

Symposium on Photonics Science and Technology

*2021 Fitzpatrick Institute for Photonics (FIP) Annual Meeting
May 16-18, 2021, Duke University, Durham, NC*



DUKE FITZPATRICK
INSTITUTE
for PHOTONICS

In Celebration of the International Day of Light (IDL)



International
Day of Light

16 May

ADVANCE PROGRAM AGENDA

Sunday, May 16, 2021 Outreach Program to Celebrate 2021 International Day of Light

1:00 – 1:05 pm **Welcome**

Tuan Vo-Dinh, Ph.D., R. Eugene and Susie E. Goodson Distinguished Professor of Biomedical Engineering, Professor of Chemistry, and Director of the Fitzpatrick Institute for Photonics, Duke University, Durham, NC

1:05 – 1:20 pm **UNESCO IDL Message**

John Dudley, Ph.D., Chair of UNESCO Steering Committee of IDL
Professor of Physics, University of Franche-Comté, Besançon, France

1:20 – 3:00 pm **Outreach Program**

Co-Chairs: **Vanessa Cupil-Garcia**, Ph.D. Candidate, Chemistry, Duke University;
Joy Li, Ph.D. Candidate, Biomedical Engineering, Duke University; and
August Burns, Fitzpatrick Institute for Photonics Business Manager, Duke University,
Durham, NC

Announcement of IDL Photo Contest Winner

Virtual Light Demonstrations: Join us to see.... Why is the sky blue? What's too small to see with eyes and light microscopes? How to create art with light?

Thanks to our Outreach Sponsor:

 Light Painting Brushes 

POSTER SESSION

The Academic Research Posters will be on display throughout the Symposium.

Winners of the Poster Session will be announced at the end of the Symposium.

Monday, May 17, 2021

1:00-1:05 pm **Introduction**

Tuan Vo-Dinh, Ph.D., R. Eugene and Susie E. Goodson Distinguished Professor of Biomedical Engineering, Professor of Chemistry, and Director of the Fitzpatrick Institute for Photonics, Duke University, Durham, NC

1:05-1:10 pm **Opening and Welcome Address**

Sally Kornbluth, Ph.D., Duke University Provost and
Jo Rae Wright University Distinguished Professor of Biology, Duke University, Durham, NC

1:10-1:15 pm **Ravi Bellamkonda, Ph.D.**, Vinik Dean of the Edmund T. Pratt, Jr., School of Engineering, Professor of Biomedical Engineering, Duke University, Durham, NC

- 1:15-1:30 pm **UNESCO International Day of Light Message**
John Dudley, Ph.D., Chair of UNESCO Steering Committee of IDL
Professor of Physics, University of Franche-Comté, Besançon, France
“An overview of the International Day of Light 2021”
- 1:30-2:10 pm **Symposium Keynote**
Rainer Weiss, Ph.D.
2017 Nobel Laureate in Physics.
Professor of Physics, Emeritus,
Massachusetts Institute of Technology, Cambridge, MA
“The beginnings of gravitational wave astronomy: current state and future”
- 2:10-2:15 pm **Fitzpatrick Institute for Photonics Award Presentation**
2021 Pioneer in Photonics Award
- 2:15-2:30 pm **BREAK**
- 2:30-4:10 pm **Session 1: Special Topic – Photonics and the Brain**

Chair: Joseph A. Izatt, Ph.D., Michael J. Fitzpatrick Distinguished Professor of Engineering in the Edmund T. Pratt, Jr., School of Engineering, Professor of Biomedical Engineering, Duke University and Professor of Ophthalmology, Duke University School of Medicine, Durham, NC

- 2:30-3:00 pm **Plenary Lecture**
Edward S. Boyden, Ph.D.
Y. Eva Tan Professor in Neurotechnology at MIT, Howard Hughes Medical Institute, McGovern Institute, Professor, Departments of Brain and Cognitive Sciences, Media Arts and Sciences, and Biological Engineering, MIT, Co-Director, MIT Center for Neurobiological Engineering, Member, MIT Center for Environmental Health Sciences, Computational and Systems Biology Initiative, and Koch Institute
Leader, Synthetic Neurobiology Group,
Massachusetts Institute of Technology, Cambridge, MA
“Optical Tools for Analyzing and Controlling Biological Systems”
- 3:00-3:25 pm **Invited Lecture**
Elizabeth M. C. Hillman, Ph.D.
Herbert and Florence Irving Professor at The Mortimer B. Zuckerman Mind Brain Behavior Institute, and Professor of Biomedical Engineering and Radiology, Columbia University, New York, NY
“Fast 3D microscopy to capture the dynamics of life”
- 3:25-3:50 pm **Invited Lecture**
Carl Petersen, Ph.D.
Director of The Brain Mind Institute, Faculty of Life Sciences, Professor, Head of the Laboratory of Sensory Processing
École Polytechnique Fédérale de Lausanne (EPFL), Lausanne, Switzerland
“Multiscale optical imaging of the mouse brain in action”

3:50-4:10 pm **Richard D. Mooney, Ph.D.**
George Barth Geller Professor of Neurobiology
Duke University School of Medicine, Durham, NC
“Imaging the neural dynamics underlying birdsong practice and performance”

4:10-4:20 pm **BREAK**

4:20-5:30 pm **Session 2: Special Topic – *Advances in Interferometry***

Chair: Nan M. Jokerst, Ph.D., J.A. Jones Distinguished Professor of Electrical and Computer Engineering, and Executive Director of the Shared Materials Infrastructure Facility, Duke University, Durham, NC

4:20-4:45 pm **Invited Lecture**
Jessica McIver, Ph.D.
Assistant Professor, Department of Physics and Astronomy
University of British Columbia, Vancouver, BC
“Detecting gravitational waves with Advanced LIGO”

4:45-5:10 pm **Invited Lecture**
(James) Ira Thorpe, Ph.D.
Astrophysicist, NASA Goddard Space Flight Center
Greenbelt, MD
“Picometers over Gigameters: The effort to build an interferometer the size of our Sun”

5:10-5:30 pm **Joseph A. Izatt, Ph.D.**, Michael J. Fitzpatrick Distinguished Professor of Engineering in the Edmund T. Pratt, Jr., School of Engineering, Professor of Biomedical Engineering, Duke University and Professor of Ophthalmology, Duke University School of Medicine, Durham, NC
“Advances in OCT for Interactive Clinical Imaging and Image-Guided Robotic Microsurgery”

Tuesday, May 18, 2021

1:00-2:45 pm **Session 3: Special Topic – *Photonics and the Brain***

Chair: Christine K. Payne, Ph.D., Yoh Family Associate Professor of Mechanical Engineering and Materials Science, Director of Graduate Studies in the Department of Mechanical Engineering and Materials Science, and Associate Professor of Chemistry, Duke University, Durham, NC

1:00-1:25 pm **Invited Lecture**
Na Ji, Ph.D., Associate Professor for the Helen Wills Neuroscience Institute, and the Departments of Physics and Molecular Cell Biology, University of California, Berkeley, CA
“Imaging the brain at high spatiotemporal resolution”

1:25-1:45 pm **Yiyang Gong, Ph.D.**, Assistant Professor of Biomedical Engineering, Assistant Professor of Electrical and Computer Engineering, Duke University and Assistant Professor in Neurobiology, Duke University School of Medicine, Durham, NC
“Advanced light-field imaging and deep learning processing of neural activity”

1:45-2:05 pm **Lindsey Glickfeld, Ph.D.**, Associate Professor of Neurobiology, Duke University School of Medicine, Durham, NC
“Diverse contributions of mouse visual areas to perceptual decision making”

2:05-2:25 pm **Junjie Yao, Ph.D.**, Assistant Professor of Biomedical Engineering Duke University, Durham, NC
“Ultra-high-speed Photoacoustic Imaging of Brain Functions”

2:25-2:45pm **Marc A. Sommer, Ph.D.**, W.H. Gardner, Jr. Associate Professor, Associate Professor of Biomedical Engineering, Associate Professor in Neurobiology and Associate Professor of Psychology and Neuroscience, Duke University, Durham, NC
“Improving the Reliability of Primate Optogenetics”

2:45-2:50 pm **BREAK**

2:50-4:05 pm **Session 4: *Photonics and Pandemics***

Chair: Warren S. Warren, Ph.D., James B. Duke Distinguished Professor of Chemistry, Professor of Radiology, Professor of Biomedical Engineering, and Professor of Physics, Duke University, Durham, NC

2:50-3:15 pm **Invited Lecture**
Christian Joachim Kähler, Ph.D., Professor and Director, Institute for Fluid Mechanics and Aerodynamics, Bundeswehr University, Munich, Germany
“From droplets to pandemic – how to prevent SARS-CoV-2 infections via droplets and aerosols”

3:15-3:40 pm **Invited Lecture**
Philip A. Anfinrud, Ph.D., Section Chief, Ultrafast Biophysical Chemistry Section, Laboratory of Chemical Physics, NIDDK, National Institutes of Health, Bethesda, MD
“Visualization and characterization of fluid droplets emitted from the oral cavity with laser light scattering show how face coverings mitigate the risk of respiratory virus transmission”

3:40-4:00 pm **Martin Fischer, Ph.D.**, Associate Research Professor in the Department of Chemistry, Duke University, Durham, NC
“Development of a low-cost measurement of facemask efficacy for reducing droplet emission during speech”

4:00-4:05pm **BREAK**

4:05-5:05pm **Session 5: *Advanced Photonics***

Chair: Volker W. Blum, Ph.D., Associate Professor in the Department of Mechanical Engineering and Materials Science, and Associate Professor of Chemistry, Duke University, Durham, NC

4:05-4:25 pm **Samira Musah, Ph.D.**, Assistant Professor in the Department of Biomedical Engineering, Duke University and Assistant Professor in Medicine, Duke University School of Medicine, Durham, NC
“Microfluidic devices for stem cell engineering and human disease modeling”

4:25-4:45 pm **Sonia Grego, Ph.D.**, Associate Research Professor in the Department of Electrical and Computer Engineering, Duke University, Durham, NC
“A Smart Toilet with Artificial Intelligence as a novel tool for digital health”

4:45-5:05 pm **Willie John Padilla, Ph.D.**, Professor in the Department of Electrical and Computer Engineering, Duke University, Durham, NC
“Deep learning the next 20 years of electromagnetic metamaterials”

5:05- 5:35pm **Plenary Lecture**
Valery V. Tuchin, Ph.D., Professor, Head of the Department of Optics and Biophotonics and Director of the Scientific Medical Center of the Saratov State University, Head of the Laboratory for Laser Diagnostics of Technical and Living Systems at the Institute of Precise Mechanics and Control of the RAS, Supervisor of the Interdisciplinary Laboratory of Biophotonics at the National Research Tomsk State University and the Femtomedicine Laboratory of the ITMO University, Russia
“Towards multimodal tissue imaging with optical clearing”

5:35-5:45 pm **PRESENTATION OF POSTER WINNERS and CLOSING REMARKS**

Tuan Vo-Dinh, Ph.D., R. Eugene and Susie E. Goodson Distinguished Professor of Biomedical Engineering, Professor of Chemistry, and Director of the Fitzpatrick Institute for Photonics,
Duke University, Durham, NC

5:45 pm **SYMPOSIUM ADJOURNS**



***2021 Fitzpatrick Institute for Photonics (FIP) Annual Meeting
Program Committee***

Symposium Chair: Tuan Vo-Dinh, Director of Fitzpatrick Institute for Photonics

Symposium Manager: August Burns, Department Business Manager of Fitzpatrick Institute for Photonics

Symposium Technical Manager: John Vincent, Multimedia User Service Specialist, Pratt School of Engineering

Symposium Posters Award Committee Co-Chairs: Professors Olivier Delaire, Martin Fischer, and Junjie Yao

Scientific Program Committee: Professors Steve Cummer, Martin Fischer, Charles Gersbach, Yiyang Gong, Nan Jokerst, Jungsang Kim, Warren Warren, Weitao Yang, Junjie Yao, and Fan Yuan

Symposium Outreach Co-Chairs: **Vanessa Cupil-Garcia**, Fitzpatrick Scholar and Ph.D. Candidate, Chemistry, Duke University; **Joy Li**, National Defense Science and Engineering Graduate (NDSEG) Fellow and Ph.D. Candidate, Biomedical Engineering, Duke University; and **August Burns**, Fitzpatrick Institute for Photonics Business Manager



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