DUKE FITZPATRICK INSTITUTE *for* PHOTONICS

Symposium on Frontiers in Photonics

2022 Fitzpatrick Institute for Photonics (FIP) Annual Meeting

March 7-8, 2022, Duke University, Durham, NC

United Nations Educational, Scientific and Cultural Organization

International Day of Light

PROGRAM AGENDA

The lectures will be held in an All-Virtual, Web Conference format via Zoom and the Poster Session will follow a hybrid format including an Online Only Version and a Live In-Person Reception.

Monday, March 7, 2022

1:00-1:05 pm **Introduction**
Tuan Vo-Dinh, Ph.D., Director of the Fitzpatrick Institute for Photonics, R. Eugene and Susie E. Goodson Distinguished Professor of Biomedical Engineering, and Professor of Chemistry, 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 **Jerome P. Lynch, Ph.D., F.EMI**, Vinik Dean of Engineering of the Pratt School of Engineering, Professor of Civil and Environmental Engineering and Professor of Electrical and Computer Engineering, Duke University, Durham, NC

1:15-1:55pm **Symposium Keynote**
Andrea Ghez, Ph.D.
2020 Nobel Laureate in Physics
Professor of Physics & Astronomy
University of California, Los Angeles, CA
"From the Possibility to the Certainty of a Supermassive Black Hole"

1:55- 2:00 pm **Fitzpatrick Institute for Photonics Award Presentation**
2022 Pioneer in Photonics Award

2:00-2:10 pm **BREAK**

2:10-2:40 pm **Plenary Lecture**
Duncan Graham, Ph.D.
Distinguished Professor, Head of Department of Pure and Applied Chemistry, Technology and Innovation Centre, University of Strathclyde, Glasgow, Scotland
"Raman, SERS and SRS Analysis of Biomolecules"

2:40-4:15 pm **Session 1: Special Topic – Photonics For Health: From Medical Diagnostics to Tracking Germs and Viruses in the Pandemic Era**

Celebration of the 200th Anniversary of Louis Pasteur, The pioneer in modern germ theory and vaccine development

Chair: Christoph Schmidt, **Ph.D**., Hertha Sponer Distinguished Professor of Physics, Professor of Biomedical Engineering, Professor of Biology, Duke University, Durham, NC

2:40-3:05 pm **Invited Lecture**
Laura M. Lechuga, Ph.D.
Professor, Group Leader of NanoBiosensors and Bioanalytical Applications Group, Catalan Institute of Nanoscience and Nanotechnology, Bellaterra, Barcelona, Spain
"Nanophotonics Biosensors for Ultrasensitive Diagnostics at the Point-of-Need"

3:05-3:30 pm **Invited Lecture**
Kimberly Hamad-Schifferli, Ph.D.
Associate Professor, Department of Engineering, Affiliate Faculty, School for the Environment, University of Massachusetts Boston, Boston, MA
"Rapid Diagnostics for Infectious Diseases Using Gold Nanoparticles"

3:30-3:55 pm **Invited Lecture**
Zachary Schultz, Ph.D.
Associate Professor, Department of Chemistry and Biochemistry, The Ohio State University, Columbus, OH
"SERS Imaging in Live Cells"

3:55-4:15 pm **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
"Nanoplasmonics Systems: From Early Cancer Diagnostics to Infectious Disease Detection"

4:15-4:25pm **BREAK**

4:25-5:40 pm **Session 2: Special Topic – Photonics and Astronomy: Light Path Beyond the Stars**

Chair: Christopher Walter, **Ph.D**., Professor, Cosmology and Astrophysics, Department of Physics, Interim Associate Chair of Physics, Duke University, Durham, NC

4:25-4:50 pm **Invited Lecture**
Anna Frebel, Ph.D.
Professor of Physics, Principal Investigator, MIT Kavli Institute for Astrophysics and Space Research, Massachusetts Institute of Technology, Boston, MA
"Discovering the Oldest Stars in the Milky Way and Its Dwarf Galaxies with High-Resolution Optical Spectroscopy"

4:50-5:15 pm **Invited Lecture**
Catherine Heymans, Ph.D.
Professor, Astronomer Royal of Scotland, Institute for Astronomy, University of Edinburgh, Edinburgh, Scotland
"New Directions in Cosmology"

~~5:15-5:40 pm **Invited Lecture**~~. ***CANCELLED***
Feryal Özel, Ph.D.
Professor, Departments of Astronomy and Physics, University of Arizona, Tucson, AZ
"From Images of a Black Hole to Tests of General Relativity"

5:15-5:40 pm Duke Cosmology & Astrophysics Team
Daniel Scolnic, Ph.D., Assistant Professor
Department of Physics, Duke University, Durham, NC
"Measuring the Expansion Rate of the Universe Using a 'Distance Ladder' of Photometry"

Tuesday, March 8, 2022

12:00 – 1:00pm
SPECIAL IN-PERSON POSTER SESSION RECEPTION – FITZPATRICK ATRIUM

1:00-1:30 pm **Plenary Lecture**
Thomas Thundat, Ph.D.
Professor, Empire Innovation Professor, Chemical and Biological Engineering, School of Engineering and Applied Sciences, University of Buffalo,
The State University of New York Buffalo, NY
"Molecular Recognition Using Nanomechanical Photothermal Effects"

1:30-3:05 pm **Session 3: Special Topic – Next-Generation: Photonics Sensing & Imaging**

Chair: Christopher Monroe, **Ph.D.,** Gilhuly Family Presidential Distinguished Professor, Departments of Electrical and Computer Engineering and Physics, Director, Duke Quantum Center, Duke University, Durham, NC

1:30-1:55 pm **Invited Lecture**
Sylvain Gigan, Ph.D., Professor of Physics, Laboratoire Kastler-Brossel, Sorbonne University, Paris, France
"A Sneak Peek with Light into Opaque Materials: from Imaging to Computing"

1:55-2:20 pm **Invited Lecture**
Dan Oron, Ph.D., Professor, The Harry Weinrebe Professional of Laser Physics, Weizmann Institute of Science, Rehovot, Israel
"Quantum Enhanced Superresolution Microscopy"

2:20-2:45 pm **Invited Lecture**
Raphael C. Pooser, Ph.D., Distinguished Research Scientist, Group Leader, Quantum Computing and Sensing Group, Oak Ridge National Laboratory, Oak Ridge, TN
"21st Century Quantum Optical Sensors"

2:45-3:05 pm **Christopher Monroe**, **Ph.D.,** Gilhuly Family Presidential Distinguished Professor, Departments of Electrical and Computer Engineering and Physics, Director, Duke Quantum Center, Duke University, Durham, NC
"Imaging of Single Atoms and Quantum Computers"

3:05-3:20 pm **BREAK**

3:20-4:35 pm **Session 4:** ***Advanced Photonics System I***

Chair: Natalia Litchinitser, **Ph.D.,** Professor, Department of Electrical and Computer Engineering, Duke University, Durham, NC

3:20-3:45 pm **Invited Lecture**
Hatice Altug, **Ph.D.,** Professor, Department of Bioengineering, Head of Bionanophotonic Systems Laboratory, Ecole Polytechnique Federale de Lausanne (EPFL), Lausanne, Switzerland
"Frontiers in Nanophotonics: Enabling Technology for Optical Biosensing and Bioimaging"

3:45-4:05 pm **Jessilyn Dunn, Ph.D.,** Assistant Professor of Biomedical Engineering, Assistant Professor of Biostatistics and Bioinformatics, Assistant Professor of Electrical and Computer Engineering, Duke University, Durham, NC
"Optical Sensing for Digital Biomarker Development"

4:05-4:25 pm **Christoph Schmidt, Ph.D**., Hertha Sponer Distinguished Professor of Physics, Professor of Biomedical Engineering, Professor of Biology, Duke University, Durham, NC
"Imaging and mechanical probing of Drosophila mechanosensory organs"

4:25-4:40 pm **BREAK**

4:40-5:45 pm **Session 5:** ***Advanced Photonics Systems II***

Chair: Yiyang Gong, **Ph.D.,** Assistant Professor, Department of Biomedical Engineering, Duke University, Durham, NC

4:40-5:05 pm **Invited Lecture**
Joerg Bewersdorf, Ph.D., Professor, Cell Biology and of Biomedical Engineering, Yale University, New Haven, CT
"All-Optical Super-Resolution Imaging of Molecules in Their Nanoscale Cellular Context"

5:05-5:25 pm **Alberto Bartesaghi, Ph.D.,** Associate Professor of Computer Science, Associate Professor of Biochemistry, Duke University, Durham, NC
"SmartScope: AI-Driven Navigation for High-Throughput Cryo-EM"

5:25-5:45 pm **Po-Chun Hsu, Ph.D.,** Assistant Professor of Mechanical Engineering and Materials Science, Duke University, Durham, NC
"Electrochemical Dynamic Solar and Mid-infrared Thermoregulation"

5:45-6:00 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

6:00 pm **SYMPOSIUM ADJOURNS**

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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 Coordinators: Vanessa Cupil-Garcia, Joy Li, Hsin-neng Wang

Scientific Program Committee: Professors Steve Cummer, Martin Fischer, Charles Gersbach, Nan Jokerst, Jungsang Kim, Daniel Scolnic, Michael Troxel, Christopher Walter, Warren Warren, Weitao Yang, and Fan Yuan