

**Professor Sophie LaRoche**  
**Canada Research Chair APTEC**  
**Advanced Photonic Technologies for Communications**

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Director  
Center for Optics, Photonics and Lasers (COPL)  
Université Laval, Québec, Canada G1V 0A6

### Education

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| Ph. D. in Optics,<br>College of Optical Sciences<br>University of Arizona, 1989-1992 | Thesis: "Origin and applications of photosensitivity in germanium-doped silica optical fibers"<br>Supervisor: Prof. G. I. Stegman                             |
| M. Sc. in Physics<br>Université Laval<br>1987-1988                                   | "Non-linéarités d'origine thermique dans des couches minces de verre dopé au CdS pouvant être utilisées comme guides d'onde"<br>Supervisor: Prof. R. Tremblay |
| B. Sc. in Engineering Physics<br>Université Laval, 1983-1987                         |   |

### Professional experience

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| 2020-     | Director, Center for Optics, Photonics and Lasers (COPL)  |
| 2012-     | Holder of the Canada Research Chair (Tier 1) in Advanced Photonics Technologies for Communications  |
| 2000-2010 | Holder of the Canada Research Chair (Tier 2) in Optical Fiber Communications and Components   |
| 1996-     | Professor, Department of Electrical and Computer Engineering, Université Laval <ul style="list-style-type: none"><li>• Member of the Center for Optics, Photonics and Lasers (COPL)</li></ul>   |
| 1992-1996 | Defence Scientist, Defence Research and Development Canada - Valcartier <ul style="list-style-type: none"><li>• Research and development in electro-optics countermeasures.</li><li>• Participation in TTCP international panels.</li></ul> |

### Awards

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- 2016 Best teacher award of the second year class given the Student association of the Electrical and Computer Engineering Department, Université Laval.
- IEEE Women in Engineering best paper award of the CCECE'2018 conference (IEEE Canada)
- 2015, Fellow of the Optical Society of America (OSA) "for contributions to optical communications by proposing innovative fiber optic components such as super-structured fiber Bragg gratings for chromatic dispersion equalizers, multi-wavelength fiber lasers and optical code-division multiplexing."

- 2010, Summa Research Award, Faculty of Science and Engineering, Université Laval in recognition of career accomplishments in research.
- 2010, LeSoleil-Radio-Canada, personality of the week in recognition of leadership in the Québec City community.
- 2010, Science and technology award, YWCA, Québec in recognition of excellence in a non-traditional career for women.
- 2009, NSERC Discovery Accelerator Supplement, Canada, in recognition of outstanding accomplishments in research (national competition).
- 2005, 2011, 2012, 2013, 2014 Professeur étoile, Faculté des sciences et de génie, Université Laval in recognition of excellence in teaching (based on student evaluations).
- 1991, CAP-Newport award, Canadian Association of Physics.
- 1988, Prix d'excellence étudiant-chercheur de l'ACFAS.
- 1987, John H Chapman award, SPAR Aerospace.
- 1987, OIQ outstanding student award, Ordre des ingénieurs du Québec.
- 1986, Julian C. Smith award, Canadian institute of engineers.

## Expertise

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More than twenty years of experience in: fiber optics propagation and components, fiber optics communications, fiber Bragg gratings and their applications, fiber amplifiers and lasers (tunable, multiwavelength, high power, narrow frequency or pulsed), all-optical signal processing (dispersion compensation, photonic code identification, pulse rate multiplication, pulse shaping and beam forming), analog optical transmissions (radio-over-fiber, GPS-over-fiber, ultra-wideband), high speed optical transmissions, optical packet switching and routing, semiconductor devices (amplifiers and lasers), optical code-division-multiple-access and integrated optics (silicon photonics).

## External Technical and Advisory Committees

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- Elected Director at large (member of the Board of Directors) of the Optical Society of America, an international professional society with more than 20000 members.
- Nominated as a member of the governing council for the Natural Sciences and Engineering Research Council of Canada (NSERC) by the Honorable Kirsty Duncan, Minister of Science and Minister of Sport and Persons with Disabilities (February 2018), for three years.
- Member of NSERC's Committee on Research Partnerships (CRP), 2018- .
- President of NSERC prize selection committee 2019.
- Member of the *Commission de la recherche* Université Laval (May 2018-April 2021).
- Member of the Advisory committee to Quebec's Minister of *Développement économique, Innovation et Exportation*, M. Clément Gignac, for the revision of Québec investment policy in research and innovation (Groupe-conseil sur la Stratégie québécoise de la recherche et de l'innovation, SQRI), 2009-2010.
- Chair of the Technical Advisory Committee, CMC Microsystems (2013-2014), member of this committee (2011-2014).
- Member of the Board of Directors, CMC Microsystems (2014-2016).

- Member of technical committees of major international conferences:
  - *Photonic Networks and Devices* topical meeting (NETWORKS'2017), OSA Advanced Photonics Congress (APC).
  - *Space-Division Multiplexing and Multimode Photonics* (SDMP'2016), IEEE summer topical meeting.
  - *Conference on lasers and electro-optics* (CLEO'2014, CLEO'2015), Science and innovation subcommittee 12: Lightwave Communications and Optical Networks.
  - *Asia Communications and Photonics Conference* (ACP'2012), Subcommittee SC1 Novel Fibers and Fiber-Based Devices, Guangzhou, China, 7 - 9 November 2012.
  - *Optical Fiber Communication Conference* (OFC), Sub-committee C: Gratings, photonic band-gap and signal conditioning devices, in 2003 and 2004; Sub-committee G: Optical Processing and Analog Subsystems in 2009 and 2010; Sub-committee D5 on Fiber-optic and Waveguide Devices and sensors in 2019- .
  - *Bragg Grating, Photosensitivity and Poling in Glass Waveguides* (BGPP), OSA topical meeting, in 2001, 2003, 2005, 2010 & 2012. Chair of the Applications of Gratings and Poled Glass subcommittee in 2010 & 2012.
  - *Photonics in Switching* (2008), OSA topical meeting.
  - *Photonics North* SPIE meeting in 2007, 2008 and 2012. Chair of the *Fiber Lasers and Amplifiers Conference*, 2007 and 2008.
- Member of award selection committees, promotion committees and technical committees of grant agencies. Some examples are:
  - John Tyndall award selection committee (2020), Optical Society of America.
  - Prix du Québec - Marie Victorin, Gouvernement du Québec (2017). Established in 1977, the *Prix du Québec* are the highest distinction awarded by the Québec government for contributions to arts and sciences. The Prix Marie-Victorin recognizes exceptional contributions in natural sciences and engineering.
  - Esther Hoffman Beller Medal Committee (2016), Optical Society of America (OSA).
  - Prize for Research in Laser Science and Applications (2015), European Physical Society (EPS), Quantum Electronics and Optics Division (QEOD).
  - Prix d'excellence de l'Université du Québec (2012), Université du Québec.
  - Richardson Medal Award Committee (2005-2007), Optical Society of America (OSA).
- Regular member of FRQ-NT grant and scholarship committees, for example:
  - Team grants: committee 210 (Imaging Systems) in 2006, committee 314 (Photonics and Plasmas) in 2007.
  - Post-doctoral scholarships B3, committee 14 (Information technologies and communications) in 2010, committee 05A (Information technologies and communications) in 2011 and 2012.
- President of the Québec Chapter of the Optical Society of America (OSA) in 1994-1995; member of the executive committee from 1991 to 1996.
- Honorary President, La Science et les filles: un duo électrisant – Québec, 2010.
- Regular reviewer for all major journals in the field of photonics.

## Leadership and Collaborative Research

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- I was the project leader (principal investigator) of 4 multi-university projects of the Network of Centers of Excellence Canadian Institute for Photonic Innovations (CIPI): Fiber Optics Components and Devices, 1999-2002; Advanced Fibre Laser Systems, 2002-2005; Packet Switched Networks with Photonic Code-Based Processing, 2004-2009; Optical Packet-Switched Architecture and Technologies for Data Centers, 2009-2012.
- I obtained six major equipment grants of the Canadian Foundation for Innovation (three as principal investigator, one as co-principal investigator and two as investigator) totalling more than an \$8.6 millions in equipment for the Optical communication laboratory. This laboratory now provides state-of-the-art facilities for research in silicon photonics, optical fiber design and characterization, and optical fiber transmission. It includes a full suite of high resolution and high bandwidth characterization equipment, as well as a very high bit rate optical transmission testbed for advanced modulation formats.
- I regularly obtain operating funds from major Canadian grant agencies. I have been the principal investigator on several industry sponsored projects. As an example, I led collaborative research projects on fiber Bragg gratings with TeraXion inc., silicon photonics with Ciena (formerly TeraXion High speed component division) and fiber lasers with CorActive Hightech.
- I have done collaborative research that have resulted in joint journal paper publications with several academic and industrial laboratories. A non-exhaustive list is: Institut National d'optique (INO), McGill University, INRS-Énergie Matériaux Télécommunications (INRS-ÉMT), École de technologie supérieure (ÉTS), Université de Sherbrooke, TeraXion (now Ciena), Coractive HighTech, University of Ottawa, Queen's University, University of Toronto, Telecom ParisTech (France), ENSSAT (France), University of Glasgow (UK), University of Bristol (UK), Nokia Bell Labs (USA), III-V Lab (France), Alcatel-Lucent (France), and the University of Sydney (Australia).

## Publications

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In career, I have published **400 papers**; about half *in peer-reviewed journals*, almost all IEEE or OSA, and the other half *papers in highly selective conferences* such as OFC (Optical Fiber Communications Conference), ECOC (European Conference on Optical Communications), and CLEO (Conference on Lasers and Electro Optics). All students under my direct supervision, including most undergraduate students, have conducted original research that has led to scientific publications in peer-reviewed journals or international conferences. As per Google Scholar, in 2020 my work had received *more than 6500 citations (h-index>40, i10-index>150)*.

## Teaching and supervision

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My team is currently composed of seven graduate students, two post-doctoral fellows and one visiting researcher. More than 60 students and post-doctoral researchers have graduated from my laboratory and found employment in the industry, research institutes and universities. Some have done post-doctoral internships in prestigious laboratories, three former Ph.D. students and two PDF now hold tenure track positions. My students acquire a broad vision of the photonics/communication fields by participating in the activities of Quebec funded Strategic Cluster Center for Optics, Photonics and Lasers (COPL). Students trained in my laboratory acquire a mix of theoretical and practical knowledge and their thesis always involve both

simulations and experimental work. They participate in the definition of research objectives and are involved in discussions with industrial partners. These skills make them extremely attractive either for academic positions or for research positions in the photonic industry.

At Université Laval, in addition to teaching regular courses of the Electrical Engineering curriculum, I have developed three new courses in the field of optics and photonics including a graduate course on optical fiber components, an undergraduate course on optical communications that includes 6 laboratory sessions, and a continuing education course on fiber optic communications that was given more than twelve times to engineers and professionals of the industry. I also participated to an online course on simulations of optical communication systems in collaborations with colleagues from Queen's University, McGill University, and Université Laval.

### **Professional Societies**

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- 2000-present, IEEE (Institute of Electrical and Electronics Engineers), Senior member.
- 1994-present, OIQ (Ordre des ingénieurs du Québec).
- 1989-present, OSA (Optical Society of America), Fellow member.