

EXECUTIVE SUMMARY

Innovation is at the heart of the elements that will allow Canada to stand out on the international stage and increase its capacity for growth.

The direction taken by the current government based on the recommendations of the Jenkins report, which clearly support applied research to rapidly commercialize innovation, is crucial and should be continued and accelerated.

The National Optics Institute (INO), through its positioning on the innovation chain, has been putting the concept recommended in the Jenkins report to work for 25 years. The attached roadmap shows our results.

This positioning is characterized upstream through collaborations with organizations working in basic research and downstream by dozens of weekly meetings with industry. Based on the inputs received, the INO develops expertise, platforms and intellectual property that allow it to carry out technology transfers and sign agreements with businesses to improve their competitive positioning. Some of these transfers have also been to start-ups: over the course of 25 years, the INO has contributed to the creation of 29 new businesses.

It is because of this success that the federal government has financially supported the INO since its beginnings. Moreover, for several months, the INO has been in talks with the Government of Canada to increase its scientific presence in Ontario, Alberta and British Columbia in advanced fields in these provinces' industrial ecosystems. This strategy aims to serve more clients and interact with them more proactively and effectively.

Furthermore, the INO is a leader in optics and photonics, which has applications in all sectors of the economy. This field receives solid financial support in all industrialized countries and a majority of emerging economies.

While efforts are being made in Canada, they are scattered throughout various programs without any coordination to align priorities.

Therefore, to increase the competitiveness of Canadian businesses by commercializing innovation more rapidly, we recommend:

1. That the next budget renew the current agreement with the INO and financially support its pan-Canadian expansion plan.
2. That Canada clearly and unequivocally support optics and photonics and hold up the INO as a national standard-bearer and possibly as a centre of excellence in the field.

SUGGESTED PRIORITIES FOR THE 2015 FEDERAL BUDGET

On behalf of the board of directors of the National Optics Institute (INO), I am pleased to share our comments as part of the 2015 federal pre-budget consultations. Please find attached a summary of our history and achievements.

Our comments will focus on “increasing the competitiveness of Canadian businesses through research, development, innovation and commercialization.”

We feel it is important to first define innovation.

Innovation comes from the development of new knowledge or technologies that, when integrated by an industrial organization, create a more competitive positioning of products commercialized by the organization or operational efficiencies that make it more competitive.

Recommendation 4 of the Jenkins report released in the fall of 2011 specified transforming NRC research centres into independent corporations whose mission would be to support businesses in a given industry in their R&D and innovation strategies. The INO has been doing just that for 25 years.

Our positioning on the innovation chain is between universities and/or basic research centres and industry. On the one hand, we have collaborative agreements with stakeholders in basic research and try to influence their choice of projects so that they respond to advances that ultimately serve industry. On the other hand, we meet with dozens of industry players each week that present their needs to us to improve their competitive positioning.

Our positioning is exactly where the Americans call death valley because it is very difficult for organizations like universities to carry out both their primary goal to provide education and their role to serve industry. In general, university researchers want to be published in order to be recognized by their peers.

Based on upstream and downstream information, we start expertise and platform development projects that relate directly to the needs of Canadian industry. These projects are supported by an intellectual property strategy that ultimately ensures our industrial client competitive exclusivity. Moreover, because the intellectual property belongs to the INO, technology transfers can be done easily and rapidly.

It is therefore crucial for Canada to have organizations such as the INO that can rapidly commercialize innovation.

The three recent case stories that follow illustrate the results of our actions.

I Solving quality control problems

The company, which delivers springs to car manufacturers, had been having serious quality control problems for four years.

For high-end springs, they performed visual inspections that resulted in 40% of their production being rejected. As we later found out, the majority of rejected springs were good and some that were bad were delivered to customers.

When we met with the company, we were told it had already tried to solve the problem with four different universities. In under eight months, we were able to find an innovative solution and implement it on the assembly line with zero defects (100% of bad springs rejected and good springs delivered to the customer) at its factory, which has more than 400 employees. The company sent us a letter, which I quote in part:

"The INO allowed us to solve quality problems, which none of the four universities with whom we do business was able to do. Solving these problems enabled us to greatly enhance our market position relative to our Japanese and Korean competitors.

The INO is the only applied research organization we know that demonstrated its ability to rapidly solve complex problems that ultimately allowed us to increase our market share."

II The INO transferred to a Canadian company the rights it held on patents to make infrared sensors that do not require cooling (bolometers)

This transfer allowed the organization to start a new product line, which will result in the hiring of dozens of employees. Similarly, it places Canada in a field where it was completely absent, with the market dominated by the Americans, French and Israelis.

III Development of a flow cytometer that can be used in space

In less than 18 months, the INO developed a shoebox-sized flow cytometer¹ that was successfully used by astronaut Chris Hadfield during his mission in space. In addition to being small, it delivers instant results that do not need to be interpreted by a specialist.

This project, in collaboration with NASA, was described at a meeting prior to the instrument's launch in space as a scientific breakthrough as important as the Canadarm, and was praised by

¹ A flow cytometer is an instrument used in all hospitals. It is used to detect the nature of a disease from blood samples or other body fluids. It is a large piece of equipment that requires a specialist to analyze and interpret results.

Colonel Hadfield several times, including during interviews he gave to *Découverte* and *The Nature of Things*.

The INO transferred the terrestrial applications tied to the instrument's patents to a new company founded in 2011 that now has more than 20 employees and made it possible for a medical device manufacturer to start-up in Canada. Such a medical device industry ecosystem is almost non-existent in Canada. We rely primarily on the Americans, Japanese, Dutch and Germans to supply us in this area.

Optics and photonics: technology that is revolutionizing market positioning

The INO is leading the way in a relatively new science, optics and photonics, which uses the properties of light and turns them into innovation. It is a transverse science that now has applications in all economic sectors. The development of lasers and fibre optics, in particular, has revolutionized many areas, including telecommunications and medicine.

25 years ago, the INO was a global pioneer in developing this science. Canada, Quebec, and particularly the Quebec City region are now seen by the international scientific community as world leaders in this field.

However, all industrialized countries and most emerging countries are now investing huge sums in this area.

For example, the United States has identified optics and photonics as a key technology for the nation in supporting the following areas: information technology, advanced manufacturing, defence and security, health care and energy.

Europe, through its Horizon 2020 program, has not only identified optics and photonics as a key lever in the same areas as the Americans, but also believes that this science:

- impacts 10% of the European economy
- employs more than 290,000 people
- represents economic leveraging generating a more than 50-fold increase in investment

Despite Canada's efforts across several programs, we believe it is urgent that Canada gives its support and financial assistance to this science in a clear, systematic way that is tied directly to Canadian priorities. The lack of clear direction could result in Canada losing major competitive advantages.

At the same time, and given its past successes and positioning on the innovation chain that directly reflect the recommendations of the Jenkins report, we believe that the INO should be the national standard-bearer to maximize synergies and optimize results.

To this end, we have held talks over several months with the federal government to intensify, through its possible support, our scientific presence in Ontario (advanced manufacturing and life sciences), Alberta (oil and gas) and British Columbia (advanced manufacturing and green energy). With this strategy, we strongly believe we are able to serve more clients and interact with them more proactively and effectively.

Therefore, to increase the competitiveness of Canadian businesses by commercializing innovation more rapidly, we recommend:

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JEAN-YVES ROY, CA, CPA
President and CEO



WHAT IS INO



- 200 employees
- \$38 annual revenues
- Locations
 - Québec City (HO)
 - Montréal
 - Hamilton ON
 - Calgary AB
- Financing of INO'S In-House Research Program: 50% Federal – 50% Provincial since its inception.
- Because of its legal status, INO does not have access to any other government financing program available to research centres and universities nor to tax credits available to high tech firms.

- A technology transfer and contract R&D organization with a complete range of integrated services in all fields of optics/photonics
- The largest concentration of skills in the field in Canada
- Clients of all size across Canada and around the world

Over the last 25 years

- > 50% of revenues directly from the industry
- 5000 R&D contracts
- 58 technology transfers
- 29 spin-offs (all still alive)
- 191 patents / 77 pending