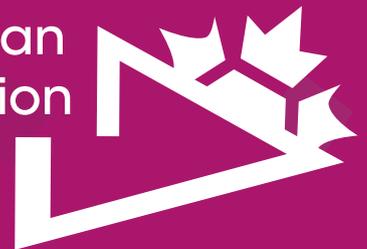


TRAIL BLAZERS

Canadian
Innovation
News



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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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UOIT EXPERT EXAMINES HOW WEARABLE TECH WILL SHAPE

TRAILBLAZERS: DR. ISABEL PEDERSEN

HUMANITY





Dr. Isabel Pedersen, Canada Research Chair, University of Ontario Institute of Technology

By CarolAnne Black

Dr. Isabel Pedersen isn't shy about asking uncomfortable questions when it comes to emerging technologies that can be carried, implanted, ingested or worn by humans. In fact, she's made a career of it.

The Canada Research Chair (CRC) in Digital Life, Media and Culture has been interested in human-computer interactions since her teenage years playing Pac-Mac in the Yonge Street arcades of downtown Toronto.

Today as a researcher and associate professor at the University of Ontario Institute of

Technology (UOIT), much of her time is devoted to launching a new institute that addresses the subjective, rhetorical, cultural, ethical and political challenges posed by these new technologies. In doing so, her research teams will address how wearables, or embodied technologies, will shift our reality, change how we interact with others and participate in digital culture.

In late 2017, Pedersen's Tier 2 CRC was renewed for another five years. That funding, combined with a grant from the Canada Foundation for Innovation, is enabling her

Dr. Isabel Pedersen's focus is on a benevolent AI – how applications can use empathy to support users.

“We need to put humans at the centre of AI”



to transform the UOIT Digital Culture and Media (Decimal) Lab that she founded into an interdisciplinary institute with two locations. One will be based at UOIT's Oshawa, Ontario campus and a second will open in Toronto, which Pedersen described as a hub for start-ups developing wearable technology, giving the lab easy connections within industry. The institute will also formalize collaborations over the next five years with other Canadian and international universities.

“Decimal Lab is a digital humanities lab. It's about humans before technology, rather than the other way around,” says Pedersen who earned her Masters and PhD in human-computer interaction design at the University of Waterloo.

The Decimal Lab conducts speculative research, tracking technology that exists only as predictions or in labs (disruptive tech) and when a market has just appeared (emergent tech).

“Right now I'm looking at brain-computer interfaces and brain implants,” says Pedersen, who published a book in 2013 entitled “Ready to Wear: A Rhetoric of Wearable Computers and Reality-Shifting Media”. Her research goes beyond today's wearable gadgets to study the effects of these emerging technologies on human communication, social interaction and human thought.

In particular, she is investigating how artificial intelligence and brain implants will be governed, and how popular culture is either celebrating or paranoid about the possible consequences of adopting these technologies. While much of the focus on wearable tech has been on the physicality of the human body using sensing devices and

biometric feedback, Pedersen's team is trying to understand how these new technologies will, and are perceived to, affect us.

For example, her lab developed an art-based project that enables visitors to experience art in a new and different way. Called iMind, the application explores an “alternative dialogue” between the viewer, the art piece and the artist. It encourages participants to ‘select’ which art piece to view, based on their interpreted emotional state.

“You use it to select paintings based on your emotional output, read by a wearable device,” she explains. Digitized paintings from the New York Metropolitan Museum were pre-coded with emotions, and a headset worn by the user reads brain activity and selects what painting to show based on the user's emotional output.

The iMind art installation is designed to investigate questions like: Is the computer really able to read my emotions, and have my emotions been reduced into a pale version of how I feel?

iMind mimics a future technology in which our smartphones constantly read our emotions and change their output as a result. The most common question Pedersen gets asked: “Will we be covered in technology in our future?” While she can't predict exactly when this will become reality, she is confident. “It will happen.”

A few of the women behind Canada's global leadership in AI

Doina Precup, DeepMind

Currently: Head, DeepMind Montreal; Associate Professor, Computer Science, McGill University; Senior Fellow, Canadian Institute for Advanced Research

Expertise: Dr. Precup's passion for science was ignited as a child growing up in Romania watching sci-fi movies. Today, she is a world-renowned expert in the field of reinforcement learning, a type of machine learning based on behavioural psychology. In essence, how can one get a software "agent" to act in such a way as to maximize its rewards, which is critical to having computers that can plan and reason.



Photo: Owen Egan

"I look forward to continue training the next generations of machine learning researchers at MILA (Montreal Institute for Learning Algorithms) and McGill, fostering diversity and inclusion in the research community through AI projects for social good, and building further the Montreal AI ecosystem."

The New Canada Science and Technology Museum

INNOVATOR SPOTLIGHT

In most people's minds, the words 'innovation' and 'museum' don't often go together.

But innovations in how museums present the old and in how they engage visitors can profoundly change those visitors' expectations and experiences.

Just over 50 years ago, the Museum's founding director set the tone for the then brand new Canada Science and Technology Museum when it opened in 1967. "I see no reason why learning shouldn't be fun. This is a swinging place," he declared.

Launched in November of Canada's centennial year, the Museum revolutionized how museums interact with the public. Glass cases, barriers, and "Please Do Not Touch" signs were replaced in favour of presenting artifacts in active, innovative, and engaging ways that were complemented by interactive experiences, with the Crazy Kitchen becoming an instant favourite.

The new [Canada Science and Technology Museum](#) in Ottawa opened this past

November after a three-year renewal process, completed on time and on budget. Visitors now find a modern, world-class museum featuring more than 7,400 m² (80,000 sq. ft.) of completely redesigned exhibition space.

A major goal of the Museum before it closed for renewal was to focus on encouraging youth to pursue studies and careers in the STEM fields: science, technology, engineering, and mathematics. Innovation requires creativity. The Museum added the arts into the mix and now champions the synergy of the STEAM subjects to more effectively inspire the next generation of innovators. Winners of the second annual STEAM Horizon Awards for youth will be announced this spring.

Whether it is the voices of those who have been overlooked in the past or the complexity of technological progress with its impact on the planet, the new Museum tells more nuanced stories. It is also letting artifacts present themselves as beautiful, inspiring, and unique objects that have their own stories to recount and that do not have to be boxed into a historical timeline.



Children experiment and exercise their creativity in ZOOM, the Museum's new Children's Innovation Zone

The [Canada Science and Technology Museum](#) along with the [Canada Agriculture and Food Museum](#) and the [Canada Aviation and Space Museum](#) are [Ingenium – Canada's Museums of Science and Innovation](#). The Museums are about driving curiosity, discovery, and innovation, all while delivering fun and unexpected moments as visitors are immersed in both Canadian and

global stories of science and technology. The new [Canada Science and Technology Museum](#) opened in Ottawa last November during Canada 150.

A few of the women behind Canada's global leadership in AI

Joëlle Pineau, Facebook AI Lab

Currently: Director, Facebook Artificial Intelligence Research (FAIR) lab, McGill University; Associate Professor and William Dawson Scholar, McGill University where she co-directs the Reasoning and Learning Lab

Expertise:

As co-director of McGill's Reasoning and Learning Lab, Dr. Pineau focuses on developing new models and algorithms designed to shape the behaviour of robots and machines to better respond to human needs. For example, she was actively involved in the Nursebot project, which developed a nursing-assistant robot prototype that provided help and companionship to elderly individuals, and SmartWheeler, a robotic wheelchair that can be operated by people with severe mobility impairments.



Photo: Laurie Devine, McGill University

"Much the same way that it takes a village to raise a child, you need an entire community of supporters to champion the growing role of women in STEM and inspire the girls who will follow in their footsteps. I've been fortunate throughout my journey to have people who've been there to shine a light on what was possible, and I'm encouraged by initiatives like Choose Science that will motivate more women and girls to pursue education and careers in STEM." (Choose Science is an online campaign that encourages women in science to share their stories with new generations of young women)

Gender diversity takes centre stage in federal budget

The Liberal government is focusing on structural changes to increase the number of women in STEM and high tech.

By Mark Henderson

The Canadian government's 2018 budget may go down in history as the first national feminist economic blueprint. [Equality Growth: A Strong Middle Class](#) introduces a bold series of initiatives to boost the participation of women and under-represented groups in science, business and society at large.

From research funding to business support systems, the budget lays out a roadmap for how the government will institutionalize much of its diversity and inclusion agenda. This includes measures to encourage, or in some cases mandate, research organizations and companies to increase the participation by and support of women.

And the government will be monitoring whether these actions lead to results. The budget includes new funding to track gender, diversity and inclusion — data that can be used to keep government, industry and academia's collective feet to the fire.

“One of the first projects this would support is an analysis of the unique challenges

visible minority and newcomer women face in finding employment in science, technology engineering and mathematics occupations,” states the budget, released February 27. “This research will fill important gaps in knowledge as to how to achieve greater diversity and inclusion among the high-paying jobs of tomorrow.”

Government officials have cited the stubbornly low participation of women in science, technology, engineering and mathematics (STEM) disciplines as one of the main reasons for its feminist budget. Women represent just one-third of those studying engineering, math and computer science and on average they earn \$9,000 less than their male counterparts.

The budget's signature initiative for the research community is an historic increase in funding to the three granting councils — \$925 million over five years to be shared by the Natural Sciences and Engineering Research Council (NSERC), Social Sciences and Humanities Research Council (SSHRC) and Canadian Institutes

“One of the first projects this would support is an analysis of the unique challenges visible minority and newcomer women face in finding employment in science, technology engineering and mathematics occupations”

Federal Budget 2018



of Health Research (CIHR). An additional \$275 million is earmarked for “research that is international, interdisciplinary, fast-breaking and higher-risk”.

“With this investment, the granting councils will be tasked with developing new plans, strategies and targets to ensure greater collaboration between NSERC, CIHR and SSHRC and support for interdisciplinary research, as well as plans to achieve greater diversity among research funding recipients, including improved support for women, underrepresented groups and early-career researchers,” states the budget.

Supporting early career researchers

Significant new funding — \$20 million over five years — for the Canada Research Chairs (CRC) program is tied to improving the outcomes for early-career researchers and increasing the number of women nominated to hold new chairs. The granting councils are expected to take steps to ensure early-career researcher awards go to scientists “whose diversity better represents Canada’s population”.

Even new funding for the National Research Council is tied to requirements to include more women, youth, Indigenous Peoples, persons with disabilities and visible minorities among its research staff and entrepreneurs supported through various programs.

The budget cites a [McKinsey Global Institute](#) study which estimates that “by taking steps to advance greater equality for women — such as employing more women in technology and boosting women’s participation

in the workforce — Canada could add \$150 billion to its economy by 2026.”

Supporting women entrepreneurs

In addition to academic research, the government also promises to incorporate greater diversity in its business innovation programs. In December, the government announced that its new [Venture Capital Catalyst Initiative](#) will require applicants “to demonstrate how they will improve gender representation among venture capital fund managers and portfolio companies”.

Additional measures in the February budget include:

- \$105 million over five years to Canada’s regional development agencies to support a Women’s Entrepreneurship Strategy
- \$1.4 billion over three years for women entrepreneurs through the Business Development Bank of Canada. This commitment is in addition to an increase in BDC’s [Women in Tech](#) fund to \$200 million from \$70 million
- \$10 million over five years to connect women with expanded export services and opportunities through the [Business Women in International Trade](#) program
- Plans to introduce measures to increase the number of women who participate in federal procurement from 10% to at least 15%

A few of the women behind Canada's global leadership in AI

Inmar Givoni, Uber ATG

Currently: Autonomy Engineering Manager at Uber ATG

Expertise: Dr. Givoni's fascination with brain functioning during a high school course sparked her ambition to become a neuroscientist. But it was a course in machine learning while at Hebrew University in Israel that persuaded her to change directions – from studying the brain to building machines that are as intelligent as humans. That new passion led her to the University of Toronto, one of the global leaders in AI research. After earning her Ph.D. in 2011, Dr. Givoni decided to work in industry, rather than academia, “because I feel what I do has a more meaningful impact to people and society,” she said in a June 2016 [interview](#). She continues to be passionate about the recruitment, retention and promotion of women in computer science and engineering,



Inmar Givoni

and has been involved in several initiatives, including developing and delivering machine learning workshops for high school girls.

“There's no point in trying to get more women into AI specifically. I think the effort should be towards getting women into STEM. From my perspective, it basically starts as soon as the baby's born. When a girl is given a shirt that reads 'I'm a princess' and the boy gets one that reads 'I'm a hero' it already sets a mindset of expectations for [the child] from society.” (Source: [The Review](#), DMZ Ryerson, Nov. 24, 2017)

Springboard Atlantic to play catalytic role in region's new growth strategy

INNOVATOR SPOTLIGHT

[Springboard Atlantic](#) is poised to play a catalytic role in advancing the new [Atlantic Growth Strategy](#) and helping to drive the region's economy forward, says the regional organization's new CEO.

"If you look at the goals of the Atlantic Growth Strategy, they align directly with our own mandate and our members efforts to provide research and capabilities to solve significant problems, and help build great companies," says Daryl Genge, who took over the helm of the regional network in late 2017 after a career in government, academia and industry. "Springboard is kind of a bridge. We can bring our members together to focus on opportunities that benefit the whole region and not just individual institutions."

Springboard is a network of academic institutions designed to accelerate innovation and commercialization in Atlantic Canada.

It works with industry and government to pool the region's expertise, knowledge and investment to better position Atlantic Canada to compete at a national and global level.

Genge also sees a role for Springboard in attracting inward investment to Atlantic Canada. He notes that most companies looking to expand into new jurisdictions are interested in more than just incentives—they're interested in regions that can help them innovate.

"Companies are looking for places that can provide highly qualified people who can work with them to really expand their market presence," says Genge. "They're also looking to work with partners who can help them continuously innovate—partners who are nimble and can offer world-class research and facilities, so they can bring new products to market faster. The Springboard network is



well positioned to work alongside government agencies to really position ourselves as an attractive place for this kind of investment.”

Looking ahead, Genge says Atlantic Canada is well poised to take advantage on several fronts.

“We’re scoring some exciting wins in Atlantic Canada—most recently the ocean technology supercluster funding. The number of new tech companies starting up and scaling up is growing significantly. We don’t have to look too far in other areas like medicine, or in some of our more traditional industry sectors such as agriculture, to see the impact that our researchers are having.

“We’re seeing growth in partnerships among universities, colleges and industry focused on solving real world problems and making us more competitive,” he adds. “And, we’re seeing a significant increase in investment—particularly private-sector investment which just goes to recognize the great talent and opportunities we have in this region.”

A few of the women behind Canada's global leadership in AI

Foteini Agrafioti, Chief Science Officer, Royal Bank of Canada; Head of Borealis AI

Currently: Chief Science Officer RBC and Head of Borealis AI, an RBC Institute for Research

Expertise: Dr. Agrafioti is among the dozens of young students who have come to Canada to pursue their dreams of a career in computer science and engineering AI. In 2006, she left her native Greece to pursue a Masters and then a Ph.D. at the University of Toronto's Biosecurity Lab. In 2012, just one year after graduating, U of T named her "Inventor of the Year" for her HeartID technology, which uses an electrocardiogram to reliably verify a person's identity. She founded a new Toronto company, Nymi, to commercialize the technology. In 2016, she joined RBC as head of Borealis AI, an RBC Institute for Research – Canada's first industrial



Photo: Borealis AI

R&D lab for fundamental and applied research in machine learning. In 2017, she was named as one of Canada's "Top 40 under 40".

"I wasn't really into engineering at first. I thought it was a male-dominated field and my perception at that time was that engineers just operated machinery and heavy equipment all day. However, I listened to my parents, pursued my degree in electrical engineering, and ended up loving it. Engineering is a platform for so many things and it lives at the intersection of many disciplines. I've done projects in healthcare, fashion, arts, education and even psychology. The possibilities are endless." (Source: Canada Learning Code, [STEM Profile Series](#), June 2015)

Ingenium's Women in STEM Initiative



Ingenium champions the engagement, advancement, and furtherance of women in STEM, such as those in the ground-breaking Homeward Bound initiative set against the backdrop of Antarctica. *Photo credit: Shelley Ball*

Women have always made important contributions to science, technology, engineering, and mathematics (STEM). Yet gender inequity often persists, especially at the highest levels of academia and industry.

[The Women in STEM initiative of Ingenium – Canada's Museums of Science and Innovation](#) is a multi-pronged approach designed to address the underrepresentation of women in STEM and to contribute to efforts to achieve gender equity in these four fields. Ingenium proposes celebrating achievements and advocates inspiring

young Canadians. Ingenium and its STEM Initiative partners also seek to shed light on persistent, and often implicit, gender biases. Supported by an Advisory Council and with partners the [Canadian Museum of Nature](#), [The Franklin Institute](#), the [Canadian Association of Science Centres](#), and [L'Oréal Canada](#), Ingenium is combining public outreach methods and tools – including a national travelling display, documentaries, a multi-faceted digital presence, and programming – to support the engagement and advancement of women in STEM.

Games bring science to life

[Ingenium – Canada’s Museums of Science and Innovation](#) is very active in the digital world, with several mobile games that bring science and artifacts to life. [Three games of the Canada Aviation and Space Museum](#) take players to the skies during the First World War. In a [fourth](#), human space explorers establish the first permanent settlement on Mars.

The [Canada Agriculture and Food Museum’s game Bee Odyssey](#) invites players to learn about the important role that bees play in nature as the bee navigates nature’s obstacles, and evades predators and pesticides.

The [Canada Science and Technology Museum’s Artebots](#) engages users with artifacts in fun, exciting ways. Users collect, test, explore, and create whatever they can imagine using artifacts from the museum’s extensive collection.

All these mobile games are available for free download from the Museums’ websites, the App Store, and Google Play.



Ace Academy: Skies of Fury is one of Ingenium’s free mobile games that bring science and artifacts to life

Carleton and India back women tech entrepreneurs

Carleton University and the All India Council for Technical Education (AICTE), India's national regulator for colleges and institutes, have teamed up to support women tech entrepreneurs.

The [Canada-India Acceleration Program \(CIAP\)](#) will help Canadian women scale-up their companies in untapped markets in cities across India. Support will come in the form of mentorships from global entrepreneurs, access to some 200 incubators, links to corporations, potential seed funding and internship opportunities. A similar program will send women entrepreneurs from India to Canada.

CIAP will tap the expertise of existing Carleton programs, including the [Lead to Win](#) incubator, [Canada-India Centre for Excellence \(CICE\)](#) and the [Centre for Research and Education on Women and Work](#). The five-year program partners with AICTE's network of 10,500 colleges in India. The first Canadian entrepreneurs will be selected this spring through a national competition and are expected to arrive in India by

the end of the year. NRI Startup India is contributing \$1 million towards the initiative

In all, 50 Canadian and 50 Indian startups will be supported over the next five years. Carleton intends to replicate the model with international partners in Africa and Brazil.



The CIAP program was announced in February in Mumbai by Navdeep Bains (fourth from right), minister of Innovation, Science and Economic Development, during the Canadian government's trip to India.

“CIAP will prepare Canadian women entrepreneurs to develop skill sets and expand their businesses into the vast Indian market. At the same time, we will invite Indian women entrepreneurs to enter the Canadian market with their unique businesses,” said Pradeep Merchant, chair of CICE's Governing Council.

Supporting women in STEM in developing countries

Canada's International Development Research Centre (IDRC) has partnered with UNESCO's Organization for Women in Science for the Developing World (OWSD) to broaden support for early career women scientists in developing countries.

Jointly funded by IDRC and the Swedish International Development Cooperation



Chilufya Mwewa, PhD Student, Department of Physics, University of Cape Town, South Africa. *Photo: IDRC*

Agency, the \$15-million [fellowship program](#) will support 140 doctoral and 60 early career women scientists in STEM in low and middle-income countries. Scientists will receive support and training to set up labs and to head research teams, and to transform their research into marketable projects. The first call for applications will be published in March 2018 and the first cohort of 20 fellows will be announced by October 2018.

In related news, IDRC is offering a \$1.5-million grant to the Centro de Investigaciones y Estudios Superiores en Antropología Social (CIESAS) to fund up to 20 postdoctoral fellowships for Indigenous Mexican women pursuing studies in STEM.

While there have been demonstrated improvements in Indigenous peoples' participation in higher education in Mexico in recent years, women in particular continue to face challenges in becoming STEM leaders. There are also few opportunities for them to apply their skills and experience to mentor younger Indigenous women and to benefit Indigenous communities.

The fellowships are intended to aid Indigenous women researchers and

students in launching their scientific careers and using their knowledge and skills in STEM disciplines to benefit local communities through innovation and training.

De Beers Canada funds new scholarships for women

De Beers Canada has [launched](#) the first four scholarships in a \$639,000 four-year initiative to support female students entering STEM programs in Canadian universities.

The first four, one-year scholarships will go to the University of Waterloo, which will receive a total of 16 through to 2020.

De Beers Canada chief executive officer Kim Truter said the launch of this scholarship program – part of the company’s three-year partnership with United Nations Women – is a significant step in enhancing female participation in the mining and technical industries.

“Females are under-represented in many technical industries, including mining, so we must do more to create opportunities at all stages of education and employment to remove barriers and be more inclusive,” said Truter.

Preferential consideration will be offered to Indigenous students from areas in the Northwest Territories and northern Ontario where De Beers Canada has mining operations.

Quebec to host “world first” UNESCO anti-radicalization chair

Three Quebec universities are launching a [new research chair](#) that will act as a centre of excellence for research on radicalization and violent extremism.

The UNESCO chair will be led by a team of researchers from Concordia University, Université de Sherbrooke and Université du Québec à Montréal. The research centre will be led by scientific director Dr. Sami Aoun from Sherbrooke, and include three chairs, all recognized experts in the field: Dr. David Morin (Sherbrooke), Dr. Ghayda Hassan (UQAM), and Dr. Vivek Venkatesh (Concordia).

“The scope of the projects conducted by the Chair will extend beyond Quebec and Canada to the rest of the world, as the Chair relies on an international network of recognized partners from all sectors of society who are involved in the prevention of radicalization leading to violence,” says Aoun. “We already have close partnerships in North America, Europe, Africa, the Middle East and Latin America, and others to come.”

UNESCO currently supports 700 institutions in 116 countries to encourage inter-university cooperation around the world.



One of Canada's leading stem cell researchers Dr. Janet Rossant was one of five women internationally to receive the prestigious L'Oréal-UNESCO women in science award in March in Paris. A senior scientist at Toronto's Hospital for Sick Children, Rossant is being recognized for her contribution to the understanding of how tissues and organs are formed in the developing embryo - research that will help to combat birth defects and other serious medical conditions. "I hope to use this opportunity to encourage more girls globally to take up careers in science, math, engineering and medicine. The future is theirs to grasp," said Rossant.



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