Optica Biophotonics Congress and Exhibit Session Guide

Disclaimer: this guide is limited to technical program with abstracts and author blocks as of 14 April. For updated and complete information with special events, reference the online schedule or mobile app.

Monday, 21 April

08:00 -- 10:00
Room: Constellation Ballroom A
DM1A • Machine Learning for Image Reconstruction, Interpretation, and Optical Design I
Presider: Mooseok Jang; Korea Advanced Inst of Science & Tech, South Korea

DM1A.1 • 08:00
Performance Benefits of Increased Wavelength Count in Transabdominal Fetal Pulse Oximetry: A Principled Approach, Rishad Raiyan Joarder[1], Soheil Ghiasi[1]; *[1]Electrical and Computer Engineering, Univ. of California, Davis, USA.* Wavelength-count in a Transabdominal Fetal Pulse-oximetry system is an important design consideration. We tackle this empirically with Feature Importance using in-vivo \& simulation data. We show increased wavelength improves depth-sensitivity but overall performance scales diminishingly.

DM1A.2 • 08:15
Scattering-Based Light Sheet Microscopy Images of Anal Lesions With Challenging Morphological Features, DongKyun Kang[1,2], Yongjun Kim[2], Jingwei Zhao[1], Ameer Nessaee[3], Brooke Liang[4], Michelle Khan[5], Eric Yang[4]; *[1]Univ of Arizona, Coll of Opt Sciences, USA; [2]Dept. of Biomedical Engineering, Univ. of Arizona, USA; [3]Dept. of Electrical and Computer Engineering, Univ. of Arizona, USA; [4]Dept. of Pathology, Stanford Univ., USA; [5]Dept. of Obstetrics and Gynecology, Stanford Univ., USA.* We evaluated cellular morphological features visualized in scattering-based light sheet microscopy images of anal biopsies that were later submitted for p16 immunohistochemistry staining due to inconclusive findings from H&E images.

DM1A.3 • 08:30 (Invited)
Seeing Beyond Limits Using AI: Noise and Wavelength, Young-Gyu Yoon[1]; *[1]Electrical Engineering, KAIST, Korea (the Republic of).* We explore how artificial intelligence is revolutionizing optical imaging for neuroscience, from enhancing signal quality to enabling highly multiplexed imaging. Our self-supervised computational approaches complement modern microscopy techniques without requiring labeled training data.

DM1A.4 • 09:00 (Invited)
Innovative Optical and AI-Driven Solutions for Neuroscience: Revolutionizing Disease Research Through Advanced Imaging and Behavioral Platforms, Murat Yildirim[1]; *[1]Lerner Research Inst., USA.* Abstract not available.

DM1A.5 • 09:30 (Invited)
AI in Advanced Microscopy, Shalin B. Mehta[1]; *[1]Chan Zuckerberg Biohub, USA.* Abstract not available.

08:00 -- 10:00
Room: Constellation Ballroom B
BM1B • Analyzing Circuitry, Network Function, and Information Processing I
Presider: Vicente Parot; Pontificia Univ Catolica de Chile, Chile

BM1B.1 • 08:00 (Keynote)
High Precision Neural Perturbations at Scale With Two-Photon Optogenetics, Hillel ADESNIK[1]; *[1]Univ. of California, Berkeley, USA.* Precise perturbations of neural activity are essential for unraveling the inner workings of brain circuits and may enable new forms of neural prostheses. I will summarize our recent advances in increasing the speed, scale, and addressable volume of patterned two photon holographic optogenetics.

BM1B.2 • 08:45 (Invited)
Genetically Encoded Voltage Sensors for Optical Monitoring of Brain Activity, Ahmed Abdelfattah[1]; *[1]Brown Univ., USA.* Voltage imaging provides unparalleled spatial and temporal resolution of the brain's electrical signaling at the cellular and circuit levels. Brightness, signal to noise ratio, and spectral color have limited the utility of existing voltage sensors, especially *in vivo*. In this talk, I will describe our efforts to develop new bright chemigenetic voltage sensors across the visible spectrum that address those limitations.

BM1B.3 • 09:15 (Top-Scored)
Voltage Imaging in Vivo Using Periodic Structured Illumination With Pseudo-HiLo Reconstruction, Forest Speed[1], Alec Teel[2], Diego Restrepo[2], Emily A. Gibson[1]; *[1]Bioengineering, Univ. of Colorado, Anschutz Medical Campus, USA; [2]Cell and Developmental Biology, Univ. of Colorado, Anschutz Medical Campus, USA.* We utilize pseudo-HiLo (pHiLo) for voltage imaging in awake mice expressing Voltron2$_{552}$ in parvalbumin (PV) interneurons in the somatosensory cortex. We demonstrate increased signal-to-background ratio using pHiLo compared to traditional widefield neural recording.

BM1B.4 • 09:30
Imaging of Spontaneous Cortical Activity Using High-Speed Wide-Field Voltage Imaging, Lisa M. Meyer-Baese[1,2], Dieter Jaeger[2], Shella Keilholz[1]; *[1]Georgia Inst. of Technology & Emory, USA; [2]Biology, Emory Univ., USA.* A novel fast voltage sensitive fluorescent protein was used to look at resting state static functional connectivity across multiple frequency bands from 1Hz – 60 Hz. We compare these to functional connectivity in slow hemodynamic signals.

BM1B.5 • 09:45
Fluorescence Lifetime Imaging of Neural Activity in Vivo, Adam Bowman[1]; *[1]Salk Inst. for Biological Studies, USA.* Fluorescence lifetime imaging holds great promise for achieving quantitative measurements of fluorescent sensors. We present the electro-optic fluorescence lifetime microscopy (EO-FLIM) technique and recent advances imaging genetically encoded voltage indicators in vivo.

08:00 -- 09:45
Room: Aurora
NM1C • Superresolution
Presider: To Be Announced

NM1C.1 • 08:00 (Invited)
Single-Molecule Orientation-Localization Microscopy: New Approaches and Applications, Matthew D. Lew[1]; [1]*Washington Univ. in St. Louis, USA.* This talk will cover two key challenges in super-resolution imaging: How can one extract maximal information from every detected photon? What biophysical mechanisms can we elucidate via precise measurement of molecular orientations and positions?

NM1C.2 • 08:30 (Invited)
Mapping Cellular Function Through 3D Volumetric Single-Molecule Super-Resolution Imaging, Anna-Karin Gustavsson[1]; [1]*Rice Univ., USA.* I will demonstrate our recent developments for improved whole-cell 3D single-molecule tracking of dynamics and super-resolution imaging of nanoscale structures and showcase applications addressing biological and biomedical questions related to cellular function and pathogenesis.

NM1C.3 • 09:00
Achieving Super-Resolution Microscopy Using Image Phase Alignment Super-Sampling, James N. Caron[1], Giuliano Scarcelli[2], Jiarui Li[2]; [1]*Quarktet, USA;* [2]*Fischell Dept. of Bioengineering, Univ. of Maryland, USA.* Image Phase Alignment Super Sampling is applied to image sets taken with an Olympus inverted fluorescence microscope. Post-processing measurements reveal a 2.71 resolution improvement while subceeding the optical diffraction limit by a factor of 1.79.

NM1C.4 • 09:15
Combining Excitation and Emission Modulation Resolves the Angular Separation Between a Pair of Dipole Emitters, Yiyang Chen[1], Yuanxin Qiu[1], Matthew D. Lew[1]; [1]*The Preston M. Green Dept. of Electrical & Systems Engineering, Washington Univ. in St. Louis, USA.* We demonstrate that modulating the polarization of fluorescence excitation and emission distinguishes dipole pairs from single wobbling dipoles, and measures the orientation centroid and angular separation between a pair of dipole emitters with high precision.

NM1C.5 • 09:30
Label-Free DNA Spectroscopic Photon-Localization Nanoscopy, Geng Wang[1,2], Ruyi Gong[1,2], Yuanzhe Su[1,2], Nicolas Acosta[1,2], Wingshun Li[1,2], Luay Almassalha[1,2], Vadim Backman[1,2]; [1]*Dept. of Biomedical Engineering, Northwestern Univ., USA;* [2]*Center for Physical Genomics and Engineering, Northwestern Univ., USA.* We present Label-free DNA Spectroscopic Photon-Localization Nanoscopy, an intrinsic-contrast 3D genomic imaging technology with nanometer resolution, leveraging DNA autofluorescence and spectral algorithms to resolve chromatin types, map genomic domains, and reconstruct 3D genome structures.

08:00 -- 10:00
Room: Cambria
OM1E • Applications of Endogenous Probes
Presider: Fay Nicolson; Dana-Farber Cancer Inst., USA

OM1E.1 • 08:00 (Invited)
FLIM in Neurosurgery, Laura Marcu[1]; [1]*Univ. of California Davis, USA.* We present studies demonstrating FLIM's capability to guide neurosurgical procedures. Our findings indicate that label-free FLIM can (1) differentiate tumors from uninvolved parenchyma during biopsy and (2) detect infiltrative tumor margins during open craniotomy.

OM1E.2 • 08:30 (Invited)
Imaging Skin and Lymph Dynamics in Vivo With Endogenous Hypoxia Contrast, Brian Pogue[1]; [1]*Univ. of Wisconsin-Madison, USA.* Abstract not available.

OM1E.3 • 09:00 (Top-Scored, Invited)
Multi-Probe Metabolic Fluorescence Microscopy Captures Poor Tumor Immunogenicity, Sarah Mekha[1], Enakshi Sunassee[2], Miguel Salgado[1], Megan Madonna[1], Brian Crouch[1], Smita Nair[1], Nimmi Ramanujam[1]; [1]*Duke Univ., USA;* [2]*Dept. of Cell Biology, Harvard Medical School, USA.* Visualizing complex tumor-immune metabolic interactions is imperative to understanding cancer progression. Cocultures of 4T1 tumor cells and CD8+ T cells were imaged for glucose uptake and mitochondrial metabolism. Results point to poor immunogenic tumor phenotype.

OM1E.4 • 09:30 (Invited)
Metabolic Characterization of Neutrophil Activation Using Label-Free Fluorescence Lifetime Imaging Microscopy, Rupsa Datta[1], Veronika Miskolci[2], Gina M. Gallego-López[1], Emily Britt[1], Amani Gillette[1], Aleksandr Kralovec[1], Jing Fan[1], Anna Huttenlocher[2], Melissa Skala[1,2]; [1]*Morgridge Inst. for Research, USA;* [2]*Univ. of Wisconsin, Madison, USA.* In this work we employ fluorescence lifetime imaging microscopy of intrinsic metabolic co-factor NAD(P)H to quantify metabolic changes in neutrophils upon activation and metabolic pathway perturbations across biological systems.

08:00 -- 09:45
Room: Britannia
TM1F • Applications of Raman Spectroscopy
Presider: Narasimhan Rajaram; Univ. of Arkansas, USA

TM1F.1 • 08:00
Investigating Biomarkers of Radiation Resistance in Head and Neck Cancer Using Raman Spectroscopy, Varsha Karunakaran[1], Ruud P. Dings[2], Narasimhan Rajaram[1]; [1]*Univ. of Arkansas, USA;* [2]*Univ. of Arkansas for Medical Sciences (UAMS), USA.* Raman spectroscopy was applied to monitor early tumor biomolecular changes in sensitive and resistant head and neck cancer. Raman contributions from glycogen could provide a potential biomarker of

radiation resistance.

TM1F.2 • 08:15
Investigating the Generalization of a Predictive Model for Intra-Operative Raman Spectroscopy Detection low-Grade Gliomas and Glioblastomas in the Face of Multiple Confound Factors, Frédéric Leblond[1]; [1]*Polytechnique Montréal, Canada.* This study evaluates the generalizability of a cancer detection model, quantifying performance in low-grade gliomas and glioblastomas. The model was trained using an intraoperative Raman spectroscopy system in the scope of a 67-patient study.

TM1F.3 • 08:30
Raman Spectrum Denoising Using Deep Learning, Mengkun Chen[1], Sanidhya D. Tripathi[1], James Tunnell[1]; [1]*Univ. of Texas at Austin, USA.* We developed a deep learning-based method to denoise low-SNR Raman signals from skin by learning sample-independent instrument noise. This approach enhances spectral recovery, improves SNR by around 33dB, and enables accurate component concentration analysis.

TM1F.4 • 08:45
Low-Cost Raman Spectroscopy for Detection of Lung Cancer in a National Blood Plasma Biobank, Katherine Ember[1,2], Frederick Dallaire[1,2], Éloïse D'Amours[1,2], Marwa Bounaas[3], Juliette Selb[1,2], Frédéric Lesage[1], Frédéric Leblond[1,2]; [1]*Polytechnique Montréal, Canada;* [2]*Centre de Recherche du CHUM, Canada;* [3]*Université de Montréal, Canada.* We present a low-cost lung cancer detection technique using Raman spectroscopy. Our study is tested in 381 patients from the Quebec Respiratory Health Network Biobank, and may bring lung cancer screening to a wider population.

TM1F.5 • 09:00
Machine Learning Based Vector-Borne Disease Detection: a Point of Care Approach, Souvik Das[1], Subhanita Roy[1], Tarun K. Bhattacharyya[1], Pooja Lahiri[1], Basudev Lahiri[1]; [1]*Indian Inst. of Technology Kharagpur, India.* This study presents a machine learning (ML) based diagnostic framework using FTIR spectroscopy to classify Dengue and Chikungunya from human serum with over 90% accuracy, offering a rapid, reliable, and scalable solution for vector-borne disease management.

TM1F.6 • 09:15 (Invited)
Raman Imaging and Deep Learning, Ishan Barman[1]; [1]*Johns Hopkins Univ., USA.* Abstract not available.

10:30 -- 12:00
Room: Constellation Ballroom A
JM2A • Joint Plenary Session I

JM2A.1 (Plenary)
Intraoperative Spectroscopic Imaging, Daniel S. Elson[1]; [1]*Imperial College London, UK.* Spectroscopy can provide high diagnostic accuracy, including in vivo, but ergonomics and visualization are barriers to their use in surgery. The use of computer vision and robotics techniques will be presented as a potential solution.

JM2A.2 (Plenary)
Pushing the Limits of Microscopy, Jerome C. Mertz[1]; [1]*Boston Univ., USA.* No matter how good microscopes have become, there will always be a need for them to be better. I will describe various strategies to push the limits of microscopes for life scienc

Constellation Ballroom A
13:30 -- 15:30
DM3A • Novel Biomedical Optical Technology I
Presider: Mini Das; Univ. of Houston, USA

DM3A.1 • 13:30 (Invited)
Ultrafast Photoacoustic and Optical Imaging for Vascular and Neural Dynamics, Yide Zhang[1,2]; [1]*Electrical, Computer, and Energy Engineering, Univ. of Colorado at Boulder JILA, USA;* [2]*California Inst. of Technology, Medical Engineering, USA.* This presentation introduces two ultrafast imaging techniques for visualizing vascular and neural dynamics. One captures real-time three-dimensional vascular structures, while the other visualizes rapid neural signal propagation.

DM3A.2 • 14:00
Characterization of a New Expansion-Assisted Selective Plane Illumination Microscope, Kaelin Wulf[1], Xiaoyun Jiang[1], Adam Glaser[1]; [1]*Allen Inst., USA.* We present the characterization results of a new large scale custom light-sheet microscope with custom optics and mechanics for high-throughput imaging of expanded tissues.

DM3A.3 • 14:15
Digital Holography Interferometry for Thermal Imaging in Cryopreservation and Biological Systems, Crysthal Alvarez[1], Carla Berrospe-Rodriguez[1], Guillermo Aguilar[1]; [1]*Texas A&M Univ., USA.* Digital Holography Interferometry (DHI) provides non-invasive thermal imaging for studying supercooling and superheating in cryopreservation applications. DHI enables precise temperature and refractive index mapping, optimizing protocols, and

demonstrating broader applications in biological systems and biophotonics.

DM3A.4 • 14:30
Optical Coherence Tomography Imaging of the Human Inner Ear as a Diagnostic for Endolymphatic Hydrops, Brian E. Applegate[1], Wihan Kim[1], Dorothy Pan[1], Bong Jik Kim[1], Zihan Yang[1], Marcela Moran[1], Joni Doherty[1], Seiji Shibata[1], John Oghalai[1]; *[1]Univ. of Southern California, USA.* Optical coherence tomography was used to image patients with Ménière's disease and vestibular schwannoma, revealing inner ear fluid chamber sizes consistent with endolymphatic hydrops, a condition linked to hearing loss and vertigo.

DM3A.5 • 14:45
3D Reconstruction of Fluorescence Images Using "Pasta" Landmarks for Whole Specimen Frozen Section Analysis, Hang M. Nguyen[1], Veronica C. Torres[1], Joshua Levy[2], Eunice Chen[3], Matthew LeBoeuf[4], Kimberley S. Samkoe[1,3]; *[1]Thayer School of Engineering, Dartmouth College, USA; [2]Dept. of Pathology and Laboratory Medicine, Cedars-Sinai Medical Center, USA; [3]Dept. of Surgery, Dartmouth-Hitchcock Medical Center, USA; [4]Dept. of Dermatology, Dartmouth-Hitchcock Medical Center, USA.* We propose a 3D reconstruction method of fluorescence images using semi-automatic registration with "pasta" fiducials. This approach aims to enhance margin assessment accuracy in cancer resection, offering a simple, precise, and computational efficient solution.

DM3A.6 • 15:00 (Invited)
Label-Free Tissue Characterization Using Fluorescence Frequency-Response Imaging (F-FRI) for Cancer Diagnosis and Image-Guided Surgery, Javier A. Jo[1,2]; *[1]Univ. of Oklahoma, USA; [2]Stephenson Cancer Center, USA.* Two clinical applications of label-free Fluorescence Frequency-Response Imaging (F-FRI) will be described: clinical metabolic endoscopy for early detection of oral cancer, and intraoperative wide-field biochemical imaging for skin tumor margin assessment during Mohs micrographic surgery.

13:30 -- 15:30
Room: Constellation Ballroom B
BM3B • Analyzing Circuitry, Network Function, and Information Processing II
Presider: Cristina Rodriguez; Yale Univ., USA

BM3B.1 • 13:30 (Keynote)
Aberration Corrected Endoscopes for Extended Field-of-View Deep Brain Imaging in Miniaturized two-Photon Microscopes, Tommaso Fellin[1]; *[1]Istituto Italiano di Tecnologia, Italy.* I will discuss current effort to enlarge the field-of-view of miniaturized two-photon microscopes using GRIN-based endoscopes corrected for optical aberrations using 3D printed polymer lenses. Validation experiments in freely moving mice will also be presented.

BM3B.2 • 14:15
Multifunctional Fiberscopes for Optical Imaging and Neuromodulation in Vivo, Taylor M. Cannon[1], Pema Maretich[1], Gari Eberly[1], Ethan Frey[1], Keisuke Nagao[1], Polina

Anikeeva[1]; [1]*Massachusetts Inst. of Technology, USA.* We demonstrate the development of miniaturized, multifunctional devices incorporating polymer optical fiber bundles, microelectrodes, and microfluidic channels for optical imaging and multimodal interrogation of neural activity in the central and peripheral nervous systems.

BM3B.3 • 14:45 (Top-Scored)
Brain Imaging Without Depth Limitation: a Two-Photon Miniscope for Functional Imaging in Freely Moving Mice, Chung En Huang[1], Yen Hsu Lu[2], Ni-Chung Lee[2], Chi Kuang Sun[1]; [1]*Dept. of Electrical Engineering and Graduate Inst. of Photonics and Optoelectronics, National Taiwan Univ., Taiwan;* [2]*Dept. of Medical Genetics, National Taiwan Univ. Children's Hospital, Taiwan.* We demonstrate a modular two-photon miniscope design with a GRIN-lens integrated baseplate, overcoming the 2mm imaging depth limitation for dendritic functional imaging in freely moving mice brains.

BM3B.4 • 15:00
In-Vivo Deep-Brain Imaging With Photoacoustics and Wavefront Shaping-Empowered Ultrathin Multimode Fibers, Weiran Pang[1], Chi Man Woo[1], Chuqi Yuan[1], Tianting Zhong[1], Puxiang Lai[1]; [1]*Hong Kong Polytechnic Univ., Hong Kong.* High-resolution in-vivo optical imaging into deep brain has been desired for long yet considered challenging. Here we present our most recent efforts based on photoacoustics and wavefront shaping-empowered ultrathin multimode fibers to break this barrier.

13:30 -- 15:15
Room: Aurora
NM3C • Nonlinear

NM3C.1 • 13:30 (Invited)
Transcriptomics Informed Label-Free, Two-Photon Excited Fluorescence Metabolic Function Imaging of Living Tissues, Irene Georgakoudi[1]; [1]*Tufts Univ., USA.* We will highlight the improved metabolic function insights that can be acquired by combining label-free, two photon microscopic assessments with transcriptomics data analysis for a range of living engineered and human tissues.

NM3C.2 • 14:00 (Invited)
Polarization-Resolved Second Harmonic Generation Microscopy for Investigating Muscle and Collagen Fibrils, MacAulay Harvey[1], Caylee MacDonald[1], Jennifer Johnson[2], Nicanor Gonzalez-Morales[3], Laurent Kreplak[3], Danielle Tokarz[1]; [1]*Saint Mary's Univ., Canada;* [2]*Dept. of Biology, Dalhousie Univ., Dalhousie Univ., Canada;* [3]*Dept. of Physics and Atmospheric Science and School of Biomedical Engineering, Dalhousie Univ., Canada.* Polarization-resolved second harmonic generation microscopy (PSHG) was used to determine baseline PSHG ρ and κ parameters for individual muscle and collagen fibrils, which can be used in future studies to further elucidate muscle and tissue structures.

NM3C.3 • 14:30
Computationally Accelerated 4D Nonlinear Optical Microscopy, Janet E. Sorrells[1], Evan K. Sharafuddin[1], Kyle Wynne[1], Yidan Yin[1]; *[1]Electrical & Systems Engineering, Washington Univ. in St. Louis, USA.* Computational methods are applied to reduce the spectral and temporal dimensionality of acquired data, enabling faster nonlinear optical microscopy image acquisition.

NM3C.4 • 14:45
Adaptive Multimode Fiber Source for Label-Free Nonlinear Microscopy, Li-Yu Yu[1], Honghao Cao[1], Kunzan Liu[1], Tong Qiu[1], Sixian Y. You[1]; *[1]Massachusetts Inst. of Technology, USA.* We demonstrate a broadband tunable femtosecond multimode fiber source spanning 650–1350 nm, pumped by a Yb laser at 1040 nm, for multimodal label-free nonlinear microscopy. Adaptive pulse optimization integrating wavefront shaping and mechanical perturbation enables high-contrast imaging with enhanced wavelength tunability and optical throughput.

NM3C.5 • 15:00
Diffractive Remote Focusing Module for High-NA Scanning Microscopy Operating at Galvo Speeds, Matthias Dallio[1], Stefan Bernet[1], Alexander Jesacher[1]; *[1]Innsbruck Medical Univ., Austria.* We present a remote axial scanning system for high NA optical microscopy. The remote focusing module uses a pair of diffractive optical elements (DOEs) forming a moiré lens. The focal length of the DOE doublet is controlled by rotating the DOEs relative to each other using a galvanometric actuator, allowing axial scan speeds of several 100~Hz.

13:30 -- 15:30
Room: Sovereign
AM3D • Enviromental Applications
Presider: Joanna Zielinska; ETH, Switzerland

AM3D.1 • 13:30
3D Optofluidic Control Using Reconfigurable Thermal Barriers for Advanced Microparticle and Flow Control, Falko Schmidt[1], Carlos D. Gonzalez[2], Emilio Ruiz Rena[3], Raul Rica[2,4], Jamie O. Arroyo[1], Romain Quidant[1]; *[1]Dept. of Mechanical and Process Engineering, ETH Zurich, Switzerland; [2]Dept. of Applied Physics, Universidad de Granada, Spain; [3]Dept. of Applied Physics II, Univ. of Malaga, Spain; [4]Research Unit Modeling Nature (MNAT), Universidad de Granada, Spain.* We introduce an optofluidic toolbox using structured light and photothermal conversion to create reconfigurable fluidic boundaries. This approach enables dynamic 3D thermal landscapes, demonstrating reconfigurability for precise particle steering and size-based sorting in heterogeneous mixtures.

AM3D.2 • 13:45 (Invited)
Optothermal Effects for Optical Trapping and Manipulation, Ruben Ramos-Garcia[1], Julio Sarabia-Alonso[2,3], José G. Ortega-Mendoza[3]; *[1]Inst Nat Astrofisica Optica Electronica, Mexico; [2]Dept. of Mechanical Engineering, Univ. of California Riverside, USA; [3]División de*

Posgrado, Universidad Politécnica de Tulancingo, Mexico. This work explores optothermal manipulation using thermal gradients from light absorption to drive particle migration via Marangoni convection and thermophoresis. Applications include low-power trapping, bubble generation, and trapping, and scalable colloidal assembly

AM3D.3 • 14:15
Optical Trapping of Irregularly Shaped Microplastic, Mimi Truong[1], Noorulhoda Kazmani[1], Jesus Poblano[1], Alexander Stilgoe[2], Anna S. Bezryadina[1]; *[1]Physics and Astronomy, California State Univ., Northridge, USA; [2]The Univ. of Queensland, Australia.* To characterize microplastics found in nature, we categorize the optical trapping stability of different irregularly shaped lab-made microplastics. Stability is evaluated based on particle material (PP, HDPE, and PET), absorption and size, and trapping wavelength.

AM3D.4 • 14:30 (Invited)
Optically Controlled Aggregation of Gold Nanorods for Ultrasensitive in-Liquid Sensing: From Biomolecules to Nano-Plastics, Antonino Foti[1]; *[1]CNR IPCF, Italy.* We use radiation pressure to control the in-situ aggregation of gold nanorods for the in-liquid SERS detection of biomolecules at trace level. A similar approach has been also applied to ultrasensitive detection of small nanoplastics.

13:30 -- 15:30
Room: Cambria
OM3E • Molecular Vibration Spectroscopy
Presider: Kenneth Tichauer; Illinois Inst. of Technology, USA

OM3E.2 • 14:00 (Invited)
Bone Quality Assessment Through Turbid Media, Rekha Gautam[1], Hui Ma[1], Pranav Lanka[1], Suraj Kumar Kothuri[1], Joseph O'Halloran[1], Carrie O'Flynn[2], Stefan Andersson Engels[1], Sanathana Konugolu Venkata Sekar[1]; *[1]Tyndall National Inst., Ireland; [2]ASSERT Center, College of Medicine and Health, Univ. College Cork, Ireland.* This study presents a dual-wavelength inverse spatially offset Raman spectroscopy system to enhance subsurface bone signal assessment, addressing challenges of quantitative analysis through turbid media.

OM3E.3 • 14:30
Optimization of Surface-Enhanced Spatially Offset Raman Spectroscopy for Applications in Pre-Clinical Cancer Imaging, Fay Nicolson[1]; *[1]Dana-Farber Cancer Inst., USA.* Deep tumor optical imaging is limited by in vivo penetration depth. We present SESORS, combining SORS with SERS nanoparticles, for non-invasive imaging of deep tumors. Instrumentation optimizations improve SNR, resolution, and speed, enhancing tumor detection and complementing radiologic methods.

OM3E.4 • 14:45
Detection of Oral Potentially Malignant Disorders Using Liquid Saliva in a Novel Optofluidic Photonic Crystal Fiber, Katarzyna I. Komolibus[1]; *[1]Tyndall National Inst., Ireland.* In this work we demonstrate novel optofluidic photonic crystal fiber to study biomarker changes associated with oral potentially malignant diseases from liquid saliva. The results show good agreement with *in vivo* tissue Raman measurements.

OM3E.5 • 15:00 (Invited)
Multimodal Nanoscopy for Studying Metabolism in Aging and Diseases, Lingyan Shi[1]; *[1]Univ. of California San Diego, USA.* We developed the A-PoD and PRM algorithm-assisted multimodal metabolic nanoscopy, which integrates DO-SRS, MPF, FLIM, and SHG into a unified molecular imaging platform for studying aging and diseases.

13:30 -- 15:00
Room: Britannia
TM3F • Advances in Spectroscopic Diagnosis and Monitoring
Presider: Timothy Muldoon; Univ. of Arkansas, USA

TM3F.1 • 13:30 (Invited)
Gas in Scattering Media Absorption Spectroscopy (GASMAS) as a Potential Monitoring Tool of Respiratory Distress in Neonatal Care, Pranav Lanka[1], Jurate Panaviene[3], Konstantin Grygoryev[1], Sanathana Konugolu Venkata Sekar[1,2], Eugene Dempsey[3], Stefan Andersson Engels[1,2]; *[1]Tyndall National Inst., Ireland; [2]School of Physics, Univ. College Cork, Ireland; [3]INFANT Research Centre, Univ. College Cork, Ireland.* Our clinical study show success in measuring gas volume and oxygen content in infants. We furthermore demonstrate breath-by-breath ability in neonatal mannequin measurements. These findings indicate potential clinical usefulness as a bed-side monitor in neonatology.

TM3F.2 • 14:00
Non-Invasive Detection of Oral Potentially Malignant Disorders Using Diffuse Reflectance Spectroscopy With Feature Selection, Siddra Maryam[1], Simone Innocente[1], Edward Fahy[4], Sanathana Konugolu Venkata Sekar[1], Richeal Ni Riordain[2], Ray Burke[1], Stefan Andersson Engels[1], Andrea Visentin[3], Rekha Gautam[1], Katarzyna I. Komolibus[1]; *[1]Tyndall National Inst., Ireland; [2]Univ. Dental School & Hospital, Ireland; [3]School of Computer Science and Information Technology, Univ. College Cork, Ireland; [4]Cork Univ. Dental School and Hospital, Ireland.* In this work we report improved performance of wavelength selection algorithms for broadband diffuse reflectance spectroscopy to enhance diagnostic accuracy of oral potentially malignant disorders based on an *in vivo* study including 69 patients.

TM3F.3 • 14:15
Classification of Gastrointestinal Tissue in Vivo During Upper GI Cancer Surgery Using Diffuse Reflectance Spectroscopy, Ioannis Gkouzionis[1,2], Maxime Giot[1,2], Scarlet Nazarian[1], Ara Darzi[1,2], Nisha Patel[1], Christopher J. Peters[1], Daniel S. Elson[1,2]; *[1]Dept. of Surgery and*

Cancer, Imperial College London, UK; [2]Hamlyn Centre, Inst. of Global Health Innovation, UK. Cancers of the upper GI tract remain a challenge. Preliminary *in vivo* analysis using diffuse reflectance spectroscopy showed promising accuracy (stomach: 77.36% sensitivity, 95.14% specificity; oesophagus: 85.24% sensitivity, 81.47% specificity), supporting surgical decision-making.

TM3F.4 • 14:30
Investigating Tissue Changes Due to Alcohol and Tobacco Consumption Using Optical Spectroscopy, Umme Marium Mim[1]; *[1]Univ. of Arkansas, USA.* A multimodal system combining Diffuse Reflectance and Raman Spectroscopy was investigated in tobacco and alcohol users, assessing its potential to detect early biomarkers of oral cavity cancer.

TM3F.5 • 14:45
Development of a Single-Fiber Spectroscopy System Using Unmodified Clinical Laser Fibers for Tissue Optical Property Recovery, Md Nafiz Hannan[1], Timothy M. Baran[1]; *[1]Univ. of Rochester, USA.* We developed a simple single-fiber spectroscopy system using an unmodified FDA-approved laser fiber. Preliminary optical property recovery with a semi-empirical model showed promise but requires further optimization for clinical implementation.

15:30 -- 17:00
Room: Avalon & Constellation Foyer Posters
JM4A • Joint Poster Session I

JM4A.1
Two Paths for Raman Excitation of Singlet Oxygen, Aristides Marcano Olaizola[1], David KIngsley[2], Fahim Jenneto[1]; *[1]Delaware State Univ., USA; [2]Residue Chemistry and Predictive Microbiology Research Unit, US Dept. of Agriculture, Agriculture Research Service, USA.* We report on visible and near-infrared Stokes signals generated upon Raman excitation of molecular oxygen dissolved in water corresponding to transitions toward singlet oxygen and second excited electronic states, respectively.

JM4A.2
Detecting Phosphorescence of Raman Photogenerated Singlet Oxygen in Hexane, Aristides Marcano Olaizola[1]; *[1]Delaware State Univ., USA.* The work reports on detection of near-infrared phosphorescence at 1272 nm from singlet oxygen photogenerated through stimulated Raman excitation of molecular oxygen dissolved in hexane

JM4A.3
High-Precision Imaging Photoplethysmography-Remote, Nancy N. Gomez[1], Sarai Dominguez Hernandez[1], Liliana Becerra Martinez[1], Manuel Servin[1], Gonzalo Paez[1]; *[1]Centro de Investigaciones en Optica, Mexico.* Imaging photoplethysmography (iPPG) allows noninvasive, noncontact monitoring of heart rate, cardiac variability, and diastole/systole ratio, overcoming the limitations of the traditional method for clinical and portable applications.

JM4A.4
Characterization of the Interaction Between Adipocytes and Macrophages Using the CARS Technique, Aline S. Berti[1], Sarah Cardoso Machado[1], Antonio Thiago Pereira Campos[1], Carlos Lenz Cesar[1], Hernandes Faustino de Carvalho[1]; *[1]Universidade Estatual de Campinas, Brazil.* Interactions between macrophages and adipocytes in adipose tissue are critical for the regulation of energy metabolism and obesity. The CARS technique showed the efficiency of the technique, highlighting lipids without prior labeling.

JM4A.5
Combining Computational Spectroscopy and Dipole Modeling for Morphology Optimization of Metastructures in Photonic Applications, Iuliia Riabenko[1,2], Thomas Pertsch[2]; *[1]V. N. Karazin Kharkiv National Universit, Ukraine; [2]Inst. of Applied Physics, Abbe Center of Photonics, Friedrich Schiller Univ. Jena, Germany.* Modeling the interaction of nanostructures and dipoles using computational spectroscopy, this study identifies conditions that maximize the sensitivity of molecular detection methods. Structural optimization enables enhanced Raman scattering for photonic systems.

JM4A.6
Exploring Quantum Yield and Signal Shifts in Tryptophan Fluorescence on Nanostructured Biosensor Surfaces, Konstantin Biloshenko[2], Iuliia Riabenko[2], Alexander Roshal[1]; *[1]Research Inst. of Chemistry, V. N. Karazin Kharkiv National Univ., Ukraine; [2]School of Radiophysics, Biomedical Electronics, and Computer Systems, V. N. Karazin Kharkiv National Univ., Ukraine.* Gold nanoparticle-implanted substrates enhance tryptophan fluorescence, overcoming low intensity and matrix interference. This study examines drying times, vacuum effects, and residue distribution, providing insights for biosensor development in biomolecular detection.

JM4A.7
Multi-Mode Fiber-Based Speckle Contrast Optical Tomography System for Humans, Connie Luk[1,2], Chen-Hao P. Lin[1,2], Faruk Beslija[3], Manish Verma[3], Lisa K. Frisk[3], Sumana Chetia[3], Turgut Durduran[3,4], Joseph Culver[1,2], Ed Richter[1], Jason W. Trobaugh[1]; *[1]Washington Univ. in Saint Louis, USA; [2]Washington Univ. School of Medicine, USA; [3]ICFO-Institut de Ciéncies Fotóniques, Spain; [4]Institució Catalana de Recerca i Estudis Avançats (ICREA), Spain.* We developed a high-density speckle contrast optical tomography system based on multi-mode fiber bundles. Measurements at multiple source-detector distances depict pulsatile flow with high SNR through hair on a human head.

JM4A.8
Addressing Missing Data With Multiple Imputation in Optical Neuroimaging, Yiyan Hao[1], Megan T. Jones[2], Simon Vandekar[2], Russell T. Shinohara[5], Brian R. White[4,3]; *[1]Dept. of Bioengineering, Univ. of Pennsylvania, USA; [2]Dept. of Biostatistics, Vanderbilt Univ., USA; [3]Dept. of Pediatrics, The Perelman School of Medicine, Univ. of Pennsylvania, USA; [4]Division of Pediatric Cardiology, The Children's Hospital of Philadelphia, USA; [5]Dept. of Biostatistics, Epidemiology and Informatics, Univ. of Pennsylvania, USA.* In optical neuroimaging, the field-of-view invariably differs across subjects. Here, we evaluate the use of techniques to address missingness, including multiple imputation, with an emphasis on their

effects on Type I and Type II error.

JM4A.9
A Data-Driven Approach for Extracting Oxygen Saturation From in-Vivo Fiber Photometry Data, Anupam Bisht[1], Marzieh Omidi[1], Amirreza Hosseini[1], Kartikeya Murari[1]; *[1]Univ. of Calgary, Canada.* Oxygen saturation (% sO_2) extraction from spectrally-resolved diffuse reflectance spectroscopy is performed through non-linear least square fitting. We present a data-driven approach to extract % sO_2 and demonstrate its usage for partial-spectra % sO_2 extraction.

JM4A.10
Impact of Melanopic Equivalent Daylight Illuminance on Mood and Well-Being: a Real-Life Longitudinal Study, Fernanda Sbaraini Bonatto[6,1], Ricardo R. Correia[7], Rogério B. Borges[8,5], Luisa K. Pilz[2,3], Pedro O. Macedo[1], Kiara Skalnes[1], Fernanda G. Amaral[4], Maria Paz L. Hidalgo[6,1]; *[1]Laboratório de Cronobiologia e Sono, Hospital de Clínicas de Porto Alegre, Brazil; [2]ECRC Experimental and Clinical Research Center, Charité, Germany; [3]Dept. of Anesthesiology and Intensive Care Medicine CCM / CVK, Charité, Germany; [4]Dept. of Physiology, Universidade Federal de São Paulo, Brazil; [5]Unidade de Bioestatística - Diretoria de Pesquisa (DIPE), Hospital de Clínicas de Porto Alegre, Brazil; [6]Graduate Program in Psychiatry and Behavioral Sciences, UFRGS, Brazil; [7]Inst. of Physics, UFRGS, Brazil; [8]Dept. of Statistics, Inst. of Mathematics and Statistics, UFRGS, Brazil.* This longitudinal study addresses gaps in understanding light exposure's effects on mental health in real-life settings. A method was proposed to investigate melanopic equivalent daylight illuminance exposure, and associations highlight its impacts on different outcomes.

JM4A.11
Blood Optoacoustic Stimulation (BOAS), Guo Chen[1]; *[1]Boston Univ., USA.* Photoacoustic is a precise non-genetic neural stimulation method. To avoid surgery and exogenous implants, we show blood as an effective endogenous absorber for PA stimulation in vivo. This study marks the first PA brain stimulation using endogenous absorbers.

JM4A.12
Ensemble Machine Learning Segmentation of Widefield Optical Imaging Using Spectral and Temporal Information, Hayden B. Fisher[1], Brian R. White[1,2]; *[1]Children's Hospital of Philadelphia, USA; [2]Perelman School of Medicine at the Univ. of Pennsylvania, USA.* We propose and evaluate a novel machine learning segmentation approach for widefield optical imaging, utilizing multi-wavelength and temporal data, surpassing traditional single baseline image segmentation methods.

JM4A.13
Mesoscopic and Neuron Level Two-Photon Mouse Imaging, Melena Abijaoude[1]; *[1]Washington Univ. in St Louis, USA.* In this study, we leverage recent advancements in large field-of-view two-photon microscopy of a mouse with genetically encoded calcium indicators to examine FC at both the neuronal and mesoscopic levels.

JM4A.14
Elucidating the 3D Tissue Microenvironment via Graph Neural Networks for Cancer Risk Stratification, Yujie Zhao[1,2], Sarah Chow[2], Rob Serafin[2], Elena Baraznenok[2,3], Jonathan

Liu[2,4]; *[1]Dept. of Biomedical Informatics and Medical Education, Univ. of Washington, USA; [2]Dept. of Mechanical engineering, Univ. of Washington, USA; [3]Dept. of Bioengineering, Univ. of Washington, USA; [4]Dept. of Laboratory Medicine & Pathology, Univ. of Washington, USA.* We propose a weakly supervised graph neural network workflow that integrates 3D histological features including cell-cell interactions for risk stratification. This framework will be developed and evaluated using 3D pathology datasets of prostate cancer.

17:00 -- 18:30
Room: Constellation Ballroom A
DM5A • Novel Biomedical Optical Technology II
Presider: Yide Zhang; Univ. of Colorado Boulder, USA

DM5A.1 • 17:00 (Top-Scored)
Phase-Contrast Imaging Using Coherent Oblique Back-Illumination, Shruti Sharma[1,2], Lia Gomez-Perez[2,3], Gyeonghun Kim[2], Brett Bouma[2,4], Martin Villiger[2]; *[1]Harvard John A. Paulson School of Engineering and Applied Sciences, Harvard Univ., USA; [2]Wellman Ctr. for Photomedicine, Massachusetts General Hospital, USA; [3]Harvard-MIT Health Sciences and Technology, Massachusetts Inst. of Technology, USA; [4]Inst. for Medical Engineering and Science, Massachusetts Inst. of Technology, USA.* Oblique back-illumination microscopy reveals phase contrast in thick samples through trans-illumination. Using coherent speckle patterns and off-axis holography we obtain phase-gradient images through incoherent summation with the benefit of digital refocusing.

DM5A.2 • 17:15
Co-Registering Catheter-Based Polarization-Sensitive Optical Coherence Tomography and Magnetic Resonance Imaging of Deep Brain Structures, Shadi Masoumi[1], Maxina sheft[2], Mireille Quémener[1], martin parent[1], Martin Villiger[2], Daniel C. Côté[1]; *[1]Cervo brain research center, Canada; [2]Wellman center for photomedicine, USA.* Deep Brain Stimulation (DBS) is an effective neurosurgical intervention for movement disorders. Comparing PS-OCT and MRI in a cadaver macaque head revealed matching neuroanatomical structures, suggesting that intrasurgical optical imaging may improve DBS targeting precision.

DM5A.3 • 17:30 (Top-Scored)
Versatile Two-Photon Brain Imaging Using a Wavelength-Tunable, Fiber-Optic Dispersive Wave Generator, Marvin Edelmann[1,3], Andreu Matamoros-Angles[2], Mosin Shafiq[2], Mikhail Pergament[1], Franz Kärtner[1,3], Markus Glatzel[2]; *[1]Center for Free Electron Laser Science, Germany; [2]Inst. of Neuropathology, Univ. Medical Center Hamburg-Eppendorf (UKE), Germany; [3]Dept. of Physics, Universität Hamburg, Germany.* We demonstrate a wavelength-tunable, fiber-optic dispersive wave generator (880 - 950 nm) driven by an Yb:fiber laser. The generated ultrashort pulses enable flexible, excitation-matched deep-tissue two-photon imaging in labeled mouse hippocampus (GFP) and cerebellum (AF488).

DM5A.4 • 17:45 (Top-Scored)
Multiplexed Nonlinear Microscopy via High-Peak-Power Tunable Broadband Fiber Source, Li-Yu Yu[1], Honghao Cao[1], Kunzan Liu[1], Sixian Y. You[1]; *[1]Massachusetts Inst. of Technology, USA.* We demonstrate multiplexed nonlinear microscopy using a high-peak-power tunable broadband multimode fiber source operating in the NIR-I and NIR-II regions. Our results include labeled imaging with fluorescent beads and proteins, as well as label-free imaging with autofluorescence and harmonic generation.

DM5A.5 • 18:00 (Invited)
X-ray Phase Imaging, Mini Das[1]; *[1]Univ. of Houston, USA.* Abstract not available.

17:00 -- 18:30
Room: Constellation Ballroom B
BM5B • Analyzing Circuitry, Network Function, and Information Processing III
Presider: Vicente Parot; Pontificia Univ Catolica de Chile, Chile

BM5B.1 • 17:00 (Keynote)
Towards Comprehensive Imaging and Control of Biological Systems, Ed Boyden[1]; *[1]Massachusetts Inst. of Technology, USA.* To analyze, repair, and simulate biological systems, we must invent and apply tools for systematically mapping, dynamically observing, and dynamically controlling these systems. This talk will cover expansion microscopy, optogenetics, and multiplexed live imaging.

BM5B.2 • 17:45 (Invited)
Light-Field Deep Learning for High-Throughput, Scattering-Mitigated Neural Circuit Imaging, Amanda J. Foust[1], Carmel Howe[1], Herman Verinaz Jadan[2], Kate Zhao[1], Pingfan Song[3], Pier Luigi Dragotti[1]; *[1]Imperial College London, UK; [2]Escuela Superior Politécnica del Litoral, Ecuador; [3]Cambridge Univ., UK.* We developed a deep neural network leveraging the high photon budget of one-photon light-field microscopy and the scattering mitigation of two-photon scanning microscopy. This integrated approach enables sensitive, high-throughput, volumetric measurement of fluorescence-reported neural activity.

BM5B.3 • 18:15
In Vivo Volumetric Voltage Imaging in Neurons Using Squeezed Light Field Microscopy, Zhaoqiang Wang[1], Ruixuan Zhao[1], Daniel A. Wagenaar[2], Diego Espino[1], Liron Sheintuch[1], Peyman Golshani[1], Tzung Hsiai[1], Liang Gao[1]; *[1]Univ. of California, Los Angeles, USA; [2]California Inst. of Technology, USA.* We introduce squeezed light field microscopy for kilohertz detection of fluorescence across a 550 μm diameter and 300 μm depth field of view. Demonstrations include voltage imaging in leech ganglion and hippocampus of behaving mice.

17:00 -- 18:15
Room: Aurora
NM5C • Light Sheet

NM5C.1 • 17:00 (Invited)
Human Brain Optimized Light Sheet Microscopy (HOLiS) for High-Throughput Cell-Type Atlasing of Whole Human Brains, Malte Casper[1]; *[1]Columbia Univ., USA.* HOLiS is a high-throughput light-sheet microscope developed for imaging optically cleared human brains at cellular resolution. Here, we present the acquisition pipeline featuring spectral multiplexing and combinatorial labeling that allows scaling-up to whole human brains.

NM5C.2 • 17:30
A new Expansion-Assisted Selective Plane Illumination Microscope for Nanoscale Imaging of Centimeter-Scale Tissues, Xiaoyun Jiang[1], Kaelin Wulf[1], Micah Woodard[1], Walter Mwaniki[1], Adam Glaser[1]; *[1]Allen Inst. for Nueral Dynamics, USA.* We present the design and fabrication of an improved version of the expansion-assisted selective-plane illumination microscope (ExA-SPIM) for imaging cleared and expanded tissues.

NM5C.3 • 17:45
Refractive Index-Corrected Light-Sheet Microscopy for Multi-View Cardiovascular Imaging, Enbo Zhu[1], Peng Zhao[1], Jae Min Cho[1], Zhaoqiang Wang[1], Yan-Ruide Li[1], Yuhua Zhang[1], Alison Chu[1], Lili Yang[1], Liang Gao[1], Tzung Hsiai[1]; *[1]Univ. of California, Los Angeles, USA.* A refractive index (RI)-corrected (rc)-LSFM system was developed, adaptable to diverse RIs from various clearing methods, enabling high-resolution, isotropic cardiovascular imaging with a large field of view, surpassing limitations of conventional LSFM restricted to specific RIs.

NM5C.4 • 18:00
Instantaneous Volumetric Light-Sheet Imaging of Beating Heart, Xinyuan Zhang[1], Jichen Chai[1], Milad Almasian[1], Alireza Saberigarakani[1], Riya Patel[1], Jonathan Brewer[1], Elijah Pollock[1], Yifei Lou[2], Yichen Ding[1,3]; *[1]the Univ. of Texas at Dallas, USA; [2]the Univ. of North Carolina at Chapel Hill, USA; [3]UT Southwestern Medical Center, USA.* Cardiac arrhythmia is prevalent and fatal. Using zebrafish as a model, we propose instantaneous volumetric light-sheet imaging employing compressed sensing for sub-Nyquist axial sampling to elucidate arrhythmia development and progression.

17:00 -- 18:00
Room: Sovereign
AM5D • Optofluidic and Optical Cavities
Presider: Antonino Foti; CNR IPCF, Italy

AM5D.1 • 17:00 (Top-Scored)
Active Amplification of Brownian Dynamics in a 3D Diffusive Cavity, Shubham Dawda[1], Florian Alushi[1], Aristide Dogariu[1]; *[1]Univ. of Central Florida, USA.* We demonstrate at-will

amplification of Brownian dynamics of micron-size particles diffusing in a three-dimensional spatially heterogeneous medium. This active matter is created within a diffusive optical cavity that emulates spatio-temporal properties of dense tissue environments.

AM5D.2 • 17:15
Trapping and Dynamics of Semi-Flexible Threads, Michael O'Donnell[1], James Paget[1], David Tudor[1], Simon Hanna[1]; *[1]Univ. of Bristol, UK.* We explore a computational, finite-element approach to the study of flexible threads in optical tweezers, illustrating the method with nanowires in Gaussian and Laguerre-Gaussian traps. We also explore optical binding effects.

AM5D.3 • 17:30 (Invited)
Multimodal Optofluidic Tweezers for High-Throughput Stimulated Raman Imaging of Single Cells, Abhay Kotnala[1]; *[1]Univ. of Houston, USA.* We present a fiber-based optofluidic tweezers platform for precise, high-throughput single-cell manipulation, integrating trapping, rotation, translation, and sorting on a single platform. Its application is demonstrated for stimulated Raman imaging of leukemic cells.

17:00 -- 18:15
Room: Cambria
OM5E • In Vivo and in Vitro Imaging
Presider: Brian Pogue; Univ. of Wisconsin-Madison

OM5E.1 • 17:00 (Invited)
Photoacoustic Imaging in Disease Diagnosis: From Vascular Conditions to Biofilm-Associated Infections, Maryam Hajfathalian[1]; *[1]New Jersey Inst. of Technology, USA.* Photoacoustic imaging (PA) is an advanced technique that leverages the high contrast of optical imaging for disease diagnosis. A critical aspect of this approach is the selection of suitable contrast agents, which enhance PA's performance by amplifying signal generation and enabling deep-tissue imaging. This review explores the fundamental principles of PA, recent technological advancements, and its applications in vascular imaging and the detection of biofilm-associated infections.

OM5E.2 • 17:30
Single-Particle Imaging of Nanomedicine Crossing the Blood-Brain Barrier, Mian Wei[1], Wei Min[1]; *[1]Columbia Univ., USA.* Current understanding of nanocarrier-brain interaction remains elusive. Based on stimulated Raman scattering, we develop an optical method for imaging nanocarriers in brain tissue with single-particle sensitivity, chemical specificity, and particle counting capability.

OM5E.3 • 18:00
Non-Invasive Simultaneous Assessment of Therapy-Induced Tumor Microenvironmental Changes in Collagen and Vasculature with Photoacoustic Imaging, Srivalleesha Mallidi[1]; *[1]Tufts Univ., USA.* This study demonstrates that photoacoustic imaging can non-invasively monitor collagen degradation and vascular changes in tumors post-photodynamic

priming, providing a promising tool to assess treatment-induced extracellular matrix remodeling and therapy efficacy.

Tuesday, 22 April

08:00 -- 10:00
Room: Constellation Ballroom A
DTu1A • Design and Fabrication of Biomedical Optical Devices I
Presider: Martin Villiger; Wellman Center for Photomedicine, USA

DTu1A.1 • 08:00 (Invited)
3D Printing of Glass Micro-Optics: Shaping the Future of Precision Optical Systems for Biomedical Applications, Rongguang Liang[1]; *[1]Univ of Arizona, Coll of Opt Sciences, USA.* This presentation will discuss our research in 3D-printed glass micro-optics, focusing on technological evolution, material innovations, practical imaging applications, and future challenges, highlighting their impact on biomedical imaging and next-generation optical systems.

DTu1A.2 • 08:30
A Raytracing Module in Python for non-Expert, Valérie Pineau-Noël[1], Shadi Masoumi[1], Elahe Parham[1], Gabriel Genest[1], Ludovick Bégin[1], Marc-André Vigneault[1], Daniel C. Cote[1]; *[1]Université Laval, Canada.* A Python module called Raytracing provides all the necessary information about an optical design: configate planes, aperture and field stops, and more. With command-line or with a UI, it simplifies the design and optimization of optical systems.

DTu1A.3 • 08:45
Improving Detection Capabilities of Few-Mode Optical Coherence Tomography Using a 4-Mode Selective Photonic Lantern., Rodrigo Itzamnà Becerra-Deana[1,2], Raphael Maltais-Tariant[1], Stéphane Virally[1], Nicolas Godbout[1,2], Caroline Boudoux[1,2]; *[1]Polytechnique Montréal, Canada; [2]Castor Optics Inc., Canada.* This study enhances few-mode optical coherence tomography through a 4-mode fiber-based multiplexer (a photonic lantern). It improves signal acquisition and reveals ten distinct speckle patterns in high-density samples, demonstrating its potential for advanced optical imaging.

DTu1A.4 • 09:00
Dynamics of Delayed Luminescence in Tubulin and Microtubule Constructs: an Insight Into Collective Radiative Effects, Mahshid Zoghi[1], Mahed Batarseh[1], Ruitao Wu[1], Jack A. Tuszynski[2], Aristide Dogariu[1]; *[1]CREOL, Univ. of Central Florida, USA; [2]Physics, Univ. of Alberta, Canada.* We report, for the first time, measurements of delayed luminescence on tubulin constructs. The results demonstrate the role of mesoscopic structure on emission strength and decay dynamics, which provides a new perspective on radiative phenomena.

DTu1A.5 • 09:15
Synthesis of Plasmonic Metal Nanoparticles by Laser Induced Cavitation in Solutions for Cryopreservation., Carla Berrospe-Rodriguez[1], Yulissa Ortega[1], Guillermo Aguilar[1]; *[1]Texas A&M Univ., USA.* A novel method for plasmonic nanoparticle synthesis by Laser Induced Cavitation in salt-water solutions is demonstrated. The synthetized Silver Oxide nanoparticles are successfully tested for Raman Scattering Enhancement of cryoprotective agents, commonly used for cryopreservation.

DTu1A.6 • 09:30 (Invited)
Point and Volumetric Illumination Through Hydrogel Optical Fibers, Xinyue Liu[1]; *[1]Michigan State Univ., USA.* Our lab is now focused on designing polymer materials to control light, heat, and mass transport for high-efficiency chemical reactions. I will discuss our recent work on modulating light transmission for light-driven biochemical reactions and energy conversions using polymer-based optical fibers.

08:00 -- 09:45
Room: Constellation Ballroom B
BTu1B • Brain Physiology and Disease I - Clinical Translation
Presider: Jennifer Lynch; University of Pennsylvania, USA

BTu1B.1 • 08:00 (Keynote)
Illuminating Biomarkers of Stroke With Diffuse Optical Spectroscopies, Erin Buckley[1]; *[1]Georgia Inst. of Technology, USA.* Our research group specializes in the validation and clinical translation of diffuse optical spectroscopies to study the brain. These non-invasive, light-based tools enable real-time bedside monitoring of microvascular hemodynamics. In this seminar, I will use our recent work in two high-risk patient populations at high risk of stroke (subarachnoid hemorrhage and sickle cell disease) to elaborate on how these tools work, and how they can be used to identify prognostic biomarkers of brain injury.

BTu1B.2 • 08:45
Optical Monitoring Reveals Increased Intracranial Pressure After the Glenn Surgery in Children With Single-Ventricle Heart Defects, Wesley Baker[1], April M. Hurlock[1], Crystal Mcintosh[1], Hongting Zhao[1], Darci Anderson[1], Briston Bayle[1], Rika Goto[1], Rodrigo M. Forti[1], Tiffany Ko[1], Brian R. White[1], Jennifer M. Lynch[1]; *[1]Children's Hospital of Philadelphia, USA.* Children with single-ventricle heart defects experience elevated central venous pressure after their Glenn surgery. We used diffuse correlation spectroscopy to measure a concurrent increase in intracranial pressure; this increase may predict future lymphatic congestion.

BTu1B.3 • 09:15
Cerebral Oxygenation Monitoring in Neonatal Cardiac Surgery: Limitations of Commercial NIRS, Nicolina Ranieri[2,1], Rodrigo M. Forti[1], Tiffany Ko[1], Alyssa Seeney[1], Darci Anderson[1], Briston Bayle[1], Wesley Baker[1], Manal Mirreh[1], Asif Padiyath[1], Lea Matthews[1], Susan Nicolson[1], Jennifer M. Lynch[1]; *[1]Children's Hospital of Philadelphia, USA; [2]Drexel Univ., USA.* This study compares continuous-wave near-infrared spectroscopy (CW-NIRS) with advanced frequency-domain diffuse optical spectroscopy (FD-DOS) for monitoring cerebral oxygen saturation in neonates undergoing cardiac surgery. FD-DOS more accurately reflects changes in venous oxygenation compared to CW-NIRS.

BTu1B.4 • 09:30
Broadband NIRS to Investigate Human Glymphatic Dynamics: Diagnosis for Mild Cognitive Impairment andEffects of Light Stimulation, Fiza Saeed[1], Kathy Lee[1], Soeum

Jang[1], Sadra Shahdadian[1], Hanli Liu[1]; *[1]Univ. of Texas at Arlington, USA.* We demonstrate new applications of broadband near-infrared spectroscopy that enables to non-invasively characterize human glymphatic dynamics. Such characterization can assist diagnosis for mild cognitive impairment and quantify effects of light stimulation of the human brain.

08:00 -- 09:30
Room: Aurora
NTu1C • Computational Methods
Presider: Hilton de Aguiar; Laboratoire Kastler Brossel, France

NTu1C.1 • 08:00 (Invited)
Understanding Skin Wound Healing Dynamics Through AI-Powered Analysis of Label-Free Multiphoton Imaging, Malavika Nidhi[1], Marcos Rodriguez[1], Jake Jones[1], Jamie Burgess[3], Jessica Gilman[2], Divya Gollapalli[1], Irena Pastar[3], Marjana Tomic-Canic[3], Aristidis Veves[2], Kyle P. Quinn[1]; *[1]Univ. of Arkansas, USA; [2]Beth Israel Deaconess Medical Center, USA; [3]Univ. of Miami Miller School of Medicine, USA.* A variety of convolutional neural networks were trained and validated for label-free multiphoton microscopy and H&E images of skin wounds. These networks enable rapid quantification and visualization of key wound properties.

NTu1C.2 • 08:30
Rapid Wavefront Acquisition for via Interferometric Multiplexing for Label-Free Microscopy of Biological Cells, Natan T. Shaked[1]; *[1]Tel Aviv Univ., Israel.* Rapid label-free quantitative phase microscopy of biological cells is obtained by projecting six wavefronts on the camera at once, without losing temporal or spatial resolution, opening new opportunities for in-vitro diagnosis and cellular assays.

NTu1C.3 • 08:45
Refining Stain Vector Accuracy in H&E Images: a Monte Carlo Approach to Color Deconvolution, Daniela Lopez[1], Mengkun Chen[1], James Tunnell[1,2]; *[1]Biomedical Engineering, The Univ. of Texas at Austin, USA; [2]Diagnostic Medicine, The Univ. of Texas at Austin, USA.* We propose stain normalization in H&E-stained images using CIELAB color space mapping and Monte Carlo optimization to improve stain vector selection precision for image decomposition, quantitatively assessed across methods.

NTu1C.4 • 09:00
New Application Domains for FIBI and Other Modes of Slide-Free Microscopy: Global Health, Biomedical Research, Richard M. Levenson[1], Farzad Fereidouni[2], Nathan Anderson[1], Eric Seibel[3]; *[1]Univ. of California Davis, USA; [2]Pathology, Emory Univ., USA; [3]Mechanical Engineering, Univ. of Washington, USA.* Fluorescence imitating brightfield imaging (FIBI) and related modes provide near-instantaneous slide-free histology. Benefits include accessible diagnostics for lower- and middle-income countries; and visualization of novel tissue features that can enhance research and development.

NTu1C.5 • 09:15
High-Resolution EUV Ptychography for Quantitative Analysis of Bacterial Structures and Composition, Chang Liu[1,2], Leona M. Licht[1,2], wilhelm eschen[1,2], Soo hoon Chew[2,3], Christina Wichmann[4,5], Felix Hildebrandt[4,5], Daniel. S. Penagos Molina[1,2], Christian Eggeling[4,5], Jens Limpert[1,2], Jan Rothhardt[1,2]; *[1]GSI Helmholtzzentrum für Schwerionenforschung, Helmholtz Inst. Jena, Germany; [2]Friedrich-Schiller Univ. Jena, Inst. of Applied Physics, Germany; [3]Fraunhofer Inst. for Applied Optics and Precision Engineering, Germany; [4]Friedrich-Schiller Univ. Jena, Inst. of Applied Optics and Biophysics, Germany; [5]Leibniz Inst. for Photonic Technology (Leibniz-IPHT), Germany.* We utilize ptychographic EUV imaging as a label-free method to study bacterial structures and composition with sub-50 nm spatial resolution, revealing physiological diversity in *Escherichia coli* and *Bacillus subtilis* and morphological changes induced by chemicals.

08:00 -- 10:00
Room: Sovereign
ATu1D • Biological Applications I
Presider: Gan Wang; Goteborgs Universitet, Sweden

ATu1D.1 • 08:00
Spatially Precise and Chemically Selective Control of Biochemical Processes in Living Organisms, Chi Zhang[1], Bin Dong[1], Seohee Ma[1], Shivam Mahapatra[1], Karsten Mohn[1], R. Michael Everly[1], Mark Carlsen[1]; *[1]Purdue Univ., USA.* The recent development of real-time precision opto-control (RPOC) technology and its applications in controlling chemical processes within living organisms will be discussed. RPOC enables an understanding of how site-specific molecular activities contribute to cell responses.

ATu1D.2 • 08:15
On-Chip Optical Trapping Enabling Real-Time Monitoring of Phage-Bacterium Interaction, Nicolas VILLA[2], Enrico TARTARI[2], Simon GLICENSTEIN[1], Hugues de Villiers de la Noue[5], Emmanuel Picard[1], Pierre Marcoux[3], Marc Zelsmann[4], Gregory RESCH[5], Romuald Houdré[2], Emmanuel HADJI[1]; *[1]Univ. Grenoble Alpes, CEA Grenoble, Grenoble INP, IRIG, PHELIQS, SiNaPS, France; [2]Institut de Physique, École Polytechnique Fédérale de Lausanne, Switzerland; [3]Univ. Grenoble Alpes, CEA, LETI, France; [4]Univ. Grenoble Alpes, CNRS, CEA/LETI Minatec, Grenoble INP, LTM, France; [5]Laboratory of bacteriophages and phage therapy, CRISP, Lausanne Univ. Hospital (CHUV), Switzerland.* Bacteriophages are viruses sought after to fight bacterial antimicrobial resistance. Here we demonstrate that on-chip optical trapping allows observing the bacterial lysis of a phage infected single bacterium without any needs of labelling or bioreceptors.

ATu1D.3 • 08:30 (Invited)
RBC Mechanical Properties, Jeremie T. Zoueuz[1]; *Institut National Polytechnique, Côte d'Ivoire.* Abstract not available.

ATu1D.4 • 09:00 (Invited)
Optically Trapped Nano-Diamond Quantum Sensors to Explore Viscoelastic Properties and Redox Metabolism of Cells in Cardiac Fibrosis, Aldona Mzyk[1], Arthur Dervillez[1], Abigael Dezerces[1,2], Ziba Arghiani[1], Agostina Crotta Asis[3], Giovanni D'Angelo[3], Kirstine Berg-Sørensen[1]; *[1]Health Technology, DTU, Denmark; [2]Polytech Grenoble, France; [3]EPFL, Switzerland.* The impact of mechanical stimuli on cell organelles' is unclear due to lack of research tools. This study introduces a novel method combining nanodiamond quantum sensing and optical trapping to explore redox metabolism and viscoelastic properties in cardiac cells.

ATu1D.5 • 09:30 (Invited)
Study of Bacterial Biofilm Formation With Optical Tweezers, Cindy Quintanilla[1], Brooke Walter-Lakes[1], Nadia Evans-Lambert[1], Anna S. Bezryadina[1]; *[1]Physics and Astronomy, California State Univ. Northridge, USA.* When the environmental conditions become hostile, bacteria secret extracellular polymeric substance (EPS) and form biofilm. In our work, we use optical tweezers to study biofilm formation and develop optical methods for biofilm regulation.

08:00 -- 10:00
Room: Cambria
OTu1E • Multimodal Imaging and Drug Delivery
Presider: Allison Dennis; Boston Univ., USA

OTu1E.1 • 08:00 (Invited)
Macroscopic Raman and Fluorescence Imaging in the Shortwave Infrared (SWIR), Oliver T. Bruns[1]; *[1]Functional Imaging in Surgical Oncology, National Center for Tumor Diseases - NCT Dresden, Germany.* I present wide-field Raman scattering imaging in the shortwave infrared (SWIR) spectral region as a powerful approach for macroscopic biomedical applications. Our approach suppresses tissue autofluorescence and achieves high chemical contrast. This imaging method can be rapidly adopted by clinicians and biologists, expanding biomedical imaging capabilities for tumor imaging and nerve imaging in surgery and promises advancements in precision medicine.

OTu1E.2 • 08:30
Increasing Objectivity in Quantitative Analysis in Immune-Histochemistry Biomarker Mapping Using Upconverting Nanoparticles, Matthias Mickert[3], Magnus Helgstrand[3], Sanathana Konugolu Venkata Sekar[1,2], Hui Ma[1], Katarzyna I. Komolibus[1], Kiang Wei Kho[1], Andreas Johansson[3], Sanna Wallenborg[3], Stefan Andersson Engels[1,2]; *[1]Tyndall National Inst., Ireland; [2]School of Physics, Univ. College Cork, Ireland; [3]Lumito AB, Sweden.* Today immunohistochemistry (IHC) stains molecular biomarkers for treatment stratification. IHC can become increasingly objective by improving sensitivity, quantification and multiplexing capabilities. We use upconverting nanoparticles to achieve this, potentially leading to improved treatment outcomes.

OTu1E.3 • 09:00 (Invited)
Restained Frozen Sections for Direct Comparison of Fluorescence With Histopathology, Veronica C. Torres[1], Sassan Hodge[1], Joshua Levy[2], Eunice Chen[3,4], Matthew LeBoeuf[3,4], Kimberley S. Samkoe[1]; *[1]Thayer School of Engineering, Dartmouth College, USA; [2]Dept. of Pathology and Laboratory Medicine, Cedars-Sinai Medical Center, USA; [3]Geisel School of Medicine, Dartmouth College, USA; [4]Dept. of Surgery, Dartmouth Hitchcock Medical Center, USA.* Restained frozen sections demonstrate a strong correlation between paired-agent imaging and histopathology, and paired-agents have superior diagnostic ability compared to single-agent targeted fluorescence.

OTu1E.4 • 09:30 (Invited)
Evaluating AAV Delivery With Whole-Body Fluorescence Cryotomography, Caleb Y. Kwon[1], Jennifer Hong[2], Augustino Scorzo[1], Rendall Strawbridge[1], Scott C. Davis[1]; *[1]Thayer School of Engineering, Dartmouth College, USA; [2]Dept. of Surgery, Dartmouth-Hitchcock Medical Center, USA.* Genetic medicines have the potential to cure genetic diseases, yet delivering these payloads to the right cells remains a challenge. We used whole-body fluorescence cryotomography of reporter mice to assess delivery of an adeno-associated virus.

08:00 -- 10:00
Room: Britannia
TTu1F • Preclinical Disease Research: Techniques and Applications
Presider: Narasimhan Rajaram; Univ. of Arkansas, USA

TTu1F.1 • 08:00 (Invited)
Metabolic Imaging and Characterization of Multicomponent Spheroid Models in Vitro., Shelby Bess[1], Narasimhan Rajaram[1], Kyle P. Quinn[1], Timothy J. Muldoon[1]; *[1]Univ. of Arkansas, USA. In vitro* assays are essential for studying cellular biology, but conventional monolayer cultures fail to replicate the complex three-dimensional interactions of cells in living organisms. We have generated a 3D spheroid in vitro model using cancer cells and macrophages, and demonstrated an image analysis approach to assess structural and metabolic changes across spheroid microregions. This platform enabless the evaluation of tumor and macrophage interactions unique to solid tumors.

TTu1F.2 • 08:30 (Invited)
Polarization Sensitive Optical Biopsy, Anna N. Yaroslavsky[1,2]; *[1]Univ. of Massachusetts Lowell, USA; [2]Deramtology, Massachusetts General Hospital, USA.* Nondestructive quantitative optical imaging offers unique advantages for safe tissue interrogation. This presentation will focus applications of polarization sensitive imaging for rapid assessment of cancer at the macroscopic and cellular levels.

TTu1F.3 • 09:00
Photodynamic Therapy of a Murine Breast Cancer Model Using Novel Peptide-Based Molecularly Targeted Pyropheophorbide-a, Zihao Li[1], Anakin de la Cruz Flecha[1], Shannon

Fung[1], Christopher DeNyse[2], Elaina Stafford[2], Regine Choe[1], Hans Schmitthenner[2], Timothy M. Baran[1]; *[1]Univ. of Rochester, USA; [2]Rochester Inst. of Technology, USA.* We developed a peptide-based molecularly targeted pyropheophorbide-a (PPa) photosensitizer (PS) for use in photodynamic therapy (PDT) in a murine breast cancer (BrCa) model, presenting preliminary findings that highlight its potential for advancing targeted therapeutic strategies.

TTu1F.4 • 09:15
Multi-Spectral Paired-Agent Imaging for Detection of Available Immune Checkpoint Proteins in Tumor Cells, Divya Ravi[1], Veronica C. Torres[1], Kimberley S. Samkoe[1]; *[1]Dartmouth College, USA.* Multi-spectral paired-agent imaging quantifies available PD-L1, PD-1, and CD80 receptor concentrations in lymphoma-mimicking phantoms. Dynamic measurements of PD-L1, PD-1, and CD80 can serve as a promising biomarker of PD-1 checkpoint inhibitor response.

TTu1F.5 • 09:30
Long-Wavelength Near Infrared Light Source Exploration for Hypoxia Assessment Using Sample-Free pH Sensing, Shree Krishnamoorthy[1], Yeasir Arafat[1], Eoin Russell[1,4], Simone Innocente[1], Andrea Visentin[2], Fatima Gunning[1], Brian Corbett[1], Stefan Andersson Engels[1,3]; *[1]Tyndall National Inst., Ireland; [2]INSIGHT Center for data analytics, Univ. College Cork, Ireland; [3]School of Physics, Univ. College Cork, Ireland; [4]Munster Technological Univ., Ireland.* Tissue acidity measured in pH is the clinical gold standard to assess hypoxia. To develop sample-free, non-invasive devices for continuous tissue pH monitoring using long-wavelength near infrared (LWNIR) spectroscopy currently available photonics sources are explored.

TTu1F.6 • 09:45
Time-Resolved Ultra-Weak Biophoton Emission in Human Breast Cancer Cells, Mahshid Zoghi[1], Carolyn Dang[1], James Velazquez[1], Annette R Khaled[1], Aristide Dogariu[1]; *[1]Univ. of Central Florida, USA.* We measured time-resolved ultra-low light bio-emission from mono-layer cultured human breast cancer cells under controlled physiological conditions. Observed photon number distributions exhibited changes in long-term emissions, highlighting potential insights into cellular dynamics and metabolic processes.

10:30 -- 12:00
Room: Constellation Ballroom A
JTu2A • Joint Plenary Session II

JTu2A.1 (Plenary)
Maximizing the Impact of Biomedical Imaging and Microscopy, Elizabeth M. Hillman[1]; *[1]St. Jude Children's Research Hospital, USA.* Optical methods are uniquely suited to mapping molecular and functional information across scales. From diffuse-imaging to super-resolution microscopy, how can we ensure that our work will lead to scientific breakthroughs and improvements in patient care?

JTu2A.2 (Plenary)
Fluorescent-proteins: New generation of sensing qubits?, Peter Maurer[1]; *[1]Univ. of Chicago, USA.* We demonstrate an optically addressable protein-based spin qubit encoded in the metastable triplet state of fluorescent protein. Our protein-qubit has coherence times rivaling NV centers in nanodiamonds but are roughly 10-times smaller and genetically encodable.

Constellation Ballroom A
13:30 -- 15:30
DTu3A • Machine Learning for Image Reconstruction, Interpretation, and Optical Design II
Presider: Murat Yildirim; Lerner Research Inst., USA

DTu3A.1 • 13:30 (Invited)
On the Use of Deep Learning Techniques for Holographic Image Reconstruction, Mooseok Jang[1]; *[1]Korea Advanced Inst of Science & Tech, Korea (the Republic of).* This talk will explore ways to incorporate physical forward models into deep learning approaches for solving inverse problems in holographic image reconstruction under perturbative configurations, where imaging systems and specimen types may vary.

DTu3A.2 • 14:00
Machine Learning Approach for Signal Processing in Diffuse in-Vivo Flow Cytometry, Mehrnoosh Emamifar[1], Jane Lee[1], Josh Pace[1], Chiara Bellini[1], Mark Niedre[1]; *[1]Northeastern Univ., USA.* We developed a convolutional neural network for analyzing Diffuse in-vivo Flow Cytometry (DiFC) data, leveraging peak shapes to better distinguish real events from artifacts in anesthetized or awake mice compared to our prior amplitude-based approach.

DTu3A.3 • 14:15 (Top-Scored)
Deep and Isotropic Structural and Metabolic Imaging for Nucleolar Dynamics in Living Biosystems, Kunzan Liu[1], Ellen Kan[1], Honghao Cao[1], Jiashu Han[1], Linda Griffith[1], Eliezer Calo[1], Sixian Y. You[1]; *[1]MIT, USA.* We develop a multimode fiber-based, label-free 3D imaging system coupled with a large-scale axial deblurring network for deep and isotropic imaging, uncovering dynamic correlations between redox states and nucleolar activities in diverse living biosystems.

DTu3A.4 • 14:30
Texture Analysis of MUSE Images of Different Resolutions for Breast Tumor Margin Detection, Tianling Niu[1], Tongtong Lu[3], Julie Jorns[2], Mollie Patton[2], Dong Ye[4], Tina Yen[2], Bing Yu[1]; *[1]Marquette Univ., USA; [2]Medical College of Wisconsin, USA; [3]Univ. of Wisconsin-Oshkosh, USA; [4]Georgia State Univ., USA.* MUSE is an imaging tool for cancer diagnosis for producing sharp, high-contrast images of cellular structures. Here, we report the MUSE images obtained with different magnifications on texture analysis for detection of breast tumor margins.

DTu3A.5 • 14:45 (Invited)
AI-Enhanced Volumetric Optical Microscopy for Faster Imaging in Living Tissues, Fei Xia[1,2]; [1]*Univ. of California Irvine, USA;* [2]*French National Centre for Scientific Research (CNRS), France.* Volumetric imaging using non-diffracting beams enables rapid 3D imaging by projecting volumes onto 2D images, but it lacks depth information. I will discuss our recent work proposing a new reconstruction model based on implicit neural representation guided diffusion model named MicroDiffusion for high-quality, depth-resolved 3D reconstruction from limited 2D projections. Our work is potentially powerful for new scientific discovery where higher speed volumetric imaging is needed.

13:30 -- 15:15
Room: Constellation Ballroom B
BTu3B • Brain Physiology and Disease II - Animal Models
Presider: Wesley Baker, Children's Hospital of Philadelphia, USA

BTu3B.1 • 13:30 (Keynote)
In Vivo Imaging of Functional Changes in the Brain of Mouse Models of Neurodegenerative Disease, Chris B. Schaffer[1]; [1]*Cornell Univ., USA.* Neurodegenerative disease ultimately leads to altered neural activity patterns associated with impaired function. We examine these changes in mouse models of Alzheimer's disease, as well as their normalizaiton with increases in cerrebral blood flow.

BTu3B.2 • 14:15 (Invited)
Hybrid Diffuse Optics for Monitoring Cerebral Physiology After Traumatic Brain Injury, Rodrigo M. Forti[1], Lucas J. Hobson[1], Shannon L. Morton[1], M K. Weeks[1], Kumaran Senthil[1], Brian R. White[1], Tiffany Ko[1], Kevin Browne[2], D K. Cullen[2], Arjun G. Yodh[2], Todd J. Kilbaugh[1], Wesley Baker[1]; [1]*Children's Hospital of Philadelphia, USA;* [2]*Univ. of Pennsylvania, USA.* Diffuse optics provides a non-invasive approach for neuromonitoring after traumatic brain injury. Using a swine model, we demonstrate its utility in detecting cerebral physiological changes, including cerebral water content, blood flow and oxygen metabolism.

BTu3B.3 • 14:45
Association of Arterial Blood Pressure Goals During Cardiopulmonary Resuscitation With Diffuse Optical Measurements of Cerebral Hemodynamics, Darci Anderson[1], Aidan Crozier[1], Kumaran Senthil[1], Jeremy Herrmann[1], Alyssa Seeney[1], Nicolina Ranieri[1], Rika Goto[2], Akshatha Krishna[1], Sara Kenna[1], Hunter Guadio[1], McKenna Mason[1], Rodrigo M. Forti[1], Wesley Baker[1], Todd J. Kilbaugh[1], Ryan Morgan[1], Tiffany Ko[1]; [1]*CHOP, USA;* [2]*Tufts Univ., USA.* We utilize non-invasive diffuse optical neuromonitoring to quantify cerebral hemodynamics during hemodynamic-directed cardiopulmonary resuscitation (HD-CPR) strategies that maintained either higher or lower arterial blood pressure targets in a pediatric swine model of asphyxia-associated cardiac arrest.

BTu3B.4 • 15:00
Multi-Exposure Speckle Contrast is a Robust Estimator of Blood Flow Index in the Diffuse Regime, Sean Aleman[1], Arnold Estrada[2], Ashwin B. Parthasarathy[1]; *[1]Univ. of South Florida, USA; [2]SPKL, LLC, USA.* Multi-exposure speckle imaging (MESI) analysis of deep tissue blood flow yields better baseline and relative blood flow index estimates than single-exposure methods in the presence of β and noise variations.

13:30 -- 15:30
Room: Aurora
NTu3C • Structured Illumination
Presider: Dan Oron; Weizmann Inst. of Science, Israel

NTu3C.1 • 13:30 (Invited)
Reimagining Line Confocal Microscopy for Fast and High-Resolution Imaging, Abhishek Kumar[1]; *[1]Univ. of Wisconsin-Madison, USA.* We have developed a dual-view stage-scanning line confocal microscope capable of imaging extended biological samples at fast speed. We will present example images of biological samples and discuss advantages and limitations of our approach.

NTu3C.2 • 14:00 (Invited)
High-Speed 3D Microscopy for in-Vivo Brain Imaging Across Species, Wenze Li[1]; *[1]Univ. of Columbia, USA.* Swept confocally aligned planar excitation (SCAPE) microscopy is a form of light-sheet imaging that enables high-speed 3D imaging of diverse specimens, from C. elegans to large-scale human tissues. Latest developments and applications will be presented.

NTu3C.3 • 14:30
Super-Resolution Chemical Imaging via Structured Illumination Fluorescence-Detected Mid-Infrared Photothermal Microscopy, Dashan Dong[1], Ji-Xin Cheng[1]; *[1]Boston Univ., USA.* A super-resolution chemical imaging method integrating structured illumination with fluorescence-detected mid-infrared photothermal microscopy (SI F-MIP) enables high-resolution chemical imaging of biological specimens.

NTu3C.4 • 14:45
Extended-Depth of Field Random Illumination Microscopy, EDF-RIM, Provides Super-Resolved Projective Imaging, Loic Legoff[1], Lorry Mazzella[1], Thomas Mangeat[1], frederic galland[1], marc allain[1], benoit rogez[1], anne sentenac[1], jerome idier[1], simon labouesse[1], Guillaume Giroussens[1]; *[1]Fresnel Institut, France.* We introduce EDF-RIM, combining structured illumination with speckles for super-resolution and extended depth of field. This approach enables faster imaging and reduced light dosage, achieving high-resolution imaging of large biological samples organized in cell sheets.

NTu3C.5 • 15:00
The SIMple Microscope: Development of a Platform for SIM Imaging in Unconventional Environments, Rebecca M. McClelland[1], Edward N. Ward[1], Francesca W. van Tartwijk[1], Stephen Devlin[1], Junqing Wang[1], Clemens F. Kaminski[1]; *[1]Univ. of Cambridge, UK.* Multicolour optical-sectioning structured illumination microscopy (OS-SIM) patterns are generated by compact, off-the-shelf, in-line fibre components that are easily assembled in a robust design, addressing practical limitations that currently prevent SIM imaging in many unconventional environments.

NTu3C.6 • 15:15
Multifocal Projection by Virtual Array Imaging, Vicente J. Parot[1]; *[1]Pontificia Univ Catolica de Chile, Chile.* We demonstrate multifocal projection using a DMD and a virtual array imaging system based on a free space optical cavity. We characterize the projection, showing the simultaneous focusing of different DMD areas at different depths.

13:30 -- 15:15
Room: Sovereign
ATu3D • Trapping with Structured Light
Presider: Anna Bezryadina; Univ. Northridge

ATu3D.1 • 13:30 (Invited)
Inverse Design Techniques for Biophotonics Applications: Optical Trapping and Sensing, Nasim Mohammadi Estakhri[1]; *[1]Chapman Univ., USA.* Recent advances in inverse design techniques offer significant potential for biophotonic applications. This talk explores neural networks and topology inverse design tools for designing and analyzing metasurface-based optical traps and compact biosensors.

ATu3D.2 • 14:00
Harnessing Dark Core Skyrmions for Optical Trapping and Imaging, Daryl C. Preece[1], Nicolas Perez[1], Roukuya Mamuti[1]; *[1]Biomedical Engineering, Unversity of California, Irvine, USA.* Dark core Skyrmions are three-dimensional dark regions surrounded by vectorial light, created using polarization-dependent wavefront shaping, enabling enhanced uniformity, stability. We discuss their utility in microscopy and optical trapping.

ATu3D.3 • 14:15 (Invited)
AI-Driven Fiber-Optic Cell Rotation for Tomographic Imaging, Jiawei Sun[1,2], Xibin Yang[1], Jürgen Czarske[2]; *[1]Suzhou Inst. of Biomedical Engineering and Technology, Chinese Academy of Science, China; [2]Competence Center for Biomedical Computational Laser Systems (BIOLAS), Dresden Univ. of Technology, Germany.* We present a fiber-optic cell rotator that enables holographically controlled 3D rotation of biological cells. Using AI-driven reconstruction workflow, we achieve full-angle, isotropic 3D tomographic imaging of single cells, revealing subcellular structures non-invasively.

ATu3D.4 • 14:45 (Invited)
Topological Optical Tweezers, Fan Nan[2,1]; [1]*Univ of North Carolina at Chapel Hill, USA;* [2]*Inst. of Biological and Chemical Systems - Biological Information Processing, Karlsruhe Inst. of Technology, Germany.* We develop a new concept called topological optical tweezers, which is inspired by topological principles in condensed matter physics. We show that analogous effects occur in optical manipulation; the creation of lateral optical forces with neither intensity nor phase gradient can behave similarly to chiral/antichiral edge states in a two-dimensional topological material.

13:30 -- 15:00
Room: Cambria
OTu3E • Reporters and Contrast Agents
Presider: Michael Bouvet; Univ. of California San Diego, USA

OTu3E.1 • 13:30 (Invited)
Near Infrared Contrast Agents to Improve Clinical Medicine, Summer L. Gibbs[1]; [1]*Oregon Health and Science Univ., USA.* Optical imaging technologies in the near infrared have demonstrated utility to improve clinical medicine by enabling fluorescence guided surgery and noninvasive cancer detection. Herein near infrared contrast agent development for clinical translation will be discussed.

OTu3E.2 • 14:00
Biostable PbS/CdS/ZnS Quantum Dots for Longitudinal Shortwave Infrared Imaging, Xingjian Zhong[1,2], Yidan Sun[2], Amish Patel[1,2], Mallory Moffett[2], Allison M. Dennis[2]; [1]*Biomedical Engineering, Boston Univ., USA;* [2]*Chemical Engineering, Northeastern Univ., USA.* PbS/CdS/ZnS quantum dots demonstrate enhanced biostability over PbS/CdS for longitudinal shortwave infrared imaging, enabling non-invasive pharmacokinetic and biodistribution analyses. This optical approach enables close observation of nano-bio interactions *in vivo* with many fewer study animals.

OTu3E.3 • 14:30
Novel Fluorophores for Precision Quantitative Imaging., Lei G. Wang[1]; [1]*Oregon Health & Science Univ., USA.* I will present the design and development of our water-soluble, cell-permeable fluorophores that are biologically compatible and environmentally inert, enabling accurate, quantitative imaging of intracellular drug distribution and protein binding in live cells and tissues for precision imaging applications.

OTu3E.4 • 15:00 (Invited)
Tracking the Fate of Antibody Conjugates Using Purpose-Built Optical Probes, Martin Schnermann[1]; [1]*National Cancer Inst., USA.* Abstract not available.

13:30 -- 15:00
Room: Britannia
TTu3F • Biophotonics in the Clinic and Beyond I
Presider: Davide Contini; Politecnico di Milano, Italy

TTu3F.1 • 13:30 (Invited)
Imaging Mueller Polarimetry: a New Lens on Human Health, Tatiana Novikova[1,2]; [1]*LPICM, CNRS Ecole Polytechnique IP Paris, France;* [2]*Dept. of Biomedical Engineering, Florida International Univ., USA.* Imaging Mueller polarimetry provides a unique way to assess the microstructure and optical properties of biological tissue based on interaction of polarized light with sample. The potential of this optical modality in diagnosis, early disease detection and health monitoring through non-contact, label-free imaging approach is presented and discussed

TTu3F.2 • 14:00
New Horizons in in Vitro Fertilization: 3D Imaging and Selection of Live Sperm Cells for Intracytoplasmic Sperm Injection, Natan T. Shaked[1]; [1]*Tel Aviv Univ., Israel.* Our label-free, real-time interferometric microscopy technique of live sperm cells allows their 3D morphological evaluation as if they are chemically stained, improving fertilization rates, usable embryo rates, pregnancy rates, and implantation rates in clinical studies.

TTu3F.3 • 14:15
Investigating Chromatic Blur Perception in Myopic Eyes Using Polychromatic Adaptive Optics, Maria Vinas[1], Paulina Dotor[1], Elena Moreno[1], Víctor Rodríguez López[1]; [1]*Consejo Sup Investigaciones Cientificas, Spain.* We investigated polychromatic visual perception for different refractive profiles, in the presence of monochromatic high order aberrations and after their correction using a polychromatic Adaptive Optics based visual simulator. Results showed significant differences in chromatic blur perception for different stimuli and refractive profiles.

TTu3F.4 • 14:30 (Invited)
Label-Free Polarized Diffuse Reflectance Imaging for Intraoperative Nerve Identification, Justin Baba[1,2]; [1]*Biomedical Engineering Dept., Vanderbilt Univ., USA;* [2]*Biophotonics Center, Vanderbilt Univ., USA.* We present results demonstrating label-free polarized diffuse reflectance imaging identification of intraoperative nerve, paving the way for clinical translation of real-time nerve visualization to facilitate the prevention of surgical iatrogenic nerve injuries.

16:00 -- 17:15
Room: Constellation Ballroom A
DTu4A • Design and Fabrication of Biomedical Optical Devices II
Presider: Rongguang Liang; Univ of Arizona, Coll of Opt Sciences, USA

DTu4A.1 • 16:00 (Invited)
Simultaneous Fiber Shape Sensing and Imaging, Erin S. Lamb[1], Zhou Shi[1], Tristan Kremp[1], David DiGiovanni[1], Paul Westbrook[1]; *[1]OFS Laboratories, USA.* We present a waveguide that enables fiber shape sensing and imaging based on a transmission matrix calibration of the multimode waveguide. We further link the measured shape information to the fidelity of the imaging calibration.

DTu4A.2 • 16:30
Low-Cost and High-Throughput Single Snapshot Imaging of Optical Properties Using a Defocused 3D-Printed Binary Mask and Raspberry Pi Camera, Zihao Li[1], Timothy M. Baran[1]; *[1]Univ. of Rochester, USA.* We developed a low-cost, high-throughput imaging system for optical property mapping using a 3D-printed binary mask and Raspberry Pi camera, employing Fourier domain demodulation and validated via phantom experiments as an affordable SFDI solution.

DTu4A.3 • 16:45
Fiber-Based Wavelength-Swept Spontaneous Raman Spectroscopy System for Whole Brain Tissue Classification, Elahe Parham[1,2], Mireille Quémener[2], Daniel C. Côté[2,1]; *[1]Laval Univ., Canada; [2]CERVO brain research center, Canada.* We introduce a wavelength-swept Raman spectroscopy technique that enhances signal detection compared to conventional Raman spectrometers using a sweeping laser and wide-area detector. Validated experimentally, it enables rapid, fiber-based data acquisition for brain tissue differentiation.

DTu4A.4 • 17:00
Specialized Fiber Couplers and Bundles for Biomedical Sensing and Imaging, Rodrigo Itzamnà Becerra-Deana[2,1], Audrey Laurence[2], Caroline Boudoux[2,1], Kathy Beaudette[2]; *[1]Polytechnique Montréal, Canada; [2]Castor Optics Inc., Canada.* This study presents advancements in optical fiber components, including bidirectional double-clad fiber couplers, wideband multimode circulators, and custom fused fiber bundles, enhancing sensitivity and reducing noise for improved biomedical applications such as imaging and sensing.

16:00 -- 17:15
Room: Constellation Ballroom B
BTu4B • Brain Physiology and Disease III
Presider: Rodrigo Forti; Children's Hospital of Philadelphia, USA

BTu4B.1 • 16:00
A High Performance Micro-Camera Array Microscope (HP-MCAM) for Cortex-Wide Cellular Resolution Calcium Imaging in Behaving Mice, Arun Cherkkil[1], Zoey Viavattine[1], Daniel Surinach[1], Ibrahim Oladepo[1], Jia Hu[1], Eunsong Ko[1], Skylar Fausner[1], Kapil Saxena[1], Vamsy Kota[1], Jill Juneau[2], Suhasa Kodandaramaiah[1]; *[1]Univ. of Minnesota, USA; [2]Kavli Inst., MIT, USA.* Here, we introduce a high-performance micro camera array microscope that can simultaneously capture cellular resolution neural activity from contiguous fields of view across a 48 mm^2 area of the dorsal cortex in behaving mice.

BTu4B.2 • 16:30
Depth-Resolved Metabolic Responses to Forearm Arterial Occlusion Measured With two-Channel Broadband NIRS, Fiza Saeed[1], Caroline Carter[1], John Kolade[1], Robert M. Brothers[1], Hanli Liu[1]; *[1]Univ. of Texas at Arlington, USA.* This study used 2-channel broadband near-infrared spectroscopy (bbNIRS) to measure tissue responses during forearm arterial occlusion. While oxy-hemoglobin concentration decreased and deoxy-hemoglobin concentration increased, oxidized cytochrome c oxidase concentration remained unchanged, indicating sustained mitochondrial metabolism

BTu4B.3 • 16:45
Spatially-Informed Hemodynamic Correction of Fluorescence Signals Acquired by Widefield Optical Imaging, Mohith Gollapalli[1], Alberto Vazquez[1]; *[1]Radiology, Univ. of Pittsburgh, USA.* We developed and tested a spatial cost function to correct for hemodynamic artifacts in fluorescence imaging data and find that it estimates correction coefficients in-line with similar methods without temporal data.

BTu4B.4 • 17:00
A Dual-Color Fluorescent Widefield Optical Mapping System, Fatema Lodgher[1], Alexis Yagielski[1], Weihao Xu[1], Elizabeth Malan[1], Elizabeth M. Hillman[1]; *[1]Columbia Univ., USA.* We developed a dual-color WFOM system to simultaneously image two fluorescent labels and hemodynamics on a mesoscopic scale across the dorsal cortex. We imaged glioma growth in vivo with this system over a five-week period.

16:00 -- 17:15

Rom: Aurora

NTu4C • AO and Wavefront Control

Presider: To be Announced

NTu4C.1 • 16:00 (Invited)
Machine Learning and Neural Representations for Enhancing Phase Diversity-Based Adaptive Optics, Magdalena C. Schneider[1]; *[1]HHMI Janelia Research Campus, USA.* Using phase-diversity wavefront sensing, machine learning-based deformable mirror control, and neural representations of the unknown sample and phase aberration, we demonstrate precise reconstruction of sample structures in fluorescence microscopy, even under severe, high-order aberrations.

NTu4C.2 • 16:30
Compressive Two-Photon Microscopy for High-Throughput Scattering Correction, Yi Xue[1]; *[1]Univ. of California Davis, USA.* A novel compressive two-photon microscopy approach employing Fourier-domain intensity coupling enables high-throughput scattering correction. Leveraging compressive sensing, it significantly enhances the efficiency and effectiveness of scattering correction, offering a transformative tool for advanced optical imaging applications.

NTu4C.3 • 16:45
Comparison of Conventional and Confocal Adaptive Optics two-Photon Excitation Fluorescence Ophthalmoscope, Wuao Jia[1,2], Rosa Martínez Ojeda[2], Alfredo Dubra[3], Jennifer Hunter[2,1]; *[1]Univ. of Rochester, USA; [2]Univ. of Waterloo, Canada; [3]Stanford Univ., USA.* A confocal pinhole has been integrated into a two-photon excitation fluorescence ophthalmoscope. The optimal pinhole size has been investigated to balance resolution, signal-to-noise ratio (SNR), and sharpness, enabling more precise imaging.

NTu4C.4 • 17:00
Complex-Valued Wavefront Correction in Nonlinear Scanning Microscopy, Maximilian Sohmen[1], Kibum Nam[1], Maria Borozdova[1], Monika Ritsch-Marte[1], Alexander Jesacher[1]; *[1]Inst. of Biomedical Physics, Medical Univ. of Innsbruck, Austria.* We present a fast, feedback-based wavefront sensing strategy, termed C-DASH, for multi-photon imaging through multiply-scattering media. C-DASH utilizes complex-valued light shaping, which offers several advantages over phase-only techniques, including fast convergence and better corrections.

16:00 -- 17:30
Room: Sovereign
ATu4D • Nanoscale Applications
Presider: Domna Kotsifaki; Duke Kunshan University, China

ATu4D.1 • 16:00 (Invited)
Determination of the Adhesion Force Between Bubbles Using Holographic Optical Tweezers, Juan Manuel Molina-Jimenez[1], Beatriz Morales-Cruzado[2], Zenaida Briceño-Ahumada[3], Virginia Carrasco-Fadanelli[4], Erick Sarmiento-Gomez[1]; *[1]Departamento de Ingenieria Fisica. UGTO, Mexico; [2]CONAHCYT - Centro de Investigación en Optica, Mexico; [3]Instituto de Química, UNAM, Mexico; [4]Dept. of Physics, Inst. of Experimental Colloidal Physics, Heinrich-Heine Univ., Dusseldorf, Germany.* This work demonstrates the possibility of manipulating and measuring forces between bubbles in a foam using holographic optical tweezers. We also present the first measurement of adhesion forces between bubbles of different sizes.

ATu4D.2 • 16:30 (Invited)
Rotational Dynamics of a Nanoparticle Levitated Using Engineered Polarization States of Light, Joanna Zielinska[2,1]; *[1]ETH Zurich, Switzerland; [2]Tecnologico de Monterrey, Mexico.* We present experimental techniques for manipulating rotational dynamics of optically levitated mesoscopic objects. Our approach involves utilizing engineered polarization states of light to control the alignment and the spinning motion of anisotropic nanoparticles.

ATu4D.3 • 17:00 (Invited)
Optical and Acoustic Trapping, Maria Grazia Donato[1]; *[1]CNR-IPCF, Istituto per i Processi Chimico-Fisici, Italy.* After a short introduction on the fundamentals of optics and acoustic trapping, we will discuss some results obtained with optical trapping in front of metamaterials for biophysics applications and with acoustic trapping for environmental monitoring.

16:00 -- 17:30
Room: Cambria
OTu4E • Novel Imaging Tools and Approaches
Presider: Ethan LaRochelle; QUEL Imaging, USA

OTu4E.1 • 16:00 (Invited)
Fluorescence Molecular Endoscopy for Early Detection of Esophageal Cancer, Dimitris Gorpas[1,2]; *[1]Inst. of Biological and Medical Imaging, Helmholtz Munich, Germany; [2]Chair of Biological Imaging, Technical Univ. of Munich, Germany.* Near-infrared fluorescence molecular endoscopy (NIR-FME) is a promising method for earlier, faster, and personalized esophageal cancer (EC) detection. A recent clinical study in Barrett's Esophagus patients highlights its potential in improving early EC diagnosis.

OTu4E.2 • 16:30

Coherent Raman Scattering Spectroscopy and Microscopy for Biological Studies, Chi Zhang[1], Karsten Mohn[1], Bin Dong[1], Shivam Mahapatra[1], Seohee Ma[1]; [1]*Purdue Univ., USA.* Here, the pulse-picking method for nonlinear optical imaging modalities, including coherent anti-Stokes Raman scattering, is introduced. Furthermore, recent studies employing coherent Raman microscopy to investigate cancer cell metabolism under hypoxic conditions are discussed.

OTu4E.3 • 16:45
Highly Stable Perovskite Based Core-Shell Nanoparticles for Deep Tissue Imaging and Sensing, Peuli Nath[1], Aniruddha Ray[1]; [1]*Univ. of Toledo, USA.* We present an ultra-bright core-shell nanoparticle contrast agent with perovskite quantum dot core, offering exceptional multi-photon fluorescence for deep tissue imaging. A ratiometric sensor for real-time detection of reactive nitrogen species was developed.

OTu4E.4 • 17:00 (Invited)
Title to be Announced, Mekhail Anwar[1]; [1]*Univ. of California San Francisco, USA.* Abstract not available.

16:00 -- 17:30
Room: Britannia
TTu4F • Roundtable Discussion: Advancing Optical Techniques for Bias-Free and Accessible Clinical Care
Presider: Sanathana Konugolu Venkata Sekar; Tyndall National Inst., Ireland

Wednesday, 23 April

08:00 -- 09:15
Room: Constellation Ballroom A
DW1A • Ophthalmic Imaging and Sensing I
Presider: Xu Feng; Univ. of Texas at Dallas, USA

DW1A.1 • 08:00 (Invited)
Retinal PS-OCT, Xinyu Liu[1]; [1]*Nanyang Technological Univ., Singapore.* Triple-input polarization-sensitive optical coherence tomography, enhanced by AI, measures birefringence in retinal nerve fibers, sub-retinal fibrosis, and posterior sclera, advancing diagnostic precision and clinical management of eye diseases including glaucoma, AMD and myopia.

DW1A.2 • 08:30 (Invited)
Adaptive Optics Rolling Slit Ophthalmoscope: High Resolution Camera-Based Multimodal Retinal Imaging, Blood Flow Visualization and Neurovascular Coupling., Léa Krafft[4], Pierre Senee[4,2], Olivier Thouvenin[1], Ana A. Brad[1], Michael Atlan[1], Michel Paques[3], Pedro Mece[1], Serge Meimon[4]; [1]*Institut Langevin, ESPCI Paris, CNRS, PSL Univ., France;* [2]*Quantel Medical, France;* [3]*Centre d'Investigation Clinique 1423, Quinze-Vingts National Ophthalmology Hospital, DGOS, INSERM, France;* [4]*DOTA, ONERA, Université Paris Saclay F-91123, France.* The Adaptive Optics Rolling Slit Ophthalmoscope is a novel high-resolution retinal imager combining the speed and wide field of view of camera-based systems with the enhanced reflectance contrast and additional phase contrast of point-scanning devices.

DW1A.3 • 09:00
Polarization-Sensitive Optical Coherence Tomography With an Existing Clinical Retinal Imaging Instrument, Po-Yi Lee[1], Chuan-Bor Chueh[1], Milen Shishkov[1], Tai-Ang Wang[2], Hsiang-Chieh Lee[2], Teresa Chen[3], Brett Bouma[1], Martin Villiger[1]; [1]*Wellman Center for Photomedicine, USA;* [2]*National Taiwan Univ., Taiwan;* [3]*Massachusetts Eye and Ear Infirmary, USA.* Commercial spectrometer-based retinal OCT systems lack the capacity for polarization-resolved measurements. Using a rotating waveplate module in combination with repeated scan patterns established for OCT angiography enables polarization-sensitive imaging of the retina with existing instruments.

08:00 -- 09:45
Room: Constellation Ballroom B
BW1B • Multimodal Probing of the Brain
Presider: Ashwin Parthasarathy; Univ. of South Florida, USA

BW1B.1 • 08:00 (Keynote)
Implantable Neurophotonics Probes, Ferruccio Pisanello[1]; *[1]Istituto Italiano di Tecnologia, Italy.* We will describe the potential of implantable neurophotonic probes for neuroscience and neurosurgery, focusing on unconventional optical systems for modal-selective, multifunctional, and plasmonic neural interfaces across the visible to near-infrared spectral range.

BW1B.2 • 08:45
Dynamic Speckle-Modulated Interferometric Near-Infrared Spectroscopy of non-Ergodic Samples, Rabisankar Samanta[1,2], Dibbyan Mazumder[1,2], Oybek Kholiqov[3], Vivek J. Srinivasan[1,2]; *[1]Tech4Health Inst., NYU Langone Health, USA; [2]Dept. of Ophthalmology, NYU Langone Health, USA; [3]Dept. of Biomedical Engineering, Univ. of California Davis, USA.* We demonstrate dynamic speckle-modulated interferometric near-infrared spectroscopy (DSM-iNIRS), which extracts the temporal point spread function (TPSF) of an intrinsically static medium. A potential application in tissue characterization is investigated.

BW1B.3 • 09:00
Multicolor High-Resolution SCAPE Microscopy for Understanding Neural Connectivity, Emine Ozen[1], Richard W. Yan[1], Wenze Li[1], Emily Evans[1], Malte Casper[1], Wei Wang[3], Elissa Bell[2], Kaidong Chai[2], Jasmine Shao[2], Jingjing Wu[2], Ting Gong[2], Anastasia Yendiki[2], Zhuhao Wu[3], Elizabeth M. Hillman[1]; *[1]Columbia Univ., USA; [2]Harvard Medical School, USA; [3]Weill Cornell Medicine, USA.* We developed a high-speed multicolor SCAPE microscope and 3D analysis pipeline that allows for simultaneous imaging of cellular and cytoskeletal markers in brain sections at submicron level to deepen our insight into neural circuit organization.

BW1B.4 • 09:15
Accuracy and Crosstalk of Hemoglobin Spectroscopy in Widefield Optical Imaging, Rodrigo M. Forti[1], Brian R. White[1,2]; *[1]Pediatrics, Children's Hospital of Philadelphia, USA; [2]Pediatrics, Univ. of Pennsylvania, USA.* Widefield optical imaging relies on accurate hemoglobin spectroscopy. Accuracy and crosstalk in this setting has been underexplored. Using the analytic solution for
widefield illumination we compare performance of common simplifications and propose a novel solution.

BW1B.5 • 09:30
Predicting Naturalistic Visual Representations in Mouse Cortex via Wide-Field Calcium Imaging and Motion Energy Modeling, Ziyuan Li[1], Shengxuan Chen[1], Wiete Fehner[1], Zachary Markow[1], Annie Bice[1], Seana Gaines[1], Joseph Culver[1]; *[1]Washington Univ. in St. Louis, USA.* Combining wide-field GCaMP6 imaging, naturalistic stimuli, and motion energy modeling in mouse cortex reveals robust encoding and decoding of complex visual experience, enabling accurate retinotopic mapping and directional tuning estimation from short movie segments.

08:00 -- 10:00
Room: Aurora
NW1C • Novel Developments
Presider: Alexander Jesacher; Innsbruck Medical Univ., Austria

NW1C.1 • 08:00 (Invited)
From Technology to Discovery: Deeper, Faster, and Colorful Photoacoustic Imaging in Life Sciences, Junjie Yao[1]; *[1]Duke Univ., USA.* Photoacoustic imaging (PAI) integrates light and sound, enabling multi-scale imaging with high spatial resolution and sensitivity. Our work advances PAI by overcoming tissue penetration limits, accelerating imaging speed, and enhancing specificity. These innovations support diverse biomedical applications, including functional brain imaging, cancer detection, and interventional therapies, providing new insights into complex biological processes.

NW1C.2 • 08:30
Laser Speckle Particle Sizer Characterizes the Size Distribution of Tissue Granularities, Zeinab Hajjarian[1,2], Ziqian Zeng[2], Nichaluk Leartprapun[2], Seemantini Nadkarni[2]; *[1]Univ. of Massachusetts Lowell, USA; [2]Wellman Center for Photomedicine, USA.* Tissues are composed of cellular and extra-cellular granularities in nm-μm range. We demonstrate that laser Speckle PARticle SizEr (SPARSE) quantifies the particle size distribution of biofluids and tissues, opening a transformative diagnostic opportunity.

NW1C.3 • 08:45
Revealing Protein Binding in Live Cells via Rotational Diffusion of Fluorescent Protein Triplets, Julia R. Lazzari-Dean[1], Alfred Millett-Sikking[1], Austin E. Lefebvre[1], Maria Ingaramo[1], Andrew G. York[1]; *[1]Calico Life Sciences LLC, USA.* Protein-protein interactions underlie most proteins' functions, but they are difficult to measure. We developed a new form of optical contrast based on triggerable fluorescence from triplet states, revealing interactions *in situ* with a single tag.

NW1C.4 • 09:00
High-Resolution on-Chip Fluorescence Microscopy for Rapid Screening of Chemotherapeutic Drugs, Somaiyeh Khoubafarin Doust[1], Cyrus Koogan[1], Aniruddha Ray[1]; *[1]Univ. of Toledo, USA.* We developed a cost-effective high-resolution on-chip fluorescence microscope with a wide field-of-view, enabling the imaging of several hundred cells simultaneously. This microscope was used to study drug-induced oxidative stress and cell death in cancer cells.

NW1C.5 • 09:15
Tissue Polarimetry: Governing Biophysics, Enabling Technologies and Correlations With Clinical Outcomes inBreast and Colorectal Cancers, Alex Vitkin[1]; *[1]Medical Biophysics, Princess Margaret Cancer Centre & Univ. of Toronto, Canada.* Polarized light interacting with biological tissues generates interesting contrast of utility in biomedicine. Here we discuss our biomedical polarimetry studies in breast and colorectal cancers, encompassing system design optimizations and initial clinical pilot studies results.

NW1C.6 • 09:30 (Invited)
Optical Thermometry Using Coded Streak Imaging, Jinyang Liang[1]; *[1]Institut National de la Recherche Sci., Canada.* Abstract not available.

08:00 -- 10:00
Room: Sovereign
AW1D • Plasmonic Tweezers and Nanoscale Applications
Presider: Agnese Callegari; Goteborgs Universitet, Sweden

AW1D.1 • 08:00 (Top-Scored)
Manipulation of Gold Nanorods and Nanodisks in Water Using Pulsed Photonic Nanojet and Hook, Maya H. Shor[1], Alina Karabchevsky[1]; *[1]Ben-Gurion Univ. of the Negev, Israel.* This study explores optical manipulation of nanoparticles using Photonic Nanojets and Photonic Hooks. We model nanoparticle displacement for various geometries in air and water, highlighting the influence of shape, orientation, and medium on force dynamics

AW1D.2 • 08:15
Directed Migration of Liposomes Using Thermoplasmonic Optical Tweezers, Zilin Jiang[1], Yixin Sun[1], Yifei Gao[1], Lilun Xu[1], Domna Kotsifaki[1]; *[1]Duke Kunshan Univ., China.* Liposomes serve as versatile platforms for drug delivery, nanocontainers, and membrane mimics. We have combined optical trapping and thermal forces in order to achieve rapid liposome migration with low laser power, with migration speeds of 1.77 μm/s for liposomes of 1 μm in diameter. This method offer new potential for drug delivery systems.

AW1D.3 • 08:30 (Invited)
Trapping Biocompatible Nanographene-Based Quantum Emitters in a Landscape of Optical and Thermal Forces, Theodoros Bouloumis[1], Hao Zhao[1], Nikolaos Kokkinidis[1], Yunbin Hu[2], Viet Giang Truong[1], Akimitsu Narita[1], Sile Nic Chormaic[1]; *[1]OIST, Japan; [2]College of Chemistry and Chemical Engineering, Central South Univ., China.* We present trapping of biocompatible quantum emitters based on D7H nanographene molecules using metamaterial plasmonic tweezers. Stable trapping was observed, with trap stiffness values as high as 8.8 (fN/nm)/(mW/μm^2). A range of intensities was used identifying a crucial value above which thermal effects drastically destabilize the trapping process. Two different types of hotspots can be simultaneously excited at the metamaterial array allowing for potential applications in sorting particles.

AW1D.4 • 09:00 (Invited)
Metamaterials and Optical Forces, Gan Wang[1]; *[1]Gothenburg Univ., Sweden.* Abstract not available.

AW1D.5 • 09:30 (Invited)
Inverse Design of Plasmonic Nanotweezers, Kenneth B. Crozier[1]; *[1]Univ. of Melbourne, Australia.* Plasmonic apertures concentrate optical fields, enhancing the gradient force for precise trapping of nanoscale entities. Traditionally, design relied on intuition and simulations. We instead present a novel approach using topology optimization and adjoint sensitivity analysis.

08:00 -- 09:30
Room: Cambria
OW1E • Optical Phantoms and Image Processing
Presider: Stefan Andersson Engels; Tyndall National Inst., Ireland

OW1E.1 • 08:00 (Invited)
Accelerating Clinical Translation and Promoting Standardization in Imaging: the Power of Phantoms, Ethan LaRochelle[1]; *[1]QUEL Imaging, USA.* Tissue-mimicking phantoms are essential for characterizing biomedical optical imaging systems. The clinical adoption of fluorescence imaging highlights the importance of reproducible phantoms in driving standardization and accelerating clinical translation, ensuring consistent performance and facilitating regulatory approval.

OW1E.2 • 08:30
Depth Imaging Using Multi-Wavelength Excitation-Emission Ratios, Veronica C. Torres[1], Samuel S. Streeter[2,3], Mayna Nguyen[4], Scott C. Davis[1], Kimberley S. Samkoe[1]; *[1]Thayer School of Engineering, Dartmouth College, USA; [2]Dept. of Orthopaedics, Dartmouth Hitchcock Medical Center, USA; [3]Geisel School of Medicine, Dartmouth College, USA; [4]QUEL Imaging, USA.* Fluorescence depth can be estimated using the linear relationship between depth and the logarithmic ratio of fluorescence intensity at two different excitation wavelengths.

OW1E.3 • 09:00 (Invited)
Title to be Announced, Sanathana Konugolu Venkata Sekar[1]; *[1]Tyndall National Inst., Ireland.* Abstract not available.

08:00 -- 09:30
Room: Britannia
TW1F • Biophotonics in the Clinic and Beyond II
Presider: Caterina Amendola; Politecnico di Milano, Italy

TW1F.1 • 08:00
Towards Real-Time Molecular Profiling of Glioblastoma via Stimulated Raman Scattering Imaging, Maximilian Brinkmann[1], Felix Neumann[1], Ramon Droop[1], Steffen Ullmann[1], Thomas Würthwein[1], Tim Hellwig[1], Felix Stark[2], Isabel Schneider[2], Christoph Sippl[2], Stefan

Linsler[2]; [1]*Refined Laser Systems, Germany;* [2]*Dept. of Neurosurgery, Medical Campus Oberfranken, Germany.* We present a fully integrated, clinical-compatible SRS imaging device giving access to the complete Raman spectrum for histological tissue examination during tumor surgeries.

TW1F.2 • 08:15
Point-of-Care Widefield Retinal OCTA Mosaicking at Capillary-Resolution With Handheld Spectrally Encoded Coherence Tomography and Reflectometry, Jacob J. Watson[1], Yuankai K. Tao[1]; [1]*Vanderbilt Univ., USA.* A multimodal handheld OCTA probe with augmented reality guidance and strip scanning protocols are demonstrated for ergonomic and high-throughput point-of-care retinal OCTA mosaicking. Clinical translation will enable efficient ultra-widefield OCTA imaging at capillary resolution.

TW1F.3 • 08:30
Correlation Tomography of Volumetric OCT Images Using HSV Color Space, Erin O'Kane[1], David A. Miller[1], Adam Wax[1]; [1]*Duke Univ., USA.* We propose a method for correlation tomography of scatterer signatures using spectroscopic OCT. We visualize spatial correlations of 5.3μm and 7.7μm polystyrene beads, and cell nuclei of A431 cells using HSV color space.

TW1F.4 • 08:45
High Performance low-Cost OCT System Powered by NVIDIA Jetson Orin Nano, Wan Wang[1], David A. Miller[1], Adam Wax[1]; [1]*Duke Univ., USA.* We developed a compact, low-cost retinal OCT system using the NVIDIA Jetson Orin Nano, achieving real-time control and image processing with a maximum A-line processing rate exceeding 500 kHz.

TW1F.5 • 09:00 (Invited)
Photobiomodulation, an Innovative Treatment With Light to Slow Down Parkinson Disease: From Bench to Bedside Story, Cécile Moro[1]; [1]*CEA Grenoble, France.* Abstract not available.

10:30 -- 11:45
Room: Constellation Ballroom A
DW2A • Ophthalmic Imaging and Sensing II
Presider: Xinyu Liu; Nanyang Technological Univ., Singapore

DW2A.1 • 10:30 (Invited)
Advancing High-Resolution, Quantitative Measurement of Corneal and Lens Biomechanics Using Optical Coherence Elastography, Xu Feng[1], Yuxuan Jiang[2], Guo-Yang Li[2], Jing Zhang[2], Roberto Pineda[3], Seok-Hyun Yun[2]; [1]*Univ. of Texas at Dallas, USA;* [2]*Harvard Medical School, USA;* [3]*Massachusetts Eye and Ear, USA.* We present optical coherence elastography techniques for high spatial resolution measurement of corneal and crystalline lens biomechanics. These methods enable *in vivo* stiffness mapping in healthy and ectasia corneas, and provide insights into lens biomechanics' role in vision accommodation.

DW2A.2 • 11:00
Color Matching of two-Photon Stimuli Projected by Scanning Laser, Mateusz Grochalski[1,4], Daniel Ruminski[1], Elena Moreno[3], Magdalena Smolis[2], Katarzyna Komar[1,4]; *[1]Faculty of Physics, Astronomy and Informatics, Nicolaus Copernicus Univ. in Torun, Poland; [2]Inst. of Physics, Jagiellonian Univ. in Kraków, Poland; [3]Complutense Univ. of Madrid, Spain; [4]International Centre for Translational Eye Research, Inst. of Physical Chemistry of the Polish Academy of Sciences, Poland.* The study investigates two-photon color perception, demonstrating how wavelength and laser power influences perceived hues. Findings could enhance understanding of two-photon vision, aiding advancements in augmented reality technology.

DW2A.3 • 11:15 (Invited)
Modeling and Optical Properties of the Optic Nerve Head: a Monte Carlo-Based Approach, Marc-Antoine Bansept[1], Guillaume Allain[1], Dominic Sauvageau[1,2], Cleophace Akitegetse[1]; *[1]Zilia Inc., Canada; [2]Chemical and Materials Engineering, Univ. of Alberta, Canada.* This study introduces the first detailed Monte Carlo model of the optic nerve head, addressing a significant gap in the literature. It combines the integration of unique optical properties, layered anatomical complexity, and experimental validation for neuro-ophthalmic applications.

10:30 -- 12:30
Room: Constellation Ballroom B
BW2B • Brain Physiology and Disease IV
Presider: Brian White; Children's Hospital of Philadelphia, USA

BW2B.1 • 10:30 (Keynote)
Minimizing the Effects of Autonomic Responses in FNIRS for Improved Data Reliability, Rickson C. Mesquita[1,2], Luis Felipe Bortoletto[2], Victor Sanchez[2], Sergio Novi[2,3], Giovani Grisotti Martins[2,4]; *[1]School of Computer Science, Univ. of Birmingham, UK; [2]Inst. of Physics, Univ. of Campinas, Brazil; [3]Dept. of Otorhinolaryngology – Head and Neck Surgery, Univ. of Maryland School of Medicine, USA; [4]School of Medicine, Emory Univ., USA.* This study examines how autonomic responses impact cortical activity measurements commonly targeted in functional near-infrared spectroscopy (fNIRS) protocols. We evaluated the effectiveness of pipelines in reducing interference, thus enhancing reliability and reducing misinterpretation in fNIRS.

BW2B.2 • 11:15 (Invited)
Exploring Individual Identifiability for Functional Fingerprinting Under Anesthesia in Mice, Arash Asadian[1], Brian R. White[2], Silvina Ferradal[1]; *[1]Intelligent Systems Engineering, Indiana Univ., USA; [2]Children's Hospital of Philadelphia, USA.* This study investigates how anesthesia impacts functional connectivity-based fingerprinting in mice using OIS imaging. Our results reveal that factors like connectivity method, scan duration, and anesthesia type significantly influence the accuracy of subject identification.

BW2B.3 • 11:45
Changes in Cerebrovascular Resistance With Hypertension and Telmisartan Treatment in Tg2576 Mice, Christian Crouzet[1], Thinh Phan[1], Danny Xie[1], Natalie Dulce Chavez[1], Natalie Johnson[1], Jihua Liu[1], Han Liu[1], Mark Fisher[1], Kim N. Green[1], David H. Cribbs[1], Bernard Choi[1]; [1]*Univ. of California Irvine, USA.* Angiotensin receptor blockers (ARBs) may slow hypertension-induced cerebrovascular changes in Alzheimer's disease (AD). We measured cerebrovascular resistance (CVR) during hypertension and ARB treatment in AD mice. Hypertension increased CVR with minimal ARB treatment effects.

BW2B.4 • 12:00
Functional Perfusion Imaging Enabled by Long Wavelength, Interferometric Diffuse Correlation Spectroscopy, Mitchell B. Robinson[1], Bin Deng[1], Ailis Muldoon[1], Shakeeb Habash[1], Maria Angela Franceschini[1], Stefan Carp[1]; [1]*Massachusetts General Hospital, USA.* Recent advancements in long-wavelength interferometric diffuse correlation spectroscopy (LW-iDCS) have enabled high signal-to-noise ratio, multichannel instruments. This study shows LW-iDCS characterization data and demonstrates highly parallel measurement of hemodynamic responses during functional brain activation.

BW2B.5 • 12:15
Single-Distance, Single-Modulation-Frequency, Multispectral Near Infrared Spectroscopy to Determine Absolute Concentrations of Tissue Chromophores, Muaaz Faiyazuddin[1], Hanli Liu[1]; [1]*Univ. of Texas at Arlington, USA.* We present a novel optimization-based methodology to estimate absolute chromophore concentrations including the redox state of cytochrome-c-oxidase using single-distance, single-modulation, eight-wavelength frequency-domain near-infrared spectroscopy. This approach facilitates the reduction of device costs and depth-resolved quantifications.

10:30 -- 13:00
Room: Aurora
NW2C • Spectroscopy and FLIM
Presider: Matthew Lew; Washington Univ. in St Louis, USA

NW2C.1 • 10:30 (Invited)
Superresolved Nonlinear Raman Microscopy by Coherent Image Scanning, Dan Oron[1], Anna Zhitnitsky[1], elad benjamin[1]; [1]*Weizmann Inst. of Science, Israel.* We demonstarte superresolved coherent anti-Stokes Raman (CARS) microscopy by implementing CARS image scanning microscopy. This requires access to the phase which we obtain using an inline interferometer.

NW2C.2 • 11:00
Ultrasensitive Chemical Imaging of Bionanoparticles by Stimulated Raman Interferometric Photothermal Microscopy, Pintian Lyu[1], Ji-Xin Cheng[1]; *[1]Boston Univ., USA.* Interferometric scattering (iSCAT) microscopy is an ultrasensitive method for single nanoparticle imaging. We incorporate chemical specificity into iSCAT by detecting the stimulated Raman interferometric photothermal (SRIP) signal for ultrasensitive label-free chemical imaging of bionanoparticles.

NW2C.3 • 11:15
High-Throughput Hyperspectral Fluorescence Imaging Using a High-Speed Silicon Photomultiplier Array, Chi Huang[1], Vincent D. Ching-Roa[1], Connor M. Heckman[1], Sherrif F. Ibrahim[2,1], Michael G. Giacomelli[1]; *[1]Univ. of Rochester, USA; [2]Rochester Dermatologic Surgery, PC, USA.* This work shows that high spectral resolution combined with high detection throughput enables the multiplexing of multiple contrast agents. Silicon photomultiplier arrays may be a promising method to extend multiplex fluorescence imaging in various scenarios.

NW2C.4 • 11:30
In Vivo Electro-Optic Fluorescence Lifetime Imaging Microscopy With Real-Time Calibration, Linghao Hu[1], Adam Bowman[1]; *[1]Salk Inst. for Biological Studies, USA.* We present a fast electro-optic fluorescence lifetime (EO-FLIM) microscope for imaging in vivo. It features a compact resonant gating unit that enables a large field of view (>300 μm) and supports real-time lifetime calibration and phasor analysis.

NW2C.5 • 11:45
A Computational Algorithm for Dead Time Correction in Fluorescence Lifetime Imaging Microscopy (FLIM), Yidan Yin[1], Yao Chen[2], Janet E. Sorrells[1]; *[1]Electrical & Systems Engineering, Washington Univ. in St. Louis, USA; [2]Neuroscience, Washington Univ. in St. Louis, USA.* Dead time correction methods are developed to improve the accuracy of FLIM measurements, incorporating statistical models, algorithm simulation, and evaluation on FLIM datasets.

NW2C.6 • 12:00
Propofol Treatment Alters the Metabolic State of MDA-MB-231 Breast Cancer Cells, Tabassum A. Tasmi[1], Alex Walsh[1]; *[1]Texas A&M Univ., USA. This study investigates the impact of propofol, an intravenous anesthetic drug, on the metabolic behavior of the breast cancer cell line MDA-MB 231, by utilizing fluorescence lifetime imaging microscopy (FLIM). It revealed significant morphological and metabolic changes in the cells, which may reveal a metabolic-component to propofol's mechanism.*

NW2C.7 • 12:15
Sum-Frequency Generation (SFG) Visualization of Collagen Tissue Through Its CH, NH, and OH Vibrational Modes, Salile Khandani[1], Yryx Luna Palacios[2], Eric Potma[2]; *[1]Biomedical Engineering, Univ. of California at Irvine, USA; [2]Chemistry, Univ. of California at Irvine, USA.* We investigated the vibrational signatures of fibrillar collagen type I in the CH, NH and OH bond regions using polarization-resolved SFG micro-spectroscopy. Our findings establish a connection between collagen's molecular structure and its SFG spectrum.

NW2C.8 • 12:30 (Invited)
Into the Deep: Shaping Light to Unravel Biology, Cristina Rodriguez[1]; *[1]Yale Univ., USA.* Multiphoton microscopy is a powerful tool, enabling non-invasive three-dimensional imaging deep within living organisms. Biological tissues, however, aberrate the wavefront of the light used by such microscopes, compromising both image signal and resolution. These aberrations ultimately limit the imaging depth and hold back our understanding of many biological processes that take place deep within living organisms. In this talk, I will discuss key technologies capable of overcoming this challenge and pushing the limits of traditional methods, including 3-photon microscopy and adaptive optics. I will show how we have implemented these innovative optical technologies to investigate the central nervous system, including imaging of synaptic structures in deep layers of the living mouse brain, and neuronal structures and somatosensory-evoked neuronal activity in the mouse spinal cord at unprecedented depths in vivo.

10:30 -- 12:15
Room: Sovereign
AW2D • Biological Applications II
Presider: Yuebing Zheng; Univ. of Texas at Austin, USA

AW2D.1 • 10:30 (Invited)
Bacterial Motion Control Using Optical Tweezers, Xiaoguang Ma[1]; *[1]Southern Univ of Science & Technology, China.* We design quasi-one-dimensional laser tweezer arrays to trap motile bacteria. Their swiming motions follow the designed array pattern and their speeds are controlled by the array lattice constant.

AW2D.2 • 11:00
Comparative Analysis of Optical Diffraction Tomography Cell Rotation Techniques for Isotropic Resolution, David Krause[1,2], Jiawei Sun[3], Bin Yang[1], Nektarios Koukourakis[1,2], Jürgen Czarske[1,2]; *[1]Technische Universität Dresden, Germany; [2]Competence Center for Biomedical Computational Laser Systems (BIOLAS), Germany; [3]Shanghai AI Lab, China.* Isotropic spatial resolution in optical diffraction tomography through sample rotation enables a deeper understanding of the intricate cellular process. The trade-offs between a fiber optical rotation and a mechanical rotation are compared.

AW2D.3 • 11:15 (Invited)
Deciphering Force Transmission at Cell-Cell Junctions in Epithelial Collectives, Marco Capitanio[1]; *[1]Univ. of Florence, Italy.* By using optical tweezers to measure force-dependence of molecular interactions, we show how adhesional proteins regulate tension at cell-cell junctions by switching between weak, strong, and dissipative interactions with the actin cytoskeleton.

AW2D.4 • 11:45 (Invited)
Nonlinear Optical Tweezers Microrheology and Probe Free Microscopy of Active Matter, Robertson-Anderson Rae[1]; *[1]Univ. of San Diego, USA.* I will discuss coupling optical tweezers with fluorescence microscopy to measure the nonlinear and spatiotemporally resolved

rheology of active biopolymer networks as well as strain-induced macromolecular dynamics and stress propagation.

10:30 -- 12:30
Room: Cambria
OW2E • Image Guided Surgery with Molecular Probes I
Presider: Edward Delikatny; Univ. of Pennsylvania, USA

OW2E.1 • 10:30
Comparison of a Fast-Acting Contrast Agent for Fluorescence-Guided Neurosurgery with Co-Administered ALA-PpIX and Second-Window ICG Using Fluorescence Cryotomography, Augustino Scorzo[1], Caleb Y. Kwon[1], Rendall Strawbridge[1], Scott C. Davis[1]; [1]*Dartmouth Engineering, Dartmouth College, USA.* A promising new untargeted, fast-acting and persistent contrast agent (TMR-PEG1k) for fluorescence-guided surgery was evaluated alongside two clinically tested fluorescent contrast agents for glioma resection (ALA-PpIX and second-window ICG) using fluorescence cryotomography of whole mice.

OW2E.2 • 11:00 (Invited)
Optimizing the Pharmacokinetics of Fluorescent Antibody Probes for Optical Surgical Navigation, Thinzar M. Lwin[1]; [1]*City of Hope National Medical Center, USA.*
This talk explores current approaches for antibody engineering to improve the pharmacokinetic properties of fluorescent antibody probes. Modification of the probe platform can enhance efficacy in optical surgical navigation by optimizing tissue penetration.

OW2E.3 • 11:30 (Invited)
Translational Development of a Fluorescent Somatostatin Analog for Intraoperative Imaging in Neuroendocrine Tumors, Ali Azhdarinia[1]; [1]*UT Health Science Center at Houston, USA.* Methods to improve intraoperative detection of neuroendocrine tumors are critically needed. We have converted a clinically approved SSTR2-targeted radiopharmaceutical into a fluorescent analog for surgical imaging applications and will report preclinical findings and translational plans.

OW2E.4 • 12:00 (Invited)
Optical Imaging Modalities to Enhance Precision in Invasive Medical Procedures, Stephan Rogalla[1]; [1]*Stanford Univ., USA.* Abstract not available.

10:30 -- 12:30
Room: Britannia
TW2F • Biophotonics in the Clinic and Beyond III
Presider: Sanathana Konugolu Venkata Sekar; Tyndall National Inst., Ireland

TW2F.1 • 10:30 (Invited)
Monitoring Revascularization After Bone Injuries With Diffuse Optics, Regine Choe[1]; *[1]Univ. of Rochester, USA.* Possibility to predict the quality of bone injury healing from early longitudinal changes in blood flow and volume will be demonstrated using mice. Additionally, instrumentation geared for human fifth metatarsal fracture monitoring will be introduced.

TW2F.2 • 11:00
Quantitative Cerebral Tissue Oximetry in Children With Lower Respiratory Tract Infections., Michele Lacerenza[1], Valeria Calcaterra[2,3], Virginia Rossi[2], Sara Zanelli[2], Mauro Buttafava[1], Maria Pia Sormani[4,5], Davide Contini[6], Alessandro Torricelli[6,7], Gian Vincenzo Zuccotti[2,8]; *[1]PIONIRS srl, Italy; [2]Pediatric Dept., Buzzi Children's Hospital, Italy; [3]Pediatric and Adolescent Unit, Dept. of Internal Medicine, Univ. of Pavia, Italy; [4]Dept. of Health Sciences, Univ. of Genoa, Italy; [5]IRCCS, Ospedale Policlinico San Martino, Italy; [6]Dipartimento di Fisica, Politecnico di Milano, Italy; [7]Istituto di Fotonica e Nanotecnologie, Consiglio Nazionale delle Ricerche, Italy; [8]Dept. of Biomedical and Clinical Science, Univ. of Milan, Italy.* An observational study using Time-Domain Near-Infrared Spectroscopy was conducted to compare cerebral tissue oxygenation between healthy controls and children with lower respiratory tract infections (LRTIs). Cerebral tissue saturation was one of the predictors of LRTIs

TW2F.3 • 11:15
Peripheral Blood Versus Chest Tissue Oxygen Saturation Responses to Different Breathing Tasks, Thien Nguyen[1], Soongho Park[1], Amir Gandjbakhche[1]; *[1]National Inst. of Health in US, USA.* This study investigates the sensitivity of peripheral blood and chest tissue oxygen saturation to three different simulated breathing tasks. We found that tissue oxygenation is more sensitive to breath holding than peripheral blood oxygen saturation.

TW2F.4 • 11:30
Intraoperative Detection and Segmentation of Pediatric Epilepsy-Related Brain Abnormalities Using a Deep Learning Model, Naomi Kifle[1], Bo Ning[1], Saige Teti[2], Eduardo T. Rodriguez[2], Jeremy Kang[1], Ava Jiao[1], Ashley Yoo[1], Daniel A. Donoho[2], Chima Oluigbo[2], Robert Keating[2], Richard J. Cha[1]; *[1]SZI, Children's National Hospital, USA; [2]Neurosurgery, Children's National Hospital, USA.* We present a deep learning-based classification and segmentation model that can identify epileptogenic tissue intraoperatively from pediatric patients diagnosed with epilepsy undergoing neurosurgical resection.

TW2F.5 • 11:45
Enhanced in Vivo Detection of Glioblastoma's Infiltrative Edge Using FLIm, Alexandra Adams[1], Alba Alfonso Garcia[1], Silvia Anbunesan[1], Julien Bec[1], Han San Lee[1], Orin Bloch[1], Laura Marcu[1]; *[1]Genome and Biomedical Sciences Facility, USA.* Detecting glioblastoma's infiltrative edge remains challenging. *In-vivo* analysis using 5-ALA-induced PpIX and NAD(P)H

autofluorescence revealed PpIX lifetime achieved higher detection accuracy (0.80) than intensity (0.73), while NAD(P)H lifetime highlighted inflammatory changes at tumor margins.

TW2F.6 • 12:00 (Invited)
Equitable Photoacoustic Imaging, Muyinatu A. Lediju Bell[1]; [1]*Johns Hopkins Univ., USA.* This invited contribution describes multiple innovative opportunities for photoacoustic imaging to be more equitable.

15:30 -- 17:00
Room: Avalon & Constellation Foyer Posters
JW4A • Joint Poster Session II

JW4A.1
A Clinical Application of Diffuse Correlation Spectroscopy for Measuring Cerebral Blood Flow in Patients With Subarachnoid Hemorrhage., Vishnukumar Raghu[1], Parveen P. Mohammad[1], Amy A. Letavay[1], Sheyar W. Amin[1], Elliot Pressman[1], Waldo Guerrero[1], Kunal Vakharia[1], Maxim Mokin[1], Ashwin B. Parthasarathy[1]; [1]*Univ. of South Florida, USA.* We present a study on non-invasive cerebral blood flow measurement in patients with subarachnoid hemorrhage, both with and without vasospasm, using diffuse correlation spectroscopy.

JW4A.2
Acute and Repeated Transcranial 1070-nm LED Photobiomodulates Working Memory Capacity on Humans, Yiqing Hu[1], Binita K C[1], R. Matthew Brothers[1], Hanli Liu[1]; [1]*Univ. of Texas at Arlington, USA.* Acute and repeated LED-based 40-Hz 1070-nm transcranial photobiomodulation was delivered to 11 human participants through an easy-to-wear helmet, enabling improving working memory capacity.

JW4A.3
A Study of Cerebral Activation and Suppression Responses Using TD-FNIRS, Cyrus S. Ho[1], Zhifei Li[2], Shujun Jing[1], Gabrielle Wann Nii Tay[1], Rachael Loh Rui Qi[1], Kenneth Tong De Sheng[1], Jinyuan Wang[1], Nanguang Chen[1,2]; [1]*National Univ. of Singapore, Singapore;* [2]*National Univ. of Singapore (Suzhou) Research Inst., China.* This paper presents a TD-fNIRS instrument and a visualized data analysis approach to detect distinctive patterns of depression from cerebral activation and suppression responses during the verbal fluency test.

JW4A.4
Light Scattering Induced by Orbital Angular Momentum Beams in Microparticle Suspensions, Roukuya Mamuti[1], Nicolas Perez[1], Daryl Preece[1]; [1]*Beckman Laser Inst. and Medical Clinic, Univ. of California, USA.* We investigate the behavior of optical vortex propagation and Orbital angular momentum conservation in scattering media by observing phase characteristics and mode content of scattered vortex beam.

JW4A.5

Pressure Monitoring Model for Investigating the Response of Mouse Optic Nerve Head Astrocyte to Elevated Hydrostatic Pressures, Clover Yang[1], Deven K. Gupta[1], Trey Highland[1], David A. Miller[1], Adam Wax[1]; *[1]Duke Univ., USA.* We designed a system to adjust and monitoring pressure to simulate intraocular pressure associated with glaucoma. Using quantitative phase microscopy and Förster resonance energy transfer, we compared cellular responses under normal and elevated pressure conditions.

JW4A.6
Assessing Deep Tissue Cervical Vasculature With Spatially Offset Trans-Illumination Imaging, Karthika Jeyachandran[1], Arpitha A.[2], Dhanush Koodi[3], Srihari V[4], Uttam M. Pal[1]; *[1]IIITDM Kancheepuram, India; [2]JIPMER Puducherry, India; [3]Sri Sairam Engineering College Chennai, India; [4]NIT Rourkela, India.* The structure of the blood vessel is a key biomarker to determine the stage and type of cancer. The trans-illumination of the cervix studied here using the GynoSight endoscope may enable the identification of deep tissue blood vessels

JW4A.7
Collagen Arrangement Analysis in an in Vivo Corneal Keratoconus Model Imaged With Second Harmonic Imaging Microscopy, Juan M. Bueno[1], Rosa M. Martinez-Ojeda[1], Enrique J. Fernandez[1], Patricia Gallego-Muñoz[2]; *[1]Universidad de Murcia, Spain; [2]Universidad de Valladolid, Spain.* Second Harmonic Generation (SHG) imaging microscopy has been used to quantify the corneal changes in a collagenase-induced disease progression keratoconus model. Images reveal changes in collagen organization depending on the enzyme concentration and the temporal follow-up.

JW4A.8
Correlation Analysis of FTIR Spectra and Salivary Free Amino Acid Composition in Breast Cancer, Lyudmila V. Bel'skaya[1], Denis V. Solomatin[1]; *[1]Omsk State Pedagogical Univ., Russian Federation.* A correlation analysis of salivary IR spectra characteristics and quantitative content of amino acids was performed. The potential applicability of using combinations of IR spectra characteristics for semi-quantitative determination of amino acid content was demonstrated.

JW4A.9
What Are the Best Conditions to Study Deep Lung Tissue Non-Invasively Through Time Domain Diffuse Optics?, Giulia Maffeis[2], Nicola Serra[2], Alessandro Bossi[1,2], Elisabetta Avanzi[2], Rinaldo Cubeddu[2], Alberto Dalla Mora[2], Laura Di Sieno[2], Antonio Pifferi[2], Paola Taroni[2]; *[1]Dipartimento di Meccanica, Politecnico di Milano, Italy; [2]Dipartimento di Fisica, Politecnico di Milano, Italy.* We assessed through Monte Carlo simulations and in vivo measurements what are the wavelengths (1150<λ<1250 nm), source-detector distance (about 5 cm) and protocol (forced breathing) to sense deep lung tissue non-invasively with time-resolved diffuse optics.

JW4A.10
Real-Time Intraoperative Margin Assessment and Biopsy Diagnosis Using High-Speed two Photon Microscopy, Chi Huang[1], Sherrif F. Ibrahim[2,1], Vincent D. Ching-Roa[1], Connor M. Heckman[1], Michael G. Giacomelli[1]; *[1]Univ. of Rochester, USA; [2]Rochester Dermatologic Surgery, PC, USA.* We demonstrated that by combining rapid fluorescent staining and fast high

dynamic range silicon photomultiplier (SiPM) sensors, two photo microscopy could provide real-time histology images for pathological evaluation.

JW4A.11
Monte Carlo Based Lookup Table Method to Improve Frequency-Domain Diffuse Optical Spectroscopy Accuracy at Short Source-Detector Separations, Yuxuan He[1,2], Joseph Majeski[1], Brian R. White[2], Wesley Baker[2,1], Rodrigo M. Forti[2]; *[1]Univ. of Pennsylvania, USA; [2]Children's Hospital of Philadelphia, USA.* Frequency-domain diffuse optical spectroscopy (FD-DOS) assesses tissue optical properties non-invasively. We propose a Monte Carlo-based Lookup Table method, improving accuracy at short source-detector separations while significantly reducing computational cost for small animal cerebral monitoring.

JW4A.12
In Vitro Validation of Dynamic Light Scattering Imaging on Fluid Phantoms, Nataliya Makeeva[1,2], Brian Le[2], Thinh Phan[1], Christian Crouzet[1], Dmitry Postnov[3], Bernard Choi[1,2]; *[1]Beckman Laser Inst., USA; [2]Biomedical Engineering, Univ. of California, Irvine, USA; [3]Center of Functionally Integrative Neuroscience, Dept. of Clinical Medicine, Aarhus Univ., Denmark.* Dynamic Light Scattering Imaging (DLSI) quantifies fluid flow and scattering by estimating correlation time and scattering ratios. This study demonstrates DLSI's sensitivity to volumetric flow and flow dynamics, optimizing parameter settings for biomedical imaging applications.

JW4A.13
Assessing Skin Dehydration With Michelson Interference Imaging: a Pilot Study, Ramy El-Bashar[1], Omnia H. Abd El-Rahman Nematallah[1]; *[1]Cairo Univ., Egypt.* This work examines using a Michelson interferometer to assess skin hydration through interference imaging. The results show noticeable differences between hydrated and dehydrated samples, supporting the method's potential for evaluating skin hydration

JW4A.14
Analysis of Stained Bone Biopsies Using Polarized Microscopy, Ana E. Espinosa[4], Rosario Porras-Aguilar[4], Mohanad Al-Sabbagh[2], Rachad Kudsi[2], Michelle Tucci[3], Ahmed El-Ghannam[1]; *[1]Dept. of Mechanical Engineering and Engineering Science, Univ of North Carolina at Charlotte, USA; [2]Dept. of Periodontology, Univ. of Kentucky, USA; [3]Univ. of Mississippi Medical Center, USA; [4]Dept. of Physics and Optical Science, Univ. of North Carolina at Charlotte, USA.* Polarized microscopy and digital image analysis were used to assess collagen organization in bone biopsies from patients receiving sinus augmentation. Picrosirius red staining revealed a significantly higher collagen I to III ratio in SCPC alloplast-grafted bone compared to Bio-Oss xenograft-grafted bone, indicating enhanced bone maturation.

JW4A.15
Withdrawn

Thursday, 24 April

08:00 -- 09:15
Room: Constellation Ballroom A
DTh1A • Novel Biomedical Optical Technology III

DTh1A.1 • 08:00 (Invited)
Spectrally Encoded Interferometry for Imaging Tympanic Membrane Vibrations, Dvir Yelin[1]; *[1]Technion Israel Inst. of Technology, Israel.* Spectrally encoded interferometry is applied for high-speed, nanometric-scale in vivo imaging of the tympanic membrane in human patients. Our initial experiments with human subjects demonstrate the system potential for conducting effective functional ear diagnosis.

DTh1A.2 • 08:30 (Invited)
Phase-Sensitive Dynamic Micro Optical Coherence Tomography, Hinnerk Schulz-Hildebrandt[1]; *[1]Massachusetts General Hospital, USA.* Dynamic optical coherence tomography (DμOCT) enhances contrast and reveals metabolic activity by analyzing signal fluctuations. We developed a phase-based algorithm that quantifies intracellular motion, enabling faster imaging than intensity-based methods, overcoming limitations of long observation times in DμOCTimaging.

DTH1A.3 • 09:00
Participant Brain Activation Metrics With Independent Component Analysis (ICA) With Infant FNIRS, Anna Blasi[1], Ethan McCormick[3], Sarah Lloyd-Fox[2]; *[1]Medical Physics and Biomedical Engineering, Univ. College London, UK; [2]Psychology, Univ. of Cambridge, UK; [3]College of Education and Human Development, Univ. Delaware, USA.* In studies of neurocognitive development in global health, it is necessary to integrate summary metrics of brain activation with contextual information. We propose Independent Component Analysis (ICA) to calculate these summary metrics, with promising results.

08:00 --09:45
Room: Constellation Ballroom B
BTh1B • Shaping Light for Multiscale Optical Imaging
Presider: Cristina Rodriguez; Yale Univ., USA

BTh1B.1 • 08:00
High-Throughput Volumetric Mapping of Synaptic Transmission and Microcirculations in the Brain, Wei Chen[1,2]; *[1]Huazhong Univ. of Sci. and Tech., China; [2]Dept. of Physics, UC Berkeley, USA.* We developed Bessel-droplet foci for high-resolution, high-contrast volumetric imaging of synaptic transmission and microcirculation in vivo, enabling high-throughput mapping of excitatory inputs and revealing novel synaptic organization and lymphatic dynamics in the mouse brain.

BTh1B.2 • 08:30 (Invited)
Retinal Microvascular and Neuronal Pathologies Probed in Vivo by Adaptive Optical two-Photon Fluorescence Microscopy, Qinrong Zhang[1]; *[1]City Univ. of Hong Kong, Hong Kong.* The retina is a critical tissue that can be directly studied using optical microscopy; however, imaging suffers from aberrations caused by the eye optics. In this work, we applied adaptive optical two-photon fluorescence microscopy to image the mouse retina *in vivo*, enabling high-resolution investigations of retinal pathology and pharmacology.

BTh1B.3 • 09:00 (Keynote)
STED Microscopy, Valentin Nägerl[1]; *[1]Université Victor Segalen Bordeaux 2, France.* Abstract not available.

08:00 -- 10:00
Room: Aurora
NTh1C • Phase Microscopy and Tomography I
Presider: Junjie Yao; Duke Univ., USA

NTh1C.1 • 08:00 (Invited)
Delivering Specificity to Interferometric-Based Microscopy, Jamie O. Arroyo[1]; *[1]ETH Zurich, Switzerland.* Abstract not available.

NTh1C.2 • 08:30
Contrast Enhancement for Next Generation Label-Free Microscopy, Tigran V. Galstian[1,2], William Boissonneault[1]; *[1]Université Laval, Canada; [2]R&D, PATQER Photonique inc, Canada.* A new technique of contrast enhancement is proposed by using an electrooptic element without labeling objects. Small optical path differences are converted into interference, without involving angular separation of waves, their phase or amplitude modulation.

NTh1C.3 • 08:45 (Top-Scored)
Slide-Free Tissue Histology Using Back-Illumination Interference Tomography and Virtual H&E Staining, Anthony Song[1], Mayank Golhar[1], Marisa Morakis[1], Mostafa Abdulrahim[1], Seth Jayawardane[1], Gregory McKay[1], Risheng Xu[1], Alexander Baras[1], Nicholas J. Durr[1]; *[1]Johns Hopkins Univ., USA.* Back-illumination interference tomography (BIT) is a novel epi-illumination microscopy technique that enables high-contrast, label-free 3D imaging of bulk tissues. We used deep learning to virtually stain BIT images into realistic H&E-like images.

NTh1C.4 • 09:00
Few-Shot Fluorescence Diffraction Tomography With Neural Volumetric Prior, Renzhi He[1], Haowen Zhou[2], Yubei Chen[1], Yi Xue[1]; *[1]UNIV. OF CALIFORNIA - DAVIS, USA; [2]Dept. of Electrical Engineering, California Inst. of Technology, USA.* We develop Neural Volumetric Prior (NVP) for few-shot fluorescence diffraction tomography. NVP utilizes the prior of explicit and implicit neural representations. Our method reduces the required number of images by 50-fold

while maintaining state-of-the-art performance.

NTh1C.5 • 09:15
Use of a Linear Feedback Loop to Null Phase Variations in a Laser Feedback Microscope, Ben Ovryn[1], Sean S. Peters[1]; *[1]New York Inst. of Technology, USA.* Our laser feedback interference microscope can measure nanometer optical paths in live cells. Implementing a feedback controller, large oscillating phase changes can be measured. We investigate cell transport with Faraday waves in a Hele-Shaw cell.

NTh1C.6 • 09:30
Broadband Near Field Ptychographic Imaging: Label-Free Contrast and Spectral Response Characterization, Bojana Ivanic[1], Cameron C. Clarke[1], Katelyn Spadavecchia[1], Daniel E. Adams[1]; *[1]Colorado School of Mines, USA.* We present a lensless near field ptychographic microscope that captures two valuable information channels: 1) phase-resolved, label-free structural contrast and 2) broadband response characterization. We quantify the behavior of the microscope in simulation.

NTh1C.7 • 09:45
Contrast Enhancement for Next Generation Label-Free Microscopy : DRiM, Tigran V. Galstian[1]; *[1]Université Laval, Canada.* We propose a new technique of enhancing the contrast of images of in focus phase objects. The proposed approach simplifies significantly the design of the microscope objective by enabling a double refraction interreference microscopy (DRiM).

08:00 -- 10:00
Room: Sovereign
OTh1D • Image Guided Surgery with Molecular Probes II
Presider: Srivalleesha Mallidi; Tufts Univ., USA

OTh1D.1 • 08:00 (Invited)
The Use of Fluorescence Imaging in Endocrine Surgery, Michael Bouvet[1,2]; *[1]Univ. of California San Diego, USA; [2]VA San Diego Heatlhcare System, USA.* In this presentation, I will discuss recent advancements in fluorescence optical imaging agents for endocrine surgery. These innovations aim to identify critical structures, minimize complications, and improve outcomes in thyroidectomy, parathyroidectomy, and adrenalectomy.

OTh1D.2 • 08:30 (Invited)
Targeted NIR Fluorescent Dyes for Intraoperative Lung Cancer Visualization, Edward J. Delikatny[1]; *[1]Univ. of Pennsylvania, USA.* We develop targeted NIR-I/II fluorophores for cancer surgery. Probes are translated through veterinary clinical trials via intraoperative imaging of canine patients. Our most advanced probe targeting choline kinase is entering human lung cancer clinical trials.

OTh1D.3 • 09:00 (Top-Scored)
Advancing Paired Agent Imaging for Head and Neck Cancer, Sanjana Pannem[1], Yichen Feng[2], Sassan Hodge[1], Eunice Chen[2], Jonathan Elliott[1], Kenneth M. Tichauer[3], Keith Paulsen[1], Kimberley S. Samkoe[1,2]; *[1]Thayer School of Engineering, Dartmouth College, USA; [2]Geisel School of Medicine, Dartmouth College, USA; [3]Dept. of Biomedical Engineering, Illinois Inst. of Technology, USA.* Paired Agent Imaging was tested in *in vivo* mouse models, demonstrating consistent binding potential (BP) quantification across increasing dosage, stable BP quantification at timepoints >5h, and no significant effects due to injection methodology.

OTh1D.4 • 09:30 (Invited)
Development and Evaluation of Fluorescence Contrast Agents for in Vivo Counting of Circulating Cancer Cells, Josh Pace[1], Nicole Rueb[2], Gauri Malankar[2], Lei Wang[2], Cody Rounds[2], Melissa Wong[2], Summer L. Gibbs[2], Philip Low[3], Mark Niedre[1]; *[1]Northeastern Univ., USA; [2]Oregon Health and Science Univ., USA; [3]Purdue Univ., USA.* The goal of this research is to develop a method to label and detect circulating tumor cells *in vivo* with different types of injectable cell targeted fluorescent molecular contrast agents while limiting immune cell labeling

08:00 -- 10:00
Room: Britannia
TTh1E • Non-invasive Optical Imaging for Disease Applications I

TTh1E.1 • 08:00 (Invited)
Recent Advances in Reflectance Confocal Microscopy for Noninvasive Diagnosis of Skin Lesions, Milind M. Rajadhyaksha[1]; *[1]Memorial Sloan Kettering Cancer Center, USA.* Reflectance confocal microscopy-guided skin diagnosis is advancing into routine practice. New capabilities are being integrated: deeper margins with OCT to guide treatment, clinical navigation with widefield imaging, and objective image analysis with machine learning.

TTh1E.2 • 08:30 (Invited)
Advances in Non-Invasive Optical Monitoring of Cerebral and Peripheral Microcirculation in Translational Models of Sepsis and High Intracranial Pressure, Mamadou Diop[1]; *[1]Western Univ., Canada.* In this presentation, we will discuss recent advances in non-invasive optical monitoring using hyperspectral near-infrared spectroscopy (hNIRS) and diffuse correlation spectroscopy (DCS) for assessing cerebral and peripheral microcirculation. Applications in preclinical models of high intracranial pressure and sepsis will be discussed, emphasizing the potential for these methods to improve early diagnosis and treatment monitoring. Further, we will highlight the potential of these technologies for clinical translation to improve patient care in critical settings.

TTh1E.3 • 09:00
Dermal Lymphatic Backflow as an Indicator of Lymphatic Disease Progression in Head and Neck Cancer Survivorship, John C. Rasmussen[1], Sara Bouhali[2], Fatima Merchant[2], Fred C. Velasquez[1], Carolina Gutierrez[1], Ron Karni[1]; *[1]Univ. of Texas Health Science Cente, USA; [2]Univ. of Houston, USA.* Using near-infrared fluorescence lymphatic imaging and 3D

profilometry techniques, we quantify the extent of dermal backflow across complex tissue surfaces and assess the lymphatic response to early physiotherapy in head and neck cancer survivors.

TTh1E.4 • 09:15
Enhanced Field Doppler Holography for Choroidal Vascularity Index Measurements, zacharie auray[1], yann fischer[1], olivier martinache[1], Michael Atlan[1]; *[1]CNRS, France.* High-speed Doppler holography enables detailed choroidal blood flow imaging, addressing limitations of current methods. By deriving functional Choroidal Vascularity Index measurements, it offers a novel biomarker for diagnosing and monitoring ocular and systemic vascular diseases.

TTh1E.5 • 09:30
Diabetes-Related Changes in Retinal Tissues Imaged With Two-Photon Microscopy: Structural and Neuroinflammation Effects, Juan M. Bueno[1], Marcelino Aviles-Trigueros[1], Nazario Bautista-Elivar[2]; *[1]Universidad de Murcia, Spain; [2]Instituto Tecnológico de Pachuca, Mexico.* Two-photon imaging microscopy has been used to explore the changes suffered by the retinal photoreceptors of a diabetic retinopathy rat model. Images reveal different cellular organization and noticeable neuroinflammation effects when comparing control and pathological specimens.

TTh1E.6 • 09:45
Developing Ultra-Widefield Panretinal Fundus Cameras for Comprehensive Pediatric Eye Disease Assessment, Xincheng Yao[1], Devrim Toslak[2], Alfa Rossi[1], Muhammet Kazim Erol[2], R. V. Paul Chan[1], Taeyoon Son[1]; *[1]Univ. of Illinois at Chicago, USA; [2]Antalya Training and Research Hospital, Turkey.* Trans-pars-planar illumination enables nonmydriatic, ultra-widefield pediatric fundus photography up to the ora serrata. It offers a unique telemedicine solution for affordable screening and management of retinopathy of prematurity and other pediatric eye diseases.

13:30 -- 15:00
Room: Constellation Ballroom B
BTh2B • Optics in the Human CNS and Peripheral Nerves
Presider: Ashwin Parthasarathy; Univ. of South Florida, USA

BTh2B.1 • 13:30 (Keynote)
Time-Resolved Near-Infrared Spectroscopy, Diffuse Correlation Spectroscopy, and Multichannel Derivative-Spectroscopy for Cerebral Microcirculation Monitoring, Mamadou Diop[1]; *[1]Western Univ., Canada.* We will discuss the integration of time-resolved near-infrared spectroscopy, diffuse correlation spectroscopy, and multichannel derivative-spectroscopy for monitoring human cerebral microcirculation. We will present applications of these techniques for real-time, noninvasive monitoring of cerebral blood flow, oxygenation, and metabolism. Applications in both adults and neonates will be discussed to highlight the potential of these techniques to enhance our understanding the human CNS.

BTh2B.2 • 14:15
Non-Invasive Multi-Modal Neuro-Monitoring of Adults Undergoing Extracorporeal Membrane Oxygenation (ECMO) for Brain Injury Detection, Chloe T. Zhang[1], Irfaan Dar[1], Ashley R. Proctor[2], Sylvine Ineza[6], David R. Busch[5,6], Mark Marinescu[3], Olga Selioutski[4,2], Imad R. Khan[2], Regine Choe[1]; *[1]Biomedical Engineering, Univ. of Rochester, USA; [2]Neurology, Univ. of Rochester Medical Center, USA; [3]Medicine, Univ. of Rochester Medical Center, USA; [4]Neurology, Stony Brook Univ., USA; [5]Anesthesiology and Pain Management, Univ. of Texas Southwestern Medical Center, USA; [6]Neurology and Biomedical Engineering, Univ. of Texas Southwestern Medical Center, USA.* We developed and improved a non-invasive multi-modal neuromonitoring system including diffuse optics and electroencephalogram to identify neurological biomarkers of brain injury for comatose adult patients undergoing ECMO.

BTh2B.3 • 14:30
Transcranial 1064-nm Laser Photobiomodulation Drives Time-Dependent Electromagnetic Dipole Source Location Changes in Healthy Adults, Subrat Bastola[1], Tyrell Pruitt[2], Joseph Maldjian[2], Elizabeth Davenport[2], George Alexandrakis[1], Hanli Liu[1]; *[1]Univ. of Texas at Arlington, USA; [2]UT Southwestern, USA.* Acute 1064-nm transcranial photobiomodulation (tPBM) was applied in 8 healthy adults, investigating effects on electromagnetic (EM) dipole source localization using concurrent MEG/EEG resting-state measurements, revealing reproducible temporal patterns in source localization results.

BTh2B.4 • 14:45
Improving the Robustness of Local Optic Axis Algorithm Under Noise in Polarization Sensitive Optical Coherence Tomography, Jiachen Wan[1,2], Hui Wang[1,2], Christopher Robert Clickner[1]; *[1]Massachusetts General Hospital, USA; [2]Harvard Medical School, Harvard Univ., USA.* We propose a super-pixel clustering approach for local optic axis recovery in PS-OCT. Simulations and ex vivo brain tissue imaging demonstrate improved robustness against noise and effective phase unwrapping, enhancing polarization-based tissue characterization.

13:30 -- 15:00
Room: Aurora
NTh2C • Phase Microscopy and Tomography II
Presider: Abhishek Kumar; Univ. of Wisconsin-Madison, USA

NTh2C.1 • 13:30
Phase-Support Constraint for Twin-Image Suppression and Phase-Based Classification of Malaria-Infected Red Blood Cells, Charlotte Kyeremah[2], Aditya Paul[3], Daniel Haehn[1], Manoj Duraisingh[3], Chandra S. Yelleswarapu[2]; *[1]Computer Science, Univeristy of Massachusetts Boston, USA; [2]Physics, Univ. of Massachusetts Boston, USA; [3]Immunology and Infectious Diseases, Harvard School of Public Health, USA.* We developed a phase-support constraint algorithm to suppress twin-image artifacts. We achieved higher parasitemia detection using the optical phase as a classifier compared to features like surface area, which offers reliable

holographic microscopy solutions for diagnostics and biomedical imaging.

NTh2C.2 • 13:45 (Top-Scored)
Adaptive Angle-Calibration for Wide Field-of-View on-Chip Phase Imaging With LED Array, Sibi Chakravarthy Shanmugavel[1], Shwetadwip Chowdhury[1]; *[1]Univ. of Texas at Austin, USA.* We introduce an adaptive angle-calibration framework for mask-less on-chip phase imaging, where an LED array is used to deliver angled illuminations. Our framework accounts for spatially-varying illumination angles produced by each LED across expansive fields-of-view, enabling wide field-of-view phase imaging.

NTh2C.3 • 14:00
Imaging the Motion of Magnetic Particles Using Modulated Doppler Phase Microscopy, Rupak Bhakta[1], Gizem Celebi Torabfam[1], Joseph Zimmer[1], Hanna Saji[1], Emily C Kryvorutsky[1], Yuanwei Zhang[1], Cristiano L. Dias[1], Xuan Liu[1]; *[1]New Jersey Inst. of Technology, USA.* We developed modulated Doppler phase microscopy technology to achieve high-speed, high-resolution quantitative motion imaging in the *en face* plane and imaged the motion of melittin-coated and naked magnetic particles in petri dishes with cultured cells.

NTh2C.4 • 14:15 (Top-Scored)
Leveraging Kramers-Kronig Relations to Enhance Signal Retrieval of Quantitative Phase Microscopy, Deven K. Gupta[1], Clover Yang[1], Trey Highland[1], David A. Miller[1], Adam Wax[1]; *[1]Duke Univ., USA.* We leveraged Kramers-Kronig relations to enhance fluorescence signal retrieval, enabling improved imaging of optic nerve head astrocytes within 3D hydrogel culture. This model uniquely combines microfluidics and interstitial flow to study glaucoma-associated mechanobiology.

NTh2C.5 • 14:30
Multi-Slice Beam-Propagation With Angle-Multiplexed Measurements, Siqi Yang[1], Jeongsoo Kim[1], Shwetadwip Chowdhury[1]; *[1]Univ. of Texas at Austin, USA.* We present a multi-slice beam-propagation (MSBP) framework to reconstruct 3D refractive-index from multiplexed angular scattering measurements. We verify this framework using synthetically multiplexed measurements and achieve high reconstruction quality up to a multiplexing factor of five.

NTh2C.6 • 14:45
Real Time 3D Tracking of Escherichia Coli Cells Using AI Accelerated Digital Holography, Samuel A. Matthews[1], Emma E. Brock[1,2], Carlos Coelho[1], Erick E. Rodriguez Salas[1], Victoria J. Hodge[1], James A. Walker[1], Laurence G. Wilson[1]; *[1]Univ. of York, UK; [2]Univ. of Cambridge, UK.* We demonstrate a novel application of the convolutional neural network `you only look once' to reduce the processing time of digital holographic microscopy, enabling its use on single board computers and at real-time speeds.

13:30 -- 14:45
Room: Sovereign
OTh2D • Novel Tools and Approaches for Data Analysis and Image Reconstruction
Presider: Katarzyna Komolibus; Tyndall National Inst., Ireland

OTh2D.1 • 13:30 (Invited)
Quantitative in Vivo Molecular Imaging With Fluorescence Paired-Agent Imaging, Kimberley S. Samkoe[1]; [1]*Dartmouth College, USA.* We have developed a fluorescence-based paired-agent imaging (PAI) methodology that allows real-time assessment of in vivo protein receptor availability over time. PAI allows both temporal changes and spatial heterogeneities to be studied in vivo.

OTh2D.2 • 14:00
A Paired-Agent Fluorescence Tomography Method to Detect and Localize Cancer Burden in Excised Lymph Nodes, Cody Rounds[1], Anjalika Sharma[1], Thom Nijboer[2], A. S. C. Sarathchandra[1], Simon Parschat[1], Rishi Goyal[1], Floris J. Voskuil[2], Jovan G. Brankov[1], Max J. Witjes[2], Kenneth M. Tichauer[1]; [1]*Illinois Inst. of Technology, USA;* [2]*Univ. Medical Center Groningen, Netherlands.* This work presents a method to detect and localize cancer burden in surgically excised lymph nodes from head and neck cancer patients. Results from porcine lymph nodes implanted with human head and neck cancer spheroids demonstrate that cancer cell clusters as small as 100-microns can be detected with >99% sensitivity and specificity within 30 min.

OTh2D.3 • 14:15 (Top-Scored)
Understanding Virtual Fluorescent Staining for Connective Tissue, Katharina Schmidt[1,2], Max von Witzleben[3], Nektarios Koukourakis[1], Michael Gelinsky[3], Jürgen Czarske[1,2]; [1]*TU Dresden, Chair of Measurement and Sensor System Technique, Germany;* [2]*TU Dresden, BIOLAS Competence Center, Germany;* [3]*TU Dresden, Centre for Translational Bone, Joint and Soft Tissue Research, Germany.* We present neural networks to virtually stain unlabeled cell samples using backscattered intensity distribution to mimic Phalloidin and DAPI staining. In addition, findings of the explainability after training are discussed.

OTh2D.4 • 14:30
Deep Learning Enabled Alleviation of Photobleaching Effects in Molecular Photoacoustic Imaging, Avijit Paul[1], Mohammad Saad[2], Marvin Xavierselvan[1], Tayyaba Hasan[2], Srivalleesha Mallidi[1]; [1]*Tufts Univ., USA;* [2]*Wellman Center for Photomedicine, Massachusetts General Hospital, USA.* This study proposes a generative deep learning framework designed to mitigate photobleaching effects in molecular photoacoustic imaging. By enhancing the signal-to-noise ratio and contrast in images generated from single laser pulses, this approach allows for real-time imaging without the need for frame averaging.

13:30 -- 15:00
Room: Britannia
TTh2E • Non-invasive Optical Imaging for Disease Applications II
Presider: Davide Contini; Politecnico di Milano, Italy

TTh2E.1 • 13:30 (Invited)
Towards Multi-Level Assessment of Brain Health at the Clinical Bedside With High-Density Diffuse Optical Tomography, Adam T. Eggebrecht[1]; [1]*Washington Univ. in St Louis, USA.* Abstract not available.

TTh2E.2 • 14:00
Multivariate Linear Regression Approach to Predicting Burn Depth Using Spatial Frequency Domain Imaging, Thinh Phan[1], Christopher Campbell[1], Nataliya Makeeva[1], Gabriela Tabone[1], Gordon Kennedy[1], Anthony Durkin[1], Bernard Choi[1]; [1]*Univ. of California Irvine, USA.* We applied multivariate linear regression to spatial frequency domain imaging (SFDI) data to predict burn depth, as determined by histological grading. To reduce the variable space, we preliminarily employed the minimum redundancy maximum relevance algorithm.

TTh2E.3 • 14:30
Assessment of Endothelial Functions in ICU Patients by Diffuse Optics, Caterina Amendola[1], Marta Zanoletti[2], Mauro Buttafava[3], Talyta Carteano[4], Davide Contini[1], Lorenzo Spinelli[5], Lorenzo Cortese[2], Turgut Durduran[2,6], Claudia Nunzia Guadagno[7], Umut Karadeinz[2], Michele Lacerenza[3], Jaume Mesquida[8], Shahrzad Parsa[9], Rebecca Re[1,5], Diego Sanoja Garcia[4], Sanathana Konugolu Venkata Sekar[7], Alessandro Torricelli[1,5], Udo Weigel[9], Atif Yaqub[2], Davide Contini[1]; [1]*Politecnico di Milano, Italy;* [2]*ICFO - Institut de Ciències Fotòniques, The Barcelona Inst. of Science and Technology, Spain;* [3]*PIONIRS s.r.l., Italy;* [4]*ASPHALION S.L., Spain;* [5]*Istituto di Fotonica e Nanotecnologie, Consiglio Nazionale delle Ricerche, Italy;* [6]*nstitució Catalana de Recerca i Estudis Avançats (ICREA),, Spain;* [7]*BioPixS Ltd – Biophotonics Standards, IPIC, Ireland;* [8]*Critical Care Dept., Parc Taulí Hospital Universitari., Spain;* [9]*HemoPhotonics S.L., Spain.* We assessed in 14 healthy volunteers and 10 intensive care unit (ICU) patients low and very low frequency oscillations in hemodynamic parameters of thenar eminence by studying their power spectral density exploiting time domain near-infrared and diffuse correlation spectroscopies

TTh2E.4 • 14:45
Quantitative Imaging for Enhanced Thyroid Cancer Diagnosis Using Second Harmonic Generation Microscopy and the Windowed Hough Transform, Wesley Poon[1,2], Orhun Davarci[1,4], Raksha Raghunathan[1], Jun Liu[3], Hong Zhao[1], Stephen Wong[1]; [1]*Dept. of Systems Medicine and Bioengineering, Houston Methodist Neal Cancer Center, USA;* [2]*College of Medicine, Texas A&M Health Science Center, USA;* [3]*Dept. of Breast-Thyroid-Vascular Surgery, Shanghai General Hospital, Shanghai Jiao Tong Univ., China;* [4]*School of Engineering Medicine, Texas A&M Univ., USA.* Thyroid nodule biopsies often yield false positives or indeterminate results, causing repeat procedures and increased costs. We developed a quantitative imaging method with second harmonic generation microscopy and windowed Hough transform to enhance diagnostic accuracy.

15:15 -- 17:00
Room: RConstellation Ballroom B
BTh3A • Optogenetics and Mesoscale Imaging
Presider: Cristina Rodriguez; Yale Univ., USA

BTh3A.1 • 15:15 (Keynote)
Accelerating Large Etendue, Large Field-of-View Scanning for Multiphoton Applications, Spencer Smith[1]; [1]*Univ. of California Santa Barbara, USA.* Multiphoton (two-photon and three-photon) imaging is important for tracking fast neural phenomenon with high resolution. However, it is typically limited to small fields-of-view due to old microscopy limits. We have developed new optics and scan engine technology for high speed, large etendue scanning across large fields-of-view for multiphoton applications. These systems unlock mm-length scale scanning with large beams to support high numerical aperture imaging and unprecedented scan speeds.

BTh3A.2 • 16:00 (Invited)
Mesoscale Two-Photon Optogenetics, Lamiae Abdeladim[1], Uday Jagadisan[1], Hyeyoung Shin[1,2], Mora Ogando[1], Hillel Adesnik[1]; [1]*Univ. of California Berkeley, USA;* [2]*Seoul National Univ., Korea (the Republic of).* I will present our recent advances in recording and manipulating neural activity with cellular resolution at large scale and discuss how these technologies open new classes of experiments for probing inter-areal cortical computations.

BTh3A.3 • 16:30
Wide-Field Imaging of Brain Tissue Stiffness and Tumour Proxies With Scattered Light, Philip Binner[1], Jack Radford[1], Mansa Madhusudan[1], Ewan McGhee[1], Ilya Starshynov[1], Gonzalo Tejeda[1], Andrew Tobin[1], Jinendra Ekanayake[2], Daniele Faccio[1]; [1]*Univ. of Glasgow, UK;* [2]*Stanford Health Center, USA.* We propose wide-field imaging of tissue stiffness using laser speckle-based approaches. We measure local tissue stiffness anomalies in fresh mouse brain samples that are not visible by intensity imaging.

BTh3A.4 • 16:45 (Top-Scored)
Integrated Photonic Meta Beam-Shaper for Single-Neuron Optogenetic Interrogation, Hrishikesh T. Iyer[1], Yurii Vlasov[1]; [1]*Univ of Illinois at Urbana-Champaign, USA.* We experimentally demonstrate an integrated photonic meta beam-shaper that produces a focused spot smaller than a single-neuron at a 46um depth inside a brain slice with over 10dB suppression of background intensity.

15:15 -- 17:00
Room: Aurora
NTh3B • Intravital
Presider: Alex Walsh; Texas A&M Univ., USA

NTh3B.1 • 15:15 (Invited)
Intravital Tracking and Manipulation of the Blood Stem Cell Niche, Cih-Li Hong[5,4], Kevin Lee[1,4], Montgomery Whalen[4], Melissa MacLiesh[1,4], Charles Lin[3], Laura Calvi[2,4], Shu-Chi A. Yeh[4,1]; *[1]Biomedical Engineering, Univ. of Rochester, USA; [2]Wilmot Cancer Inst., Univ. of Rochester Medical Center, USA; [3]Wellman Center for Photomedicine, Massachusetts General Hospital, USA; [4]Center for Musculoskeletal Research, Univ. of Rochester Medical Center, USA; [5]Pharmacology and Physiology, Univ. of Rochester Medical Center, USA.* Blood stem cells constitute < 0.01% cells in the bone marrow and are regulated by biochemical cues in proximity (the niche). Intravital microscopy shows spatiotemporal information within the stem cell niche, yet the underlying biological significance remains to be defined. Our lab focuses on developing intravital image-guided functional assays, bone marrow sensing/ manipulation, and analysis pipelines to decipher targetable regulatory machineries mediating hematopoiesis and blood malignancies.

NTh3B.2 • 15:45 (Invited)
Mapping Metabolism and Myelin Dynamics in Live Brain Tissue by Label-Free Multimodal Non-Linear Microscopy, Chiara Stringari[1]; *[1]CNRS, Ecole Polytechnique, France.* Here we develop label-free optical methods to probe metabolism at the cellular level and visualize myelin at the single fiber level to investigate how neuron-glia metabolic coupling shapes myelin plasticity in the brain.

NTh3B.3 • 16:15
Imaging Retinal Hyperreflective Foci With Optical Coherence Microscopy: a Potential Biomarker for Alzheimer's Disease, Jun Song[3], Shrivatsan Rajagopalan[3], Printha Wijesinghe[1], Hyung-suk Yoo[1], Shuichi Makita[2], Yoshiaki Yasuno[2], Joanne Matsubara[1], Myeong Jin Ju[1,3]; *[1]Dept. of Ophthalmology & Visual Sciences, Univ. of british columbia, Canada; [2]Univ. of Tsukuba, Japan; [3]School of Biomedical Engineering, Univ. of British Columbia, Canada. Ex vivo* optical coherence microscopy and numerical refocusing algorithm were used to image retinal hyperreflective foci (HRF) in Alzheimer's disease (AD) patients. Enhanced imaging depth revealed HRF absent in controls, suggesting potential biomarkers for AD.

NTh3B.4 • 16:30 (Top-Scored)
Deep and Dynamic Metabolic and Structural Imaging in Living Tissues, Kunzan Liu[1], Honghao Cao[1], Kasey Shashaty[1], Li-Yu Yu[1], Sarah Spitz[1], Francesca M. Pramotton[1], Zhengpeng J. Wan[1], Ellen Kan[1], Erin Tevonian[1], Manuel Levy[1], Eva Lendaro[1], Roger Kamm[1], Linda Griffith[1], Fan Wang[1], Tong Qiu[1], Sixian Y. You[1]; *[1]MIT, USA.* We demonstrate that the imaging depth for NAD(P)H can be extended to over 700 μm in living engineered human multicellular microtissues by adopting multimode fiber (MMF)-based low-repetition-rate high-peak-power three-photon (3P) excitation of NAD(P)H at 1100 nm.

NTh3B.5 • 16:45

Intravital Three-Photon Microscopy of Calvarial Bone Marrow, Kamdin Mirsanaye[2,1], Clemens Alt[2,1], Charlotte Muse[2,1], Abiramy Karunendiran[2,1], Judith Runnels[1], Michael Moskowitz[2,1], Matthias Nahrendorf[2,1], Charles Lin[2,1]; *[1]Massachusetts General Hospital, USA; [2]Harvard Medical School, USA.* Bone marrow is essential for the production of immune cells. We developed a three-photon microscopy technique to study the connection between the skull bone marrow and brain immunity through deep channels at the skull base.

JD1 • Joint On-Demand Session

JD1.1
Diffusion Model for Isotropic Restoration in Light Microscopy, Wenkai Chen[1], Nanguang Chen[1]; *[1]National Univ. of Singapore, Singapore.* We propose a diffusion model based algorithm to process the light microscopy images obtained from mouse brain sections. The axisal resolution is significantly improved and becomes comparable to lateral resolutions.

JD1.2
Stable Micro-Nano Bubble Generation by Low-Power Laser Excitation in a Biocompatible Medium for Drug Delivery, Ulviya Bunyatova[1], Mustafa Dogan[2], Onur Ferhanoglu[3], Engincan Tekin[3], MUHAMMED H. KILINC[4]; *[1]Dept. of Biomedical Engineering, Baskent Univ., Turkey; [2]Dept. of Control and Automation Engineering, Istanbul Technical Univ., Turkey; [3]Dept. of Electronics and Communications Engineering, Istanbul Technical Univ., Turkey; [4]Shot Noise LLC, USA.* This study demonstrates ultra-stable nano-micro bubbles formed around functionalized silver nanoparticles in a biocompatible medium using low-power laser excitation, achieving over seven-day stability for precise, targeted anti-cancer drug delivery, minimizing side effects.

JD1.3
An NIR Based Tabletop System for Identification of Veins in a Hospital Setting, Aman Anand[1], Harsh Dev Singh[1], Rohit Kumar[1], Vivek Kumar[1], Uttam M. Pal[1]; *[1]IIITDM Kancheepuram, India.* Using an 850nm infrared light source, the location and dimensions of veins can be accurately identified with an error of less than 1.3%.

JD1.4
Skin Burn Severity Assessment Using Integrated Diffuse Reflectance and Machine Learning, Fatma Heikal[1], Omnia H. Abd El-Rahman Nematallah[1], Jala El-Azab[1], Tawfik Ismail[1]; *[1]Cairo Univ., Egypt.* This study aims to classify skin burn severity using diffuse reflectance at 672-nm laser, combined with a Python-based Convolutional Neural Network. This approach promises to enhance clinical diagnosis by offering a rapid and non-invasive tool

JD1.5 (Top-Scored)
Exploring Cerebral Oxygen Metabolism and Cytochrome Oxidase Dynamics During Cardiac Arrest, Nima Soltani[1], Vladislav Toronov[1], Steve Lin[2], Rohit Mohindra[3,4]; *[1]Toronto Metropolitan Univ., Canada; [2]Keenan Research Centre, Li Ka Shing Knowledge Inst., St. Michael's Hospital, Canada; [3]North York General Hospital, Canada; [4]Schwartz Reisman Emergency Inst., Canada.* This study uses optical methods (NIRS and LDF) and hemodynamic models to explore CMRO2, rCCO, and CBF dynamics during cardiac arrest, CPR, and ROSC, revealing linear and non-linear cerebral oxygen metabolism trends under stress.

JD1.6
Unsupervised and High-Accuracy Multi-Animal Tracking for Quantitative Ethology, Sihan Jing[1], Yixin Li[1], Qi Zhang[1], Xinyang Li[1]; *[1]Tsinghua Univ., China.* Current methods for multi-animal tracking are highly reliant on manual annotations for training. We pesent an unsupervised deep-learning method, UDMT, that does not require any human annotations and achieves state-of-the-art performance under various challenging conditions and model animals.

Disclaimer: this guide is limited to technical program with abstracts and author blocks as of 14 April. For updated and complete information with special events, reference the online schedule or mobile app.