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Overview of the Canadian Photonics Sector and Funding Opportunities with Eurostars

Workshop: Funding Opportunities for Swiss Companies and Research Organisations

Fachhochschule Nordwestschweiz (FHNW), Olten, Switzerland

November 28, 2016

Rouslan Kats, Senior Trade Commissioner, Embassy of Canada in Bern

Trade Commissioner Service – Embassy of Canada

- Canada-Switzerland bilateral commercial relations: Trade, Investment and Innovation
- Covering multiple sectors (cleantech, ICT, life sciences …)
- Switzerland: 10th largest foreign investor to Canada
- Canada: 2nd largest trade partner for Switzerland in the Americas
- Priority on investment attraction & innovation partnerships

Canadian Achievements in Photonics

- Development of first solid state laser range finder by Defense Research Establishment Valcartier (1960s)
- Communications Research Centre Canada's invention of Fiber Bragg Grating (1992)
- Invention of Charge Coupled Devices (CCDs)
- World's first open-heart surgery using an excimer laser
- NRC's pioneering work in short pulse duration laser research (2003)
- First approved photodynamic drug therapy for cancer treatment
- Nortel Networks first to market with 10 Gbit/s – OC192 optical transport for telecom (1997)
- At the height of the "telecom boom" Canadian companies (Nortel, JDS Uniphase) supplied 41% ($3.3 B) of the world's demand for telecom optical components

Canadian Photonic Industry – An Overview

- 400 companies (77% in Quebec and Ontario)
- 25 000 employees
- 4.6 billion CAD revenues (2014); annual growth 10%
- Mainly small companies
- Historical pillars: telecommunications and defence & security
- Current drivers: biomedical sector (ONT) and sensing (QC)
- Growing sectors: energy and environment
- Technological shifts following the burst of the telecomm bubble
- Majority of companies add value: sub-system or system integration

Canadian Photonics R&D

- Currently, Canada invests 150 million CAD/year in photonics R&D centres and universities
- Government recognizes that photonics is an increasingly strategic sector
- Challenge: technology transfer between academic research and industry still inadequate
- Federal Budget 2016: 50 million CAD to the National Optics Institute (INO, Quebec City)
- INO provides R&D support and technical assistance to companies (manufacturing, biomedicine, the life sciences, defence and aerospace)

Photonics Clusters and R&D Centres in Canada

- Quebec Photonic Network (Réseau photonique du Québec)
- Ottawa Photonics Cluster
- Ontario Photonics Technology Industry Cluster
- Canadian Photonic Industry Consortium
- Centre for Optics, Photonics and Lasers (U. Laval)
- Institut National d'Optique
- Canadian Light Source Synchotron
- Advanced Laser Light Source
- University of Waterloo: Nanophotonics, Integrated Optoelectronics, Quantum Photonics
- And many others …

Key sectors and technological developments: aerospace

- Increased resolution of electro-optic systems such as imagers, fibre sensors and lidars
- Laser-additive manufacturing
- LEDs and lasers for display and illumination
- Improved 3D displays
- Increased use of fibre lasers

Key sectors and technological developments: automotive

- Improved image sensors and vision systems
- Much higher accuracy of manufacturing systems through photonic technologies
- 5-axes manufacturing equipment guiding laser processing
- Advanced manufacturing with an improved quality factor
- High-power, high-frequency and short-pulse lasers

Key sectors and technological developments: communications and microelectronics

- Integrated photonics with Silicon Photonics and Indium Phosphide technologies (PICs)
- More accessible nano-photonics
- Quantum dot-based lasers and amplifiers
- High-power, short-pulse lasers applied to micro-fabrication
- Moving toward mid-infrared and Terahertz spectral windows

Key sectors and technological developments: defence and security

- Rapid increase of photovoltaic capability
- Multi-sensing capability
- Spectroscopic detection of chemicals
- Hyper-spectral, multi-spectral, polarization-based and quantum sensors
- Higher-power and wavelength diversification of fibre lasers

Key sectors and technological developments: energy

- Reliability improvement
- Photonic packaging for harsh environments
- Increased availability of photonic solutions
- Wider use of spectrum
- Increasing use of high-power lasers

Natural Resources

- Automated fielded sensors
- Fielded spectroscopy systems
- Quantum sensing to differentiate materials

Key sectors and technological developments: health and medical sector

- Quantum optics for sources and sensing
- 3D imaging
- Fibre lasers tuned to diverse applications

Pharmaceutical Sector:

- Imaging spectroscopy with higher spatial and spectral resolution, and near-field imaging
- Use of high-power/ultrafast lasers
- Increased use of integrated optics
- Multimodal imaging
- Improving light sources, LEDs, broadband, near-infrared, far-infrared, lasers

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National Research Council

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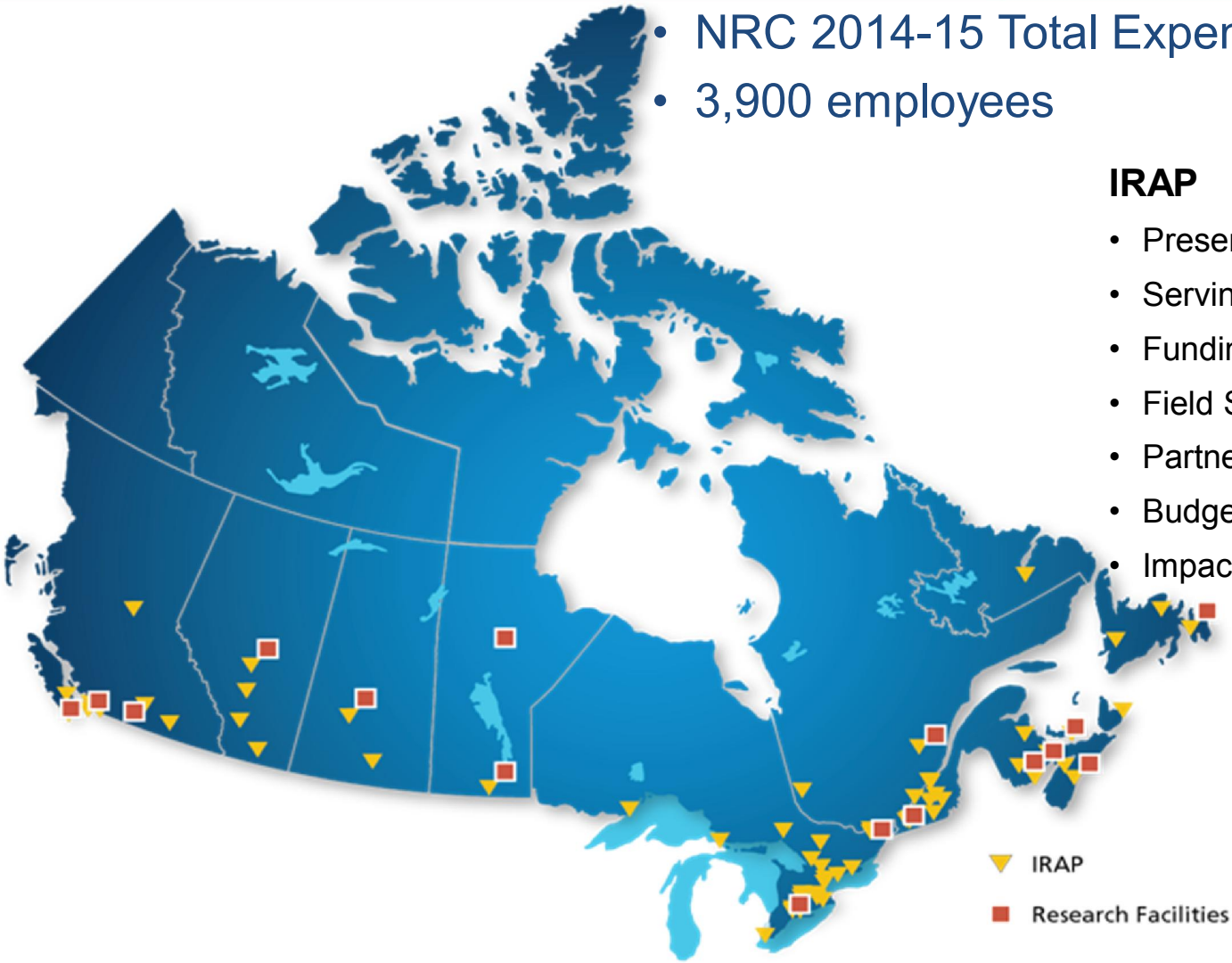
Canada

Canada's EUREKA National Office

- The National Research Council manages Canada's EUREKA Office
- The National Research Council's Industrial Research Assistance Program (IRAP) is the main national funding body for EUREKA in Canada
- Joined EUREKA in 2012
- Joined Eurostars in 2016

About the National Research Council

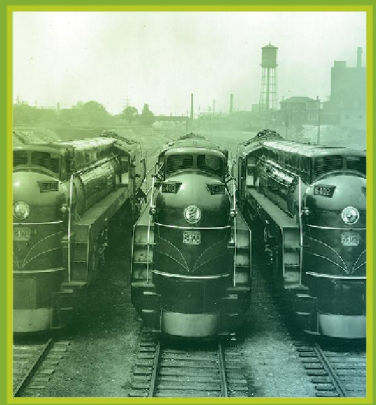
- NRC 2014-15 Total Expenditures: M $955.7
- 3,900 employees

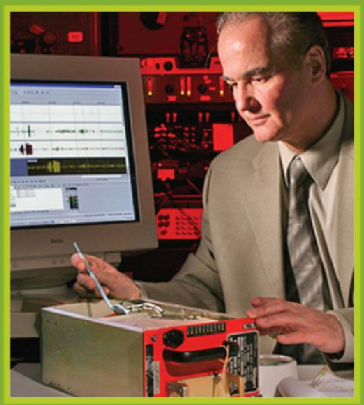
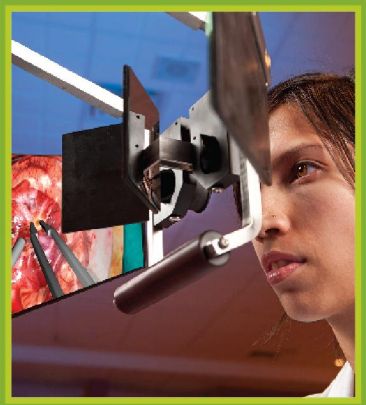


IRAP

- Present in124 locations
- Serving 10,000 SME
- Funding 3,000 SME/year
- Field Staff: 250 Advisors
- Partners: 200 Organizations
- Budget: $300M
- Impact: $1 IRAP → $10 Revenue

NRC – A Century of Innovation




1920s
Concrete for a harsh climate

1930s
Redesigned steam locomotive

1940s
Wartime innovations: radar, atomic energy

1950s
Pacemaker, electric wheelchair

1960s
Crash position indicator

1970s
Anti-counterfeiting technology

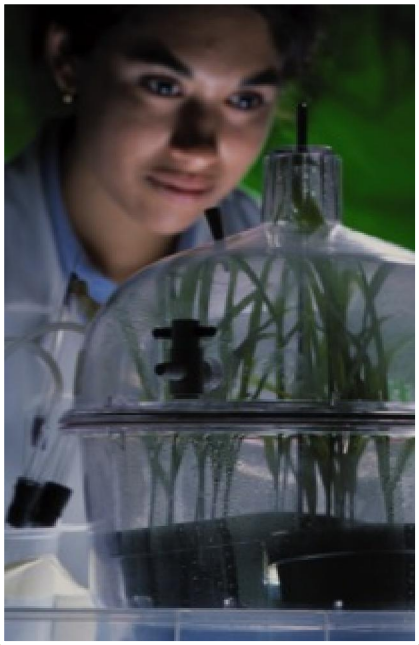
1980s
Canadian Astronaut Program, Canadarm

1990s
Synthetic meningitis C vaccine

2000s
Simulated brain surgery

2010s
Biofuel for civil aircraft

NRC business lines



Strategic Research & Development

National Science Infrastructure

Technical Services

Industrial Research Assistance Program (IRAP)

Canadian results, 2013 to 2016-06

61 Network Projects, 56.8€M total budget

12 Cluster Projects, 125€M total budget (20€M from Canada)

- Germany: 12 Projects (7.2€M)
- UK: 12 Projects (9.2€M)
- Israel: 11 Projects (15.16€M)
- Finland: 5 Projects (2.5€M)
- France: 4 Projects (3.34€M)
- Spain: 3 Projects (2.35€M)
- Switz.: 3 Projects (1.64€M)

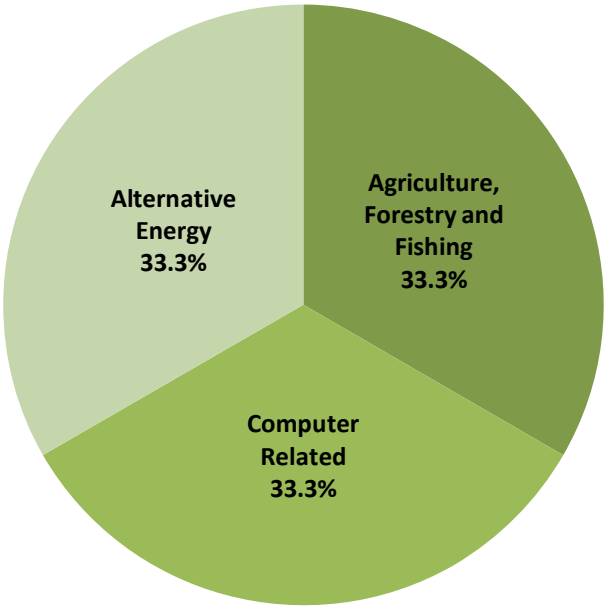
The National Office for EUREKA is managed by NRC, jointly delivered by International Relations Office (IRO) & Industrial Research Assistance Program (IRAP)

Canada-Switzerland EUREKA Portfolio*

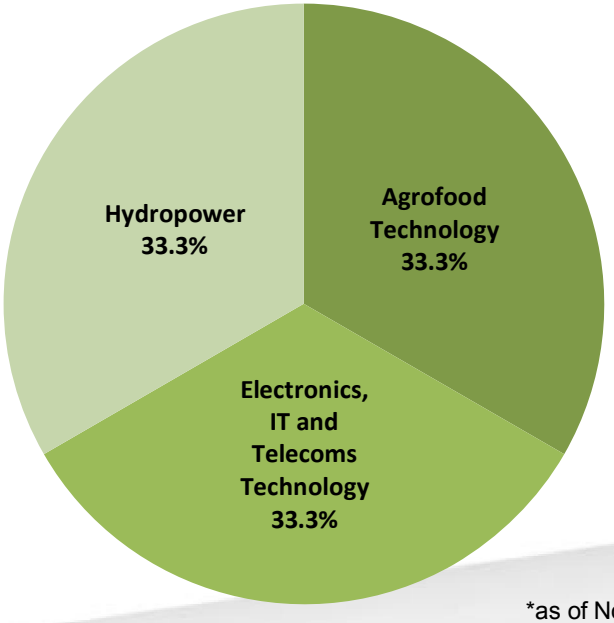
EUREKA Network Projects = 3

Total Investment (M Euro)	1.64
Total CAD Investment (M Euro)	0.80
Canadian Lead	67%
Number of Participants	6
Number of Canadian Participants	3

Market Sector



Technology Sector



*as of November 29, 2016

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IRAP funding for Eurostars

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Help for EUREKA (incl. Clusters)

A. SME eligible for IRAP funding

- Firm located in Canada, incorporated, profit-oriented
- 500 or fewer full-time-equivalent employees
- Objective to grow through technological innovation
- Capacity to undertake international project

➢ **Guidance and (maybe) funding from IRAP**

B. All others (University, Research Center, Large firm, Other SME, …)

➢ **Guidance from NRC** International Relations Office

➢ Participants self-fund or look for alternative sources

Help for **Eurostars**

- **Eurostars** assess the projects
- **IRAP** performs a Financial Viability Check
- **Eurostars** will rank all projects, and put a threshold above which projects are Selected
- For projects Selected “i.e. Awarded” with Canadian SME eligible for **IRAP** funding:
  - **IRAP** will fund the Canadian SME.
  - **IRAP** funding criteria (formula) will apply.
  - **IRAP** disbursement process will apply.

IRAP Funding parameters

This program is* discretionary; *IRAP* decides if the firm and the project are a good 'investment' decision.

- Non-repayable contribution (grant-like).
- The larger the amount, the better must be the Business Case and the Technological Innovation: 50k$, 100k$, 350k$, >500k$ (rare).
- Typical support is up to 50% of project cost, which includes:
  - **Salaries**, excluding bonuses and such.
  - **Overhead**, typically 55% of salaries.
  - **Contractors** cost, net of taxes.
- Monthly claim, as reimbursement for project expenses (good for cash flow!)
- SR&ED may apply on balance of total project cost!

**** Or Eurostars, as the case may be***

SR&ED Tax Incentive Program

- Scientific Research and Experimental Development Tax Incentive Program
- Two tax incentives: (1) a deduction to reduce the income for tax purposes; and (2) an investment tax credit
- Basic & applied research and experimental development
- Eligible expenses: wages and salaries, overhead expenses, materials, contract expenditures
- Foreign companies may qualify through a Canadian subsidiary of a foreign parent or a Canadian-controlled private corporation
- Provincial R&D tax incentive programs may apply

Eligibility for IRAP Funding

If the Canadian company meets all of the following criteria:

- incorporated and profit-oriented entity, located in Canada with fewer than 500 full-time employees
- have the desire and potential to improve innovation capacity
- open to developing a trusting relationship with NRC-IRAP
- have the objective to grow and generate profits in Canada through the development and commercialization of innovative, technology-driven new or improved products, services, or processes.

Your Canadian partner company <u>may</u> be eligible for support

Synchronizing IRAP and EUREKA

- In many countries, applicants must obtain the EUREKA Label before they can submit their funding application.
- In Canada, both applications proceed in parallel.
  We are optimistic!
- We synchronize EUREKA labelling and IRAP funding decision (as best as we can).
- Actual project start may depend on the foreign partners' funding decision and timing.
- IRAP funding may be awarded with a clause relative to obtaining the EUREKA label and the funding for the partners.

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Alternative sources of funding for EUREKA & Eurostars

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Indirect funding as a contractor

- Case: SME applies to EUREKA or Eurostars, and is awarded financial support.
  - Project costs include **contract with University or other**.
  - SME must have rights on IP (ex: strong licence).
  - ➢IRAP may support up to 50% of contract cost (before tax).

NSERC Idea to Innovation (i2i) Grant

Case: University research with foreign collaboration.

1. Build your i2i project, add a Canadian industry partner to make a strong proposal
   - Phase I: Reduction-to-practice
   - Phase II: Technology enhancement (with industry partner)
   - If Canadian partner is SME, they may get IRAP funding!
2. Involve foreign partners in a EUREKA or Eurostars project

Other funding sources, examples

- Quebec: PSR-SIIRI – International Research & Innovation. SME, Universities, Research Centers, etc.
- Alberta: Funding for SME, Call-for-proposals w/France (deadline Dec.20, 2016; contact IRAP)
- Natural Resources Canada (NRCan), and Sustainable Development Technology Canada (SDTC): Occasional calls for projects.

- SMEs may call our **NRC Concierge Service**, for free tailored advice about all government programs in Canada https://concierge.innovation.gc.ca/

What Canada has to offer

- Extensive photonics research infrastructure
- New technologies that can be leveraged into commercial success
- Preferred access to North American markets through NAFTA
- Attractive cost of doing business
- The lowest business costs in the G7 for R&D-intensive sectors, with a 27.7% cost advantage over the US

Thank you for your interest and attention!

The Embassy of Canada is your main point of contact for any further inquiries regarding partnership or investment opportunities with Canada

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