Symposium on Photonics Science and Technology

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

In Celebration of the International Day of Light (IDL)

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

Plenary Lecture
2:30-3:00 pm  Edward S. Boyden, Ph.D.
Y. Eva Tan Professor in Neurotechnology at MIT, Howard Hughes
Medical Institute, McGovern Insitute, 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*

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**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 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**
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”

5:05-5:35 pm  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
**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