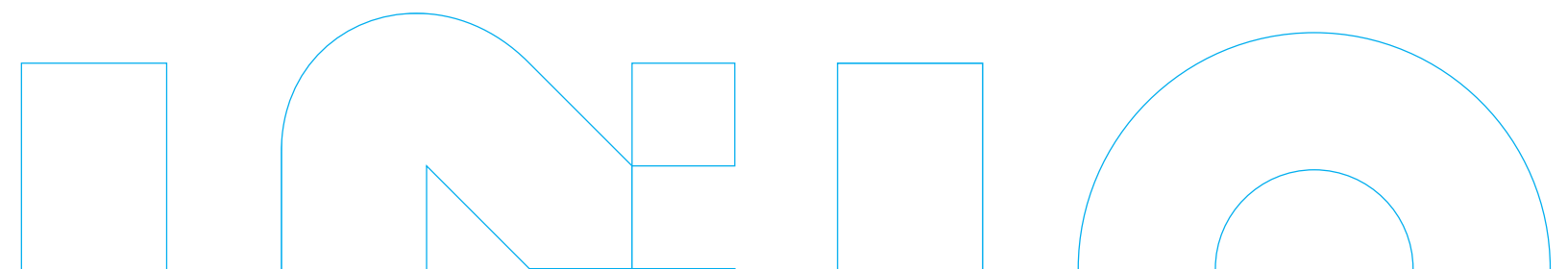




INVO

ANNUAL REPORT 2018-2019



INO's activities are made possible thanks to our partners' sustained collaboration:




Canada Economic
Development
for Quebec Regions

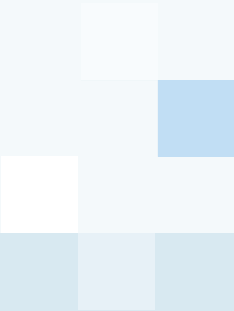
Développement
économique Canada
pour les régions du Québec

Québec 

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A word from the Chairman of the Board of Directors

Greetings dear Colleagues and Partners,

As I write this, I am enthusiastically embarking on the second year of my term as Chairman of INO's Board of Directors. *Bold* is a good way to describe what INO's Board of Directors, management and employees have accomplished over the past year to advance this key organization—a true jewel of the Québec City region. As such, we are extremely proud to present to you, in the pages that follow, the results for the 2018–2019 fiscal year.

But first, I would like to revisit three major elements carried out this year on the initiative of management, and keenly overseen by the Board of Directors.



NEW GOVERNANCE

Major work went into reviewing INO's governance structure, which included increasing the number of internal committees, and aligning their scope with the priorities of the Board of Directors. This new approach led to the creation of four internal committees focusing on the following themes: governance and human resources; innovation; and auditing and major proposals. These committees allow Board members

to focus more closely on critical issues, such as the innovation investment portfolio, attracting and retaining employees, approving major projects involving INO with clients and partners, and the integrity of financial information.

LOOKING AHEAD

In the past year, the Board of Directors held several discussions on INO's updated mission and the new values behind its long-term vision. The Board has played a key role in supporting the changes undertaken by management, both in terms of reorganizing internal work teams and in developing our new business approach.

STRATEGIC PLANNING EXERCISE

The members of the Board of Directors took part in defining the objectives of the five-year strategic plan presented by management, and endorsed its strategic orientations. For 2019–2020, the Board will continue to reflect on and actively participate in discussions about the various elements of this key piece that guides INO's future actions.

We also intend to monitor the many actions resulting from the changes brought about by the new structure.

As Chairman of the Board and on behalf of my colleagues, I can only reiterate how crucial it is to ride this wave of change and renewal brought about by INO's new orientations, mission, and vision. More than ever, I am convinced that INO will succeed in positioning itself as a true catalyst for innovation, to the great benefit of Quebec and Canadian businesses.

Happy reading!

A handwritten signature in black ink, which appears to read "Jacques Topping". The signature is fluid and cursive.

Jacques Topping CA, CPA, MBA, CSA

A word from the President and CEO



I am very proud to present the 2018–2019 Annual Report, which highlights our results for the last fiscal year, and is full of the many activities we have carried out. Thanks to the significant growth in our revenues, and the increase of orders in our backlog, we can say that one more milestone in our transformation has been reached. INO is changing and bringing with it progress, and new challenges!

A transformed organization, resolutely centered on Quebec and Canadian industry clients... and this is just the beginning!

Our organization is growing strong. With total revenues of \$40.6 million for the 2018–2019 fiscal year, which represents an increase of 11% compared to last year, it is clear that restructuring our client approach and internal teams is paying off.

External revenues also increased by nearly 16%, going from \$14.6 million to \$16.9 million. This fruitful year is due in part to the major increase in prototype sales. This significant growth in our recurring orders demonstrates how crucial and relevant our solutions are to the industry.

To continue to build on this momentum, and strengthen our client approach, the operations department's work teams were reorganized to be in line with the business development foundations laid last year. Our work cycles are now better aligned and in synergy with the five business units, strengthening our ability to act, and enhancing our effectiveness. I invite you to consult page 11 of this document for more information on this new approach.

Finally, special effort was dedicated to increasing the frequency, quality, and diversity of the methods used to communicate with our employees.

SPOTLIGHT ON THE FUTURE

The past year, which marked our 30th anniversary, was an opportunity to proudly look back at past achievements, to spur our transformations that

began last year, and to look forward with enthusiasm to the next 30 years. Several events were held to celebrate this important milestone; I invite you to read about them on page 12.

In 2018–2019, INO firmly established itself as a key player in the innovation ecosystem. Through our active participation in numerous business events, our increased presence on social media, our networking with other innovation centres across Quebec and Canada, as well as the creation and hosting of a major, public science outreach event celebrating photonics, INO has positioned itself as a reliable leader among industry stakeholders.

One of the most visible changes we've made in our strategic positioning was to update our mission and unveil our new visual identity. A strong and modern new image that highlights INO's crucial role in the development of intelligent photonics and the Internet of Things, which are both at the heart of its future work.

The new INO logo comes with a promise: Shedding light. To shed light is to design, implement, and promote solutions for our clients, regardless of the development stage of their projects. And in the coming years, we have committed to fulfil our new mission: to bring innovations to life to allow the Canadian industry to become more productive and competitive.

...

A profound transformation obviously brings new challenges and must be clearly defined over time. I am very proud to be able to count on an experienced management team and seasoned experts to see these changes through. We will confidently go through the entire 2019–2020 cycle following this new approach. I look forward to seeing the results!

As one of the most successful applied and translational research centres in the world, INO must act as an innovation leader in the field of intelligent photonics. We therefore plan to develop and renew close ties with our business and high-tech communities in Quebec and Canada by rethinking our membership model. My greatest wish for the coming year is to see INO stimulate collaboration among the driving forces of the photonics industry to shed light on a better world together!



Alain Chandonnet



Governance

The Board of Directors

INO's Board of Directors is composed of 12 members, all experts in their field, who ensure that the organization's activities are aligned with the needs of our clients and partners. Each member also contributes their expertise through one or more internal committees.



From left to right: François Giroux, Monique L. Bégin, Alain Chandonnet, Jean-Guy Paquet, Jacques Topping, Guy Laberge, Hugues St-Pierre, Michel Audet, Jean-Marie Toulouse and Normand R. Bourque.

Jacques Topping (4)

Chairman of the Board of Directors, INO
Corporate Director
Québec, QC

Michel Audet (2)

Corporate Director
Verdun, QC

Monique L. Bégin (1)

Corporate Director
Québec, QC

André Bolduc (4)

Director—Account Management
Bell Canada
Verdun, QC

Normand R. Bourque (3)

Corporate Director
Lorraine, QC

Alain Chandonnet

President and CEO
INO
Québec, QC

Denis Faubert (3) (4)

President and CEO
CARIC
Montréal, QC

François Giroux (2) (4)

President
Gentec Inc.
Québec, QC

Guy Laberge (3)

Corporate Director
Québec, QC

Jean-Guy Paquet (1)

Corporate Director
Québec, QC

Hugues St-Pierre (1) (4)

Corporate Director and
President of MAXXAB
Rimouski, QC

Jean-Marie Toulouse (2)

Professor Emeritus
HEC Montréal
Montréal, QC

Denise Moranville of the Ministère de l'Économie et de l'Innovation, as well as Pierre Schembri and Youri Rousseau of Canada Economic Development have been appointed as observers on the INO Board of Directors.

*Numbers identify which committee the board member is part of.

Internal Committees

(1) GOVERNANCE AND HUMAN RESOURCES COMMITTEE

Chair : Hugues St-Pierre

This committee is in charge of governance and ethical rules, executive recruitment, compensation, and organizational life.

(2) AUDIT COMMITTEE

Chair : François Giroux

This committee oversees INO's financial management, supervises the external audit, and reviews the financial statements.

(3) INNOVATION COMMITTEE

Chair : Denis Faubert

This committee is strongly linked to the Internal Research Program (IRP): it participates in reviewing the annual and three-year innovation investment plan, jointly with the RDAC, as well as in strategic IRP investment initiatives. The committee also monitors the organization's dashboard and intellectual property portfolio. Finally, it approves technology transfers and spin-offs.

(4) MAJOR PROPOSALS COMMITTEE

Chair : Jacques Topping

This committee reviews major proposals and bids, and approves requests for financial assistance from governments in the range of \$1 to \$5 million; it also examines major loans and purchases of key goods or services.

In memory of Jean Pronovost 1938-2018



INO would like to acknowledge the sustained contribution of Jean Pronovost, who passed away on December 26, 2018. A member of INO's Board of Directors since 2005, Chairman of the Audit Committee for two years, and a valued contributor, this great servant of the state distinguished himself by his rigour, great integrity, passion, and exceptional commitment.

The INO team



R&D Advisory Committee

Composed of members from the public and private sectors across Canada, the Research and Development Advisory Committee's mandate is to advise INO on strategic orientations relating to science in response to the evolving needs of Canadian companies.

Richard Boudreault

Chairman of the Committee
Orbite Aluminae, Saint-Laurent, QC

Michel Arsenault

NRC-IRAP, Québec, QC

Eugene G. Arthurs

SPIE, Bellingham (WA, United States)

Alain Chandonnet

INO, Québec, QC

Sylvain Charbonneau

University of Ottawa, Ottawa, ON

André Fougères

INO, Québec, QC

Jean Giroux

TELOPS Inc., Québec, QC

Jean Maheux

DRDC-Valcartier, Québec, QC

Raphaël Desbiens

ABB, Québec, QC

Martin Maltais

UQAR, Lévis, QC

Michel Piché

Centre for Optics, Photonics and Lasers (COPL),
Québec, QC

Ruth Rayman

National Research Council of Canada (NRC),
Ottawa, ON

Antonio Scandella

Bell Canada, Montréal, QC

Michael Schmidt

Friedrich-Alexander Universität,
Erlangen-Nürnberg (Bavaria, Germany)

Brian C. Wilson

University Health Network, Toronto, ON

Management

Composed of savvy and innovative managers, the management team inspires passion and commitment among INO's 200 or so employees.

Alain Chandonnet

President and CEO

Michel Arnault

Chief Operations Officer

Philippe Boivin

Vice President,
Corporate Affairs

Louis Martel

Vice President, Business
Development and
Partnerships

André Fougères

Vice President, Innovation
and Technology

Martin Larrivée

Vice President, Finances



From left to right (back row) : Michel Arnault, Philippe Boivin, Louis Martel.
Front row: André Fougères, Alain Chandonnet and Martin Larrivée.

Our new customer approach

In 2018–2019, INO adopted a new 5-step approach to guide its clients—the vast majority of whom are SMEs—in developing and achieving their technological objectives. INO acts as a mentor, enabling companies to adopt best practices for defining, evaluating, creating, and manufacturing the solution that best suits their needs.



THE REQUIREMENT PHASE | YOUR CHALLENGE

A clear and complete description of expected performance, as well as operational and non-operational requirements.

A translation of the clients' requirements into technical specifications.



THE SOLUTION BLUEPRINT | WHAT CAN WE DO?

No need to reinvent the wheel: technical, commercial and legal due diligence of what is in place. Identify an optimal solution that meets the requirements.

A solution framework, including its scope of nominal performance, associated risks and contingencies, and a cost scenario and timeline.



PROTOTYPING POSSIBILITIES | A FIRST CONCEPT

This is where risk mitigation hypotheses and technical trade-offs are tested. A full report including measures to establish the final system's actual possibilities and performance package. A comprehensive project plan.



A COMPREHENSIVE SOLUTION | INTEGRATION

Production from start to finish leading to compliance testing and validation of the solution based on targeted specifications under typical or actual conditions of use. A demonstration and documentation of the final solution's performance.



MANUFACTURING - TEACHING

INO can help you deliver the full benefits of the solution by supporting you in its deployment using its pilot manufacturing scaling service. Or, INO can teach you or a third party how to become self-sufficient in manufacturing.

INO's 30th anniversary

A pivotal year

The year 2018 at INO was marked by multiple celebrations—with our employees, loyal partners, and the general public—for the organization's 30th anniversary. The highlight of the festivities was undoubtedly the event "*Il était une fois l'innovation*," which took place on November 8 in the presence of 225 guests and dignitaries.

Hosted by journalist and communicator Marie-Pier Élie, this full-day conference was an opportunity for participants to hear four renowned speakers—Bernard Kress, Jennie Carignan, Sophie D'Amours and Bob Moesta—highlighting the ways in which innovation influences their leadership and helps shape the future.



Highlights 2018-2019

■ *past and present*

1 SPIN-OFF
COMPANY
■ *34 in 30 years*

30 YEARS



We also took this opportunity to unveil INO's new visual identity and vision for the upcoming years.

A FIRST EVENING FOR THE GENERAL PUBLIC

Among the initiatives that are to be repeated is our activity aimed at the general public, the first of which was an evening on the theme of astronomy and astrophysics held on April 2. Thanks to its tremendous success, INO ended this year of festivities with an activity attended by more than 230 people.



Hosted by Pierre Chastenay, professor at UQAM and well-known popular science advocate, this event brought together leading experts in the field: Loïc Albert (IREX), Luc Simard (Herzberg Astronomy and Astrophysics Research Centre), and David Shoemaker (MIT Kavli Institute). The evening allowed participants to learn more about the latest advances in astrophysics, such as the search for exoplanets and the chemical composition of their atmosphere, as well as optical instruments for observing the universe, and gravitational waves.



The evening was also enhanced by the presence of valuable partners and exhibitors.

The 30th anniversary celebrations were crucial to look back on the progress made, recognize the contribution and unwavering support of our partners, and look to the future with confidence.

22 PATENTS GRANTED

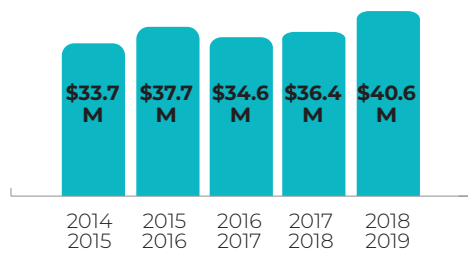
■ 295 to date

2 technology transfers

■ 74 in 30 years

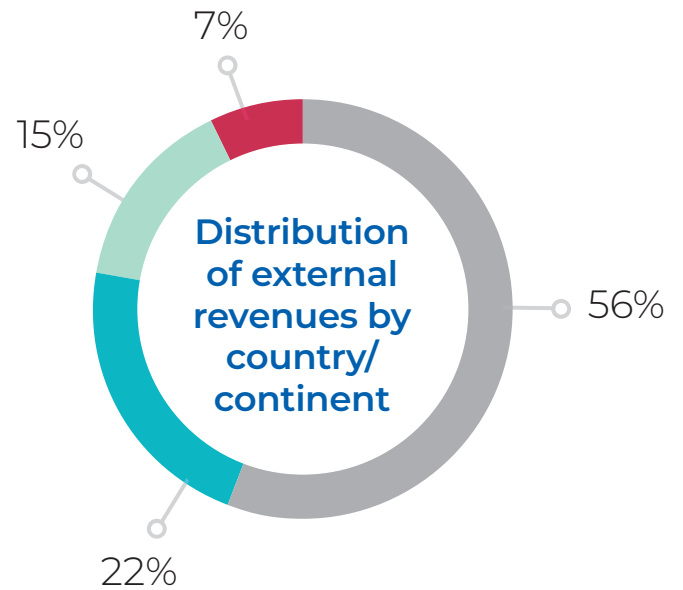
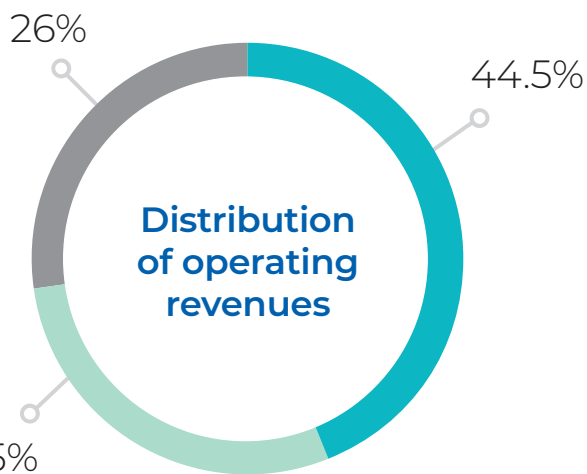
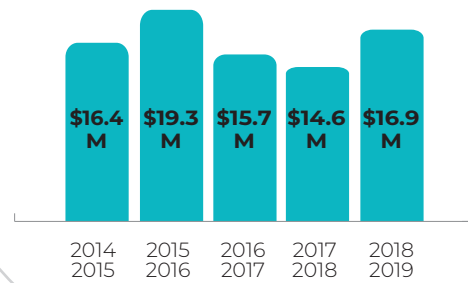
Conclusive results

EVOLUTION OF OVERALL REVENUES

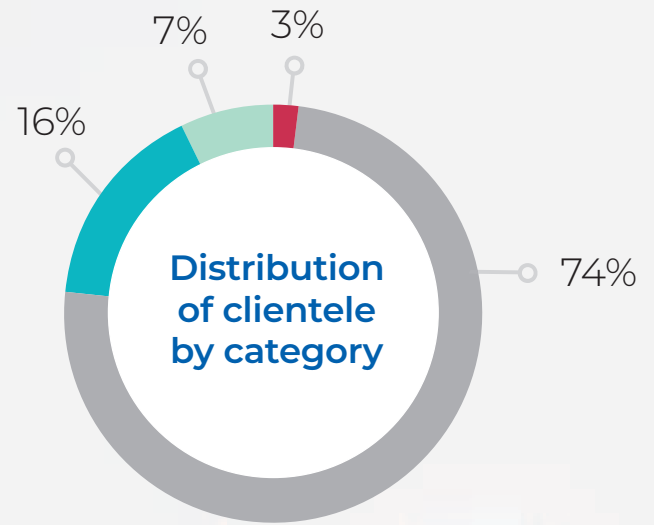
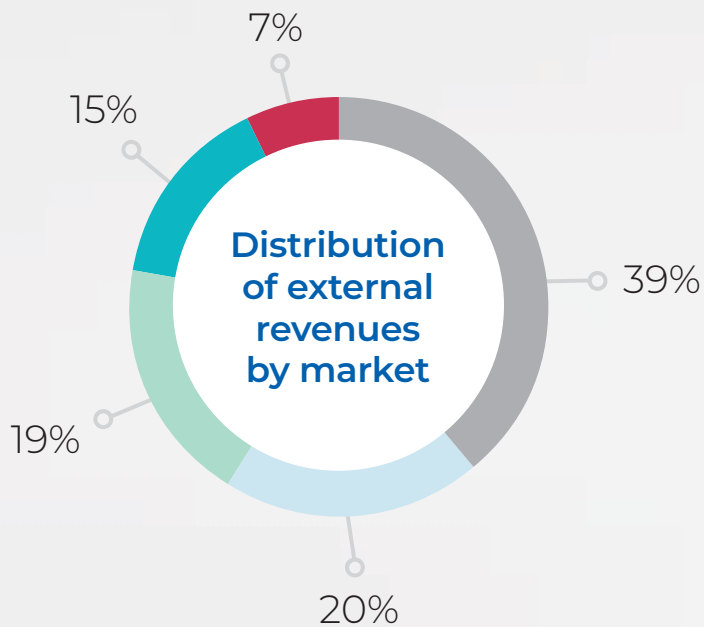


EVOLUTION OF EXTERNAL REVENUES

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



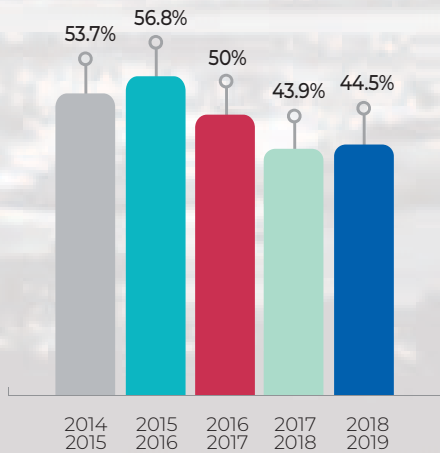
- External revenues
- Internal Research Program—Quebec
- Internal Research Program—Canada



- Advanced Manufacturing
- Defence, Security and Aerospace
- City, Infrastructure and Mobility
- Biomedtech
- Energy, Resources and Environment

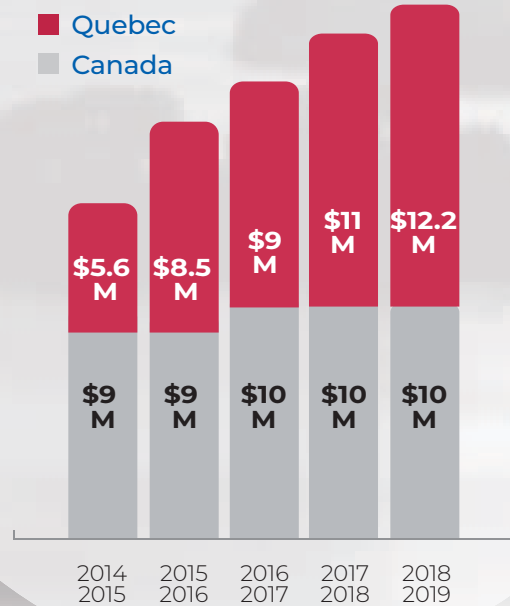
- SME
- Large company
- Government
- University

Evolution of self-financing



5-year average :
49.8%

Evolution of government funding



Review of technological activities

A year of consolidating achievements

■ With the creation of its five business units, and in light of its internal research program and proven technologies, INO is more able than ever to take on major challenges, whether in terms of safety, manufacturing efficiency, the proper use of resources, or the health of people living in increasingly “smart” cities.

To better align our actions and consolidate our achievements, we have thoroughly reviewed our technological development roadmaps. This has provided an even stronger foundation for our technological pillars, such as microfabrication, optical fibres as well as vision, telemetry and terahertz (THz) systems.

The Governments of Quebec and Canada, as well as the United Nations, have established sustainable development objectives for the upcoming years. Our 2018–2019 technology review is designed with this in mind.

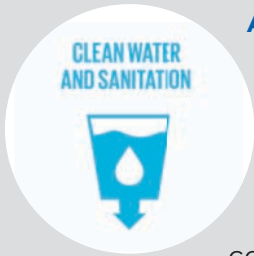


Safety of people

For INO, ensuring the safety of people requires, in particular, the detection of threats (weapons and explosives) hidden in public places. We are leveraging our THz video imagers and the development of reflective imaging systems to create the first furtive high-throughput screening portals and non-intrusive strip search devices. To support this vision, and the growth of our THz camera sales, several formative projects involving the microfabrication of THz bolometers were carried out. Thus, the complete qualification of our production chain of bolometer arrays on larger wafers has allo-

wed us to be more productive and competitive, and to reduce manufacturing time. We have also doubled our vacuum packaging capacity, and reduced the time required for this process by one third. Finally, the development of frequency-selective surfaces has made it possible to tune the response, and multiply the sensitivity of our detectors by a factor of five.

For parcel or luggage surveillance, we have developed a software module based on artificial intelligence (AI). Its advantage is that it automatically detects and identifies people and luggage from the video streams of airport security systems.



Air, water and soil

People’s health can be compromised by very small dust particles dispersed in the air by industrial activity. Accurate measurement of the presence of these particles will make it possible to better control fugitive emissions. The validation of our iSIPS instrument required a major laboratory measurement campaign, which was conducted in collaboration with the University of Edmonton. It allowed us to build an extensive database used for calibrating the device, and for the robust interpretation of AI signals. At the same time, we implemented an absolute calibration method, and tested the combination of our atmospheric lidar with industrial water sprinkler systems to reduce fugitive dust emissions at source.

Finally, we continued to develop a UV laser source for the early detection of leaks along underground pipelines. The airborne system will prevent excessive contamination of the soil and water around these infrastructures.

Manufacturing efficiency

The fine treatment of materials is increasingly carried out using ultrashort laser pulses. INO has enhanced its range of optical fibre solutions for the development of these lasers, namely: a new ytterbium-doped fibre with very low photo-darkening, a tapered optical fibre with a large effective area, and a high-power tip to preserve beam quality. We have also completed the upgrade and qualification of our stretching tower dedicated to the production of glass rods. This equipment offers new preform manufacturing capabilities by assembly and sleeving. Another important technological advance is that we have succeeded in improving the drilling efficiency of polarization-maintaining fibre preforms by 70%.



Think of point-of-care diagnostics and intelligent packaging to monitor and control the cold chain of pharmaceutical and food products to preserve their safety and integrity. Having targeted cerebral oximetry as a first medical application, which requires sources and detectors operating in the near-infrared range, we developed our first prototypes of printed infrared sensors based on an organic semiconductor.

In terms of surgical applications, our work has led to the integration of a hollow optical fibre into the needle of a syringe used for biopsies. The adequacy of the samples collected can then be confirmed with an optical reader during collection. This reader benefited from our new additive manufacturing capabilities for the production of a printed cell to manipulate the needle fibres during analysis. A first batch of data was also generated from thyroid cancer tissue samples in collaboration with the University Health Network in Toronto.

Intelligent infrastructure and cities

The creation of a digital twin, i.e. the virtual representation of an infrastructure, such as a road or sewer line, makes it possible to obtain more accurate inspection information, and to monitor aging of the physical twin. Our 360-degree laser profilometer makes it possible to virtualize a sewer line when it is commissioned, to quantify its deformation and deterioration over time, and to facilitate and validate its cladding during rehabilitation. This year, we developed a robust calibration method for our sensor; following its integration on our partner Can-Explore’s robot, we tested its performance in the field in the municipal sewer systems of Montréal and Québec.

Health and nutrition

Staying healthy and preserving our food will be easier with flexible, portable, washable, and non-toxic devices on which INO is working; these devices will likely result in a variety of applications in the health industry.





Lynx Inspection, the 4th startup company to stem from a partnership between the Entrepreneurs-in-Residence Program, INO and the City of Québec, is benefiting from the integration of a 3D optical sensor to its X-ray imaging system. The fusion of optical and X-ray data makes it possible to more effectively detect defects in parts produced by additive manufacturing for the aeronautics and automotive industries.

ACHIEVEMENTS

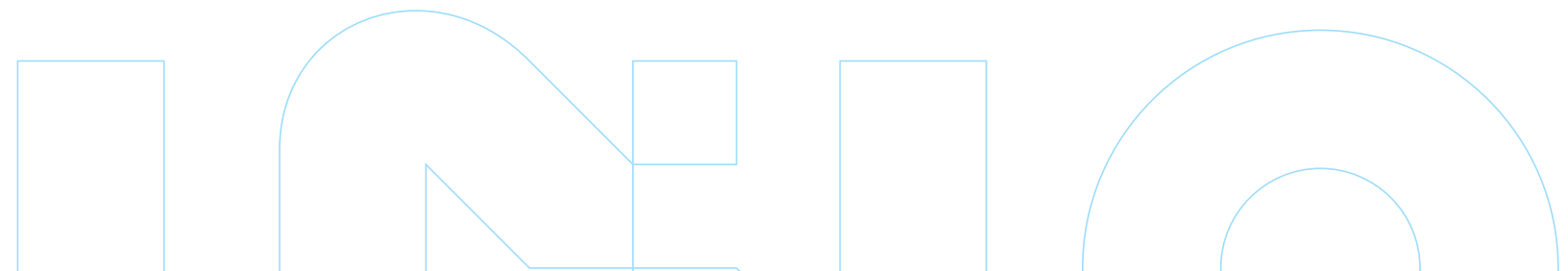
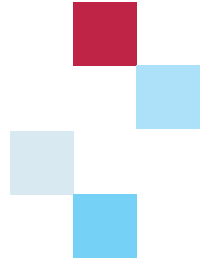




Photo credit: Can-Explore

CAN-EXPLORE

Thrive on challenges to offer more and more!

■ Can-Explore is a Québec-based company founded by two university friends, Louis Légaré-Lapointe and Olivier Lefebvre, in 2014. Specialized in engineering services, the company sets itself apart thanks to its complete mastery of new technologies, both in terms of field work and the presentation of information to their clients. Can-Explore's experienced team offers its clients a technological and personalized service; it collects, processes and disseminates data on the state of their assets, and is always looking for new and innovative techniques to meet and exceed requirements in the field.

Can-Explore collaborated with us in 2016 when our INO Pipe 3DC laser profilometer, designed to measure the inside of pipes, such as sewer and water pipes, was in its infancy. Why? From the beginning, Can-Explore sought to enhance its client offering, and knew that partnering with INO would ensure they had the added value that would make all the difference.

Generally speaking, inspection is done with a camera installed on a vehicle, pulled by a rope, or on a robot-vehicle that films the inside of the pipes. The results are then analyzed, commented and annotated by certified technicians.

Thanks to INO, the company was able to provide a digital twin of the pipes, in addition to the traditional and official reports.

Over the past year, INO and Can-Explore have partnered on a few tests and projects. Among

other things, we made high-precision measurements to confirm the shape and dimensions of the City of Québec's water main. The inspection provided important parameters required to manufacture the pipe ends to replace and strengthen the pipe. Thanks to the measurements obtained by the laser profilometer and the know-how of the Can-Explore team, the work was successfully completed.

Strengthening its position as a technological pioneer and leader in the field, Can-Explore was the first to regularly purchase and use INO's 3DC Pipe to obtain a point cloud and thus take advantage of the wealth of data the sensor offers.

"A player like INO could only bring a fresh vision, and indeed, we were able to obtain a very interesting product. The team was available and came out in the field to experience our reality. The sensor provides us with quality data, allowing us to optimize the expenditure and the life span of the pipes."

*- Louis Légaré-Lapointe, Eng.,
Can-Explore President*



Photo credit: Mailhot

“We were looking for a group of experts capable of developing an absolute optical positioning system for our cylinders. At INO, we found a team with solid expertise, and the ability to meet our high-level challenge, while maintaining a good pace for the project.”

- Luc Mainville, Vice President Innovation Product Development, Mailhot Industries

MAILHOT

Helping the industry in the 4.0 era

■ Mailhot Industries has been a leader in the cylinder market since 1956. The company stands out from the competition thanks to the quality of its innovation-based products. Mailhot Industries manufactures nearly 50,000 cylinders annually for various types of vehicles in the environmental and waste management, natural resource exploitation, construction, and snow removal markets. In particular, the company aims to grow in the mining market.

Recently, Mailhot Industries developed, in conjunction with the Novika, the college centre for technology transfer (CCTT) in La Pocatière, a cylinder rod laser texturing process. They called on INO to add advanced functions to make their cylinders intelligent, and to allow them to be integrated into automated systems.

We are in the process of developing a sensor capable of reading a cylinder's current position, with the aim of making it intelligent. The system must be based on a method used to encode the positions, integrate a position reading system that meets the requirements,

and ideally be able to determine the cylinder's level of wear for predictive purposes.

The sensor must be integrated into or located near the cylinder head.

The INO-Mailhot partnership is in full swing. Development is divided into a series of phases leading to the production of intelligent cylinders. The first phase consisted of an overview of possible optical techniques for encoding and reading the absolute position. This feasibility study made it possible to target the method tested in the lab during the second phase in order to validate its ability to accurately indicate the absolute position.

A third phase served to prove the concept in a lab simulating actual operating conditions. What follows will make it possible to design and test more mature prototypes in a real environment, and then to initiate production.

Our partnership with Mailhot will, without a doubt, allow the INO team to go further thanks to artificial intelligence!



Photo credit: Rio Tinto

RIO TINTO

Respect for the environment through optics and photonics

■ For several years now, Rio Tinto, a mining group and aluminum producer, has been committed to conducting its operations with a vision focused on sustainable development.

Reducing dust emissions is a priority on which the company is continuously working to improve its environmental performance. It is in this context that Rio Tinto's team at its port facilities in La Baie, Saguenay, was looking for a solution to measure fugitive dust emissions. Rio Tinto needed technology that was efficient, reliable, robust, and easy to deploy in the field to measure and quantify the effectiveness of the mitigation measures put in place.

A Rio Tinto-INO partnership has made it possible to meet this need. Rio Tinto is now working with Aeromap, our lidar technology, to map absolute and relative concentrations of dust and aerosols in the air.

Thanks to the expertise of the INO team, Rio Tinto was able to quantify the data resulting from its dust emission reduction strategy. Aeromap is a safe and effective solution for measuring dust emissions.

The collaboration between INO and Rio Tinto continues; the partners are working on integrating an

adapted version of Aeromap. Other optics-based tools for environmental monitoring are also part of Rio Tinto's ongoing work with INO.

“We liked Aeromap’s 2D/3D mapping capabilities because they did not measure the concentration of particulate matter at a point, but rather in the volume surveyed. In addition, the ability to perform measurements from a distance (several tens of metres) is a clear advantage from a safety perspective when measurements must be carried out in a heavy industrial environment that is highly coactive.”

- Jonathan Bernier, Research Scientist, Chemist, M.Sc., Rio Tinto


CCM

Optics shoot and score!

■ CCM is a Canadian company well known to sports and hockey fans. The company is associated with several NHL professional players and for decades, it's also producing consumer equipment such as skates, helmets, gloves, sticks and more.

In order to always give more to its customers, CCM wanted to offer hockey sticks adapted to the style of each player. The right stick, for the right player, based on his/her shooting mechanics. To do this, CCM wanted to develop a "Stick Fitting System" which could be deployed in retail locations. This new technology analyzes the player's movement while he shoots and then recommends the best CCM stick.

CCM was already working on this application before contacting INO. The system was too expensive to be installed in stores, so our mandate was to develop an efficient technology to do the same player analysis, but at a lower cost.

The INO team has therefore applied to the task of developing a simple system that can measure the players' movement in 2D and can be easily used in store. The system had to detect and follow the movement of the player's stick when he shoots or hits the puck. All analysis taken during the tests had to be linked to precise data, matching the player to

the ideal CCM hockey stick for his shooting mechanics. Reference points on the stick and puck are used for the test result to match a CCM stick.

The system produced by INO includes a high-speed camera and software that provides the information and analysis needed, including 2D trajectory, puck speed, and more.

The system is currently tested by CCM with hockey players for future installation at their retailers' shop.

"We had a great experience with the INO team. It felt more like a partnership than a client/clientele relationship, which is what we needed. They were also flexible in how they structured their contracts, in order to align with our deadlines and internal needs."

- Marc LeVangie, Biomechanical Researcher—CCM Hockey



Photo credit: GEDI and NASA

“Using a GRM allows us to more precisely control the mode size inside and outside the cavity. Without a GRM, we would not be able to achieve a TEM₀₀ far field beam and therefore not be able to make accurate measurements for the GEDI mission.”

- Paul Stysley, Laser Engineer, NASA-GSFC
and Barry Coyle, Physicist, NASA-GSFC

GEDI

INO Across the Universe

■ On December 5th, 2018, the SpaceX Commercial Resupply Mission 16 was launched from Cape Canaveral. Did you know there was a little bit of INO on board?

The mission carried GEDI into the Dragon capsule and it was deployed on the International Space Station (ISS) for a two-year mission. The name stands for Global Ecosystem Dynamics Investigation and its mission is to produce high resolution laser ranging observations of the 3D structure of the Earth. GEDI's precise measurements of forest canopy height, canopy vertical structure, and surface elevation will greatly advance our ability to characterize important carbon and water cycling processes, biodiversity, and habitat. With this instrument, we will be able to have the first high resolution laser ranging observations of the 3D structure of the Earth.

The HOMER class laser design used on the GEDI mission employs INO GRM (Graded Reflectivity Mirror) in a linear oscillator-only cavity. This allows the laser system to have high output power (approximately 4 – 5 W at 242 Hz) with a low optical part count, and a robust reliability for space flight applications when compared to other systems. We already knew our GRM could stand in space but

with this mission, it confirms to us the high quality of our technology.

Thanks to GEDI, we will better understand how the Earth behaves. The data collected will help numerous domains including water resource management, weather prediction, forest management, and geomorphometry. This will help scientists, resource managers and many more who are working on subjects such as flood risk from storms, fresh-water supplies, forest resources and biodiversity conservation.

GEDI has the highest resolution and densest sampling of any lidar ever put in orbit and INO is very proud to be a part of this mission with our GRM technology.

GEDI mission is a collaboration between the National Academy of Sciences and NASA's Science Mission Directorate.

****This article is possible thanks to GEDI and NASA****

INO in the community

Our 200 employees are, without a doubt, our greatest asset. Thanks to their strong social commitment, team spirit, and unflinching determination to encourage the next generation of scientists, we are able to share INO's values with the community.



INO gives back to the community

In 2018, the Centraide campaign raised \$45,000! INO employees' impressive mobilization, combined with an incentive from our CEO to increase donation, helped to significantly exceed our objective. INO is proud of its campaign's success, and to contribute to the well-being of our community.

Girls in Science

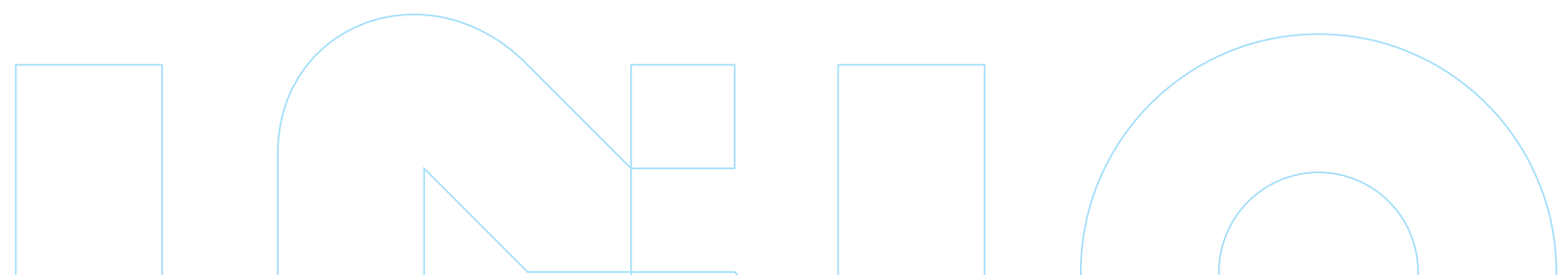
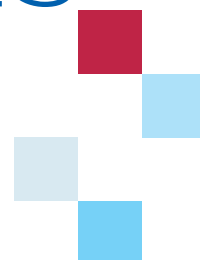
Contributing to the development of the next generation of female scientists is really important to us. Four of our employees participated in the 20th Les filles et les sciences event, which celebrates science awareness among women. Our crew had a chance to meet many of the 175 participants at the INO booth. They also led an interactive workshop featuring a demonstration of the THz system, an invisibility experiment using an optical assembly, and polarization-based experiments.



Math whizzes and athletes

Did you know that many of our scientists are also sports enthusiasts? Twenty-eight of our employees participated in the corporate component of the Pentathlon des neiges de Québec. Two of our six teams finished third on the podium (open and women's categories). INO is proud to encourage healthy habits among its employees!

APPENDICES



Our members 2018-2019

GOVERNMENT MEMBERS

Ministère de l'Économie et de l'Innovation

Canada Economic Development for Quebec Regions

AFFILIATE MEMBERS

Bell Canada

Caisse de dépôt et placement du Québec

Desjardins Business—Québec-Capitale

Thales Canada

ASSOCIATE MEMBERS

ABB

B-Con Engineering inc.

Celestica International Inc.

CorActive High-Tech inc.

Exfo inc.

Faculty of Engineering and Design (Carleton University)

Gentec Électro-Optique inc.

LeddarTech inc.

Telops Inc.

TeraXion

Université Laval

University of Ottawa

Spin-off companies

Lynx Inspection

Digital imaging system for industrial inspection, 2018

DxBioTech

Compact cytometer, 2017

Swiftsure

Optronics processor for synthetic aperture radar, 2017

FlyScan

Lidar for benzene detection, 2016

RaySecur

Terahertz technology for letter bomb detection, 2015

INOXX Technologies and Services

Lidar measurement and laser triangulation technology to measure truck load volume, 2013

Handyem

Compact cytometer, 2011

Opti Rythmix

Virtuo library, 2011

Company in the environmental field

Confidential project, 2010

Pavemetrics

Machine vision systems for the inspection of transportation infrastructures, 2009

RealTraffic Technologies

Image analysis, 2008

Hedzopt

Thermal weapon sight, 2007

LeddarTech

Use of LEDs for distance detection and measurement, 2007

Quantum BioMedical (QBM)

Endoscope for intravascular diagnosis, 2006

IRphotonics

Fluoride fibres and glasses, 2004

Neoptix

Temperature sensors, 2004

OpSens

Fibre optic sensors, 2004

Optosecurity

Optical correlator, 2004

PyroPhotonics Lasers

PEFL laser technology, 2004

Cybiocare

Hypoglycemia monitor and glucose meter, 2003

Obzerv Technologies

Vision systems, 2002

NEKS Technologies

Colour-based gingival tartar detection, 2001

TeraXion

Optical system components, 2000

CorActive High-Tech

Specialty optical fibres, 1998

Pierre Langlois Consultant

Diffractive optics consulting, 1997

P&P Optica

Optics engineering shop, 1995

FISO Technologies

Fibre optic sensors, 1994

Doric lenses

Microlenses, 1994

Optiwave Corporation

Integrated optics software, 1994

AEREX Avionics

Electro-optical consulting firm, 1993

I/FO Technologies

Fiber optics technology consulting firm, 1993

Optel Vision

Optical instrumentation, 1992

Regent Instruments

Optical instrumentation, 1990

Nortech Fibronic

Optical instrumentation, 1989

Our technology transfers

ABB

Pyramid wavefront sensor

Arcane Technologies

Computing library—Amazon

Autolog

3D Imaging calibration software
Code source
PlanoVision

Avensys/Bragg Photonics

All-fibre photo-induced filters

Brio Conseils

Managerial innovation in the development process

Bristol Aerospace

Infrared detector

Communications Research Centre Canada

Integrated processes system—IPS

CorActive High-Tech

Triple-clad specialty optical fibre

CTEX

Bolometers

Cybiocare

Hypoglycemia monitor and glucose meter

Dellux Technologies

LED lights

DxBioTech

Compact cytometer

American company

Diamond marking

American company

Auto-centring technology

Asian company

Bolometers

Asian company

Bolometers

Asian company

Bolometers

Asian company

Fibre components

Asian company

Reading circuit

Asian company

Terahertz imaging

Canadian company

Infrared imaging

European company

Lens auto-centring technology

European company

Bolometers

Company in the oil sector

Fibre sensor technology

Western Canadian Oil Sector Company

Fibre optic sensors

FISO Technologies

Fibre optic sensors for temperature, stress and pressure End-of-service indicator for respiratory protective device

FlyScan

Lidar for benzene detection

Gentec Electro-Optics

Holographic wave sampler

handyem

Flow cytometry

Hedzopt

Thermal sights

Industries Maibec

Feature detection of cedarwood shingles

Asian research institute

Bolometers

Instruments Régent

Optical instrumentation

Asian integrator

MOPAW laser

iOmniscient

Classification module

IRphotonics

Fluoride fibres

Krispy Kernels

Hyperspectral vision system for quality control

Lasiris

Diffraction optical elements

LeddarTech

LEDs for distance detection and measurement

Doric lenses

Graded refractive index microlens

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

Fibre optics temperature sensors
Tunable fibre laser

Opti Rythmix

Virtuo library

Optiwave Corporation

Integrated optics software

Optosecurity

Optosecurity
Technologie de corrélation optique numérique

Our 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

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Carleton University

Gideon Avigad

Vineland Research
& Innovation Centre

Martin Bernier

Université Laval

Lukas Chrostowski

University of British Columbia

Sylvain Cloutier

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supérieure (ÉTS)

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Université Laval

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National Research
Council Canada

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National Research
Council Canada

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SAOT, University of Erlangen,
Germany

Simon Thibault

Université Laval

Réal Vallée

Université Laval

Peter Vanrolleghem

Université Laval

Brian Wilson

University of Health Network

Yeni Yucel

Ryerson University

Summary Financial Statements

INDEPENDANT AUDITORS' REPORT

To the Board of Directors 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, 2019
- 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, 2019 (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.

Other matter - Comparative Information

The summary financial statements for the year ended March 31, 2018, were reported on by another auditor who expressed an unmodified opinion on those summary financial statements of June 7, 2018.

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 auditor report thereon, therefore, is not a substitute for reading the Entity's audited financial statements and the auditor's 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

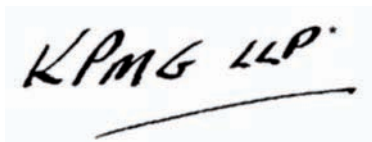
On our report dated June 13, 2019, we have issued an unmodified opinion on the audited financial statements for the year ended March 31, 2019.

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*.



Summary Statement of Financial Position

March 31, 2019, with comparative information for 2018

Assets	2019	2018
	\$	\$
Current assets		
Cash and cash equivalents	\$ 3,311,693	\$ 263,498
Accounts receivable	3,911,777	3,503,906
Financial support receivable related to internal Research Program (note 2(a)(i))	—	2,193,468
Financial support receivable related to tangible capital assets and intangible assets (note 2(b))	—	392,966
Inventories	2,145,907	2,075,002
Research contracts in progress	661,500	516,238
Prepaid expenses	642,664	760,059
Current portion of investments	4,412,539	5,327,501
	<hr/>	<hr/>
	15,086,080	15,032,638
	<hr/>	<hr/>
Investments	12,074,329	16,549,214
Investments in private companies	229,233	229,233
Financial support related to the building (note 2(c))	—	77,270
Tangible capital assets	24,880,932	25,967,902
Intangible assets	354,854	109,870
	<hr/>	<hr/>
	\$ 52,625,428	\$ 57,966,127
	<hr/>	<hr/>
Liabilities and Net Assets		
Current liabilities		
Excess of outstanding cheques over bank balances	\$ —	\$ 538,384
Bank loans	162,768	2,707,195
Accounts payable and accrued liabilities	6,746,930	4,943,335
Deferred revenues and advances on contracts	595,456	1,032,869
Current portion of long-term debt	472,349	214,298
Deferred financial support related to additional financial support program (note 2(a)(ii))	5,000,000	5,000,000
	<hr/>	<hr/>
	12,977,503	14,436,081
Long-term debt	2,050,028	1,778,269
Employee future benefit obligations	2,838,235	4,916,136
Deferred financial support related to tangible capital assets and intangible assets (note 2(b)(ii))	17,170,173	18,518,778
Additional financial support program (note 2(a)(ii))	12,421,217	17,268,725
	<hr/>	<hr/>
	47,457,156	56,917,989
	<hr/>	<hr/>
Net assets	5,168,272	1,048,138
	<hr/>	<hr/>
	\$ 52,625,428	\$ 57,966,127
	<hr/>	<hr/>

See accompanying notes to summary financial statements.

Summary Statement of Operations

Year ended March 31, 2019, with comparative information for 2018

	2019 \$	2018 \$
Revenues		
Financial support related to internal research program (note 2(a))	\$ 21,400,000	19,400,000
Assistance financière relative aux immobilisations corporelles et aux actifs incorporels (note 2 b) ii))	2,013,609	1,862,355
Assistance financière relative à des coûts de financement (note 2 b) hi))	—	11,348
Assistance financière relative au programme Croissance des entreprises et des régions I Innovation	—	16,248
Ventes et contrats	15,136,279	13,761,534
Redevances	634,343	171,223
Ententes de transfert de technologie et autres ententes	825,692	694,386
Revenus de dividendes	265,080	
Loyer et autres revenus	271,602	296,222
Gain à la disposition d'actifs	—	196,015
Cotisations des membres	51,000	49,000
	40,597,805	36,458,331
Expenses		
Salaries and fringe benefits	22,140,080	19,406,870
Cost of goods and services pertaining to project completion	5,663,993	6,511,360
Other operating expenses	7,696,121	6,952,340
Foreign exchange (gain) loss	(6,653)	111,296
Interest on long-term debt	99,421	48,405
Interest and bank charges	73,186	192,025
Depreciation of tangible capital assets	2,788,432	2 609,877
Amortization of intangible assets	105,591	69,059
	38,560,171	35,901,232
Excess of revenues over expenses for the year	\$ 2,037,634	\$ 557,099

See accompanying notes to summary financial statements.

Summary Statement of Changes in Net Assets

Year ended March 31, 2019, with comparative information for 2018

	2019 \$	2018 \$
Net assets, beginning of year	\$ 1,048,138	\$ 61,339
Excess of revenues over expenses for the year	2,037,634	557,099
	3,085,772	618,438
Remeasurements and other items	2,082,500	429,700
	5,168,272	1,048,138
Net assets, end of year	\$ 5,168,272	\$ 1,048,138

See accompanying notes to summary financial statements.

Summary Statement of Cash Flows

Year ended March 31, 2019, with comparative information for 2018

	2019 \$	2018 \$
Cash provided by (used in)		
Operating		
Excess of revenues over expenses for the year	\$ 2,037,634	\$ 557,099
Items not involving cash:		
Depreciation of tangible capital assets	2,788,430	2,609,877
Amortization of intangible assets	105,591	69,059
Amortization of premiums and discounts on coupons and bonds	125,084	113,747
Adjustment related to employee future benefits	4,599	(603,607)
Financial support related to tangible capital assets and intangible assets (notes 2(b)(ii))	(2,013,809)	(1,878,603)
Deferred financial support recognized in revenues (note 2(a))	(5,000,000)	(3,000,000)
Gain on disposal of assets		
Changes in non-cash working capital items	3,523,243	2,794,572
	1,570,772	466,129
Financing		
Change in bank loans	(2,544,427)	1,496,681
Long-term debt contracted	980,654	1,670,000
Repayment of long-term debt	(450,844)	(149,352)
Investment income generated related to deferred financial support (note 2(a))	152,492	268,725
Financial support used (note 2(a)(ii))	665,204	(1,469,283)
	(1,196,921)	1,816,771
Investing		
Acquisition of tangible capital assets	(1,701,460)	(3,924,595)
Acquisition of intangible assets	(350,575)	(58,154)
Proceeds from disposal of tangible capital assets	—	274,530
Finance lease, net of repayments	—	104,524
Disposal of a term deposit	5,550,000	22,000,000
Acquisition of investments	(285,237)	(22,590,463)
Disposal of investments	—	600,000
	3 212 728	(3,594,158)
Increase (decrease) in cash and cash equivalents during the year	3,586,579	(1,311,258)
(Excess of outstanding cheques over bank balances) cash and cash equivalents, beginning of year	(274,886)	1,036,372
Cash and cash equivalents (excess of outstanding cheques over bank balances), end of year	\$ 3,311,693	\$ (274,886)
Supplemental information		
Cash and cash equivalents (excess of outstanding cheques over bank balances) comprise the following amounts presented in the Statement of Financial Position:		
Cash and cash equivalents	\$ 3,311,693	\$ 263,496
Excess of outstanding cheques over bank balances	—	(538,384)

See accompanying notes to summary financial statements.

Notes to Summary Financial Statements

Year ended March 31, 2019, with comparative information for 2018

The National Optics Institute ("INO") was incorporated on December 31, 1985 under Part II of the *Canada 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:

- A -** 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;
- B -** Use of the same presentation for the summary financial statements as for the audited financial statements, except for cross-references to notes disclosures;
- C -** Exclusion of notes to financial statements, unless their omission would prevent the financial statement users to have a clear understanding of economic resources and obligations at a period end or its evolution during the period then ended.

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

2. Financial support:

- A -** Financial support - Internal Research Program:

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

		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 Québec	57,000,000	29,800,000	11,400,000
Financial support - internal research program	\$ 107,000,000	\$ 49,800,000	\$ 21,400,000

Notes to Summary

2. Financial support (continued)

A - Financial support - Internal Research Program (continued)

		2018	
	Total support	Remaining support balance available as at March 31, 2019	Revenues
Government of Canada			
Canada Economic Development	\$ 50,000,000	\$ 30,000,000	\$ 10,000,000
Government of Québec	57,000,000	41,200,000	9,400,000
Financial support - internal research program	\$ 107,000,000	\$ 71,200,000	\$ 19,400,000

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, an amount of nil (2018 - \$2,193,468) was still receivable.

ii) Government of Québec:

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, 2019.

In addition, in March 2017, the Government of Québec 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 Montréal area. As at March 31, 2017, this financial support had been received in full, and an amount of \$5,000,000 was used in fiscal 2019.

2. Financial support (continued)

A - Financial support - Internal Research Program (continued)

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

	2019	2018
Balance, beginning of year	\$ 22,268,725	\$ 25,000,000
Investment income generated	152,492	268,725
Amount recognized in revenues during the year	(5,000,000)	(3,000,000)
	\$ 17,421,217	22,268,725
Less: current portion	5,000,000	5,000,000
Balance, end of year	\$ 12,421,217	\$ 17,268,725

Notes to Summary

As at March 31, 2019, a total of \$17,421,217 in deferred financial support under the additional financial support program was held as investments.

b) Support program for the purchase of research equipment - Government of Québec:

i) Financial support receivable related to tangible capital assets and intangible assets:

The financial support receivable pertains to the following items:

	2019	2018
Financial support receivable for research equipment acquired during the year ⁽ⁱ⁾	\$ -	\$ 392,966
Less: current portion	-	392,966
	\$ -	\$ -

⁽ⁱ⁾ Under the financial support agreement, the Government of Québec refunds INO directly for 80% of the acquisition cost of equipment. Acquisitions made in fiscal 2019 are covered by financial support in a maximum amount of \$3,984,447 granted during fiscal 2019. As at March 31, 2019, a balance of \$133,361 had been received in advance (2018 - \$392,466 was receivable).

2. Financial support (continued):

B - Support program for the purchase of research equipment - Government of Québec (continued):

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

	2019	2018
Balance, beginning of year	\$ 18,518,778	\$ 18,784,778
Financial support related to the purchase of tangible capital assets and intangible assets for the year	665,204	3,059,100
Financial support related to the building for the year	—	6,538
Use of financial support received in advance		(1 469 283)
Transfer to revenues to offset the corresponding depreciation and amortization	(2,013,809)	(1,862,355)
Balance, end of year	\$ 17,170,173	\$ 18,518,778

Notes to Summary

(iii) Financial support related to financing costs:

INO was granted financial support pertaining to interest expenses related to a long-term loan. Financial support received in that regard during the year amounts to nil (2018 - \$11,348).

C - Financial support related to the building:

In 2016, the Government of Québec granted INO financial support of up to \$772,691 for major work on the building. Financial support is paid as disbursements are made by INO. As at March 31, 2019, an amount of nil (2018 - \$77,270) was receivable for the disbursements made during the year.

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, 2019. Information related to the defined benefit pension plan is as follows

	2019	2018
Defined benefit obligations	\$ (45,189,800)	\$ (45,328,900)
Fair value of plan assets	42,767,700	40,755,300
	\$ (2,422,100)	\$ (4,573,600)

B - Other employee future benefits:

As at March 31, 2019, the obligations under other employee future benefits were \$416,135 (2018 - \$342,536). The decrease in the provision relating to these obligations resulted in an increase of \$4,599 (decrease of \$258,607 in 2018) in salaries and fringe benefit expenses for the year.

As at March 31, 2019, the employee future benefit obligations were as follows:

	2019	2018
Defined benefit pension plan	\$ 2,422,100	\$ 4,573,600
Other employee future benefits	416,135	342,536
	\$ 2,838,235	\$ 4,916,136



ANNUAL REPORT 2018-2019

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