



INO

**DELIVERING
INNOVATION**

2019-2020

ANNUAL REPORT

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Our Mission

To deliver innovations that allow businesses across the country to be more productive and competitive.

INO's activities are made possible thanks to the continued collaboration of our partners:



Développement
économique Canada
pour les régions du Québec

Canada Economic
Development
for Quebec Regions

Québec

Message from the Chair of the Board

On solid ground

Over the past few years, INO has developed the structure and tools it needs to effectively focus on innovation—and ultimately maximize its impact by helping businesses be more productive and competitive. In the current pandemic where the only certainty is uncertainty, we now know that INO is more nimble and better equipped than ever to be an agent of change.

MORE NIMBLE THAN EVER

We are already reaping the benefits of the new governance structure we introduced, focused more on core missions such as investing in innovation and attracting and retaining top talent. This has given us the framework and flexibility we need to anticipate and react to change.

« INO is more nimble and better equipped than ever to be an agent of change. »

The directors are proud the organization was so quick to adjust to the pandemic and our staff so focused on best practices so they could continue serving clients in these challenging times.

This same agility has led us to review and revise our strategic plan based on the new priorities we think INO clients might have in light of the situation. The experience of our management team and directors has taught us that we must not only meet these challenges, but also identify and seize opportunities as they arise. This is a chance for us to push ourselves to do even more for clients and demonstrate all the potential that applied research in optics and photonics can unlock.

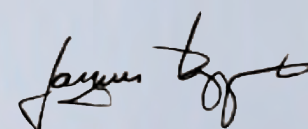
LOOKING AHEAD WITH CONFIDENCE

Thanks to the achievements of the past year, the vision of our clients, the support of our partners, and the unflagging commitment of our teams, we can look to the future with confidence.

In the coming year, the board of directors will continue working to ensure that all the right conditions are in place to secure continued funding for INO's innovation research.

I would like to thank each of INO's directors for their commitment and dedication to helping the organization grow and maximize its impact on businesses in Quebec and across Canada.

On behalf of the board of directors, I am pleased and proud to present INO's 2019–2020 annual report, and am already looking forward to the year to come.



Jacques Topping
FCPA, FCA, MBA, ASC



Message from the President and Chief Executive Officer

Into high gear

INO has just recorded one of the best fiscal years in its history with just over \$19 million in earnings from its industrial clients. In addition to this performance, which attests to the organization's pivotal role in the Quebec and Canadian innovation ecosystem, our experienced teams added 18 patents and 46 invention disclosures as a result of our world-class inhouse research program.

These results are not only a proud achievement, but also proof that our mission is more vital and timely than ever. The past year and all our hard work stand in testimony to our drive to succeed and our ability to leverage all the talent at INO and the full economic potential of its work.

Because that is the promise we have made: to create value for our clients. We develop practical solutions to address operational challenges, improve productivity, and reduce costs for Canadian businesses. Our goal is to make clients more competitive and provide them with a significant and rapid return on their innovation investments while also generating a positive economic impact for society. In this regard, by working with other Canadian industrial research centers like INO, this year we launched an important process to better quantify and calculate these benefits in Quebec and across Canada.

As a member of the worldwide community of research and technology organizations (RTOs), we provide industry with a critical mass of multidisciplinary experts and sectoral specialists with specialized knowledge and an in-depth understanding of the issues in the field. We are a true vector of innovation in the sense of the OECD, i.e., a generator of inventions deployed and brought to market by our clients.



And we're gaining momentum. INO's simplified and methodical new client approach allows us to more efficiently and effectively identify solutions and bring them to maturity. We are currently working to ramp up our contribution to the innovation cycle, from ideation to scaling up solutions for industry. We will continue in this vein through added emphasis on custom industrial solutions reflecting best practices in product design and engineering.

THIS CONTRIBUTION IS MORE CRITICAL THAN EVER

The COVID-19 pandemic and resulting economic crisis have shown how important it is to be able to quickly adapt, innovate, and achieve tangible, meaningful results. Applied research has never been more important, and INO plays a key role in this regard. Our mastery of photonics—a field of science with cross-cutting applications—puts us front and center in the important task of helping businesses and our economy to recover.

In carrying out this mission, INO is fortunate to have the support of its dedicated and hard-working teams. The tenacity and creativity of our employees are evident in everything they do, whether big or small, in good times and bad, no matter what the challenges we face.

Our employees not only make a difference for clients, they make our world a better place through their dedication to important social and environmental causes. We are particularly proud to have reduced our environmental footprint by replacing close to 5,000 neon tubes with LED

lights in our indoor lighting system and by purchasing four Tero devices (developed by a Quebec City startup) for converting table scraps into fertilizer.

"These results show we can be proud of the progress we've made, but also that our mission is more vital and timely than ever!"

I would like to sincerely thank our employees for this year of growth, as well as our clients and partners for their support and trust.

Together, we have all the tools we need to maximize INO's impact and deliver results. We will continue our efforts in the coming year, which promises to bring its share of challenges and opportunities.

The best is yet to come.
I'm sure of it.



Alain Chandonnet, Ph.D.

INO at a Glance

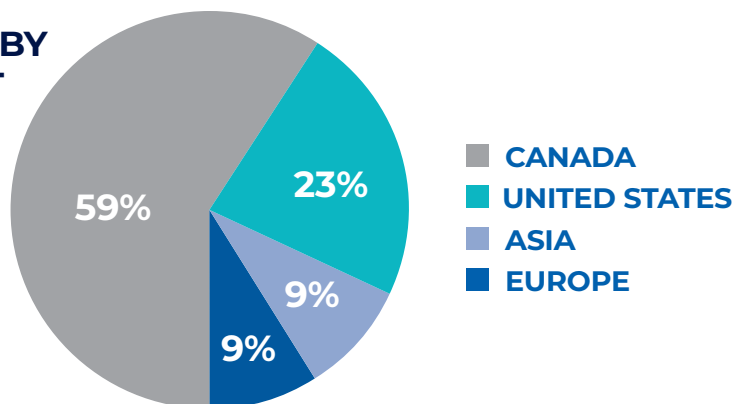
AFTER OPENING IN 1988, INO is now the largest center for industrial optics and photonics expertise in Canada.

18 PATENTS AWARDED TO INO IN 2019-2020

 **215** EMPLOYEES MORE THAN

150  CLIENTS

CLIENT BREAKDOWN BY COUNTRY/CONTINENT



6 BUSINESS UNITS



BIOMEDTECH



**Defense, Security,
and Aerospace**



**CITY, INFRASTRUCTURE,
AND MOBILITY**



**ENERGY, RESOURCES,
AND ENVIRONMENT**



**ADVANCED
MANUFACTURING**



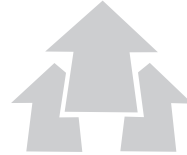
Industrialized Solutions

74

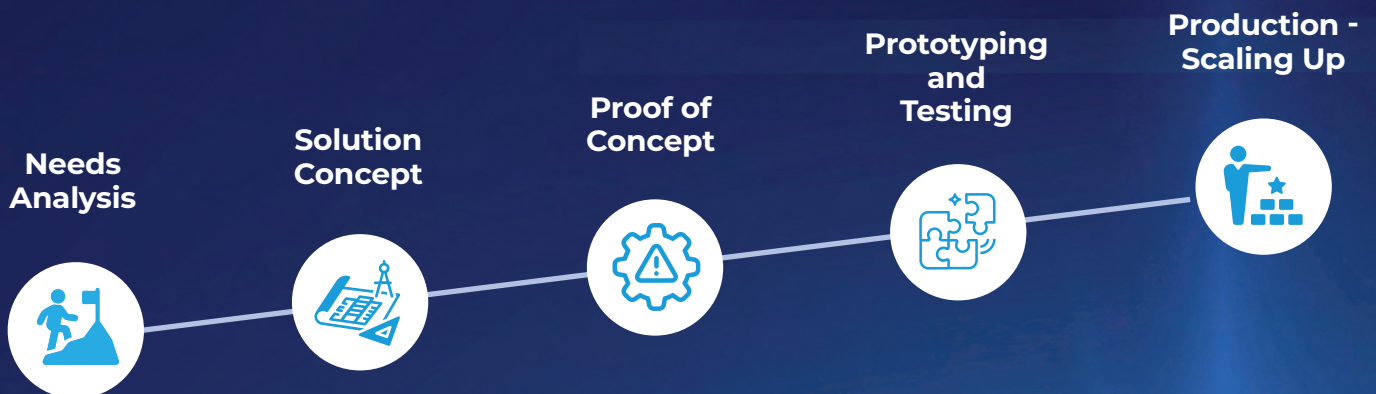


**TECHNOLOGY
TRANSFERS**

35 SPINOFF COMPANIES

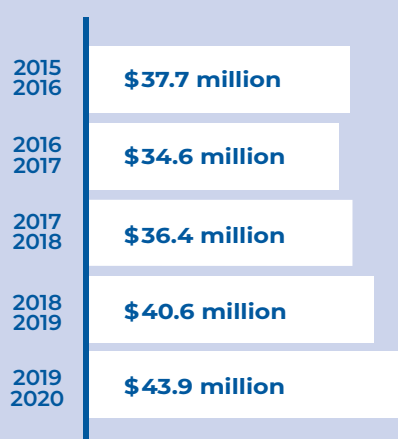


A proven client approach



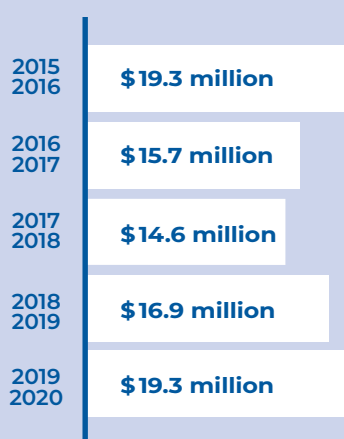
Highlights from 2019-2020

CHANGES IN TOTAL EARNINGS

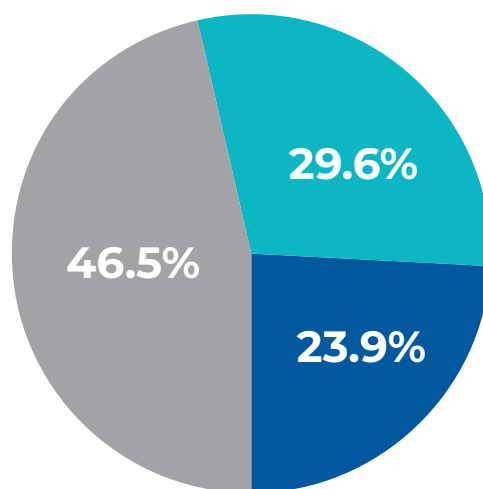


CHANGES IN EXTERNAL REVENUES

(R&D contracts, sales, transfer considerations, royalties, dividends)

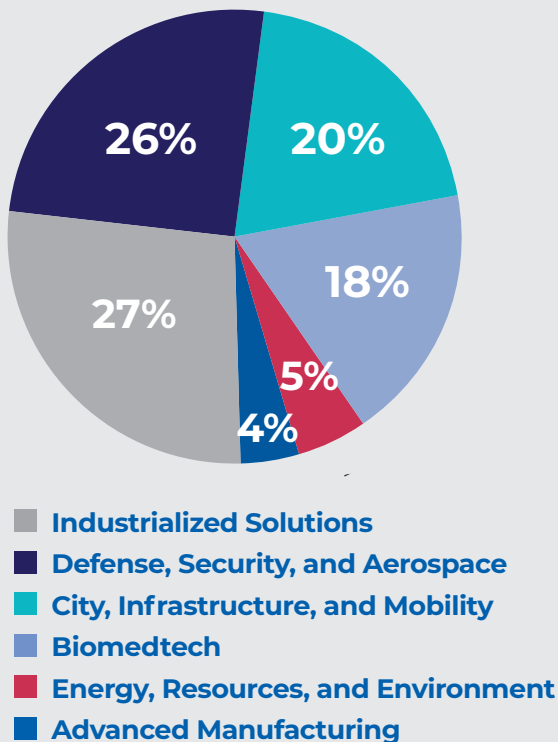


DISTRIBUTION OF OPERATING REVENUES

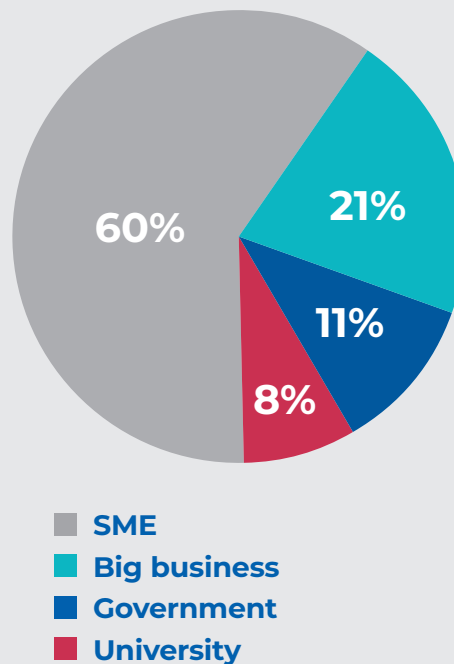


- External Revenues
- Inhouse Research Program - Quebec
- Inhouse Research Program - Canada

DISTRIBUTION OF EXTERNAL REVENUES BY BUSINESS UNIT



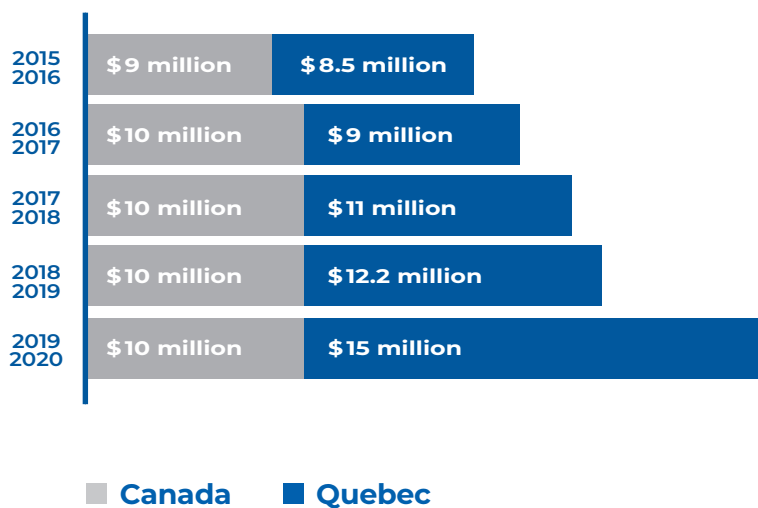
DISTRIBUTION OF REVENUES BY CLIENT CATEGORY



SELF-FINANCING RATIO

5-year average:
48.3%

CHANGES IN GOVERNMENT FUNDING



Review of technological activities 2019–2020

SUPPORTING CLIENT GROWTH

For the second straight year, INO posted one of the best performances in its history. And it was not luck, but rather the result of the work we started more than two years ago to transform our processes and put industrial clients front and center.

The impact for clients was even greater as we also continued to develop our technical expertise and achieved breakthroughs that really accelerated identification of solutions to the industrial problems they face. Here are a few highlights and concrete examples of our activities in 2019–2020 based on the five steps that now guide our clients in their solution development process.



Needs Analysis

Needs analysis provides a clear understanding of the industrial issues at stake and allows us to address the right issues with the right technologies.

Industrial processes using water constitute a vast field with a number of issues that our Energy, Resources, and Environment business unit wanted to examine. To cut costs and comply with environmental standards, the mining industry needs to reduce its use of fresh water as much as possible, for example by treating and reusing its wastewater, and ensuring that its waste is nontoxic.

Pumping water with too high a concentration of suspended particles can damage pumps and lead to huge maintenance costs and delays. In addition, better control of suspended solids helps optimize flocculant use and reduce related operating costs and environmental impacts. The goal of our project was to measure suspended solids in the water used in the mining industry.

Late last year we undertook to analyze quantum photonics technologies such as quantum illumination and quantum imaging to determine their suitability for known defense and security needs.

Examples include remote detection of explosives beyond the 50-meter limit, or detection of targets in confined areas and dark environments (i.e., around corners, behind walls, and through smoke, fog, or dust).





Solution Concept

This document is an analysis of a custom solution tailored to a specific need. It identifies the risks and estimates the effort required to achieve the desired outcome.

Through technology transfers, INO seeks to provide clients with a comprehensive data processing chain, from data capture to interpretation. This chain comprises physical data sensors, including proximity calculations using artificial intelligence, and cloud-based data storage and processing for deep learning and inference. It will make it possible to automate sensor deployment to eliminate the need for manual configuration and, more importantly, avoid having to write communication and programming interface calls.

We have validated that the solution meets requirements and mitigated associated risks by carefully defining the solution architecture, the cloud container hosting the AI processing algorithms, and the cloud system. Applications can be developed as new devices usher in new capabilities, all based on the same programming interfaces and the same architecture.

INO is working with a horticultural research partner to solve labor shortage issues and boost the performance of farms and greenhouses.

Our robotic cucumber picking solution concept is based on multimodal scene vision technology that uses fusion and reconstruction algorithms to combine complementary and multispectral 3D modalities. Ultimately, the goal is to offer the industry a hardware and software platform of active-passive sensors that can be used to adapt industrialized solutions to different usage conditions and different types of fruits and vegetables.

Corem, a research partner specializing in mineral processing innovation, wanted to provide mining companies with data on representative measurement of water content in iron ore pellets. Fast, accurate, online measurement could provide a key parameter for better pellet control by improving pellet quality and reducing energy needs.

After taking a detailed look at the challenges involved in pelletizing, INO developed an online system for measuring moisture content with an accuracy of 0.1% using an accelerated optical mass loss method.





Proof of Concept

At this stage, hypotheses are verified and risks minimized.

To improve security in public spaces, we needed to develop a remote, contactless inspection tool able to detect threats under clothing or in luggage without the need for a physical search. This tool not only makes security screening more pleasant for those being screened, it also makes the job easier for security personnel.

We tested the tool's ability to detect and identify objects made of metal, ceramic, and carbon fiber hidden underneath clothing. The portable, contact-free THz screening prototype was equipped with an ultra-fast lens to improve spatial resolution and a volumetric image tracking and reconstruction algorithm.

End-of-line inspection of the internal structures of objects made of foam, plastic, and rubber is a problem that affects car manufacturers and others.

We conducted a series of THz imaging and spectroscopy in transmission and reflection mode with a resolution of about 1 mm to successfully detect defects under the surface of large objects.

The food home delivery market is expected to grow considerably. This poses challenges to the cold chain during the food transport process—food producers need a way to guarantee the integrity and safety of the products delivered to their customers.

INO has processes for printing temperature and moisture sensors on flexible substrates. The data is transmitted to the cloud every second to ensure that the cold chain is monitored through every stage of transportation. We have also demonstrated that the same sensors printed with “greener” inks and synthesized at Université Laval show similar performance.

Epidermolysis Bullosa is a genetic disease that leads to the formation of blisters on the skin and mucous membranes. The disease ranges in severity from mild to fatal, and no cure is currently available.

We are working with a partner to investigate a therapy based on the transplantation of genetically modified skin using dynamic thermography. Since the underlying cause is a defect in the adhesion of subcutaneous layers, we are testing the hypothesis that the disease affects local thermal conductivity and can therefore be detected via active thermographic imaging.



Prototyping and Testing

The solution is tested and validated to confirm that it is compliant and performs to the desired level.

Many industrial sectors are legally required to find ways to manage their fugitive dust emissions, given the impacts these have on the environment and public health.

Field tests of Aeromap, a lidar solution we developed with partner mining company Rio Tinto, have demonstrated the effectiveness of countermeasures in controlling fugitive dust emissions during specific events.

We also continued our work on the early detection of oil leaks along underground pipelines:

We tested the robustness of the airborne UV laser for detecting benzene. The detection limit demonstrated in the lab is well below that required by the application.



Production - Scaling Up

At this stage INO leverages the full benefits of its verified processes to deliver the specific commercial production volumes required by client business cases.

Our THz imagers are the key component of the cameras we sell. They are also used in our emerging no-contact body search solution for detecting hidden threats as well as in other client products.

Building on the work begun last year, we have upped our overall THz imager production capacity by 100% while also increasing productivity. One improvement we made was to the laser welding process. It extends the lifespan of our imagers by reducing outgassing inside the housings.



Accelerating the growth of high-tech companies and turning innovative ideas into commercialized products

Created and operated by INO, Quantino is Canada's first optics/ photonics business incubator. It specializes in quantum technologies, hardware, deeptech, and microelectronics.

Quantino will encourage and support technology development by giving incubatees access to specialized facilities and equipment and world-renowned expertise. Every year, eight to ten new companies will join Quantino and receive support for an average of 18 to 24 months.

Quantino was set up in cooperation with Ville de Quebec, Ministère de l'Économie et de l'Innovation du Quebec, Quebec City's Groupe des Accélérateurs et des Incubateurs, and Quantreprendre.



Valérie Hénaire
Quantino Director



Some of Our Achievements

TORNADO

Tornado Spectral Systems and INO: A Long-lasting Relationship

Tornado Spectral Systems was established in 2013 as a leading manufacturer of chemical analysis and measurement systems using Raman spectroscopy. However, INO and Tornado started working together well before that!

Our first collaborations were with Arjae Spectral, one of two sister companies that would merge to form Tornado Spectral Systems. We worked together on the productization of spectrometers based on their proprietary high throughput virtual screening (HTVS) technology. The Sensei spectrometer developed with Arjae in 2012 was the predecessor of the Fuji Pro Plus still manufactured at INO today and used in Tornado's HyperFlux Pro Plus Raman spectroscopy systems.

"We have worked closely with INO in the development of novel spectrometers and probes for many years now. INO has the deep expertise in optical and optomechanical design and production engineering that allows them to understand and productize our prototypes. The open collaboration between our personnel at both the development and production levels is a key factor in our success, and the success of our customers."

- Scott Baker, President and CEO
Chief Executive Officer
Tornado Spectral Systems

INO's complementary expertise gave Tornado the agility they needed to scale up internal capacity, while INO's solid reputation gave customers and development partners added confidence in the technology. The partnership therefore grew in recent years with the production of the Hudson optical probe.



Tornado Spectral Systems developed a Raman optical probe prototype designed to interface the HyperFlux Pro Plus analyzer to a variety of different sample types. They needed the help of INO's experts to optimize the Raman probe head for maximum efficiency and manufacturability. Our teams in optics and optomechanics worked together to complete the probe design, testing, and a first short-run production of the Hudson probe. Given the positive feedback from Tornado customers, INO foresees the production of many Hudson probes in the years to come.

Working with INO helps Tornado cut their time to market and increase trust in their products among partners and customers. INO is very pleased to be a major part of Tornado's business strategy and looks forward to the collaboration continuing for years to come.

TERAXION

Mission possible for fiber optics experts!

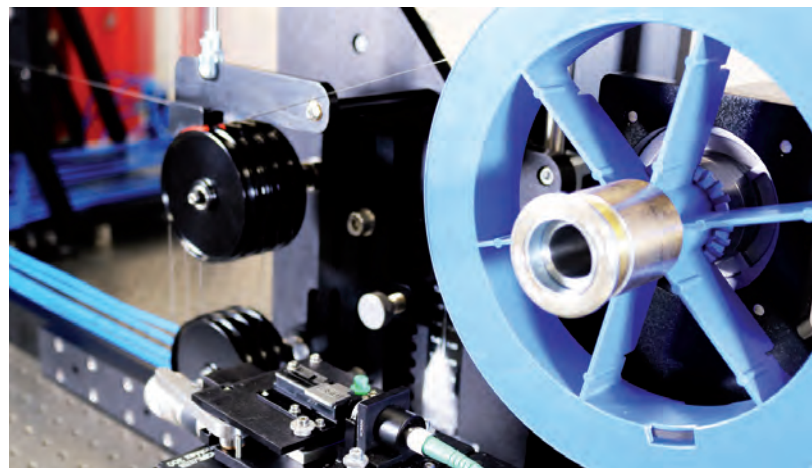
Backed by its team of seasoned experts always on the cutting edge and with more than 30 years in the business, INO has earned its reputation as a leader in fiber optics. Our specialists' subject matter expertise opens the door to innovative solutions that boost business productivity.

TeraXion, an INO spinoff company, has become the leader in the manufacture of innovative components incorporating Fiber Bragg Gratings, low-noise lasers, and integrated photonic components. For some time now, the company has been looking to step up production of its fiber components to keep pace with increasing competition. The goal was to automate certain manufacturing steps to streamline production. That meant unwinding precise lengths of fiber and measuring the optical signal. For the first time, the company did not have the resources inhouse to carry out the job. Knowing that INO had the requisite expertise, TeraXion asked us to help bring their idea to life.

“Our recent experience goes to show that INO has what it takes to tackle projects methodically and provide innovative solutions based on cutting edge knowledge.”

- Claude Carignan, Senior Director of Research and Development, TeraXion

The technical challenges for the team included maintaining even tension while unwinding the fiber, then releasing it precisely and measuring the reflected optical signal in a moving roll of fiber. TeraXion needed a solution that would automate tasks, cut production time, and ensure greater uniformity. And it all had to be done on a tight schedule. Teamwork between INO and TeraXion was the secret to project



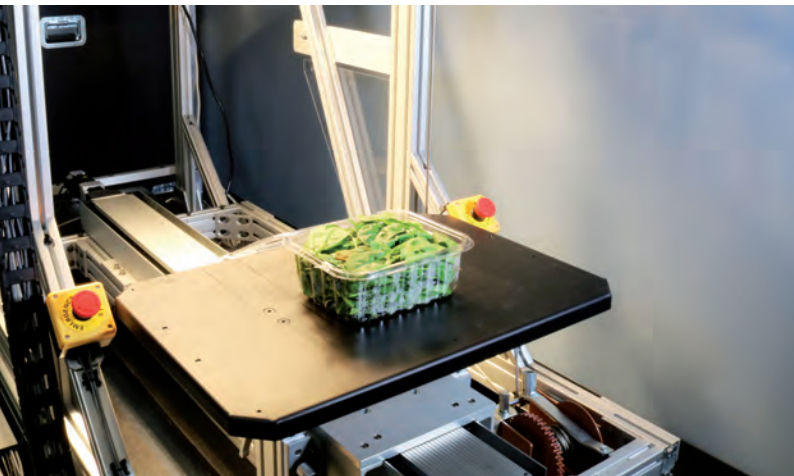
success. Communication and planning were critical from the outset, with both teams regularly consulting with each other. Thanks to the hard work and creativity of both teams, they successfully completed the project on time.

With INO's solution, TeraXion can now profitably manufacture products that otherwise would have been priced out of the market. This collaboration gave TeraXion a chance to see everything INO can do and all the support we offer Canadian companies.

VEGPRO

Using light to determine the shelf life potential of leafy vegetables

IRDA "Research and Development Institute for the Agri-Environment" is an agroenvironmental research and development institute dedicated to supporting the development of sustainable farming in Quebec through innovation and partnerships. In recent years, the big grocery chains have increasingly required agricultural producers to guarantee the shelf life of their products. This prompted INO and IRDA to work together to develop a solution for the leafy vegetable supply chain. Given the wide range of vegetable life cycles, agricultural producers sometimes have a hard time guaranteeing shelf life, which can lead to losses and unhappy customers.



Faced with this challenge, Vegpro expressed interest in working with INO and IRDA to find a solution. Founded in 1998, Vegpro is now the largest producer of fresh vegetables in Canada. Its subsidiary Vert Nature, which specializes in baby lettuce, farms 5,800 acres in Quebec and Florida and more than 700 acres in British Columbia to supply markets year round. The company's main priorities are to improve marketing methods and reduce losses. For Vegpro, incorporating a solution into its operations for determining shelf life is an opportunity to maximize the value of its crops. Recently, INO and IRDA joined forces to identify a technology that could guarantee 12-day shelf life for Vegpro's ready-to-eat products.

Certain intrinsic parameters of leafy vegetables can be measured by hyperspectral imaging, a non-destructive and contact-free testing method that can be done in real time. INO used its own hyperspectral imaging station and, in collaboration with IRDA researchers, created a database of spinach leaf samples. This data allowed our artificial intelligence experts to develop algorithms to evaluate the life expectancy of the leafy greens. This led to a preliminary method for determining spinach shelf life for up to 12 days after packaging, give or take 1.2 days.

“Working with INO gave us access to the additional cutting edge expertise IRDA needed to develop hyperspectral imaging applications in agrifood.”

- Caroline Côté, Agr., Ph.D., Researcher, Agricultural Environmental Health and Crop Safety, Coordinator – Organic Farming, IRDA

The next step in the study will be to enrich the spectral database to improve measurement accuracy. Eventually, the process could also be used with plants other than spinach, such as arugula, kale, or lettuce.

A Sustainable Contribution...

To the community



Helping people help people!

Thanks to the dedication of the entire **INO** team, we raised a record \$51,000 for the Centraide Québec et Chaudière-Appalaches 2019 campaign, which supports 214 local organizations and projects.



Promoting science to youth and girls

INO hosted an event in honor of the winners of the 2019 Expo-sciences Québec et Chaudière-Appalaches. We were the first scientific organization to host such an event. We hope to see these young people as members of our team in a few years!

Our researchers also took part once again in the “Girls in Science” day to encourage girls to pursue careers in science.



Supporting our guardian angels

Like many other businesses, **INO** answered the call to give our healthcare workers cases of masks and PPE during the COVID-19 pandemic.



A Sustainable Contribution...



For the environment

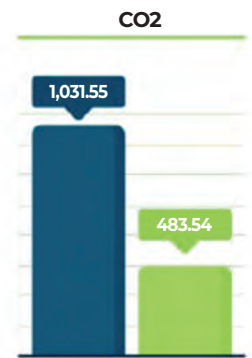
Replacing neon tube lights—what a brilliant idea!

INO revamped its entire indoor lighting system by replacing 5,000 neon tube lights with LEDs. This cut our greenhouse gas emissions by more than half—or what 21 energy-consuming homes would generate every year in Quebec.

Environmental Impact

Analysis of greenhouse gas emissions (1)

GHG	kWh	Carbon dioxide (kg) ⁽¹⁾
Current	515,773	1,031.55
Projected	241,769	483.54
Cut out	274,004	548.01



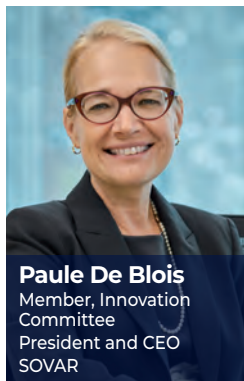
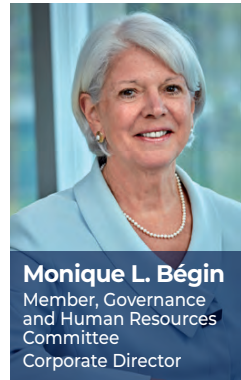
INO leads the charge!

INO set up new charging stations for electric and PHEV vehicles.

A very popular initiative with employees!



Board of Directors



INO would like to welcome two new members of the board, **Paule De Blois** and **Vanessa Grondin** and thank this year's outgoing members **Normand R. Bourque** and **Jean-Marie Toulouse** for their valuable contribution.

Management Team



Members

Government Members

Ministère de l'Économie et de l'Innovation
Canadian Economic Development
for Quebec Regions

Affiliate Members

Bell Canada
Caisse de dépôt et placement du Québec
Desjardins Business — Québec-Capitale
Thales Canada

Associate Members

Carleton University, Faculty
of Engineering and Design
CorActive High-Tech Inc.
Exfo Inc.
Gentec Electro-Optics Inc.
LeddarTech Inc.
Telops Inc.
TeraXion
Université Laval

Research and Development Advisory Committee

The Research and Development Advisory Committee advises INO on strategic scientific planning in light of the changing needs of Canadian businesses.

Richard Boudreault
Committee Chair
Orbite Aluminae
Saint-Laurent, Quebec

Michel Arsenault
PARI-CNRC,
Quebec City, Quebec

Eugene G. Arthurs
SPIE, Bellingham,
WA, USA

Alain Chandonnet
INO, Quebec City, Quebec

Sylvain Charbonneau
University of Ottawa,
Ottawa, Ontario

André Fougères
INO, Quebec City, Quebec

Jean Giroux
TELOPS Inc.,
Quebec City, Quebec

Jean Maheux
RDDC-Valcartier,
Quebec City, Quebec

Raphaël Desbiens
ABB, Quebec City, Quebec

Martin Maltais
UQAR, Lévis, Quebec

Michel Piché
Centre d'optique, photonique
et laser (COPL),
Quebec City, Quebec

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Friedrich-Alexander Universität,
Erlangen-Nürnberg, Germany

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University Health Network,
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Bernard Caron
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l'Environnement et
de la Lutte contre
les changements
climatiques

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École de technologie
supérieure (ÉTS)

Yves De Koninck
Université Laval

Louise Deschenes
Agriculture and
Agri-Food Canada

Mohamed Kashkoush
Vineland Research
& Innovation Centre

Tigran Galstian
Université Laval

Lucie Germain
Université Laval

Pierre Gosselin
INSPQ

Johnathan Orish
University of Toronto

Ashraf A. Ismail
McGill University

Matthew Johnson
Carleton University

Joshua Johnston
University of Toronto,
NRCan

Steffen Kurth
Fraunhofer ENAS
(FhG ENAS), Germany

Boris Le Drogo
INRS

Frédéric Leblond
Polytechnique
Montreal

Mario Leclerc
Université Laval

Levi Ofer
University of Toronto

Jason Olfert
University of Alberta

Ozzy Mermut
York University

Patrick Rochette
Université Laval
Hôpital du
Saint-Sacrement

Michel Piché
Université Laval

Christophe Py
National Research
Council Canada

Ruth Rayman
National Research
Council Canada

Manoj Sachdev
University of Waterloo

Michael Schmit
SAOT, University Erlangen,
Germany

Simon Thibault
Université Laval

Réal Vallée
Université Laval

Peter Vanrolleghem
Université Laval

Julia Wecker
Fraunhofer ENAS
(FhG ENAS), Germany

Brian Wilson
University of
Health Network

William Wong
University of Waterloo

Spinoff Companies

UmanX, 2019

Optical sensor for security robot

Lynx Inspection, 2018

Digital imaging system for industrial inspection

DxBioTech, 2017

Compact cytometer

Swiftsure, 2017

Optronics processor for synthetic aperture radar

FlyScan, 2016

Lidar for benzene detection

RaySecur, 2015

Terahertz technology for letter bomb detection

Technologies et services

INOXX, 2013

Lidar measurement and laser triangulation technology to measure truck load volume

Handyem, 2011

Compact cytometer

Opti Rythmix, 2011

Virtuo library

Company in the environmental field (confidential), 2010

Pavemetrics Systems, 2009

Machine vision systems for the inspection of transportation infrastructures

RealTraffic Technologies, 2008

Image analysis

Hedzopt, 2007

Thermal weapon sight

LeddarTech, 2007

LEDs for distance detection and measurement

Quantum BioMedical (QBM), 2006

Endoscopic probe for intravascular diagnosis

IRphotonics, 2004

Fluoride fibres and glasses

Neoptix, 2004

Temperature sensors

OpSens, 2004

Fiber optic sensors

Optosecurity, 2004

Optical correlator

PyroPhotonics Lasers, 2004

PEFL laser technology

Cybiocare, 2003

Hypoglycemia monitor and glucose meter

Obzerv Technologies, 2002

Vision systems

NEKS Technologies, 2001

Colour-based gingival tartar detection

TeraXion, 2000

Optical network components

CorActive High-Tech, 1998

Specialty optical fibers

Pierre Langlois Consultant, 1997

Diffractive optics consulting

P&P Optica, 1995

Optics engineering shop

FISO Technologies, 1994

Fiber optic sensors

Doric Lenses, 1994

Microlenses

Optiwave Corporation, 1994

Integrated optics software

AEREX Avionics, 1993

Optoelectronics consulting

I/FO Technologies, 1993

Fiber optic technology consulting

Optel Vision, 1992

Optical instrumentation

Regent Instruments, 1990

Optical instrumentation

Nortech Fibronic, 1989

Optical instrumentation

Technology Transfers

ABB

Pyramid wavefront sensor

American company

Diamond marking

American company

Auto-centering technology

Arcane Technologies

Computing library - Amazon

Asian company

Bolometers

Asian company

CO2 laser cleaving

Asian company

Fiber components

Asian company

Reading circuit

Asian company

Terahertz imaging

Asian integrator

MOPAW laser

Asian research institute

Bolometers

Autolog

3D imaging calibration software

Source Code

Planovision

Avensys/Bragg Photonics

All-fiber photo-induced filters

Brio Conseils

Managerial innovation in the

development process

Bristol Aerospace

Infrared detector

Canadian company

Infrared imaging

Communications Research**Centre Canada**

Integrated processes system (IPS)

CorActive High-Tech

Triple-clad specialty optical fibers

CTEX

Bolometers

Cybiocare

Hypoglycemia sensor
and glucose meter

Dellux Technologies

LED lights

Doric Lenses

Graded refractive index microlenses

DxBioTech

Compact cytometer

European company

Bolometers

European company

Lens auto-centering technology

FISO Technologies

Fiber optic sensors for
temperature, stress, and
pressure End-of-service
indicator for breathing
apparatus

FlyScan

Lidar for benzene detection

Gentec Electro-Optics

Holographic beam sampler

Handyem

Flow cytometry

Hedzopt

Thermal weapon sight

Industries Maibec

Feature detection of cedarwood
shingles

Instruments Régent

Optical instrumentation

iOmniscient

Classification module

IRphotonics

Fluoride fibers

Krispy Kernels

Hyperspectral vision system
for quality control

Lasiris

Diffraction optical elements

LeddarTech

LEDs for distance detection
and measurement

Lynx Inspection

3D imaging system

Microsphere

Optical correlator for inspection
of plastic components

MPB

Infrared spectrometer

NEKS Technologies

Colour-based gingival tartar
detection

Netcorp

Optical switch

Normand PROJEX

Inspection system for 3D
verification of hardwood floor
mortise and tenon dimensions

Nortech Fibronic

Fiber optics temperature sensors
Tunable fiber laser

Oil sector company

Fiber sensor technology

Opti Rythmix

Virtuo library

Optiwave Corporation

Integrated optics software

Optosecurity

INOSegmenter - Image
segmentation software
Numerical optical correlator
technology
Optical correlator

Technology Transfers

PyroPhotonics Lasers

PyFL fibre laser unfolded cavity configuration
PEFL laser technology

Quantum Biomedical (QBM)

Endoscope for intravascular diagnosis

RaySecur

Terahertz technology

Searidge Technologies

Video monitoring technology
Video surveillance and detection technology and source codes

Seastar Optics

Erbium fibre laser

Solvision

Structured light projector

STAS

Hydrogen fluoride detector

Swiftsure

Optronic processor for synthetic aperture radar

SYGIF International

Integrated processes system—IPS

Symbiotech Medical

Intra-arterial analysis and detection

Pavemetrics

Machine vision systems for the inspection of transportation infrastructures

Machine vision systems for a new scope of application

Obzerv Technologies

DALISTM laser illuminator

RealTraffic Technologies

Image analysis

Teledyne Dalsa

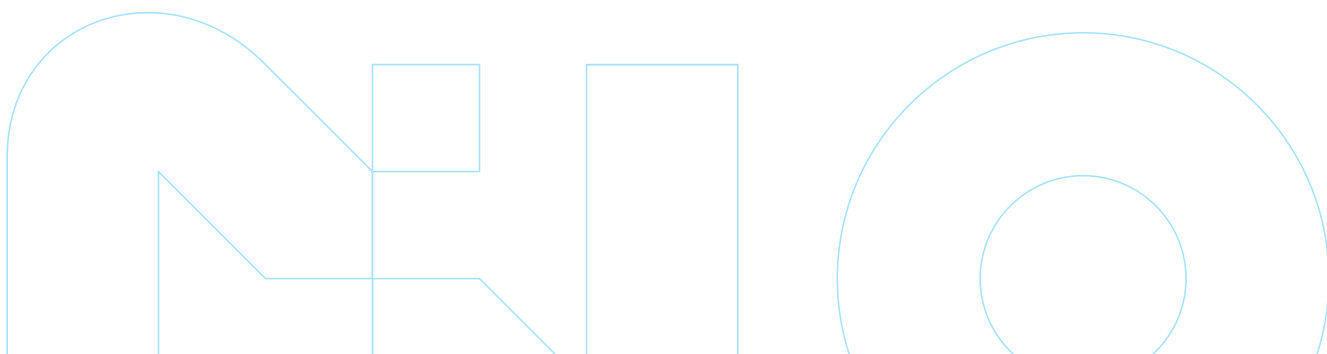
Bolometers

Telops

Integrated processes system—IPS

Western Canadian Oil Sector Company

Fibre optic sensors



Appendices



Financial Statements

INDEPENDENT AUDITORS' REPORT

To the members of National Optics Institute

Opinion

The summary financial statements of National Optics Institute (the "Entity"), which comprise:

- the summary financial position as at March 31, 2020
- the summary statement of operations for the year then ended
- the summary statement of changes in net assets for the year then ended
- the summary statement of cash flows for the year then ended
- and related notes

(hereinafter, the "summary financial statements")

are derived from the audited financial statements of National Optics Institute as at and for the year ended March 31, 2020 (the "audited financial statements").

In our opinion, the accompanying summary financial statements are consistent, in all material respects, with the audited financial statements, in accordance with the criteria disclosed in Note 1 in the summary financial statements.

Summary Financial Statements

The summary financial statements do not contain all the disclosures required by Canadian accounting standards for no-for-profit organizations. Reading the summary financial statements and the auditors' report thereon, therefore, is not a substitute for reading the Entity's audited financial statements and the auditors' report thereon.

The summary financial statements and the audited financial statements do not reflect the effects of events that occurred subsequent to the date of our report on the audited financial statements.

The Audited Financial Statements and Our Report Thereon

On our report dated June 18, 2020, we have issued an unmodified opinion on the audited financial statements for the year ended March 31, 2020.

Management's Responsibility for the Summary Financial Statements

Management is responsible for the preparation of the summary financial statements in accordance with the criteria disclosed in Note 1 in the summary financial statements.

Auditors' Responsibility

Our responsibility is to express an opinion on whether the summary financial statements are consistent, in all material respects, with the audited financial statements based on our procedures, which were conducted in accordance with *Canadian Auditing Standards 810, Engagements to Report on Summary Financial Statements*.



Quebec, Canada
June 18, 2020

Summary Statement of Financial Position

March 31, 2020, with comparative information for 2019

	2020	2019
Assets		
Current assets:		
Cash and cash equivalents	\$ 1,638,799	\$ 3,311,693
Accounts receivable	4,578,671	3,911,777
Financial support receivable related to tangible capital assets and intangible assets (note 2(d))	1,775,523	—
Financial support receivable related to the entrepreneurship assistance program (note 2(b))	125,000	—
Inventories	636,812	2,145,907
Research contracts in progress	632,623	661,500
Prepaid expenses	742,960	642,664
Current portion of investments	4,404,305	4,412,539
	14,534,693	15,086,080
Investments	8,762,280	12,074,329
Investments in private companies	229,233	229,233
Tangible capital assets	25,394,303	24,880,932
Intangible assets	322,376	354,854
	\$ 49,242,885	\$ 52,625,428
Liabilities and Net Assets		
Current liabilities:		
Bank loans	1,360,491	162,768
Accounts payable and accrued liabilities	6,728,061	6,746,930
Deferred revenues and deposits on contracts	584,634	595,456
Current portion of long-term debt	472,349	472,349
Deferred financial support related to additional financial support program (note 2(a)(ii))	5,000,000	5,000,000
	14,145,535	12,977,503
Long-term debt	1,577,678	2,050,028
Employee future benefit obligations	5,558,283	2,838,235
Deferred financial support related to tangible capital assets and intangible assets (note 2(b)(ii))	17,929,301	17,170,173
Additional financial support program (note 2(a)(ii))	6,775,209	12,421,217
	45,986,006	47,457,156
Net assets	3,256,879	5,168,272
Subsequent event (note 4)		
	\$ 49,242,885	\$ 52,625,428

See accompanying notes to summary financial statements

On behalf of the Board:



Director



Director

Summary Statement of Operations

Year ended March 31, 2020, with comparative information for 2019

	2020	2019
Revenues:		
Financial support related to internal research program (note 2(a))	\$ 22,400,000	\$ 21,400,000
Financial support related to tangible capital assets and intangible assets (note 2(d)(ii))	1,948,319	2,013,809
Financial support related to the entrepreneurship assistance program (note 2(b)(i))	125,000	—
Sales and contracts	18,052,364	15,136,279
Royalties	117,902	634,343
Technology transfer agreements and other agreements	—	825,692
Dividend income	1,109,350	265,080
Rent and other revenues	121,421	271,602
Members' contributions	50,000	51,000
	43,924,356	40,597,805
Expenses:		
Salaries and fringe benefits	23,265,096	22,140,080
Cost of goods and services pertaining to project completion	8,076,328	5,663,993
Other operating expenses	8,618,861	7,696,121
Foreign exchange loss (gain)	42,484	(6,653)
Interest on long-term debt	94,727	99,421
Interest and bank charges	99,501	73,186
Depreciation of tangible capital assets	2,778,383	2,788,432
Amortization of intangible assets	148,469	105,591
	43,123,849	38,560,171
Excess of revenues over expenses for the year	\$ 800,507	\$ 2,037,634

See accompanying notes to summary financial statements.

Summary Statement of Changes in Net Assets

Year ended March 31, 2020, with comparative information for 2019

	2020	2019
Net assets, beginning of year	\$ 5,168,272	\$ 1,048,138
Excess of revenues over expenses for the year	800,507	2,037,634
	5,968,779	3,085,772
Remeasurements and other items	(2,711,900)	2,082,500
Net assets, end of year	\$ 3,256,879	\$ 5,168,272

See accompanying notes to summary financial statements.

Summary Statement of Cash Flows

Year ended March 31, 2020, with comparative information for 2019

	2020	2019
Cash provided by (used in):		
Operating:		
Excess of revenues over expenses for the year	\$ 800,507	\$ 2,037,634
Items not involving cash:		
Depreciation of tangible capital assets	2,778,383	2,788,430
Amortization of intangible assets	148,469	105,591
Amortization of premiums and discounts on coupons and bonds	47,398	125,084
Adjustment related to employee future benefits	8,148	4,599
Financial support related to tangible capital assets and intangible assets (notes 2(d)(ii))	(1,948,319)	(2,013,809)
Deferred financial support recognized in revenues (note 2(a))	(6,000,000)	(5,000,000)
Changes in non-cash working capital items	(833,853)	3,523,243
	(4,999,267)	1,570,772
Financing:		
Change in bank loans	1,197,723	(2,544,427)
Increase in long-term debt	—	980,654
Repayment of long-term debt	(472,350)	(450,844)
Investment income generated related to deferred financial support (note 2(a))	353,992	152,492
Financial support used (note 2(a)(ii))	2,381,868	665,204
	3,461,233	(1,196,921)
Investing:		
Acquisitions of tangible capital assets	(3,291,754)	(1,701,460)
Acquisitions of intangible assets	(115,991)	(350,575)
Disposal of a term deposit	100,000	5,550,000
Acquisitions of investments	(1,621,812)	(285,237)
Disposals of investments	4,794,697	—
	(134,860)	3,212,728
(Decrease) increase in cash and cash equivalents during the year	(1,672,894)	3,586,579
Cash and cash equivalents (excess of outstanding checks over bank balances), beginning of year	3,311,693	(274,886)
Cash and cash equivalents, end of year	1,638,799	3,311,693

See accompanying notes to summary financial statements.

Notes to Summary Financial Statements

Year ended March 31, 2020, with comparative information for 2019

The National Optics Institute ("INO") was incorporated on December 31, 1985 under Part II of the *Canada Business Corporations Act* and continued on September 11, 2013 under the *Canada Not-for-profit Corporations Act*. Its mandate is to bring to life innovations that enable the Canadian industry to be more productive and competitive.

As a non-profit organization, INO is exempt from income tax.

1. Basis for presentation:

INO elected to prepare the summary financial statements based on the following criteria:

- Presentation of a set of financial statements which includes a summary financial position, a summary statement of operations, a summary statement of changes in net assets, and a summary statement of cash flows;
- Use of the same presentation for the summary financial statements as for the audited financial statements, except for cross-references to notes disclosures;
- Exclusion of notes to financial statements, unless their omission would prevent the financial statements users from having a clear understanding of economic resources and obligations at a period end or their evolution during the period then ended.

INO's complete set of financial statements are available upon request from management.

2. Financial support:

- Financial support - Internal Research Program:

The financial support that INO receives as part of the Internal Research Program is as follows:

		2020	
	Total support	Remaining support balance available as at March 31, 2020	Revenues
Government of Canada			
Canada Economic Development	\$ 50,000,000	\$ 10,000,000	\$ 10,000,000
Government of Quebec	57,000,000	17,400,000	12,400,000
Financial support			
internal research program	\$ 107,000,000	\$ 27,400,000	\$ 22,400,000

Notes to Summary Financial Statements

Year ended March 31, 2020

2. Financial support (continued):

(a) Financial support - Internal Research Program (continued):

		2019	
	Total support	Remaining support balance available as at March 31, 2019	Revenues
Government of Canada			
Canada Economic Development	\$ 50,000,000	20,000,000	10,000,000
Government of Quebec	57,000,000	29,800,000	11,400,000
Financial support - internal internal research program	\$ 107,000,000	49,800,000	\$ 21,400,000

(i) Government of Canada:

In August 2016, the Government of Canada, through the Business and Regional Growth Program of Canada Economic Development, granted INO financial support of up to \$50,000,000 for the five-year period ending on March 31, 2021, for its Internal Research Program. As at March 31, 2019 and 2020, the total amount receivable amounts to nil.

(ii) Government of Quebec

In July 2016, the Government of Quebec granted INO financial support of \$32,000,000 over a five-year period ending on March 31, 2021 for INO's Internal Research Program. The amount of \$6,400,000 allocated for the year was received in full as at March 31, 2020.

In addition, in March 2017, the Government of Quebec granted INO additional financial support in an amount of \$25,000,000 for the period from April 1, 2017 to March 31, 2022 to carry out research activities and develop expertise in the areas of IoT (Internet of Things), advanced robotics and 3D printing, as well as to establish an office in the Montreal area. This financial support had been received in full as at March 31, 2017, and an amount of \$5,000,000 was used in fiscal 2019.

Notes to Summary Financial Statements

2. Financial support (continued):

(a) Financial support - Internal Research Program (continued):

Deferred financial support under the additional financial support program is as follows:

	2020	2019
Balance, beginning of year	\$ 17,421,217	\$ 22,268,725
Investment income generated	353,992	152,492
Amount recognized in revenues during the year	(6,000,000)	(5,000,000)
	11,775,209	17,421,217
Less: current portion	5,000,000	5,000,000
Balance, end of year	\$ 6,775,209	12,421,217

The deferred financial support under the additional financial support program was held as investments.

(b) Financial support related to the entrepreneurship assistance program:

(i) In January 2020, the Government of Quebec granted INO financial support of \$375,000 for a three-year period ending March 31, 2022 to support assistance activities for startup entities. An amount of \$125,000 had been recognized in revenues for the year and is included in the financial support receivable at the end of the year.

(ii) In March 2020, the Quebec City granted INO financial support of \$1,400,000 for the period from October 19, 2019 to March 31, 2023 in order to set up an incubator dedicated to optics-photonics technology. No amount was recorded for this financial support as of March 31, 2020.

(c) Financial assistance related to the support program for research-innovation projects:

In March 2020, the Government of Quebec granted INO financial support of \$600,000 for a three-year period ending March 31, 2022 to support the completion of an industrial research program in quantum photonics. No amount was recorded for this financial support as of March 31, 2020.

(d) Support program for the purchase of research equipment - Government of Quebec:

(i) Under the financial support agreement, the Government of Quebec refunds INO directly for 80% of the acquisition cost of equipment. Acquisitions made in fiscal 2020 are covered by financial support in a maximum amount of \$3,984,447 granted during fiscal 2020. As at March 31, 2020, a balance of \$1,775,523 was receivable (2019 - \$133,361 received in advance).

(ii) Deferred financial support related to tangible capital assets and intangible assets:

	2020	2019
Balance, beginning of year	\$ 17,170,173	\$ 18,518,778
Financial support related to the purchase of tangible capital assets and intangible assets for the year	2,707,447	665,204
Transfer to revenues to offset the corresponding depreciation and amortization	(1,948,319)	(2,013,809)
Balance, end of year	\$ 17,929,301	\$ 17,170,173

Notes to Summary Financial Statements

(e) Financial support related to the building:

In 2019, the Government of Quebec granted INO financial support of up to \$1,024,000 for major work on the building. Financial support is paid as disbursements are made by INO. No acquisitions had been made under this agreement during fiscal 2020. As at March 31, 2020, a balance of \$204,800 had been received in advance.

3. Employee future benefits:

INO offers employee future benefit plans, including a defined benefit plan guaranteeing the payment of pension benefits to some of its employees.

(a) Defined benefit pension plan:

The most recent complete actuarial valuation of the pension plan was performed on December 31, 2017 and was extrapolated as at March 31, 2020. Information related to the defined benefit pension plan is as follows:

	2020	2019
Defined benefit obligations	\$ (46,729,900)	\$ (45,189,800)
Fair value of plan assets	41,705,900	42,767,700
Defined benefit liability	\$ (5,024,000)	\$ (2,422,100)

(b) Other employee future benefits:

As at March 31, 2020, the obligations under other employee future benefits were \$534,283 (2019 - \$416,135). The decrease in the provision related to these obligations resulted in an increase of \$125,518 (increase of \$4,599 in 2019) in salaries and fringe benefit expenses for the year.

As at March 31, 2020, the employee future benefit obligations were as follows:

	2020	2019
Defined benefit pension plan	\$ 5,024,000	\$ 2,422,100
Other employee future benefits	534,283	416,135
	\$ 5,558,283	\$ 2,838,235

4. Subsequent events:

On March 11, 2020, the World Health Organization declared the COVID-19 epidemic a pandemic. The situation is constantly changing, with cities and countries reacting in different ways to deal with the pandemic. Management is currently assessing the impact of this situation on its revenues, and the repercussions will be adequately reflected in the 2021 financial year.



**DELIVERING
INNOVATION**



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