. Photo Credit: NCE

Sensor-equipped drones monitor pipeline leaks from above

Monitoring Canada's vast network of more than 242,000 km of gas pipelines, and many more globally, is about to get easier and less expensive. In 2015, LOOKNorth, a federally-funded Centre of Excellence for Commercialization and Research, brought together two Alberta companies, Boreal Laser Inc. and Ventus Geospatial Inc., to field test a new low-powered sensor that can be mounted on drones to detect a range of greenhouse gases, including methane leaks from natural gas pipelines.

The trial, jointly funded by LOOKNorth and Cenovus Energy, demonstrated the operational ability of Ventus' drone platform equipped with Boreal's GasFinder ABTM laser system to detect leaks while flying over a gas pipeline in Alberta. Boreal Laser credits LOOKNorth's support with reducing its development time by half. The product, now available commercially, can also monitor greenhouse gas emissions from other large-scale infrastructure. (Source: NCE)

As part of a joint effort to fight climate change, Prime Minister Justin Trudeau and U.S. President Barack Obama announced a new bilateral deal on March 10 that could cut methane emissions in the oil and gas sector by as much as 45% by 2025.



A drone equipped with Boreal's gas detection analyzer detected increasing concentrations of methane from a cattle feedlot (yellow and red dots). The same technology can be used to detect gas pipeline leaks. Photo Credit: Boreal Laser

Replacing dirty diesel with e-vehicles in mining

A Sudbury, Ontario manufacturer will hit the market in 2018 with a new battery-powered electric vehicle that bolsters the business case for deep underground mining, while creating a cleaner and healthier environment for miners. With support from the industry-led Ultra-Deep Mining Network (UDMN), Industrial Fabrication Inc. partnered with FVT Research Inc. of Pitt Meadows BC to develop a new electric motor that can replace existing diesel engines in heavy-duty utility vehicles. This world-first significantly reduces ventilation costs—which account for 30-50% of a deep mine's (over 2.5 km) operating expenses—as well as fuel and maintenance costs. Switching to electric also creates a quieter working environment and eliminates the cancer risk of diesel exhaust fumes. (Source: NCE)

"Within five to ten years, I expect there won't be any mining companies putting diesel underground. We're talking about a dynamic shift in how underground mines are operated."

Todd Pratt, CEO, FVT Research Inc., British Columbia

UDMN - Minecast Photo Credit: Industrial Fabrication Inc.

In the news

Ontario nanotech centre opens in China

Ontario has boosted its collaboration with China in nanotechnology with the creation of a Nanotechnology Innovation Centre and accompanying industrial R&D program. The agreement between the Ontario Ministry of Research and Innovation and the Jianhsu Province's Department of Science and Technology will see a dedicated Ontario office in the sprawling Suzhou Industrial Park where Canadian companies can incubate.

"It's all about faster research and moving innovations into the economy," says Dr. Alain Franq, managing director of the Waterloo Institute of Nanotechnology. "Pull together inter-disciplinary teams and that's the powerful thing that's part of something great. You need to lead to be a global centre of excellence. You can't sit here at home."

The Ontario office is funded by Nanopolis Suzhou Co. Ltd., an industry-oriented body that works to ensure there are receptors for promising collaborative research. Several other countries such as Finland and the Netherlands have also opened up offices at the Suzhou Industrial Park seeking similar opportunities and a commercial leg up.

"In Canada we have the top 5% of nanotechnology journal publishing. That's the ticket to the other 95% — go find like-minded researchers to create a solution," says Franq. "Ontario companies can go there and they have a program and can incubate. The park has a huge international component."

Canada and Korea renew S&T agreement

In March, Canada and South Korea renewed a 2011 Memorandum of Understanding on Cooperation in Innovation and Energy Technologies. The agreement supports collaboration on clean energy technologies to enhance energy efficiency, security of energy supply and reduced greenhouse gas emissions. Canada is also exploring partnership opportunities with Korea in renewable energy, smart grids, energy storage, and shale gas.

Canada, EU launch aerospace projects

Three industry-led collaborative aerospace research projects have been launched following extensive dialogue among 30 partners from Canada and Europe, including France, the United Kingdom, Poland, Germany, Italy, Sweden, Spain and the Netherlands. Funding of the Canadian component of the projects is being provided by the Consortium for Aerospace Research and Innovation in Canada and the Natural Sciences and Engineering Research Council, with the European Commission supporting European partners. The approved industry-academic projects call for the development of an additive manufacturing optimization and simulation platform for repairing and remanufacturing aerospace components, an electromagnetic platform for lightweight integration/installation of electrical systems in composite electrical aircraft, and ice phobic surfaces to prevent ice formation on aircraft.

In the news

Canada and Sweden sign Arctic cooperation deal

Canada and Sweden have signed a new five-year science cooperation arrangement aimed at establishing a framework for cooperation between the two countries for collaborative science and innovation activities in the Arctic, specifically the Arctic Ocean.

Activities include marine surveying, exchange of scientific data and promotion of research results. Future activities to be discussed include data gathering in support of Canada's extended continental shelf submission for the Arctic Ocean. The agreement was signed between Natural Resources Canada and the Swedish Polar Research Secretariat and is further to a 2010 MOU on S&T cooperation between the two countries.

Ontario and Québec top European Union partners

A recent report on Canadian-European collaboration in science, technology and innovation (STI) reveals that researchers from Ontario and Québec are most active in the European Framework Programme for Science and Technology (FP7) and also have the highest number of scientific agreements with European Union member states.

The Observatory Report by the European Commission identified several prominent areas of joint R&D, including aeronautics, aerospace, health, Arctic and marine science, as well as agriculture and the social sciences and humanities. Information and communications technologies, however, had the highest Canadian participation rate in FP5 and FP6 and remains "the most attractive theme for submitted Canadian proposals for FP7".

Québec and France establish maritime institute

Québec and France are launching a new maritime research and innovation institute in 2016 focusing on the environment, resource management, innovation and coastal erosion. It will be located at the Université du Québec à Rimouski, with involvement from Saint Pierre and Miquelon, a French archipelago south of the Canadian province of Newfoundland.

We hope you enjoyed

Canadian Innovation News

The next CIN will be published in Summer 2016.