ETOP 2019
Québec, Canada

CONFERENCE PROGRAM

Education and Training in Optics and Photonics

May 21-24, 2019
Québec City, Canada

www.facebook.com/ETOP2019
http://etop2019.copl.ulaval.ca
etop2019@copl.ulaval.ca

ETOP 2019 - PROGRAM AT A GLANCE

Tuesday, May 21, 2019			
09:00 - 14:00	**Registration** **Hall 2000**		
14:00 - 16:30	Visit of COPL at Université Laval Registration required at badge pick-up		
16:30 - 18:30	Free time		
18:30 - 20:00	Welcome reception Espace Urbain		

Wednesday, May 22, 2019			
09:00 - 10:30	**10:00** IDL Workshop with highschool students 309AB	Training using specialized software and platforms as practical tools *New technologies* 308A	Education through publication and research *Higher education* 308B
10:30 - 11:00		Coffee break (2000BCD)	
11:00 - 12:00		Training using specialized software and platforms as practical tools *New technologies* 308A	Education through publication and research *Higher education* 308B
12:00 - 13:00	Lunch (2000BCD)		
13:00 - 14:30	Meet, learn and share - A multidisciplinary get-together 309AB		

14:30 - 17:00	Training the trainer in OPTIK: Outreach for profressionals who teach in informal environments and K-12 schools (McKee, Posner) *Registration required* 307A	Optics and photonics education in diverse, remote or un-priviledged communities Softskills: enhancing technical training *Special topic-Challenges* 307B	AR/VR for optics and photonics education Online classroom and remote learning *New technologies* 308A	Curriculun development and improvement *Higher education* 308B
17:00 - 18:30	Poster session & Cocktail 2000BCD			
18:30 - 23:15	Conference Banquet at the Sugar Shack			

Thursday, May 23, 2019				
09:00 - 10:30	Using digital technologies in the teaching and learning of STEM - Ten innovative things that work in active learning classrooms (Whittaker) *Registration required* 307A	Hands-on experiments and demonstra-tions for young audiences *K12 Outreach* 307B	Optics and photonics curriculum and programs *Industry and education* 308A	Laboratory curriculum and experiments for hands-on training *Higher education* 308B
10:30 - 12:00	Diversity, inclusion and equity activity Leslie A. Rusch 309AB			
12:00 - 13:15	Lunch (2000BCD)			
13:15 - 14:15	PN Plenary session - Donna Strickland, University of Waterloo, Canada 2000A			

14:15 - 14:30	Coffee break (2000BCD)			
14:30 - 16:30	Problem-based learning - Enhancing learning in the STEM classroom (Donnelly, Massa) *Registration required* 307A	Optics in natue and in our surroundings Art and photonics *Special Topic-Nature and art* 307B	Industry and academia interaction in education In-company training and internships *Industry of education* 308A	Laboratory curriculum and experiments for hands-on training *Higher education* 308B
16:30 - 18:00	Training photonics experts for industry roles Panel and cocktail 309AB			
18:00 - 19:00	Free time			
19:00 - 23:30	Special activity at Wendake Tickets required			

Friday, May 24, 2019				
09:00 - 10:30	How to teach optical design software - Getting your students started (Bentley) *Registration required* 307A	Program evaluation *K12 Outreach* 307B	Problem-, project- and case-based learning *Pedagogical models* 308A	Development and multidisciplinary training programs *Higher education* 308B
10:30 - 11:00	Coffee break (Hall 310)			
11:00 - 12:00	How to teach optical design software - Getting your students started (Bentley) *Registration required* 307A	K12 education and outreach initiatives *K12 outreach* 307B	Novel models and methods for photonics education *Pedagogical models* 308A	Light sources and radiometry in education *Higher education* 308B

PN 2019 - Program at a glance

Tuesday, May 21, 2019					
08:00 - 10:25	Theory Design 2000A	Quantum 2101	Nonlinear 2104AB	Biophotonics 207	
10:25 - 10:55	Coffee Break - Hall 2000				
10:55 - 12:00	Theory Design 2000A	Quantum 2101	Nonlinear 2104AB	Biophotonics 207	Lumerical 2000B
12:00 - 13:00	Lunch Break - On your own				
13:00-13:15	Opening Welcome 2000A				
13:15-15:00	Plenary Lecture - Robert W. Boyd, University of Ottawa, Canada 2000A				
15:00 - 15:15	Coffee Break - Hall 2000				
15:30 - 18:00	Theory Design 2000A	Quantum 2101	Nonlinear 2104AB	High Power 207	
18:00 - 19:30	Welcome Evening & Cocktail Espace Urbain				

Wednesday, May 22, 2019					
08:30 - 10:30	Quantum 2000A	Material 2101	Optical 2104AB	Biophotonics 207	
10:30 - 11:00	Coffee Break & Exhibition Hall Visit				
11:00 - 12:00	Plenary Lecture - Peter Winzer, Nokia Bell Labs, USA 2000A				
12:00 - 13:00	Lunch Break & Exhibition Hall Visit 2000BCD				
12:00 - 13:00	Industry Student Lunch 306A				
13:00 - 15:00	Theory Design 2000A	Nonlinear 2101	Optical 2104AB	High Power 207	Entrepreneurship 2000B
15:00 - 15:15	Coffee Break & Exhibition Hall Visit				

15:15 - 17:00	Theory Design 2000A	Nonlinear 2101	Optical 2104AB	High Power 207	Entrepreneurship 2000B
17:00 - 20:00	Poster session & COPL 30th Anniversary Cocktail 2000BCD				
Thurday, May 23, 2019					
08:00 - 10:25	Theory Design 2000A	Nonlinear 2101	Green 2104AB	Biophotonics 207	Quantum 2000B
10:25 - 11:00	Coffee Break & Exhibition Hall Visit 2000BCD				
11:00 - 12:00	Theory Design 2000A	Materials 2101	Optical 2104AB	Biophotonics 207	
12:00 - 13:15	Lunch Break & Exhibition Hall Visit 2000BCD				
13:15 - 14:15	Special Nobel Talk Session - Donna Strickland, University of Waterloo, Canada 2000A				
14:15 - 14:30	Short transition Break 2000BCD				
14:30 - 15:35	Theory Design 2000A	Materials 2101	Green 2104AB	High Power 207	COPL 306A
15:35 - 16:00	Coffee Break and PN Awards Session 2000BCD				
16:00 - 18:35	Theory Design 2000A	Materials 2101	Green 2104AB	Optical 207	COPL 306A

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ORGANIZING COMMITTEE

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Anne-Sophie Poulin-Girard
Université Laval, Québec, Canada

Joseph A. Shaw
Montana State University, Montana, USA

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Véronique Zambon - Telops, Canada

WELCOME MESSAGE

On behalf of the scientific committee and local organizing committee, it is our pleasure to welcome you to Québec for the 15th edition of Education and Training in Optics and Photonics.

Since the first meeting in 1988 in San Diego, ETOP has traveled around the world, bringing together leading experts and educators around the topic of high quality training in optics and photonics at all levels. Along the way, ETOP has integrated the efforts of four professional organizations around a common goal: advancing and sharing knowledge in education in our field.

Light and light-based technologies touch the daily lives of everybody, and are central to the future development of the global society. Innovation in education is essential to solving the grand challenges faced by the optics and photonics community. We need leading education programs at all levels and relevant continuous training for the workforce, to be welcoming and inclusive with the future and current professionals, and to reach out to the young people and the general public to meet the growing demands of research, science and industry.

This year's technical program is rich and diverse with your contributions. It is divided into five tracks discussing higher education, the use of new technologies, industry training, pedagogical methods, and K-12 and outreach. Two special sessions address the special topics of challenges in optics, and optics and nature. Crowned with four free workshops, an industry panel, a multidisciplinary activity and the social program, we hope you will appreciate this 15th edition that celebrates the long-lasting success of ETOP.

Enjoy the conference and your time in Québec, and we hope to see you again in 2021 for the next edition of ETOP.

Anne-Sophie Poulin-Girard
Conference co-chair

Joseph A. Shaw
Conference co-chair

GENERAL INFORMATION

VENUE
Quebec City Convention Centre
900, Honoré-Mercier
Québec QC

PARKING
There are many underground parking spaces close to the Centre. More specifically, Marie-Guyart complex, Place Québec, Delta Hotel and finally in the Place D'Youville parking lot all linked by underground connections. These lots operate 24 hours a day, 7 days a week.

REGISTRATION
All participants should register at registration desk and take relevant certificates, materials and invoice. The registration desk is located in Hall 2000 and it will be open at the Conference venue:

**Friday registration desk will be located in Hall 310.

Tuesday, May 21	07:00 - 19:00
Wednesday, May 22	07:30 - 18:00
Thursday, May 23	08:00 - 16:00
Friday, May 24 **Hall 310	08:30 - 11:30

EXHIBITION HALL
Wednesday, May 22	10:00 - 20:00
Thursday, May 23	10:00 - 16:00

NAME BADGE
Please wear your name badge at all times. This will ensure your access to the conference rooms and Exhibition Hall.

CERTIFCATE OF ATTENDANCE
An official Certificate of Attendance will be provided. If you need it, come to ask for it at the Registration Desk.

INTERNET ACCESS / MOBILE PHONE
Free internet facilities are available to all pariticipants in the Conference Venue. During the meetings, please tun off your mobile phone or set it to mute.

DISCLAIMER
The Education and Training in Optics and Photonics secretariat and organizers cannot assume liability for personal accidents, loss of or damage to private property of participants, and accompagnying persons, either during or directly arising from the Education and Training in Optics and Photonics Conference. Participants should make their own arrangement with respect to health and travel insurance.

SECURITY & SAFETY
Please do not leave bags and luggage unattended at any time, whether inside or outside session rooms.

ANTI-HARASSMENT POLICY
IEEE, OSA, SPIE, and ICO are committed to providing a safe conference environment because all individuals are entitled to respectful treatment. Any form of harassment, including, but not limited to, inappropriate conduct relating to an individual's race, color, religious creed, sex, national origin, ancestry, citizenship status, age, gender or sexual orientation, other offensive remarks, intimidation, stalking , verbal abuse, threats of violence, or sexual harassment, is unacceptable. For more information, visit our website : http://etop2019.copl.ulaval.ca/diversity.html

SPEAKER READY DESK
All speakers are required to check in at the Speaker Ready Desk to upload their presentation at least 1 hour prior to the start of their session. The staff will be available to answer your questions and to help you upload your presentation from your USB memory stick.

SOCIAL EVENTS

Tuesday, May 21 , 2019

WELCOME RECEPTION - CENTRE DES CONGRÈS DE QUÉBEC

ROOM: Espace Urbain
Tuesday, May 21, 2019 - 18:30 (1h30)

Included with your registration Get your conference off to a good start! Join ETOP and Photonics North attendees for a joint event at the conference venue. The welcome reception provides an excellent opportunity to network, meet old friends and colleagues, as well as meet new people as the program begins. Light food and beverages will be served.

Wednesday, May 22 , 2019

CONFERENCE BANQUET - SUGAR SHACK

Wednesday, May 22, 2019 - 18:30 (5h00)

Included with your registration **Bring your plaid shirt** and join us for a copious traditional meal in a warm, relax, and cozy atmosphere of this joyful Québec traditional activity. And, while the maple syrup alone makes the excursion worthwhile, get ready to dance to folk songs and learn more about the sweet-smelling process of making maple syrup with specialists as Québec accounts for 74% of the world's production. Transportation to and from the venue will be provided.

Thursday, May 23 , 2019

VISIT AND DINNER AT A TRADITIONAL HURON SITE - 70 CAD

Thursday, May 23, 2019 - 19:00 (4h30)

Tickets available The trip to the Traditional Huron Site located on the Huron-Wendat reservation is a unique opportunity to discover the history, culture and lifestyle of Hurons of the past and of today.

"The evolutionary path of the Americas has to a certain extent historically tied our people. While visiting our recreated village and by letting yourselves be carried away by our stories, you will discover the hidden faces of the Huron way of life. We trust your stay amongst us will bring a better understanding of our evolution and culture." - Mario Gros-Louis, Owner and founder

TECHNICAL EVENTS

Wednesday, May 22 , 2019

MEET, LEARN AND SHARE - A MULTIDISCIPLINARY GET-TOGETHER

ROOM: 309AB
Wednesday, May 22, 2019 - 13:00 (1h30)
Moderators: Philippe Archambault, Professor of biology, Université Laval and Simon Rainville, Professor of Physics, Université Laval

You are involved in multidisciplinary training programs, would like to engage in multidisciplinary education, or you are simply curious? Join us for this special event to meet with colleagues from other fields and discuss challenges and best practices in multidisciplinary education. During the activity, you will have the opportunity to exchange with other ETOP attendees and specialists from environmental sciences, health, and astrophysics. It is your choice ! Visit our registration platform to select your topics of interest and reserve your seat at the table. Stick around to share your ideas with other community members after the activity and enjoy a sweet treat. The activity is free to all ETOP attendees but registration is required. The activity will be followed by a networking session

1- RISKY BUSINESS- TRAINING FOR MEETING THE CHALLENGES OF CLIMATE CHANGE

Christian Katlein , Researcher, Alfred-Wegener-Institut

AREAS OF INTEREST: Sea ice physics

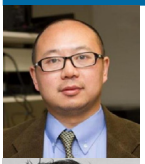
Normand Voyer, Professor of chemistry, Université Laval

AREAS OF INTEREST: Green chemistry

Martine Lizotte, Research assistant, Takuvik Joint international laboratory Canada-France

AREAS OF INTEREST: Marine biology, oceanography

2- SHEDDING LIGHT ON HUMAN HEALTH WITH NEXT GENERATION LEARNING



Qiyin Fang, Canada Research Chair in Biophotonics, McMaster University

AREAS OF INTEREST: Biomedical, Smart systems

Frédéric Raymond, Researcher, Institute of nutrition and functional foods

AREAS OF INTEREST: Microbiota, Bioinformatics

Denis Boudreau, Professor of chemistry, Université Laval

AREAS OF INTEREST: Spectroscopy, Nanotechnologies

3- TO THE STARS AND BEYOND - CROSS TRAINING IN OPTICS AND ASTRONOMY

Olivier Hernandez, Director, Rio Tinto Alcan Planetarium

AREAS OF INTEREST: Galaxies kinematics and dynamics, Instrumentation, Exoplanet detection

Gilles Joncas, Director, Département de physique, génie physique et optique, Université Laval

AREAS OF INTEREST: Physics of the interstellar medium

Simon Thibault, Professor of physics and physical engineering, Université Laval

AREAS OF INTEREST: Astronomical instrumentation, Adaptive optics

Wednesday, May 22, 2019

JOINT ETOP-PHOTONICS NORTH POSTER SESSION

ROOM: 2000BCD
Wednesday, May 22, 2019 - 17:00 (1h30)

You are invited to attend the joint ETOP-Photonics North Poster Session to view the high-quality posters and engage the authors in discussion. Enjoy light refreshments while networking with colleagues in your field. For information for poster presenters, visit the Instructions for presenters and authors section of the website.

Thursday, May 23 , 2019

DIVERSITY, INCLUSION AND EQUITY EVENT

ROOM: 309AB
Thursday, May 23, 2019 - 10:30 (1h30)
Plenary speaker: Leslie A. Rusch, Professor, Université Laval

Welcome to ETOP 2019 diversity, inclusion and equity event. Join us for a special presentation by Prof. Leslie A. Rusch and for a coffee break to share your ideas with other community members.

NOBEL LAUREATE DONNA STRICKLAND - PHOTONICS NORTH PLENARY SPEAKER

ROOM: 2000A
Thursday, May 23, 2019 - 13:15 (1h00)

Did you know that your ETOP registration gives you access to all of Photonics North technical content, including 2018 Physics Nobel Laureate Donna Strickland keynote talk? Visit Photonics North website for more information.

Thursday, May 23 , 2019

TRAINING PHOTONICS EXPERTS FOR INDUSTRY ROLES - PANEL AND COCKTAIL

ROOM: 309AB
Thursday, May 23, 2019 - 16:30 (1h30)
Moderator: Dirk Fabian, Community Lead, SPIE

Join us to hear our panel discuss what is at stake for industry sector seeking qualified personnel and the opportunity for relevant continuous education. It will be an opportunity to exchange about this crucial topic of the training of the next generation of scientist for the future of research, science, and industry. The discussion will be followed by a cocktail. This activity is included for all registered attendees of ETOP. Industry and academia representatives who would like to join the discussion and are not registered for ETOP can purchase tickets.

Dr. Markus Michler received his PHD from the University of Vienna in 2002 and now works as a lecturer in Physics and Photonics at the NTB in Buchs. He is responsible for the "Applied Photonics" module within the Swiss MSE Master's program and developed new curriculum in photonics within the NTB Bachelor "Systems Engineering".

Dr. Carmiña Londoño received her PhD from the Electro-Optics Technology Center (Tufts University), MS in Optics (University of Arizona), and BS in Physics (University of Lowell). In 2008. she joined the NSF Office of International Science and Engineering having programmatic responsibility for a multidisciplinary set of scientific collaborations with Latin America. She is currently Deputy Division Director for the NSF Division of Electrical, Communications & Cyber Systems.

Mathieu Drolet is Product and Technology Development Manager at TeraXion, a manufacturer of key photonic components for laser, telecommunications and sensing systems based in Quebec City. Mathieu has eight years of experience managing cross-functional teams in different organizations, and he led several product development programs from design to production. Mathieu sees first-hand the difference highly-qualified personnel can make to the success of technical projects. He holds a master and a bachelor of science in physics from Université Laval.

Marie-Christine Ferland is the General Manager of Optonique, Quebec's cluster of excellence in optics-photonics. Her renown leadership and collaboration approach are key when it comes to find innovative solutions for the photonics sector. She earned a degree in Physics and an MBA from Laval University and served the industry for more than 10 years in business development. Marie-Christine understands both the training from the academy and the need for talents in the industry.

WORKSHOPS

Wednesday, May 22 , 2019

TRAINING THE TRAINER IN OPTIKS: OUTREACH FOR PROFESSIONALS WHO TEACH IN INFORMAL ENVIRONMENTS AND K-12 SCHOOLS **REGISTRATION REQUIRED

Wednesday, May 22, 2019 - 14:30 (2h30)

Instructors: Mike McKee, Associate Director of Academic Support Services, University of Central Florida and Matthew Posner, Process specialist, Excelitas Technologies

Thursday, May 23 , 2019

USING DIGITAL TECHNOLOGIES IN THE TEACHING AND LEARNING OF STEM – TEN INNOVATIVE THINGS THAT WORK IN ACTIVE LEARNING CLASSROOMS **REGISTRATION REQUIRED

Thursday, May 23, 2019 - 9:00 (1h30)

Instructor: Chris Whittaker, Professor, Dawson College

PROBLEM BASED LEARNING – ENHANCING LEARNING IN THE STEM CLASSROOM **REGISTRATION REQUIRED

Thursday, May 23, 2019 - 14:30 (2h00)

Instructors: Judy Donnelly, co-PI, the PBL Projects and Nicholas Massa, Professor, Springfield Technical Community College

Friday, May 24 , 2019

HOW TO TEACH OPTICAL DESIGN SOFTWARE - GETTING YOUR STUDENTS STARTED **REGISTRATION REQUIRED

Friday, May 24, 2019 - 9:00 (3h00)

Instructor: Julie Bentley, Associate professor, University of Rochester

IDL WORKSHOP

Wednesday, May 22 , 2019

IDL WORKSHOP WITH HIGHSCHOOL STUDENTS

ROOM: 309AB
Wednesday, May 22, 2019 - 10:00 (1h00)
Organizers: Centre de démonstrations en sciences physique, Cégep Garneau

Thanks to the support of IDL and the participation of CDSP, four workshops will be given during ETOP (one each day) to groups of highschool students. One of these workshops will take place at the conference venue. ETOP participants are invited to attend. CDSP has create in the past three tinkering workshops (Magnetic Cars, Wind Turbine and Musical Instruments) in which teams of students have 60 minutes to build and test a specific device. The objective of the tinkering workshop is to offer activities that promotes people's interest in science and technology, while giving an opportunity to college students (the Ambassadors) to participate in a significant extracurricular activity in the community. A new activity about light will be created especially for ETOP and will ultimately enter CDSP portfolio of activities to be available to more young people.

IN 2018, SPIE GAVE MORE THAN $4 MILLION IN SUPPORT OF EDUCATION, OUTREACH, AND ADVOCACY

SPIE supports tomorrow's leaders—and the future of our industry—by providing scholarships, grants, and educational materials and opportunities.

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Innovators of Tomorrow in the Photonics Community
PhotonicsSociety.org

Educational Initiatives ◆ Community Outreach ◆ Humanitarian Activities

The IEEE Photonics Society is the professional home for a global network of scientists and engineers who represent the laser, optoelectronics and photonics community. The Society provides its members with professional growth opportunities, publishes journals, sponsors conferences and supports local chapter and student activities around the world.

Interested in Volunteering?
Please email PhotonicsSociety@ieee.org
for more information.

IEEE

ORAL PRESENTATIONS

Wednesday, May 22, 2019

TEACHING OPTICS AND PHOTONICS USING NEW TECHNOLOGIES

TRAINING USING SPECIALIZED SOFTWARE AND PLATFORMS AS PRACTICAL TOOLS

ROOM: 308A

Chair: Simon Rainville, Université Laval, Canada

9:00-9:15 NEW-TECH-1-2-1 / Demonstration polarization phenomenon and laser system simulation by software in university lecture course
Lyu Bohan, Bohan Photonics, Taiwan

9:15-9:30 NEW-TECH-1-2-2 / Insights into physical optics with virtual lab fusion for optics education
Olga Baladron-Zorita, Friedrich-Schiller-University Jena, Germany
Huiying Zhong, Site Zhang, Frank Wyrowski

9:30-9:45 NEW-TECH-1-2-3 / Lidar: a new self-driving vehicle for introducing optics to broader engineering and non-engineering audiences
Corneliu I. Rablau, Kettering University, USA

9:45-10:00 NEW-TECH-1-2-4 / Teaching photonic integrated circuits with Jupyter notebooks: design, simulation, fabrication
Wim Bogaerts, Universiteit Gent, Belgium

10:00-10:15 NEW-TECH-1-2-5 / Teaching digital holography using an interface
Ma Araiza-Esquivel, Universidad Autónoma de Zacatecas, Mexico
Pilar Cecilia Godina, Alfonso López-Martínez, Carlos Olvera-Olvera, Santiago Villagrana-Barraza, Diana Ortiz, Lluís Martínez-León, Enrique Tajahuerce

11:00-11:30 NEW-TECH-1-2-6 / Teaching of optical imaging and aberrations
Virendra N. Mahajan, College of Optical Sciences, The University of Arizona, USA

11:30-11:45 NEW-TECH-1-2-7 / Open source photonics at the Abbe School of Photonics
Reinhard Geiss, Friedrich-Schiller-University Jena, Germany
David Zakoth, Sabine Best, Christian Helgert, Oliver Mauroner, Thomas Pertsch

11:45-12:00 NEW-TECH-1-2-8 / A free spectroscopic databank of optical constants for use in optics education and modeling: Complex refractive index data n and k from 1.0 to 25 _m
Timothy J. Johnson, Pacific Northwest National Lab, USA
Tanya L. Myers, Ashley M. Oeck, Bruce E. Bernacki, Russel G. Tonkyn, John S. Loring

HIGHER EDUCATION IN OPTICS AND PHOTONICS

EDUCATION THROUGH PUBLICATION AND RESEARCH

ROOM: 308B

Chair: Qiyin Fang, McMaster University, Canada

9:00-9:15 HIGH-ED-1-1-1 / Education development via discussion panels utilizing latest photonic research papers and experimental projects for final year undergraduate electronics engineering students
Ahmed Abd El Aziz, Arab Academy for Science, Technology & Maritime Transport, Egypt
Mariam Galal

9:15-9:30 HIGH-ED-1-1-2 / Max Planck School of Photonics: research-oriented photonics education in a network of excellence throughout Germany
Reinhard Geiss, Friedrich-Schiller-University Jena, Germany
Julia Hengster, Thomas Kaiser, Gerd Leuchs, Andreas Tünnermann

9:30-9:45 HIGH-ED-1-1-3 / Stringent and result-oriented training requirements at the heart of research funding opportunities: the case of the CSA FAST program and the HiCIBaS project
Simon Thibault, Université Laval, Canada
Guillaume Allain, Olivier Côté, Mireille Ouellet, Deven Patel, Cédric Vallée, Denis Brousseau, Anne-Sophie Poulin-Girard

9:45-10:15 HIGH-ED-1-1-4 / NSF's support for Education and Training of the Optics and Photonics Workforce
Carmiña Londoño, National Science Foundation, USA

11:00-11:15 HIGH-ED-1-1-5 / Concept and development of research-oriented education in the university context
Oliver Vauderwange, Hochschule Offenburg, Germany
Dan Curticapeau, Nicolas Javahiraly

11:15-11:30 HIGH-ED-1-1-6 / Engaging undergraduate students in the Philippines in photonics research with a novel publication-driven online mentoring approach
Minella C. Alarcon, Ateneo de Manila Univiversity, Philippines
Nathaniel Libatique, Aria Buenaventura, Annelle R. Chua, Benjamin B. Dingel

11:30-11:45 HIGH-ED-1-1-7 / Teaching undergraduate integrated photonics and fabrication through research
Donald Witt, The University of British Columbia, Canada
Enxiao Luan, Kashif Masud Awan, Jaspreet Jhoja, Lukas Chrostowski

SPECIAL TOPIC - CHALLENGES IN OPTICS AND PHOTONICS EDUCATION

OPTICS AND PHOTONICS EDUCATION IN DIVERSE, REMOTE OR UNDERPRIVILEDGED COMMUNITIES

ROOM: 307B

Chair: Dirk Fabian, SPIE, United States

14:30-14:45 ST-CHALL-1-5-1 / Interactive teaching methods of optoelectronics for enhancing engagement of under-represented groups
Pouya Dianat, Drexel University, USA

14:45-15:00 ST-CHALL-2-5-2 / Optometry outreach for diverse middle school students
Pamela O. Gilchrist, North Carolina State University, USA
Alonzo B. Alexander, Phillip Kelly

SPECIAL TOPIC - CHALLENGES IN OPTICS AND PHOTONICS EDUCATION

SOFTSKILLS: ENHANCING TECHNICAL TRAINING

ROOM: 307B

Chair: Dirk Fabian, SPIE, United States

15:00-15:15 ST-CHALL-2-6-1 / Creating confident scientific writers engaged in a productive writing and editing using portfolios with contemplative essays
Stacey K. Vargas, Virginia Military Institute, USA
Paul Hanstedt

15:15-15:30 ST-CHALL-2-6-2 / Project-based learning in photonics for teaching soft skills
Sandhra-Mirella Valdma, University of Tartu, Estonia
Jan Bogdanov

TEACHING OPTICS AND PHOTONICS USING NEW TECHNOLOGIES

AR/VR FOR OPTICS AND PHOTONICS EDUCATION

ROOM: 308A

Chair: Joseph A. Shaw, Montana State University, United States

14:30-14:45 NEW-TECH-2-7-1 / Training in polarization through a virtual learning environment
Juan Campos, Universitat Autònoma de Barcelona, Spain
Angel Lizana, María Josefa Yzuel

14:45-15:00 NEW-TECH-2-7-2 / Web-based interactive simulations and virtual lab for photonics education
Erik Verlage, Massachusetts Institute of Technology, USA
Sajan Saini, Anuradha M. Agarwal, Lionel C. Kimerling

15:00-15:15 NEW-TECH-2-7-3 / Feasibility of using virtual reality and augmented reality for virtual education and training in optics
Aditya Pandya, Ryerson University, Canada
Alexandre Douplik

TEACHING OPTICS AND PHOTONICS USING NEW TECHNOLOGIES

ONLINE CLASSROOM AND REMOTE LEARNING

ROOM: 308A

Chair: Guillermo E. Sanchez-Guerrero, Universidad Autónoma de Nuevo León, Mexico

15:15-15:45 NEW-TECH-3-8-1 / Integrated photonics and application-specific design on a massive open online course platform
Sajan Saini, AIM Photonics Academy, Massachusetts Institute of Technology, USA
Stefan Preble, Milo_ Popovi_, Jaime Cardenas, Alan Kost, Erik Verlage, Gregory Howland, Lionel C. Kimerling

15:45-16:00 NEW-TECH-3-8-2 / Harnessing peer instruction in and out of class
with myDALITE
Rhys Adams, Vanier College, Canada
Elizabeth S. Charles, Nathaniel Lasry, Sameer Bhatnagar, Jonathon Sumner, Yann Brouillette, Kevin Lenton, Phoebe Jaskson

16:00-16:15 NEW-TECH-3-8-3 / Freely available optics lectures and a proposal for universal free online education
Rick Trebino, Georgia Institute of Technology, USA

16:15-16:30 NEW-TECH-3-8-4 / Instructional design of problem-based teaching in optical system design courses using informatization teaching resources
Yifan Huang, Beijing Institute of Technology, China
Lin Li, Qun Hao

HIGHER EDUCATION IN OPTICS AND PHOTONICS

CURRICULUM DEVELOPMENT AND IMPROVEMENT

ROOM: 308B

Chair: Aaron Danner, National University of Singapore, Singapore

14:30-14:45 HIGH-ED-2-4-1 / Developing updated physical optics curriculum: incorporating the neglected reality of non-interaction of waves (NIW)
Chandrasekhar Roychoudhuri, University of Connecticut, USA

14:45-15:00 HIGH-ED-2-4-2 / Integrating fiber optics into electronic communications curriculum
Shuping Wang, University of North Texas, USA

15:00-15:15 HIGH-ED-2-4-3 / Teaching research of clustered graduation design for undergraduates
Hang Xiao, National University of Defense Technology, China
Feng Shi, Ye Tian, Ci Song, Guipeng Tie, Junfeng Liu

15:15-15:30 HIGH-ED-2-4-4 / Undergraduate course on biomedical optics at a liberal arts college
Michael E. Durst, Middlebury College, USA

15:30-15:45 HIGH-ED-2-4-5 / Teaching optics from a linear vector space perspective
Bahaa E. Saleh, CREOL, The College of Optics and Photonics, University of Central Florida, USA

15:45-16:00 HIGH-ED-2-4-6 / Teaching silicon photonics at the University of Southampton
Goran Z. Mashanovich, University of Southampton, United-Kingdom

16:00-16:15 HIGH-ED-2-4-7 / Quantum harmonic oscillator fluorescence
Daniel Boye, Davidson College, USA
Larry Cain, Mario Belloni, Sarah Friedensen, Nancy Pruett, Henry Brooks

K12 EDUCATION AND COMMUNITY OUTREACH

HANDS-ON EXPERIMENTS AND DEMONSTRATIONS FOR YOUNG AUDIENCES

ROOM: 307B

Chair: Colette R. DeHarpporte, Laser classroom, United States

9:00-9:15 K12-CO-1-11-1 / A tabletop line-of-sight stabilization demonstrator for STEM outreach activities
Brennan Taylor, Air Force Research Lab, USA
Evan Threlkeld, Tyler Brewer, Matthew A. Cooper

9:15-9:30 K12-CO-1-11-2 / The disassembly and re-purposing of unwanted consumer electronics: low-cost tools for optics outreach
Laura B. Andre, University of Michigan, USA
Timothy Jones

9:30-9:45 K12-CO-1-11-3 / A tabletop adaptive optics demonstrator for STEM outreach activities
Brennan Taylor, Air Force Research Lab, USA
Evan Threlkeld, Tyler Brewer, Matthew A. Cooper

9:45-10:00 K12-CO-1-11-4 / Camera obscura: demonstrations and experiments to discover the history of optics
Mathieu Riopel, Centre de Démonstration en Sciences Physiques, Canada
Dominic Boudreau, Audrey Julien

10:00-10:15 K12-CO-1-11-5 / A STEM outreach tool for demonstrating the sensing and compensation of atmospheric turbulence
Casey Pellizzari, U.S. Air Force Academy, USA
Douglas Thornton, Barton Pilmmer, Matthew A. Cooper, Mark Spencer

SPECIAL TOPIC - TEACHING OPTICS THROUGH ART, NATURE, AND COLOR

OPTICS IN NATURE AND IN OUR SURROUNDINGS

ROOM: 307B

Chair: Perla Maria Viera Gonzalez, Universidad Autónoma de Nuevo León, Mexico

14:30-15:00 ST-ANC-1-14-1 / Flowers and photonics: an interactive exploration of colorimetry
Nicholas S. Kochan, University of Rochester, USA
Di Xu, Saleem Iqbal, Benjamin Moon, Janet Hrdina, David Lippman, Saniat Ahmed Choudhury, Matthias T. Banet, Kaitlin J. Dunn, Ashan Ariyawansa Galabada Dewage, Witold Stepien, Robert Draham, Nicholas Takaki, Jennifer D. T. Kruschwitz

15:00-15:15 ST-ANC-1-14-2 / Near infrared photography of atmospheric optical phenomena
Joseph A. Shaw, Montana State University, USA
Michael Vollmer

14:45-15:15 ST-ANC-1-14-3 / Astronomical events and their impact on knowledge transfer in optics and photonics
Dan Curticapean, Hochschule Offenburg, Germany
Benjamin Heitz, Oliver Vanderwange

15:15-15:30 ST-ANC-1-14-4 / Extended visual range: an observation during a total solar eclipse
Michael Vollmer, Technische Hochschule Brandenburg, Germany
Joseph A. Shaw

SPECIAL TOPIC - TEACHING OPTICS THROUGH ART, NATURE, AND COLOR

ART AND PHOTONICS

ROOM: 307B

Chair: Perla Maria Viera Gonzalez, Universidad Autónoma de Nuevo León, Mexico

15:30-15:45 ST-ANC-2-15-1 / Art and photonics
Dan Curticapean, Hochschule Offenburg, Germany
Benjamin Heitz, Oliver Vanderwange

15:45-16:00 ST-ANC-2-15-2 / When outreach in optics meets architecture: The Optical Terrace
Guillaume Allain, Université Laval, Canada
Madison Rilling, Jean-Christophe Gauthier, Frédéric Jobin, Antoine Michel, Isabelle Jobin

16:00-16:15 ST-ANC-2-15-3 / Optics and the colorful world
Jihua Gu, Soochow University, Taiwan
Dan Wu, Min Qian, Yan Ye

EDUCATION AND TRAINING TAILORED TO INDUSTRY NEEDS

OPTICS AND PHOTONICS CURRICULUM AND PROGRAMS

ROOM: 308A

Chair: Matthew Posner, Excelitas, Canada

9:15-9:30 IND-1-12-1 / Problem-based learning in advanced photonics manufacturing: Bringing real-world applications to the classroom
Nicholas M. Massa, Springfield Technical Community College, USA
Judith F. Donnelly, Gary J. Mullet

9:30-9:45 IND-1-12-2 / Photonics education in Switzerland on Bachelor and Master level triggered by industrial needs
Markus Michler, NTB Interstaatliche Hochschule für Technik Buchs, Switzerland

9:45-10:00 IND-1-12-3 / A modular industry-centered program for photonics and integrated photonics certification
David S. Simon, Stonehill College, USA
Guiru Gu, Cheryl Schnitzer, Edward Deveney, Thomas Kling, Julie Diop

EDUCATION AND TRAINING TAILORED TO INDUSTRY NEEDS

INDUSTRY AND ACADEMIA INTERACTION IN EDUCATION

ROOM: 308A

Chair: Jessica DeGroote Nelson, Optimax, United States

10:00-10:30 IND-2-16-1 / Your precious engineers will be increasingly disabled by a shortage of optics technicians. What can be done?
Alexis Vogt, Monroe Community College, USA

14:30-14:45 IND-2-16-2 / Examination optical education role of university for optical industry and efforts at Chiba Institute of Technology
Yasushi Fujimoto, Chiba Institute of Technology, Japan
Koji Suizu, Kazuki Wakita, Goran Z. Mashanovich

14:45-15:00 IND-2-16-3 / The intricate and symbiotic relationship between educational institutions and the industry
Gabrielle Thériault, Gentec-EO, Canada
Stéphane Galibois

15:00-15:15 IND-2-16-4 / Company at univerzity laboratory like efficient means for training of future engineers
Vladimír Vasinek, V_B-Technical University of Ostrava, Czech Republic
Vladimira Rasnerova, Lukas Hajik, Petr Siska, Jan Látal

15:15-15:30 IND-2-16-5 / The Industry Driven Photonics Technician Education Project in Montana
Elizabeth Noonan, Montana State University - Gallatin College, USA
Trenton Berg

EDUCATION AND TRAINING TAILORED TO INDUSTRY NEEDS

IN-COMPANY TRAINING AND INTERSHIPS

ROOM: 308A

Chair: Gabrielle Thériault, Gentec-EO, Canada

15:30-15:45 IND-3-17-1 / Industry training on on-wafer optoelectronic vector network analysis
Nicholas Heng Loong Wong, DenseLight Semiconductors, Singapore
Brian C. Pile, Junqiang Zhou

15:45-16:00 IND-3-17-2 / Apprenticeship: precision optics manufacturing technician
James VanKouwenberg, Optimax Systems, Inc., USA

16:00-16:15 IND-3-17-3 / Construction of school-enterprise cooperation internship platform to improve the practical ability of professional degree master based on PBL mode
Qianqian Wang, Beijing Institute of Technology, China
Lijun Zhang, Dongxiao Wang, Shanshan Wang, Qun Hao

HIGHER EDUCATION IN OPTICS AND PHOTONICS

LABORATORY CURRICULUM AND EXPERIMENTS FOR HANDS-ON TRAINING

ROOM: 308B

Chairs: Suzie Dufour, INO, Canada and

Yukitoshi Otani, CORE, Utsunomiya University, Japan

9:00-9:15 HIGH-ED-3-10-1 / Studying fundamental laser diode properties in applied physics laboratories
Michael Vollmer, Technische Hochschule Brandenburg, Germany
Klaus-Peter Möllmann, Martin Regehly

9:15-9:30 HIGH-ED-3-10-2 / Laboratory training in silicon photonics for undergraduate and graduate students
Azad Siahmakoun, Rose-Hulman Institute of Technology, USA

9:30-9:45 HIGH-ED-3-10-3 / Femtosecond fiber laser: from theory to experiment
Michel Piché, Université Laval, Canada
Mathieu Hunneault, Mireille Ouellet

9:45-10:00 HIGH-ED-3-10-4 / CCCC and LASER-TEC educational Raman spectrometer demo
Gary B. Beasley, Central Carolina Community College, USA
Chrysanthos A. Panayiotou

10:00-10:15 HIGH-ED-3-10-5 / Some remarks of teaching the concepts in experimental optics for students in natural sciences in Brazil
Alberto Tufaile, Universidade de São Paulo, Brasil
Adriana P. B. Tufaile

14:30-15:00 HIGH-ED-3-10-6 / Public domain optics: experimental gems from pre-1923 textbooks
Aaron Danner, National University of Singapore, Singapore
Aaron

15:00-15:15 HIGH-ED-3-10-7 / Simple optical setup for the undergraduate experimental measurement of the refractive indices and attenuation coefficient of liquid samples and characterization of laser beam profile
Bora Ung, École de Technologie Supérieure, Canada
Dipankar Sengupta

15:15-15:30 HIGH-ED-3-10-8 / Quantum optics laboratories for illustrating fundamentals of quantum-information technologies
Enrique J. Galvez, Colgate University, USA
Aayam Bista, Baibhav Sharma

15:30-15:45 HIGH-ED-3-10-9 / Obtaining a triplet-triplet absorption spectrum with a camera flash and a common spectrophotometer
Tiago Palmeira, Instituto Superior Técnico, Portugal
Mário Nuno Berberan-Santos

15:45-16:00 HIGH-ED-3-10-10 / A modular laboratory curriculum for teaching integrated photonics to students with diverse backgrounds
Anuradha M. Agarwal, Massachusetts Institute of Technology, USA
Samuel Serna, Gerald Gagnon, Kevin McComber, Erik Verlage, Julie Diop, Sajan Saini, Lionel C. Kimerling, Stefan Preble, Gregory Howland, Mathew van Niekerk, Jaime Cardenas, Meiting Song, Milo_ Popovi_, Anatol Khilo, Farhad Vazehgoo, Ira Moskowitz, Guiru Gu, Cheryl Schnitzer, Edward Deveney, Douglas Petkie, Jacob Longacre

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K12 EDUCATION AND COMMUNITY OUTREACH

PROGRAM EVALUATION

ROOM: 307B

Chair: Anne-Sophie Poulin-Girard, Université Laval, Canada

9:00-9:15 K12-CO-2-21-1 / Method of continuous improvement of multidisciplinary programs and outreach activities
Marcelo Saito Nogueira, Tyndall National Institute, Ireland
Jacqueline Elizabeth Gunther, Katarzyna Komolibus, Sinead M. Ryan, Brian Murray, Moises A. Jezzini, Decland Kennedy, Stefan Andersson-Engels

9:15-9:30 K12-CO-2-21-2 / Long term impact of the optics outreach workshops
Cristina E. Solano, Centro de Investigaciones en Óptica, A.C., Mexico
Charvel M. López

K12 EDUCATION AND COMMUNITY OUTREACH

K12 EDUCATION AND OUTREACH INITIATIVES

ROOM: 307B

Chair: Cristina E. Solano, Centro de Investigaciones en Óptica, Mexico

9:30-10:00 K12-CO-3-24-1 / Exploratory science learning in a high school curriculum, using structured materials and light polarization
Yasuyo Suzuki, Utsunomiya Girls' High School, Japan
Nathan Hagen, Yukitoshi Otani

10:00-10:15 K12-CO-3-24-2 / OPTIKS: Outreach for professionals who teach in informal environments and K-12 schools
Michael McKee, CREOL, The College of Optics and Photonics, University of Central Florida, USA
Nancy Magnani, Matthew T. Posner

10:15-11:00 K12-CO-3-24-3 / The Optics Suitcase: educational outreach tool for inspiring careers in light
Jessica DeGroote Nelson, Optimax Systems, Inc., USA
Tanya Kosc, Phillip Nelson

11:00-11:15 K12-CO-3-24-4 / Increasing photonics awareness for youngsters using technology boot camps
Chrysanthos A. Panayiotou, Indian River State College, USA
Gary B. Beasley

11:15-11:30 K12-CO-3-24-5 / Enlightening students: optics applications in the math classroom
Judith F. Donnelly, Saint Bernard School, USA
Matthew Donnelly

11:30-11:45 K12-CO-3-24-6 / Bringing STEM to light
Colette R. DeHarpporte, Laser Classroom, USA

11:45-12:00 K12-CO-3-24-7 / Light-based educational outreach activities for pre-university students
Kareem W. Hamdy, University of California, Santa Barbara, USA
Takako Hirokawa, Philip Chan, Warren Jin, Victoria Rosborough, Eric Stanton, Andrew M. Netherton, Wendy Ibsen, Demis D. John, John E. Bowers

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PEDAGOGICAL APPROACHES

PROBLEM-, PROJECT- AND CASE-BASED LEARNING

ROOM: 308A

Chair: Nicholas M. Massa, Springfield Technical Community College, United States

9:00-9:15 PED-APP-1-20-1 / Implementation of problem-based teaching and learning in optical instrument design course
Yao Hu, Beijing Institute of Technology, China
Qun Hao, Shaohui Zhang, Ya Zhou, Yifan Huand, Yuejin Zhao, Liquan Dong, Shanshan Wang

9:15-9:30 PED-APP-1-20-2 / 20 new problems for the website: problem-based learning for college physics
Olivier Tardif-Paradis, Cégep Garneau, Canada

9:30-9:45 PED-APP-1-20-3 / A project-based engineering course in optical communications
Karimi Nastaran, Infinera Corp., USA
Amir Rashidinejad

9:45-10:00 PED-APP-1-20-4 / Project-based optical design practice course and teamwork: from a programmer to a lens designer
Xiaotong Li, Zhejiang University, China
Weige Lv, Zhaofeng Cen, Lingying Jiang, Jianfeng Xu, Dong Liu

PEDAGOGICAL APPROACHES

NOVEL MODELS AND METHODS FOR PHOTONICS EDUCATION

ROOM: 308A

Chair: Rhys Adams, Vanier College, Canada

10:00-10:30 PED-APP-2-23-1 / On the use of reflective writing in an introductory photonics course
Lawrence R. Chen, McGill University, Canada
Maxime Jacques

11:00-11:15 PED-APP-2-23-2 / Why a laboratory course? An example in biophotonics
Simon Rainville, Université Laval, Canada
Daniel Côté

11:15-11:30 PED-APP-2-23-3 / Let us complete the puzzle together: a jigsaw cooperative learning trial on optical graduate course
Yao Hu, Beijing Institute of Technology, China
Ya Zhou, Shanshan Wang, Yeujin Zhao, Liquand Dong, Yong Song

11:30-11:45 PED-APP-2-23-4 / Improving student efficacy in Electromagnetics through constant formative feedback, and aligning of courses
Simarjeet S. Saini, University of Waterloo, Canada
Seyed H. Mirjahanmardi

HIGHER EDUCATION IN OPTICS AND PHOTONICS

DEVELOPMENT OF MULTUDISCIPLINARY TRAINING PROGRAMS

ROOM: 308B

Chair: María Josefa Yzuel, Universidad Autónoma de Barcelona, Spain

9:00-9:15 HIGH-ED-4-19-1 / Optics education for multidisciplinary students: how to focus on the relationship between optical technology and human civilization in group discussion
Xiaotong Li, Zhejiang University, China
Qing Yang, Ke Si, Kaiwei Wang

9:15-9:30 HIGH-ED-4-19-2 / SMAART training program
Daniel Côté, Université Laval, Canada
Julie Lamarche

9:30-9:45 HIGH-ED-4-19-3 / The University of Bordeaux Graduate Research School in Light Sciences and Technologies: training the future generation of researchers in photonics
Marie Bénédicte Vieules, Université de Bordeaux, France
Brahim Lounis, Evelyne Fargin, Emmanuel d'Humières, Nicolas Dubreuil

9:45-10:00 HIGH-ED-4-19-4 / Adapting short courses content and teaching strategies to multidisciplinary audience
Suzie Dufour, INO, Canada

10:00-10:15 HIGH-ED-4-19-5 / Educating and Training Biomedical Researchers in Biophotonics and Advanced Light Microscopy Methods
Thomas Abraham, Penn State College of Medicine, USA

10:15-11:00 HIGH-ED-4-19-6 / Graduate programs in biophotonics : unique transdisciplinary training in applied photonics for the life sciences
Andréanne Deschênes, Université Laval, Canada

HIGHER EDUCATION IN OPTICS AND PHOTONICS

LIGHT SOURCES AND RADIOMETRY IN EDUCATION

ROOM: 308B

Chair: Michael Vollmer, Technische Hochschule Brandenburg, Germany

11:00-11:30 HIGH-ED-5-22-1 / Lab-based radiometric concepts for undergraduate and graduate students
Emmett J. Ientilucci, Rochester Institute of Technology, USA

11:30-11:45 HIGH-ED-5-22-2 / Satisfactory role of LEDs as a light receiving component and their uses in science demonstration experiments for educational purposes
Makoto Hasegawa, Chitose Institute of Science and Technology, Japan

11:45-12:00 HIGH-ED-5-22-3 / Illumination optics for solid state lighting
Mark Jongewaard, University of Colorado Boulder, USA

POSTER PRESENTATIONS

Wednesday, May 22, 2019

FROM 17:00 TO 18:30

HIGHER EDUCATION IN OPTICS AND PHOTONICS

POSTER-ET-01 Education development employing latest free space optical research papers for undergraduate communication engineering students in class and examination
Ahmed Abd El Aziz, Arab Academy for Science, Technology & Maritime Transport, Egypt
Abeer Badawi

POSTER-ET-02 Increased knowledge transfer through the integration of research projects into university teaching
Oliver Vauderwange, Hochschule Offenburg, Germany
Nicolas Javahiraly, Dan Curticapean

POSTER-ET-03 Teaching research and exploration of integrated design experiment in photoelectric courses
Bing Lei, National University of Defense Technology, China
Jianhua Shi, Wei Wang, Chengfang Duan, Hairong Zhong

POSTER-ET-04 Creation of an engineering course: design and simulation of high-capacity fiber optic systems utilizing VPI-photonics
Sanjib Sarkar, The University of Texas at San Antonio, USA
Mehdi Shadaram, Morad K. Eghbal

POSTER-ET-05 Using a laboratory free space optics setup to teach a variety of optics and optoelectroincs concepts to undergraduates
Stacey K. Vargas, Virginia Military Institute, USA

POSTER-ET-08 Educational opto-mechatronic apparatus to calculate the refractive index of liquids based on Snell's Law
Alberto Uriel Rivera Ortega, Tecnológico de Monterrey, Mexico
Carlos Roberto Hernández Gómez, Guadalupe Vega Torres

POSTER-ET-09 The photoelectric effect: project-based undergraduate teaching and learning optics through a modern physics experiment redesign
Corneliu I.Rablau, Kettering University, USA
Uma Ramabadran

POSTER-ET-10 Enhancing optics teaching in an experiential-learning applied physics program through undergraduate research theses
Corneliu I.Rablau, Kettering University, USA

POSTER-ET-11 Teaching reform and practice of optoelectronic technology curriculum
Dan Wu, Wenzheng College of Soochow University, Taiwan
Min Qian, Yan Ye, Guiju Zhang, Jihua Gu

POSTER-ET-12 Bringing reality in physics: system engineering interpretation of optical phenomena
Chandrasekhar Roychoudhuri, University of Connecticut, USA
Negussie Tirfessa

POSTER-ET-13 Study on the feasibility of classified cultivation for master majoring in precision optical engineering
Hang Xiao, National University of Defense Technology, China
Feng Shi, Ci Song, Ye Tian, Guipeng Tie, Junfeng Liu

POSTER-ET-14 Physical optics in Beijing Institute of Technology
Bin Hu, Beijing Institute of Technology, China
Jian Liu, Ya Zhou, Ting Zhang

POSTER-ET-15 Similarities and differences in microwave and optical radiation detection
Negussie Tirfessa, Manchester Community College, USA
Chandrasekhar Roychoudhuri

POSTER-ET-16 International Day of Light (IDL): a new forum for interdisciplinary learning concepts in optics and photonics
Dan Curticapean, Hochschule Offenburg, Germany
Benjamin Heitz, Oliver Vauderwange

POSTER-ET-17 Medical laser safety
Mohanad Jamal Al-Rubaiee, Al-Karkh University for Science, Irak
Shaymaa Al-Qaisi

POSTER-ET-18 CCCC and LASER-TEC laser eye safety experiment/lab
Gary B. Beasley, Central Carolina Community College, USA
Chrysanthos A. Panayiotou

POSTER-ET-19 Is a glowing LED meaningful to determine the Plank's constant accurately?
Chetan Kotabage, Chetan Gogte Institute of Technology, India

POSTER-ET-20 Experiential learning of data acquisition and sensor networks with a cloud computing platform
Colleen Chau, McMaster University, School of Biomedical Engineering, Canada
Eric Mahoney, Qiyin Fang

K12 EDUCATION AND COMMUNITY OUTREACH

POSTER-ET-21 Exploration of energy levels using diffraction gratings
Perla MarleneViera-González, Universidad Autónoma de Nuevo León, Mexico
Guillermo E. Sanchez-Guerrero, Jose I. Martinez-Contreras

POSTER-ET-22 Optics for everyone: measuring the results after five years of work
Perla Marlene Viera-González, Universidad Autónoma de Nuevo León, Mexico
Guillermo E. Sanchez-Guerrero, Jose I. Martinez-Contreras

POSTER-ET-24 Optoelectronic nor gates and rotating drum memory illuminate logic
Edward P. Vogel, Leonardo's basement, USA

PEDAGOGICAL APPROACHES

POSTER-ET-25 Student feedback on hybrid problem based learning in a digital image processing course
Songxin Tan, South Dakota State University, USA
Zixing Shen

POSTER-ET-26 An optoelectronic integrated design practice project: laser countermeasure, reconnaissance alarm, and jamming system
Hairong Zhong, National University of Defense Technology, China
Renyan Zhang, Wenke Xie, Quan Zhou, Bo Jiang, Wenjie Jiang

POSTER-ET-27 An innovative practical teaching model based on information technology
Jianhua Shi, National University of Defense Technology, China
Hairong Zhong, Bing Lei, Wei Liu, Chenfang Duan, Wei Wang

POSTER-ET-28 Flipped-classroom with interactive videos in first year undergraduate physics course in Hong Kong
Chi Wah Leung, The Hong Kong Polytechnic University, Hong Kong
Katie E. Chong, Ka-Lai Wong, Fridolin Ting

POSTER-ET-29 Error detection tasks and peer feedback for engaging physics students
Rhys Adams, Vanier College, Canada
Phoebe Jackson, Kevin Lenton, Michael Dugdale, Nathaniel Lasry, Elizabeth S. Charles

POSTER-ET-30 Exploration and practice of teaching reform on photoelectric comprehensive experiments
Wei Wang, National University of Defense Technology, China
Bing Lei, Jiaanhua Shi, Wei Liu

POSTER-ET-31 A pilot study of optics laboratory activities impact on students connections between theory and experiment
Christopher M. Nakamura, Saginaw Valley State University, USA
Marie T. Cassar, Rafael Rey-Gonzalez

POSTER-ET-32 The flipped classroom models of applied optics in National University of Defense Technology
Xu Zhongjie, National University of Defense Technology, China
Ziang-Ai Cheng, Yu Ning, Weihong Hua, Zilun Chen, Zefeng Wang, Hairong Zhong

TEACHING OPTICS AND PHOTONICS USING NEW TECHNOLOGIES

POSTER-ET-33 Application of video micro-course teaching in optical manufacturing technology course
Shanshan Wang, Beijing Institute of Technology, China
Yifan Huang, Wun Hao, Qianqian Wang, Yao Hu, Ya Zhou, Yong Song

SPECIAL TOPIC - CHALLENGES IN OPTICS AND PHOTONICS EDUCATION

POSTER-ET-34 Blended learning strategies on teaching light concepts for underprivileged school students
Sumit Ghosh, Andhra Vidyalaya College of Arts, Science & Commerce, India

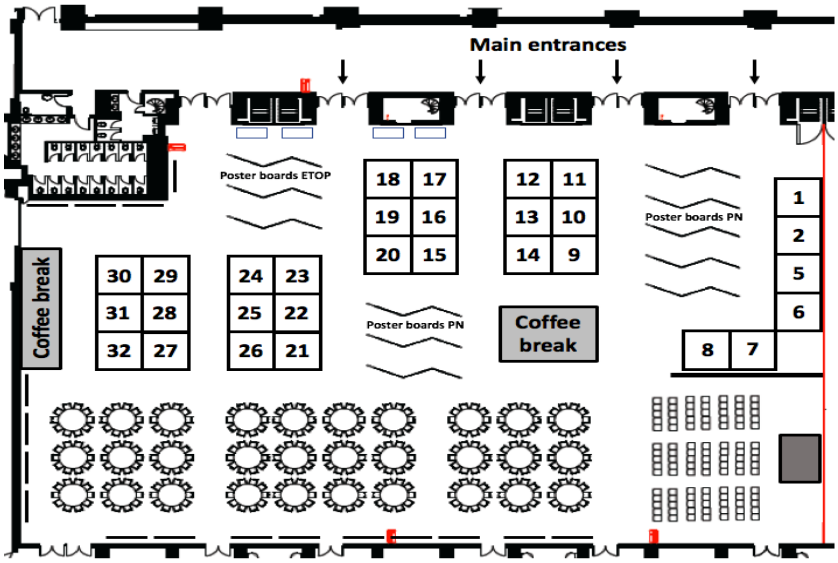
SPECIAL TOPIC - TEACHING OPTICS THROUGH ART, NATURE, AND COLOR

POSTER-ET-35 A report on Indian Student Chapter of OSA's Lunar Eclipse Observation Event of July 2018
Sumit Ghosh, Andhra Vidyalaya College of Arts, Science & Commerce, India

POSTER-ET-36 Thermal imaging and heat islands: cross-discipline learning in optics and meteorology
Lena Heuscher, The University of Alabama in Huntsville, USA
Joseph A. Shaw, Paul Nugent

EXHIBITION

EXHIBITION BOOTHS



PARTNERS AND EXHIBITORS

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Advanced Photonic Sciences, LLC ("APS") develops and manufactures microlaser and laser module products for industrial and government organizations for biomedical, illumination, and aiming applications in both laboratory and demanding industrial conditions; kilowatt-class cryogenic lasers; diode-pumped solid-state lasers operating in the UV, visible, and near and mid-infrared spectral regions; offers more than 40 experimental kits for photonics and laser technology education of students at universities and related educational bodies; spectroscopy services; and conducts research and development in collaboration with organizations to develop novel new optical and laser materials.

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AMEC Machining is a machining workshop specialized in the manufacture and assembly of small and medium parts in the field of optics/photonics since 1995. AMEC provides all its customers with impeccable quality, competitive delivery times and personalized service.

AMSTERDAM SCIENTIFIC INSTRUMENTS

Why is the TPX3Cam state-of-the-art and unique from Amsterdam Scientific Instruments? Amsterdam Scientific Instruments (ASI) based in Amsterdam, The Netherlands, manufactures and markets Hybrid Pixel Single Photon Counting detectors. The Timepix and Medipix ASICS derives from CERN. TPX3Cam based on the Timepix technology, is the fastest time-resolved optical pixilated camera in the world with a pixel size of 55 × 55 µm2, and acts independently as a fast digitizer that can be used to record timing information. The TPX3Cam is optically sensitive in a wavelength range of 400 to 1000 nm with high quantum efficiency. It can provide arrival time in Time-of-Flight (ToF) mode information and charge deposit information in Time-over-Threshold (ToT) mode together with the coordinates of the illuminated pixel. The TPX3Cam employs a SPIDR read out board. This readout board provides high speed interfaces including 1 Gb Ethernet and 10 Gb Ethernet. The latter allows the TPX3Cam readout at the maximum bandwidth of 80 Mhits/s with a time resolution of 1.56 ns. The TPX3Cam can be used to register single electron/ion/neutron and record images as well as timing information. Based on the unique features, the TPX3Cam has high flexibility and excellent performance in various applications. For instance, it can be easily used in both velocity map Imaging (VMI) and coincidence momentum imaging (CMI) for studying fragmentation dynamics. It is mounted outside the vacuum chamber compared to the delay-line or cross-strip detector. The TPX3Cam is a camera to be applied in quantum optics and fluorescence microscopy with the capability of single photon counting imaging.

BOCK OPTRONICS INC.

Since 1987, Bock Optronics has served the Canadian manufacturing, factory automation and maintenance industries, R&D, institutional studies, machine learning and other high technology sectors with machine vision products. As a comprehensive distributor for innovative and progressive manufacturers of imaging hardware and software, providing quality products and the latest advancements in technology has been their goal since day one. Supporting system integrators, OEMs, and end user customers, Bock Optronics' knowledge, experience and excellent customer service has helped them to establish valuable, lasting relationships with their customers for over 30 years.

CCEM - CANADIAN CENTRE ELECTRON MICROSCOPY

Canadian Centre for Electron Microscopy

The Canadian Centre for Electron Microscopy (CCEM) is a one-stop solution to materials characterization problems. Our experienced and dedicated staff are here to help determine structural and compositional information of material through their advanced knowledge in electron microscopy. Not only does the CCEM offer a suite of electron microscopes and sample preparation space that can be used for characterization needs, but our staff members are fully equipped and available to train users, acquire various data, prepare characterization reports, and consult on user's specific questions

CIENNA

Ciena (NYSE:CIEN) is a global supplier of telecommunications networking equipment, software and services that support the delivery and transport of voice, video and data service. Ciena supports 85 percent of the world's largest service providers as well as cloud and cable operators, governments and enterprises. From our founding in 1992, Ciena has been a pioneer in the networking industry with industry first such as first coherent 40G, 100G, 300G, and 400G solutions. With approximately 6 000 specialists (close to 50% are R&D experts) in more than 45 countries, our inspiration to innovate comes directly from the unique dynamics of each client's business. Ciena engineers have received more than 2 000 patents, representing a diverse range of inventions that underpin our clients' continued success.

CMC MICROSYSTEM

Through partnerships with leading global suppliers in commercial and academic environments, CMC Microsystems provides access to photonics manufacturing, including SOI-based silicon photonic technologies, III-V epitaxy and processing on GaAs and InP substrates, and packaging and assembly services to integrate multiple technologies. CMC enables industrial-class technologies for designing, prototyping and testing microfabricated devices, circuits and systems. www.cmc.ca/photonics

COPL - UNIVERSITÉ LAVAL

The Centre for Optics, Photonics and Lasers (COPL) is composed of 42 research teams from eight Quebec universities working in synergy to develop the outstanding potential of optics & photonics for the benefit of future generations.

Founded in 1989 with the goal of sharing knowledge, know-how and resources, the COPL carries out its stated mission of:
- training students and highly qualified personnel
- conducting fundamental and applied research
- contributing to socio-economic development.

Celebrating 30 years of unwavering commitment to the field of optics and photonics, the COPL is proud of its contributions that have placed it among the most prominent centres for research and training worldwide.

CHANNEL SYSTEMS INC.

Channel Systems is a scientific imaging solutions provider. We offer spectral and infrared solutions for laboratory, industrial and outdoor applications, covering the UV, VNIR, SWIR, MWIR and LWIR. In addition, we offer a full line of accessories including lighting, lenses, software and scanners. If we aren't able to recommend an off the shelf solution, our engineering and software designers are able to develop custom solutions for your unique imaging projects. We are authorized distributors for Specim Spectral Imaging, Xenics Infrared Solutions, InfraTec Thermal Imaging Cameras and Thorlabs LCTF's.

ELECTRO-METERS CO. LTD.

For Over fifty years Electro-Meters has provided a variety of solutions for Measurement applications in Canada. As the Exclusive Canadian Representative for Yokogawa Optical Products, we are pleased to exhibit the worlds most trusted Optical Spectrum Analyzer. For the last twenty years the AQ6370 series has led the industry with its robust Free Space optical Input, the widest Wavelength Range from 350nm up to 3.4um and the highest sensitivity down to -90dBm. If you are interested in adding the best Optical Measurement equipment to your lab, stop by our booth to discuss an onsite evaluation with Connie Ranieri, Jerome Descoteaux or Matt Remmes.

EXFO

EXFO develops smarter test, monitoring and analytics solutions for fixed and mobile network operators, webscale companies and equipment manufacturers in the global communications industry. Our customers count on our unique blend of equipment, software and services to accelerate digital transformations related to fiber, 4G/LTE and 5G deployments. We've spent over 30 years earning this trust, and today more than 2,000 EXFO employees in over 25 countries work side by side with our customers in the lab, field, data center and beyond.

FIBERGUIDE INDUSTRIES

Fiberguide Industries manufactures over 500 different specialty optical fibers. These fibers are primarily used for photonics applications involving optical power delivery and optical sensing. Fiberguide also offers several high-performance metal coated fibers, Al and Au, that can operate at extreme temperatures and survive in harsh environments. Fiberguide's assembly facility in ID provides assemblies for the Medical, High Power, Oil and Gas Sensing, High Temperatures, and Bio-analytical Sensing markets. We also provide VFT and Collimator capabilities. Our three facilities are ISO 13485:2003 and ISO 9001 certified.

GENTEC-EO

With a 45 year track record of innovation and providing quality solutions for laser power and energy measurement applications, Gentec-EO stands ready to serve you now and in the future. Our product line includes a complete range of laser power & energy meters, photodetectors, THz detectors, OEM detectors and beam diagnostics. We also have calibration centers on 3 continents for fast turn-around times, just what you need to keep pace with today's rapid market.

INO

INO is the largest centre of expertise in optics and photonics in Canada. For 30 years, it has been creating and developing customized solutions to meet the needs of companies in Quebec and throughout Canada in various sectors of activity. A leader in high technology, INO has implemented more than 6,500 solutions, carried out 74 technology transfers, and contributed to the creation of 34 new companies, which employ more than 2,000 people. INO's activities are made possible thanks to the sustained collaboration of the Ministère de l'Économie, de la Science et de l'Innovation and of Canada Economic Development for Quebec Regions.

LASERAND

Laserand Inc. is a Montreal, Canada based company working in the fields of photonics, robotics, industrial manufacturing & automation and weak signals imaging. The company supplies photonics components, scientific & industrial equipment and complex systems to customers throughout North America. Our team of engineers, marketing and technical support specialists with more than 20 years of experience in supplying optical components, CW DPSS lasers, optical spectroscopy systems, motion control, hexapods and scientific cooled full-frame CCD cameras for imaging and spectroscopy is ready to assist you in choosing the right product for your application.

LRIO

Led by Prof. Simon Thibault, PhD, Ing., the Optical Engineering research lab (LRIO in French) at Université Laval is the only Canadian laboratory offering post-graduate training in optical design. Our goal is to develop solutions in different fields of study within modern optics, working on both theoretical and practical applications for astronomy, space exploration, medical application, security and surveillance, teledetection, machine vision, industrial inspection, military systems and lighting.

OPTONIQUE

Optonique is a non-profit organization created in response to a call by Quebec's optics-photonics entrepreneurs and researchers for a province-wide forum that would act as a source of synergy for promoting Quebec optics-photonics technologies and expertise at the local, national, and international level. Optonique's main role is to unite the businesses, research centers, and academic institutions operating in Quebec's optonics-photonics sector. As the province's official hub for excellence in optics-photonics, Optonique is recognized by Quebec's ministry of economy, and innovation (Ministère de l'Économie et de l'Innovation) and receives support through the ACCORD initiative for the development of Quebec's strategic sectors and areas of excellence.

OZ OPTICS LIMITED

High Power Components/ Isolators/Combiners/ Patchcords/Connectors/ Intelligent Tunable Laser Diode Sources/Safety Interlocks/Shutters/Optical Coatings, Laser to Fiber Delivery Components, Adjustable Collimators/Focusers, PM/SM/MM Fused Fiber Couplers, PM Patchcords/Connectors/Splitters/ Switch, Polarized Sources, Polarization Rotators/ Controllers/Analyzers, Polarizers, PDL Emulators, ER Meter, Laser Diode Sources, Hermetically Sealable Patchcords, Fiber Optic Sensors OZ-PEN, Bias Controllers, EDFA, Spectrometer, OSNR, Mode-Field –Adaptor, Fiber Optic Test Equipment, Power Meters, Smart Detector Heads, Fault Finders, Smart Patchcords, Optical Power Monitors, Fixed / Tunable Filters, Optical Delay Lines, High Power Visual Fault Locators, Light Sources, Attenuators, High Speed Polarization Controllers / Scramblers, PDL Emulators, Switches, PLCS. Benchtop family: ER Meters, Backreflection Meters, Fiber Length Meters.

PHOTONICS MEDIA

www.photonics.com

SENTINELLE NORD / UNIVERSITÉ LAVAL

With its Sentinel North strategy, Université Laval is building on half a century of excellence in northern and optics/photonics research to develop innovative new technology, train a new generation of transdisciplinary researchers, and improve our understanding of the northern environment and its impact on humans and their health.

Sentinel North deploys a transdisciplinary approach by encouraging unprecedented convergence of strategic research fields in which the institution is assuming internationally recognized leadership, including Arctic and northern science, optics/photonics, microbiomes, cardiometabolic health, and neuroscience.

SPIE

SPIE is the international society for optics and photonics, an educational not-for-profit organization founded in 1955 to advance light-based science and technology. The Society serves 257,000 constituents from 173 countries, offering conferences and their published proceedings, continuing education, books, journals, and the SPIE Digital Library in support of interdisciplinary information exchange, professional networking, and patent precedent. SPIE provides $4 million annually in support of education and outreach programs like ETOP.

SYNOPSYS INC.

www.synopsys.com

TERAXION

TeraXion is a Canadian photonic components manufacturer who helps customers around the world design industry-defining laser, telecom and optical sensing systems with more power, speed and precision. We are leaders in developing cutting-edge fiber Bragg grating-based products, including CPA laser pulse stretchers, high-power laser reflectors and optical filters. Beyond our technology portfolio, our true strength stands in our ability to transform and evolve existing technology to meet our customers' changing needs.

TESTFORCE SYSTEMS INC, COMPLIANCE & CONNECTIVITY

Testforce Compliance and Connectivity is an authorized distributor of EMC, Video, 5G, Power Electronics and Optical Test Equipment in Canada. With premier brands such as Teledyne LeCroy, ETS-Lindgren, Ametek CTS and Ixia, Testforce Compliance and Connectivity has you covered for all of your testing needs. IoT and Big Data are not only pushing the boundaries of connectivity but also of test, we understand that. This is why our Technical Account Managers are equipped with the latest product knowledge to recommend you the best solution whether you are an industry-leading technology firm or a start-up company.

THORLABS

Thorlabs has been proud to serve the photonics industry for 30 years. We manufacture a broad portfolio of optomechanics, motion control, light sources, optoelectronics, optics, fiber, and instrumentation building blocks. Our educational products and kits utilize these building blocks in experiments covering physics, optics, and photonics as well as emerging fields of research. The available experiments include spectroscopy, interferometry, optical tweezers, Fourier optics, and polarization, with each experiment including detailed setup instructions and extensive teaching materials. Our educational products are offered at the price of the included components, with the educational materials offered for free. For more information, visit www.thorlabs.com<http://www.thorlabs.com/>.

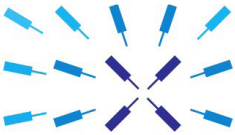
UNIVERSITÉ LAVAL - VRRCI

UNIVERSITÉ LAVAL
Vice-rectorat à la recherche, à la création et à l'innovation

Université Laval, one of Canada's leading research universities, proudly upholds a tradition of excellence dating back to its founding in 1852. Characterized by openness, innovation, and faculty engagement, it pushes the frontiers of knowledge in numerous fields of study like optics and photonics, northern research and sustainable health.

Université Laval is an active member of its community, working hand-in-hand with local, national and international leaders and innovators in research and development. By sharing its knowledge and expertise, the university plays a vital role in sustaining a vibrant, thriving community.

ZURICH INSTRUMENTS AG



Zurich Instruments

Zurich Instruments is a manufacturer of test & measurement equipment for advanced research & development applications. The instruments use LabOne® control software that sets a benchmark for efficient instrumentation control and a good user experience. This progressive approach reduces the complexity of laboratory setups, removes sources of problems and supports new measurement strategies that accelerate the progress of research. Zurich Instruments' portfolio comprises lock-in amplifiers, arbitrary waveform generators, impedance analyzers, quantum computing control systems, phase-locked loops and boxcar averagers.

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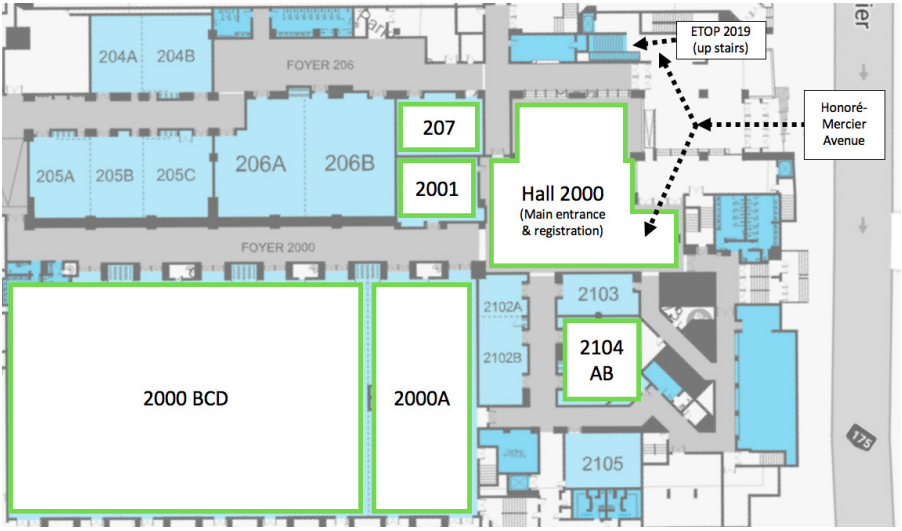
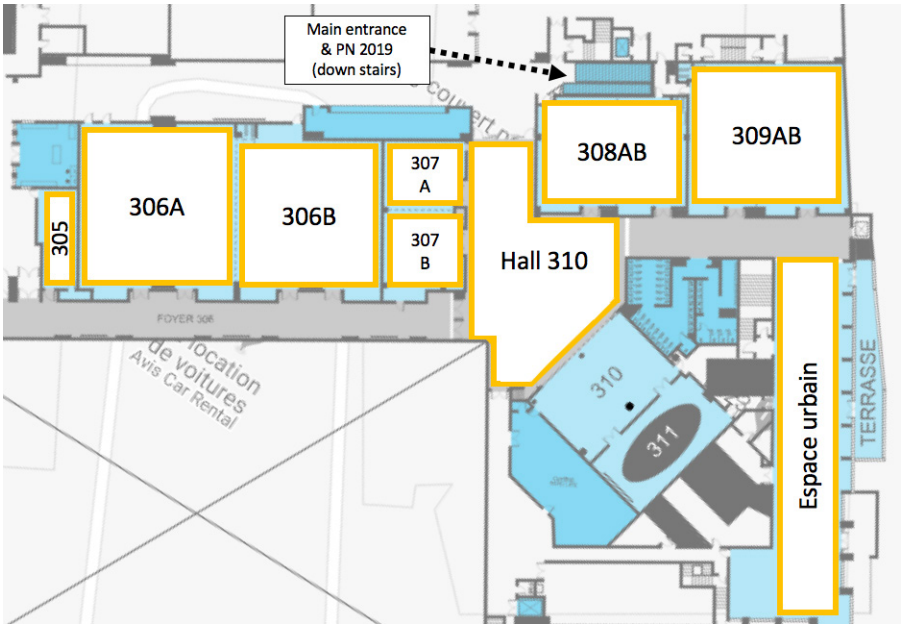
MEETING ROOMS FLOOR LAYOUT

LEVEL 2 :



LEVEL 3 :



Thank you to our partners !

OPTONIQUE

Pôle d'excellence en optique-photonique du Québec

Sentinelle Nord | Sentinel North

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International Day of Light 16 May

LRIO

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THORLABS

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UNIVERSITÉ LAVAL

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SPIE.

OSA The Optical Society | 100 Since 1916

IEEE Photonics Society