

# CORM-CIE 2019 Preliminary Program

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CORM 2019 Annual Technical Conference and 12<sup>th</sup> Biennial Joint Meeting of the CNC/CIE and CIE-USNC Technical Program – October 28 -30, 2019, NRC Sussex Auditorium, 100 Sussex Drive

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*28 October*

*Monday Morning*      *8:30-9:00 AM*

**8:30 – 9:00**      **Registration**

**9:00 – 9:15**      **Welcome:** by Dr. Alan Steele, Director-General, NRC Metrology

Short Introduction by Organizing Committee (J. Zwinkels, T. Moggridge)

**9:15-10:30**

## **Session I: Current Research Activities at NMIs**

Session Chair: Angela Gamouras (NRC)

### **CCPR K3 Key Comparison of Luminous Intensity**

Arnold Gaertner (NRC Metrology, Ottawa, ON, Canada)

### **Recent developments in photometry at NIST**

Yuqin Zong and C. Cameron Miller (NIST Sensor Science Division, Gaithersburg, MD, USA)

### **Applications of spectrophotometry in emerging nanomaterials**

Li-Lin Tay, John Hulse, Shawn Poirier, and Jeff Fraser (NRC Metrology, Ottawa, ON, Canada)

**10:30-11:00**      Coffee break and vendor exhibit

## **Session I: Current Research Activities at NMIs (continued)**

### **Current research in high-accuracy radiometers for solar and earth observation**

Michelle Stephens<sup>1</sup>, Nathan Tomlin<sup>1</sup>, Chris Yung<sup>1</sup>, Malcolm White<sup>1</sup>, Anna Vaskuri<sup>1</sup>, John Lehman<sup>1</sup>, Dave Harber<sup>2</sup>, Eric Richard<sup>2</sup>, Karl Heuerman<sup>2</sup>, Joel Rutkowski<sup>2</sup>, Cameron Straatsma<sup>2</sup>, and Greg Kopp<sup>2</sup> (<sup>1</sup> NIST Boulder; <sup>2</sup> Laboratory for Atmospheric and Space Physics)

## **Progress in few-photon metrology at NRC**

Jeongwan Jin, Dan Dalacu, Robin Williams, and Angela Gamouras (NRC, Ottawa, ON, Canada)

### **Session II: Environmental Radiometry**

Session Chair: Carol Johnson (NIST)

#### **Improving non-dispersive infrared (NDIR) sensors for greenhouse gas monitoring**

Howard Yoon and George Eppeldauer (NIST, Sensor Science Division, Gaithersburg, USA)

#### **Photothermal interferometry for the traceable measurement of climate-warming black carbon**

Joel C. Corbin, Jalal Norooz-Oliaee, Prem Lobo and Greg Smallwood (NRC Metrology, Ottawa, Canada)

**12:45-2:00** Lunch (provided) in vendor exhibit area

### *Monday Afternoon*

### **Session II: Environmental Radiometry (continued)**

#### **Performing tower-based solar induced fluorescence retrievals in the context of physiological, environmental, and hardware-based sources of uncertainty**

Julia Marrs<sup>1</sup>, Lucy R. Hutyla<sup>1</sup> and David W. Allen<sup>2</sup> (<sup>1</sup> Boston University, Dept. of Earth and Environment; <sup>2</sup> NIST, Sensor Science Division)

#### **Measurements of downwelling irradiance using a diffuse reflectance standard and calibrated radiometer for validation of modeled bias errors**

B. Carol Johnson and Thomas Larason (NIST, Sensor Science Division)

#### **Mid-infrared tunable diode laser spectroscopy for the detection of fugitive methane emissions**

Jalal Norooz Oliaee, N. Sabourin, J. A. Gupta, P. Lobo, K. Thomson and G. Smallwood (NRC Metrology, Ottawa)

**3:15 – 3:45** Coffee break and vendor exhibit

### **Session III – UV and IR Radiation – Measurements, Concerns & Applications**

Session Chair: David Sliney

**Asymptotics of diffraction corrections in radiometry**

Eric L. Shirley (NIST Sensor Science, Gaithersburg, MD, USA)

**Measurement errors due to limitations of lenses to focus wide wavelength light**

Tim Moggridge (Westboro Photonics, Ottawa, ON, Canada)

**Status Update of the NIST Infrared Optical Properties of Materials Program**

Leonard Hanssen, Simon Kaplan, Braden Czapla and David Deisenroth (NIST, Gaithersburg, MD, USA)

**Update on Revisions of Standards for Photobiological Safety of Lamps**

David Sliney (Consulting Medical Physicist, Fallston, MD, USA)

**CORM 9<sup>th</sup> Report – Invited Talk**

Chair: John Bullough (CORM VP)

**Exhibitor Introductions (2 minutes max each)**

Chair: Tim Moggridge

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*29 October*

*Tuesday Morning*

**8:30-10:15**

**Session IV – Optical Properties of Materials**

Session Chair: Heather Patrick (NIST)

**SIM K6 – The regional intercomparison for spectral transmittance**

Catherine Cooksey (NIST, Gaithersburg, MD, USA)

**Heading down the profiling rabbit hole**

Dave Wyble (Avian Technologies, New London, NH, USA)

**NIST high-accuracy index measurements of IR materials**

John Burnett (NIST, Gaithersburg, MD, USA)

**Development of a new absolute diffuse reflectometer at NRC: status and outlook**

Luke Sandilands, Éric Côté and Joanne Zwinkels (NRC Metrology, Ottawa, ON, Canada)

**9:45-10:15 Registration for CIE-only attendees**

**10:15-10:45 Coffee break and vendor exhibit**

**Poster Session for Students/ Emerging Professionals**

Chair: Mark Jongewaard (University of Colorado)

**10:45-11:05 Presented Posters (3 minutes each)** in NRC Sussex auditorium

**Investigation of controllable-tone lighting systems using phosphor and UV LEDs with different peak wavelengths**

Narufumi Kawanobe (Kanagawa Institute of Technology, Japan)

**What we do with NON-STANDARD samples in NRC Spectrophotometry Team**

Stacey Lee (NRC Metrology, Ottawa, ON, Canada)

**Spatial uniformity and spectral responsivity measurements of large area indium gallium arsenide and germanium photodiodes**

Allison Sibley (NRC Metrology, Ottawa, ON, Canada)

**A real-time spatial photobiological light monitoring and control system**

Mojtaba Parsaee (École d'Architecture, Université Laval, QC, Canada)

**Sensor selection and integration into a wearable sensor array for human health monitoring**

Mohammed Adnan Shareef (Northern Illinois University, Dekalb, IL, USA)

**Blue light blocking capabilities and hazardous light transmission evaluation**

Ken Tsui (Northern Illinois University, Dekalb, IL, USA)

**11:05-11:15 Set-up for CIE/CORM Poster Session**

**11:15-12:00 Poster Session** in vendor area

**12:00-12:15 Judging of the Poster Presentations**

**12:15-1:30 Lunch (provided) in vendor exhibit area**

*October 29*

*Tuesday Afternoon 1:30-5:00 PM*

### **Session V – LED Lighting for Specialized, Industrial or Commercial Applications**

Session Chair: Yuqin Zong (NIST)

#### **Specifying LED colors for horticultural lighting**

Ian Ashdown (SunTracker Technologies, Victoria, BC, Canada)

#### **Comparison of LM-85 LED measurement techniques**

Jeff Hulett (Vektrex, San Diego, California, USA)

#### **Solid-state lighting measurement activities at the National Research Council of Canada**

Amin Rasoulof, William Neil, Éric Côté and Arnold Gaertner (NRC Metrology, Ottawa, ON, Canada)

**2:45-3:15 PM Coffee break and vendor exhibit**

### **Session VI– Health and Well-Being Responses to Light and their Measurement**

Session Chair: Jennifer Veitch (NRC)

#### **Experimental evaluation of optical filters for reduction of blue light hazard and circadian stimulus**

William J. Mills, III, Kevin B. Martin, Justin L. Cathey and Ken Tsui (Northern Illinois University, USA)

#### **Evaluating the circadian experience of supportive living residents**

Sandy Byers, D. Hetrick, J. Kline, D. Northcutt, P. Ward, D. Olguin, E. Schumacher, E. Valdivia, and K. van den Wymelenberg, University of Oregon, USA)

#### **Ameliorations in both mood and subjective sleep following light: an open-label light therapy intervention study**

Ashley Nixon<sup>1</sup>, M. Strick<sup>2</sup>, N. Glozier<sup>3</sup>, K-L Fields<sup>3</sup>, R. Wallis<sup>3</sup>, D. Biddle<sup>3</sup>, C.Chan<sup>3</sup>, I. Hickie<sup>3</sup>, J. De Koninck<sup>1</sup> and R. Robillard<sup>1</sup> (1 The Royal's Institute of Mental Health Research, affiliated with University of Ottawa, Canada; <sup>2</sup> The Royal Ottawa Mental Health Centre, Ottawa; <sup>3</sup> Clinical Research Unit, Brain & Mind Centre, The University of Sydney, AU)

#### **Health and well-being responses to daylighting in northern buildings**

Mojtaba Parsae<sup>1</sup>, C. M.H. Demers<sup>1</sup>, M. Hébert<sup>2</sup>, J-F Lalonde<sup>3</sup> and A. Potvin<sup>1</sup> (<sup>1</sup> GRAP, École d'Architecture, Université Laval, Québec, QC, Canada; <sup>2</sup> CERVO Brain Research Centre, Faculty of Medicine, Université Laval; <sup>3</sup> Computer Vision and System Lab, Dept. of Electrical and Computer Engineering, Université Laval, Canada)

**6:00 PM**      **Reception and Dinner at Canadian Museum of History, Gatineau, QC**

**7:00 PM**      **Franc Grum Memorial Dinner and Lecture**

Guest Speaker: Ian Ashdown (President, SunTracker Technologies)

**“Metric Follies, or the Folly of Metrics”**

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**30 October**

**Wednesday Morning 8:30 to 12:00 PM**

**Session VII – Interior and Exterior Lighting**

Session Chair: Venkat Venkataramanam (University of Toronto)

**Photobiological lighting adaptation scenarios for healthy adaptive buildings**

Mojtaba Parsae<sup>1</sup>, Claude M.H. Demers<sup>1</sup>, Marc Hébert<sup>2</sup>, Jean-François Lalonde<sup>3</sup> and André Potvin<sup>1</sup>

(<sup>1</sup> GRAP, École d'Architecture, Université Laval, Québec, QC, Canada, <sup>2</sup> CERVO Brain Research Centre, Faculty of Medicine, Université Laval, <sup>3</sup> Computer Vision and System Lab, Dept. of Electrical and Computer Engineering, Université Laval, Canada)

**Temporal light modulation: Research progresses, but questions remain**

Jennifer A. Veitch (NRC Construction, Ottawa, ON, Canada)

**Organization and analysis of interior light measurements produced by multiple optical spectrometers utilizing open source software**

Matthew Bikun (Northern Illinois University, USA)

**9:45-10:15**      **Coffee break and vendor exhibit**

**Session VIII – Vision and Colour**

Session Chair: Jeff Hovis (University of Waterloo)

**Color Discrimination**

Tony Esposito (Lighting Research Solutions LLC, Boston, MA, USA)

**Quantifying perceived chroma and hue changes of object colors in lighting due to Hunt Effect**

Yuki Kawashima and Yoshi Ohno (NIST, Gaithersburg, USA)

**Assessing color disagreement due to diversity in spectral sensitivity functions**

Lorne Whitehead<sup>1</sup> and Michael Royer<sup>2</sup> (<sup>1</sup> University of British Columbia, Vancouver, BC Canada; <sup>2</sup> Pacific Northwest National Laboratory, Portland, OR, USA)

**Vision experiment on perception of correlated color temperature**

Yoshi Ohno<sup>1</sup> and Semin Oh<sup>2</sup> (<sup>1</sup> NIST, Gaithersburg, USA; <sup>2</sup> Ulsan National Institute of Science and Technology, Ulsan, South Korea)

**Color vision challenges in perceptual displays for automobiles**

Jeremie Gerhardt, Hyunjin Yoo, Tara Akhavan and Hossein Ziaei Nafchi (IRYStec Software, Inc., Montreal, QC, Canada)

**Photopic and mesopic visual resolution in Parkinson's disease patients with and without freezing of gait**

Jeffery K. Hovis<sup>1</sup>, Mosaad. Alhassan<sup>2</sup> and Quincy. J. Almeida<sup>3</sup> (<sup>1</sup> School of Optometry & vision Science, University of Waterloo, Waterloo, ON, Canada; <sup>2</sup>Dept of Optometry & Vision Science, College of Applied Medical Sciences, King Saud University, Riyadh, Saudi Arabia; <sup>3</sup> Sun Life Financial Movement Disorders Research and Rehabilitation Center, Wilfrid Laurier University, Waterloo, ON, Canada)

**12:15-12:30 CORM Business Meeting and Poster Award Announcement**

**12:30-1:30 Lunch (provided) in vendor exhibit area**

**1:30 PM** Buses depart for NRC Montreal Road campus

**2:00-4:15 PM Tour of the NRC Photometry and Radiometry Labs at 1200 Montreal Road**

**4:30 PM** Buses depart for return to NRC Sussex

**4:45-5:30 CORM BOD meeting** in NRC Sussex Board Room, 1<sup>st</sup> floor

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*31 October*

*Thursday Morning 8:30 – 12:00*

**CNC/CIE and CIE-USNC Plenary Session** in Room 3001, NRC Sussex

Session Chairs: Venkat Venkataramanam (CNC/CIE President) and Jim Leland (CIE-USNC President)

**Activity Reports by Country Members (Canada and USA) for CIE Divisions**

Division 1 (Jeffrey Hovis, CA and Ellen Carter, USA)

Division 2 (Joanne Zwinkels, CA and Yuqin Zong, USA)

Division 3 (Jennifer Veitch, CA and Terry McGowan, USA)

**10:15-10:45 Coffee break** in the NRC Sussex Library

Division 4 (Cristian Suvagau, CA and Ronald Gibbons, USA)

Division 6 (Sami Qutob, CA and George C. Brainard, USA)

Division 8 (Tara Akhavan, CA and Max Derhak, USA)

**12:00-1:30 Lunch (provided)** in the NRC Sussex Library

*31 October*

*Thursday Afternoon 1:30-5:00*

**Separate CNC/CIE and CIE-USNC Business Meetings**

CIE-USNC in Room 3001, NRC Sussex

CNC/CIE and SMC ISO TC274 in NRC Sussex Board Room, 1<sup>st</sup> floor

**3:00-3:30 Coffee break** in the NRC Sussex Library

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**List of Exhibitors at CORM-CIE 2019 in Ottawa, Canada**

**Gamble Technologies**

**Radiant Vision Systems**

**PCO-TECH**

**Westboro Photonics**

**National Research Council Canada**