

**NRC-CNRC**

**EXCELLENCE IN RESEARCH AND INNOVATION**



Annual Report 2018-2019



National Research  
Council Canada

Conseil national de  
recherches Canada

Canada



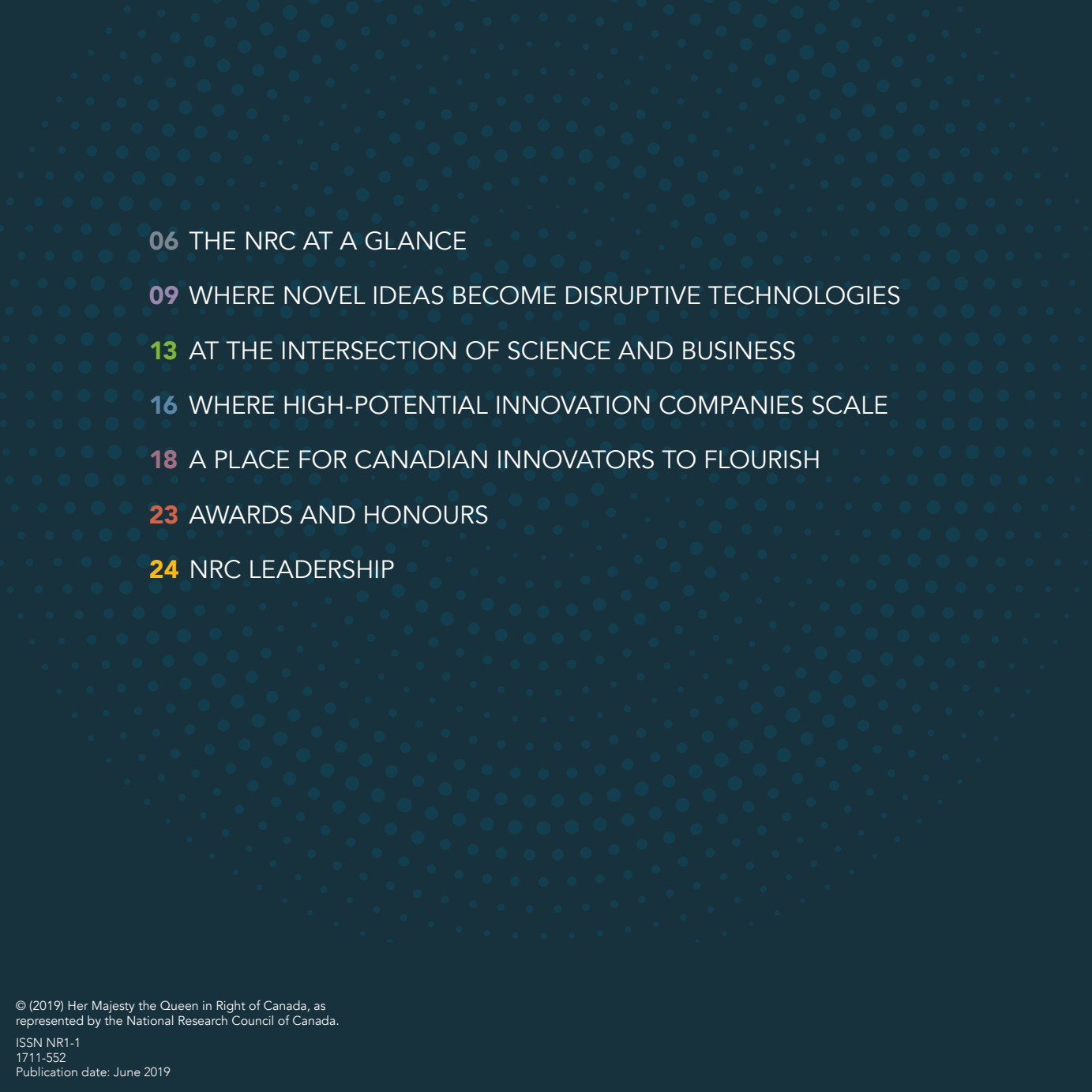
Opened in 1932, the NRC's 100 Sussex Drive location in Ottawa features a decorative main lobby. The ceiling has a circular pattern bordered with a Grecian key design, which outlines a night sky with many stars.





The 100 Sussex Drive location also includes a library with a two-storey reading room that once featured a naturally illuminated panel.





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## MESSAGE FROM THE PRESIDENT



Two years ago, the NRC embarked on an extensive internal NRC Dialogue initiative to generate new ideas to renew our organization in support of the federal Innovation and Skills Plan. In Budget 2018, the Government of Canada endorsed these ideas and provided new funding to the NRC.

A significant focus in 2018-2019 was on the implementation of Budget 2018 initiatives, including more exploratory research through an Ideation Fund to incent grassroots partnerships between our researchers and universities and industry. We have substantially expanded assistance to scale up SMEs through the National Research Council Industrial Research Assistance Program (NRC IRAP) and reduced labour fees the NRC charged to SMEs for our services. We are supporting strategic initiatives such as Canada's five Innovation Superclusters, and we are organizing teams of NRC and external researchers to address challenge missions identified by our Ministers.

In addition to Budget 2018 initiatives, NRC Dialogue has also resulted in a range of internal initiatives that are currently underway. For instance, we are enhancing our focus on research excellence through establishing a whole-of-NRC President's Research Excellence Advisory Committee – having created a President's Science Advisor position, held by Dr. Greg Smallwood, and appointed a Departmental Science Advisor, Dr. Dan Wayner. We are also working to increase our workforce diversity and renewal of our staff. This has involved diversity training regarding hiring and promotion of our employees, and initiatives to increase the number of students and post-doctoral fellows.

We are renewing our facilities, ranging from the completion of new research facilities for automotive research in London, Ontario and aircraft cabin interiors in Ottawa, advancing construction of new NRC buildings in Mississauga and Winnipeg, actively participating in the development of four of the five planned new federal Science and Technology shared campuses, and investing in new equipment and tools, such as computing infrastructure for artificial intelligence and quantum theory. We have also increased

our connections with leading research partners. In Canada, this has involved establishing collaboration centres with universities, and increasing international collaboration opportunities with the United Kingdom, Germany, and Japan.

Each of these renewal initiatives have been undertaken in addition to the normal day-to-day work of our employees. With the future in mind, the NRC is finalizing a five-year strategic plan. While NRC Dialogue focused on new tools for improving how we work, the five-year strategic plan is about the substance of what we should be focusing on as an organization.

It takes the hands of many people to achieve so much in a year. This includes the arrival of a new senior executive, Dr. Carolyn Watters, and changes in our NRC Council, including incoming members Aled Edwards, Neil Bose and Mohamed Lachemi. We also welcomed Carolyn Cross as a returning member, and a new incoming Chair of the NRC Council, Dr. Doug Muzyka.

I am very grateful to all NRC employees for the work we have achieved over the past 12 months, and look forward to the contribution we will make for Canadians in the coming year.

Iain Stewart, President





## THE NRC AT A GLANCE



2018-2019

### OUR VISION

A better Canada and world through excellence in research and innovation.

### OUR MISSION

To have an impact by advancing knowledge, applying leading-edge technologies and working with other innovators to find creative, relevant and sustainable solutions to Canada's current and future economic, social and environmental challenges.

### OUR VALUES

**Integrity** · Behaving at all times ethically, honestly and objectively; being impartial and transparent with our colleagues, collaborators, stakeholders, clients and the people of Canada; and exercising sound stewardship of our resources.

**Excellence** · Pursuing excellence in all that we do — in our research and innovation, in our collaborations, in the execution of our programs, in our support to firms and in our delivery of our common corporate services.

**Respect** · Valuing and respecting the knowledge, expertise and diversity of our colleagues, our workplace, our collaborators, our stakeholders and our clients to have an impact on Canada and the world.

**Creativity** · Harnessing our imagination, passion for excellence, scientific exploration, technology and innovation to generate new knowledge, new technologies, new business processes and new collaborations for a better NRC and a better world.

### GOVERNMENT'S INNOVATION AND SKILLS PLAN

**People focused to**  
*capitalize on our diversity*

**Partnership driven to**  
*collectively take action*

**Whole of government**  
*to maximize results*

### PEOPLE AND SKILLS

Global skills strategy  
CanCode/digital skills  
Work-integrated learning

### PROGRAM SIMPLIFICATION

Innovation.Canada.ca  
Clean growth hub  
Strategic innovation fund  
Economic strategy tables

### RESEARCH, TECHNOLOGY, COMMERCIALIZATION

Innovation  
Superclusters  
Intellectual property strategy

### INVESTMENT AND SCALE

Innovation solutions Canada  
VC catalyst initiative  
Clean technology  
Regional growth strategies



## SCIENTIFIC ACHIEVEMENTS

1,030

PEER REVIEWED PUBLICATIONS\*  
(48 publications per 100 scientists/  
engineers/technicians)

1.51

CITATION SCORE\*\*  
relative to world average



80.6% CO-AUTHORSHIP RATE\*  
with external partners

## PATENTS

Filed 207

Active 1,669

\* Calendar year 2018

\*\* 3-year average (2016-2018 calendar years)



## PEOPLE

3,950

TOTAL NRC FULL-TIME EQUIVALENT  
2,151 Scientists, engineers and technicians  
255 IRAP ITAs

426

STUDENTS, POSTDOCTORAL FELLOWSHIPS  
AND RESEARCH ASSOCIATES

89

NATIONALITIES  
in our workforce



25.3% STEM WORKFORCE (WOMEN)  
(relative to Canadian market availability: 24.8%)



83% DIVERSITY AND INCLUSION  
department treats employees with  
respect (public service 81%: +2)



## CLIENTS

1,000

R&D  
clients

1,585

R&D PROJECTS  
for clients



90% NRC ENABLES RESULTS  
jobs, sales, R&D (client feedback:  
28% response rate)



## INDUSTRIAL RESEARCH ASSISTANCE PROGRAM (IRAP)

27%

REVENUE GROWTH  
of client firms

18%

EMPLOYEE GROWTH  
of client firms

8,159

TOTAL IRAP REACH  
4,618 advisory services only  
3,541 firms funded



FINANCIALS  
(unaudited results)

\$193.4M  
TOTAL REVENUES

\$1,145.2M  
TOTAL EXPENDITURES

\$389.2M  
G&C EXPENDITURES





## WHERE NOVEL IDEAS BECOME DISRUPTIVE TECHNOLOGIES



Commitment to research and innovation excellence underpins everything the NRC does. It's the fundamental value that drives exploration, leads to disruptive discoveries, and governs how the NRC functions as a collaborative science and innovation platform.

Excellence in research and innovation begins with the opportunity to explore new lines of enquiry and push the boundaries of knowledge. Practically for the NRC, that requires investing in fundamental research, continually building and maintaining a rich bank of intellectual property, and providing the capabilities and infrastructure to be a partner of choice for innovative Canadian firms and international collaborators.

To support the above, during 2018-2019, the NRC established an Ideation Fund to incent researchers to pursue new, high-risk innovations. As a result of the funding received in Budget 2018, and with an envelope of \$6 million a year, the Ideation Fund will give NRC researchers and scientists the opportunity to pursue self-directed research in collaboration with external partners. The fund will also inform the next-generation of collaborative R&D required for transformative scientific and technological breakthroughs important to the economy and society of tomorrow.

The fund has two different-sized streams. Through the first stream, New Beginnings, 52 projects received funding last year, for a total of \$1 million a year in grants. The second stream, Small Teams, kicked off in February 2019, and will provide \$2 million a year in grants for up to three years to NRC teams and external researchers. The aim of the Ideation Fund is to enable a broader range of discoveries and potentially inform future large-scale, collaborative R&D programs.

## Facilitating collaboration, generating peer-reviewed publications and intellectual property

The collaboration at the heart of Ideation Fund projects is a regular feature of the NRC's work — whether between NRC researchers and external peers in Canada and abroad or between NRC teams and researchers in other government departments on issues of broader public policy importance.

Not every collaboration entails joint research. In 2018-2019, for example, NRC IRAP personnel lent their expertise to Innovation, Science and Economic Development Canada (ISED) to evaluate proposals to the Innovative Solutions Canada program, which aims to scale up Canadian firms by having the federal government as their first customer. NRC IRAP's experience with project assessment and broad knowledge of industry demand helped to ensure the government's choices represented the best bets for Canadians and the country's economy.

The NRC's daily pursuit of research and innovation excellence also aims to generate and maintain a steady stream of made-in-Canada intellectual property (IP). In 2018-2019, NRC research labs published 1,030 papers in respected peer-reviewed journals, filed 207 patents for novel, commercially relevant innovations. By the end of the year, the NRC's patent portfolio exceeded more than 1,669 holdings.

## Designing more effective medicines for the brain

For medications to treat Alzheimer's disease, amyotrophic lateral sclerosis (ALS), dementia, epilepsy, neural infections, Zika virus and other brain diseases, they first have to get through the blood-brain barrier, which filters unwanted pathogens and toxins but also some 95 percent of medicines and treatments. An NRC research team last year announced a breakthrough that uses stem cells to develop more effective medical and pharmaceutical applications and gives researchers a

way to identify the best treatment candidates earlier. It's a faster, simpler, more affordable approach than conventional methods, presenting new possibilities for improving people's lives.

### **A more precise Periodic Table of Elements**

NRC metrologists contributed to an update of 14 elements in the international Periodic Table of Elements in 2018-2019 based on state-of-the-art multi-collector inductively coupled plasma mass spectrometry of iridium. This first accurate measurement of iridium's isotopic composition will give chemists and physicists more precise information to work with as they investigate a vast range of questions about our world and the wider universe — including the mass extinction of the dinosaurs.

## **CHAMPIONING EXCELLENCE ON THE INSIDE**

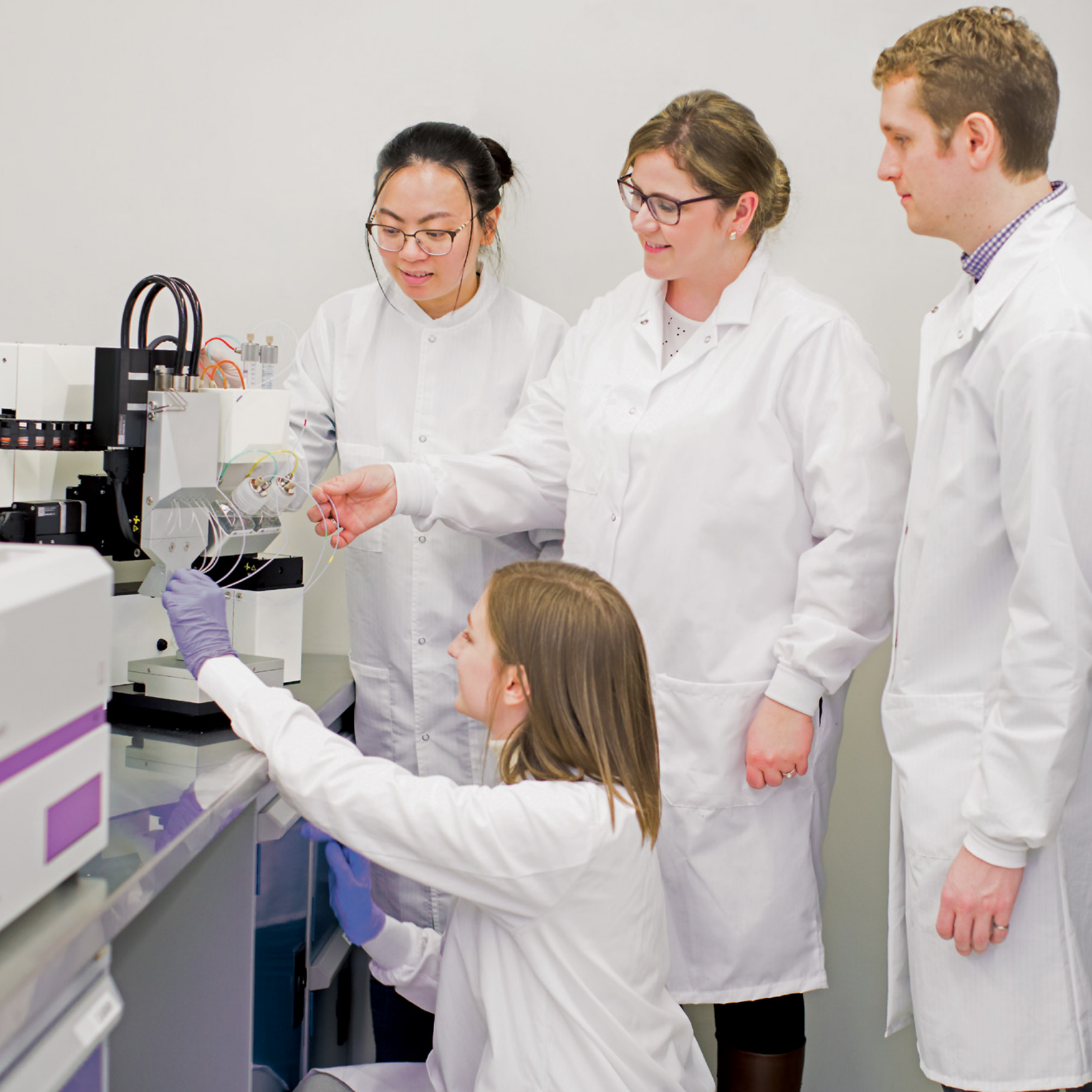
To reinforce research and innovation excellence as an operational value, in 2018-2019 the NRC also appointed a President's Science Advisor, Dr. Greg Smallwood, and established a Research Excellence Advisory Committee — creating the infrastructure and policy context to embed research and innovation excellence in all NRC decision-making.



### **Launch of a one-of-a-kind facility to redefine air travel**

The NRC's Aerospace Research Centre has a long history of conducting research, performing technical services and developing technology solutions to support the aerospace industry. With specialized infrastructure such as wind tunnels, engine testing cells, destructive and non-destructive testing labs as well as a research aircraft fleet, the NRC provides platforms to test, de-risk, validate and demonstrate new technologies. In 2018-2019, the Research Centre completed 174 strategic research and technical services projects with 120 industrial partners and generated \$37.8 million in revenues. It also opened the doors on a ground-breaking Centre for Air Travel Research to help ensure Canada remains an industry leader. Among the Centre's unique facilities are five laboratories for simulating the passenger experience and a Flexible Cabin Laboratory, which will benefit large aircraft manufacturers and air carriers concerned about the comfort and safety of passengers.









## AT THE INTERSECTION OF SCIENCE AND BUSINESS



The NRC is uniquely positioned to engage with the ecosystems of research and innovation, bringing together the best minds from across the country to deliver solutions and discoveries that matter to Canadians.

The hard questions and complex problems that drive research and innovation often are solved by the mix of skills, research disciplines and perspectives that arise from research collaboration. Last year, the NRC helped create the conditions for Canadian scientists and researchers to take on some of the biggest challenges facing the world through a set of multi-disciplinary, seven-year, collaborative Challenge Programs involving NRC researchers, university partners and businesses.

The Challenge Programs address challenge missions identified by the federal government. The first four focus on developing new materials for clean, sustainable energy; creating new technologies to support safe, accessible and affordable engineered cell and gene therapies; delivering affordable, secure, high-speed broadband to rural and remote communities; and using artificial intelligence (AI) to assist with the design of molecules, photonics and genomics.

In each case, mixed teams of NRC and external domestic and international collaborators from industry, academia and other research institutions will work together on shared projects related to their challenge area. In 2019-2020, the NRC will start consultations to define the next wave of Challenge Programs in response to government-identified priority areas, set to launch in 2022, to address the needs of Canada's North, the country's aging population and our society's move into the Internet of Things.

## New ways for researchers to work together

Picking up on a proposal from the NRC Dialogue initiative on how to address barriers to collaboration, efforts got underway last year to establish 10 collaboration centres across the country — hubs where the NRC and universities can create a shared team of researchers and students to generate intellectual property, and develop the talents of graduate students and post-doctoral fellows. The first of these, the Centre for Research and Applications in Fluidic Technologies, launched during 2018-2019.

Also in 2018-2019, the NRC lent its expertise to the federal Innovation Superclusters initiative, helping the five chosen superclusters organize, identify and engage SME participants and address their approaches to key issues such as the handling of intellectual property. Now that the five are up and running (Digital Technology, Protein Industries, Advanced Manufacturing, SCALE.AI and Ocean), the NRC will provide access to its research facilities, personnel and NRC IRAP project assessment services as needed. To sustain the impact of Superclusters over seven years, the NRC is developing R&D programs that align with the superclusters' focus areas and has earmarked grants and contributions to fuel collaboration with universities and SMEs on supercluster-related R&D projects.



## COLLABORATION FOR THE BENEFIT OF CLINICIANS AND PATIENTS

The NRC and University of Toronto formally unveiled plans for a Centre for Research and Applications in Fluidic Technologies (CRAFT) in November 2018. Located on campus in downtown Toronto and at the NRC facility in Boucherville, CRAFT will provide facilities where researchers and students will work on applications for microfluidics, including rapid in vitro disease diagnostics, organ-on-a-chip engineering to test how organs respond to medicines using simulations on small devices, and bioprinting — the printing of biological tissues for personalized regenerative medicine. CRAFT will involve more than 200 people, 45 labs and 25 technology companies.



## International collaboration leads to article in esteemed Science magazine

More than 200 scientists from 20 countries — including a team of researchers from the NRC — culminated over 13 years of collaborative research with the publication of two articles in the world-leading journal, *Science*, last August. NRC researchers Raju Datla, Daoquan Xiang, Janet Condie and Yifang Tan contributed to the sequencing of the wheat genome and the mapping of certain traits key to crop health such as grain size and quantity. Given wheat's importance as a global food source, understanding its genome has an impact for billions of people — and has been elusive up to now due to the number of subgenomes involved.

## Recognized as an innovation leader and essential collaborator

The NRC's Canadian Photonics Fabrication Centre (CPFC) works closely with a broad range of Canadian SMEs and companies to partner on their research and technical needs, working with 15 partners in 2018 and generating \$17 million in external funding. This demanding work requires world-leading research and technical skills, combined with agility and responsiveness to client needs. Reflecting their excellence in meeting these challenges, the CPFC once again received the Supplier of the Year award from MACOM for excellence in service and technical innovation. The CPFC has partnered with MACOM for the last 10 years, consistently showcasing its ability to shepherd low-readiness level technology ideas through to production-worthy level and high-volume manufacturing. Skilled CPFC experts have worked hand-in-hand with MACOM to accelerate time to market of their laser designs. Through statistical analysis techniques and carefully planned experimentation, the CPFC team was able to achieve substantial impact in the development of MACOM's next generation of high speed lasers.





### **NRC researchers help solve 30-year-old mystery of “missing link”**

Physicists have struggled for decades to understand the quantum-photonic behaviour of carbon double-bonded chains, which act as the tiniest “sensors” in biology — such as the visual sensor rhodopsin in the eye that registers light and tells the brain something has been seen. This 30-year-old puzzle was solved last year thanks in part to NRC researchers Dr. Michael Schuurman and Dr. Albert Stolow (NRC and University of Ottawa), who combined state-of-the-art ultrafast laser experiments with quantum dynamics simulations to explain how butadiene converts light into energy, leading to a more unified picture of the quantum dynamics of carbon chains. This will unlock possibilities for research and new applications in artificial vision, plastic electronics and new photovoltaic technologies.

### **For longer-lasting concrete**

Pyrrhotite is an iron sulfide that can lead concrete to break down, causing serious problems for Canadian homeowners who have pyrrhotite in their foundations. The NRC, the Government of Quebec and Université Laval last year kicked off a \$4.9 million project to create a test to determine safe levels for pyrrhotite (if there are any) and to identify the presence of pyrrhotite in quarries across Canada. Results are urgently awaited by some 8,000 homeowners in Quebec with potentially compromised foundations — where more than \$400 million in damages have been incurred over the years.



## WHERE HIGH-POTENTIAL INNOVATION COMPANIES SCALE



Through the National Research Council Industrial Research Assistance Program (NRC IRAP), the NRC actively helps grow and scale Canadian firms, providing targeted, streamlined and sustained support businesses need to commercialize innovations and realize their potential to become global market leaders.

Between 2012-2013 and 2017-2018, NRC IRAP delivered 77,000 advisory services to 35,000 firms, provided funding to over 16,000 SMEs and supported over 58,000 jobs. As a result, reported revenue from SMEs demonstrated, on average, an increase of 21 percent between 2012 and 2016. Last year, NRC IRAP soft-launched an initiative to make an even greater contribution to SME growth, increasing its funding maximum from \$1 million to \$10 million.

With an additional \$100 million in 2018-2019 allocated through Budget 2018, NRC IRAP began to identify high-potential firms whose rapid growth could be furthered. To pinpoint “emerging winners” — firms with critical R&D projects that could transform the scale of their businesses, create next-generation products or reach new markets — NRC IRAP tapped its network of Industrial Technology Advisors (ITAs), drawing on their

knowledge and years of project data. By the end of March 2019, NRC IRAP had made larger-scale investments in 31 SMEs.

NRC IRAP plans to cast an even wider net going forward, supporting SMEs it has not worked with before, including “ecosystem champions” that foster thriving regional SME networks and early stage companies that represent strong strategic bets for the Canadian economy. Its goal is to support 30 projects a year at \$1 million to \$3 million, and five a year between \$3 million to \$10 million, giving potential market leaders an extra boost.

## ACCESSING INNOVATION CAPACITY IN CANADA AND AROUND THE WORLD

**In 2018-2019, the NRC received funding to discount its labour fees for SMEs by 40 percent, significantly lowering the barrier for smaller firms to take advantage of the NRC’s technical and research resources. NRC IRAP also continued to deliver the NRC’s pilot R&D Certificate Program to help more SMEs take advantage of the services offered by the NRC. Over the course of the year, NRC IRAP monitored the performance of the Certificate Program initiative and fine-tuned it to be even more SME-friendly — for example, by allowing projects to run across fiscal year boundaries so they can start and end at any time, when the opportunity is greatest.**

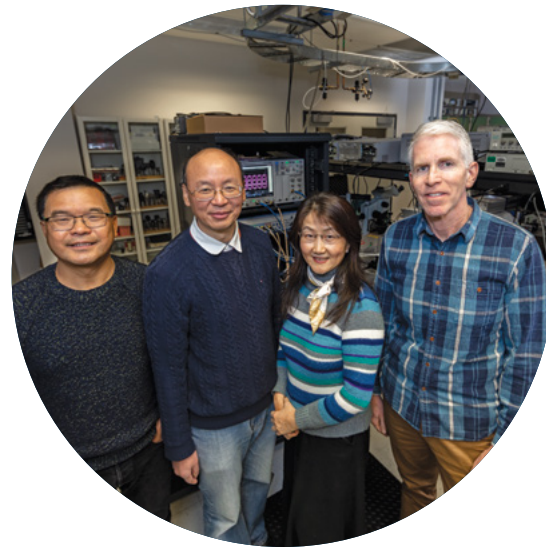
### **The resources to make a bigger difference**

Budget 2018 provided \$150 million per year ongoing to support hard-working Canadian entrepreneurs as they grow and expand their companies, increasing NRC IRAP's overall capacity to support contributions to Canadian companies. This will enable NRC IRAP innovation technology advisors (ITAs) to support more Canadian SMEs with larger projects and sustain NRC IRAP in its role as one of four flagship platforms within the streamlined federal suite of innovation and scale-up programs.

While funding is a key enabler of NRC IRAP's ability to make a difference for Canadian firms, responsiveness and agility are also crucial given the pace of today's market. NRC IRAP invested in technology last year to make it easier for ITAs to connect securely to NRC IRAP's corporate IT resources on the move — speeding up and improving their interactions with SMEs anywhere, any time.

### **Speed, scale and sustainable energy**

Global demand for energy storage will grow significantly with wider adoption of electric vehicles and renewable energy solutions. To meet market demand at scale, manufacturers will need to produce batteries and other storage systems at high speed. Ontario's Hibar Systems Limited is a world leader today in high-speed alkaline battery manufacturing — enabling production at up to 1,000 parts per minute. A large-scale investment of \$2 million from NRC IRAP is supporting the company's efforts to develop high-speed manufacturing technology for lithium-ion cells, key to the clean energy future.



### **When manufacturing operations need a (really) light touch**

New Brunswick's Smart Skin Technologies helps global companies like Coca-Cola, the world's top beer brands and pharmaceutical makers reduce production line bottle breakage and damage with highly precise, real-time pressure monitoring. The company is now using a nearly \$3 million investment from NRC IRAP to enhance its software to handle smaller and lighter containers, extending its applications to even more industries, reducing waste, improving productivity and increasing container reuse.

### **A tradition of collaborative innovation with Japan**

Building international research collaborations with Japan, Germany and the United Kingdom is a priority for the NRC. As part of an effort to deepen its relationship with Japan, in 2018-2019, NRC organized workshops with Japan's National Institute of Advanced Industrial Science and Technology, National Institute of Materials Science and RIKEN to discuss joint research opportunities. The NRC also became a member of the Science and Technology in Society (STS) forum, an organization that gathers research and technology organizations from around the world, as well as Japanese innovation leaders from government, industry and academia.

## A PLACE FOR CANADIAN INNOVATORS TO FLOURISH



People are at the heart of research and innovation excellence. That's why the NRC is firmly committed to developing the people and skills that will carry Canada forward into the next decades of discovery.

With unique research infrastructure and specialized personnel across the country, the NRC is a key training ground for Canada's next generation of researchers and innovators. That capacity-building role expanded in 2018-2019 with the addition of 12 new post-doctoral fellows to the Post-Doctoral Fellowship program, which gives promising scientists the chance to work on projects of critical importance to Canada. In the past two years, 24 post-doctoral fellows have entered the program, chosen from a pool of 614 applicants through a highly competitive process.

The NRC exceeded its student placement target for the year, offering 393 undergraduate and master's level student opportunities. Successful candidates presented posters and gave three-minute thesis presentations during the NRC's summer symposium. Additionally, a special biotechnology program over the 2019 reading week led another cohort through a simulated process of taking a cancer therapeutic from concept to commercialization. The NRC also brought on 21 PhD research associates in 2018-2019.

These efforts helped deepen Canada's scientific capacity and create a direct talent pipeline for the NRC. Going forward, the NRC aims to extend its reach with students in high school to attract even more talented young people into the STEM continuum.

## A representative NRC

Challenged in Budget 2018 to expand diversity to include more women, youth, Indigenous Peoples, persons with disabilities and visible minorities among its researchers, the NRC created a three-year equity and diversity strategy in 2018-2019. That strategy was accompanied by mandatory training in diversity, inclusion and unconscious bias for all NRC employees, training in managing bias for all hiring managers, and diversity objectives for all NRC managers as part of their individual performance management agreements. The NRC also committed to study the unique challenges and obstacles women are facing in the workplace — with the findings from that effort informing the NRC's Recruitment and Retention of Women Strategy.

Modern facilities are essential for a diverse, inclusive innovation workforce to excel. The NRC will develop those facilities as an active partner in the Federal Science and Technology Infrastructure Initiative (FSTII). Newly built or renovated labs will incorporate sustainable features while bringing together federal scientists from different departments for collaborative research. The NRC is the co-lead on two of the five clusters — Terra Canada and Transportation Safety — and is a partner in two others: Regulatory and Security Science, and the Atlantic Science Enterprise Centre.



## SPOTLIGHT ON WOMEN IN STEM

The NRC actively advocated for greater opportunities for women in STEM last year. A committee dedicated to the topic was established to provide leadership in the implementation of the NRC's Recruitment and Retention of Women strategy. As part of the strategy, committee members are currently leading a number of activities, including supporting the NRC's participation in a University of British Columbia study on implicit bias and workplace culture, developing a mentoring approach for women in research and technical positions, and building a professional community of women across educational institutions, professional societies and other organizations.

On 2019's International Day of Girls and Women, Vice-President of Emerging Technologies Geneviève Tanguay took part in a science policy panel with Canada's Chief Science Advisor, Dr. Mona Nemer, and Her Excellency the Right Honourable Julie Payette, Governor General of Canada. As part of the federal Women Entrepreneurship Strategy, NRC IRAP established its own strategy for increasing the representation and success of firms led by underrepresented groups (including women) with an internal Sector Team for Client Inclusiveness developing services to be available in fiscal year 2019–2020.



### **NRC scientist takes the highest honour in illuminating engineering**

The NRC's own Dr. Jennifer Veitch received the Illuminating Engineering Society Medal Award at a Gala Dinner and Awards Presentation in August 2018. The medal is given in recognition of meritorious technical achievement that has conspicuously furthered the profession, art, or knowledge of illuminating engineering. Dr. Veitch, a Principal Research Officer for indoor environment, has developed national and international standards, including a lighting quality model that is now proposed as part of the International Commission on Illumination's International Lighting Vocabulary.



### **From NRC summer student to Nobel Prize-winning scientist**

In 2018, Dr. Donna Strickland received the Nobel Prize in Physics. She shared insights into her research with a lecture at the NRC in January 2019, returning to the place she got her start as a summer student in metrology, and where she later returned as a Post-Doctoral Fellow to work with NRC researcher and University of Ottawa Canada Research Chair in Attosecond Photonics, Dr. Paul Corkum. Today a professor at the University of Waterloo, Dr. Strickland received the Nobel Prize for her work on a chirped-pulse amplification laser that has numerous applications, including corrective laser eye surgery. The 2015 recipient of the Nobel Prize in Physics, Dr. Arthur MacDonald, was also a summer student at the NRC.

### **Photonics pioneer receives the Order of the Slovak Republic**

Dr. Pavel Cheben and his colleagues at the NRC are among the first scientists to work with subwavelength integrated photonics, a new area of research described as a game-changer in meta-material science and integrated optics with implications for the next generation of optical communication, and bio-medical, quantum, and sensing technologies. For his contributions, Dr. Cheben received the Order of the Slovak Republic from President Andrej Kiska in Bratislava, Slovakia, in January 2019. He also holds fellowships in the Institute of Physics, the Optical Society of America, European Optical Society, the Engineering Institute of Canada and Canadian Academy of Engineering, and is a past recipient of the NRC Excellence in Research Award.







## AWARDS AND HONOURS



Several NRC researchers and scientists were recognized throughout the year for the excellence of their work and career-long contributions to their respective fields, including:

### Individual awards and recognitions

**Dr. Pavel Cheben** — Order of the Slovak Republic

**Dr. Paul Corkum** — Isaac Newton Medal and Prize

**Dr. Greg Fahlman** — Executive Award for Outstanding Service, Canadian Astronomical Society

**Dr. Laura Ferrarese** — Vice-President, International Astronomical Union

**Dr. Marek Korkusinski** — Member of the Royal Society of Canada's College of New Scholars

**Dr. Lisa Locke** — Jansky Fellowship, U.S. National Radio Astronomy Observatory

**Dr. Zoubir Lounis** — Ernest E. Howard Award, American Society of Civil Engineers

**Dr. Juris Meija** — 2018 Top 40 Under 40 Power List, Analytical Scientist

**Dr. Nienke van der Marel** — Honourable mention, Christiaan Huygens award, Royal Dutch Academy of Sciences

**Dr. Jennifer Veitch** — Illuminating Engineering Society Medal Award

**Dr. Ibrahim Yimer** — Outstanding Service Award, American Society of Mechanical Engineers

### Collaborative awards

Canadian Composites Manufacturing Research & Development Inc. (NRC-industry collaboration) — Award of Excellence for Innovation and Technology Development, Manitoba Aerospace All-Stars Awards

ADRIQ – Prix du partenariat technologique, TM4 en partenariat avec le Conseil national de recherches Canada et Poudres Métalliques Rio Tinto

### NRC overall awards

MACOM Supplier of the Year award – NRC Canadian Photonics Fabrication Centre

Standards Council of Canada Corporate Commitment Award

Distinguished Achievement Award for Organizations, Arctic Technology Conference

## CELEBRATING 100 YEARS OF CELESTIAL DISCOVERIES

In May 2018, the NRC marked the 100th anniversary of the Dominion Astrophysical Observatory in Victoria, B.C., whose Plaskett Telescope was Canada's first publicly funded major science project. The telescope has contributed to a wide range of international astronomical research over the years into the structure of the Milky Way, binary stars, stellar X-ray sources, stellar-mass black holes, and advanced optical/infrared instrumentation.



## NRC LEADERSHIP



### Council Members

*(composition as of June 1, 2019)*



**Douglas W. Muzyka**

Chair of the NRC Council,  
Former Senior Vice-President and  
Chief Science and Technology Officer,  
E.I. DuPont de Nemours and Company,  
Indian River, Nova Scotia



**Iain Stewart**

President, National  
Research Council Canada,  
Ottawa, Ontario



**Mohamed Lachemi**

President and Vice-Chancellor,  
Ryerson University,  
Toronto, Ontario



**Aled Edwards**

Founder and Chief  
Executive Officer, Structural  
Genomics Consortium,  
Toronto, Ontario



**Carolyn Cross**

Founder, Chairman and  
Chief Executive Officer,  
Ondine Biomedical Inc.,  
Vancouver, British Columbia



**Neil Bose**

Vice-President, Research,  
Memorial University, St. John's,  
Newfoundland and Labrador

## Senior Executive Committee

(composition as of June 1, 2019)



**Iain Stewart**  
President



**Michel Dumoulin**  
Vice-President,  
Engineering



**Dale MacMillan**  
Vice-President,  
Corporate Services and  
Chief Financial Officer



**Geneviève Tanguay**  
Vice-President,  
Emerging Technologies



**Maria Aubrey**  
Vice-President,  
Business and  
Professional Services



**Emily Harrison**  
Vice-President,  
Human Resources



**Roger Scott-Douglas**  
Secretary General



**François Cordeau**  
Vice-President,  
Transportation and  
Manufacturing



**David Lisk**  
Vice-President,  
Industrial Research  
Assistance Program



**Roman Szumski**  
Vice-President,  
Life Sciences



**Dan Wayner**  
Departmental  
Science Advisor

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