Optica Biophotonics Congress: Biomedical Optics Session Guide

Disclaimer: this guide is limited to technical program with abstracts and author blocks as of 2 April. For updated and complete information with special events, reference the online schedule or mobile app.

Sunday, 7 April

08:00 -- 10:00
Room: Las Olas III
BS1C • Enhancing Biological Contrasts: Agent Development
Presider: Alipasha Vaziri; Rockefeller Univ., USA

BS1C.1 • 08:00 (Invited)
Designing Brighter Dyes for Advanced Fluorescence Microscopy and Beyond, Luke Lavis[1]; *[1]Howard Hughes Medical Inst., USA.* We made some dyes. They were really bright. Then we made more dyes. They are also bright and work in tissue and in animals. Then we made sensors out of them for voltage and calcium.

BS1C.2 • 08:30 (Invited)
Chemigenetic Fluorescent Biosensors, Eric Schreiter[1]; *[1]Janelia Research Campus, USA.* We have developed chemigenetic fluorescent indicators built from engineered protein sensor domains and bright fluorescent dyes. Advantages include increased photon output for demanding microscopy applications and bright fluorescence at wavelengths not well covered by fluorescent proteins.

BS1C.3 • 09:00 (Invited)
Voltage Imaging, Adam E. Cohen[1]; *[1]Harvard Univ., USA.* A combination of red-shifted voltage indicators, blue-shifted optogenetic actuators, and high-speed structured illumination imaging enable all-optical electrophysiology in behaving mice.

BS1C.4 • 09:30 (Invited)
Imaging Dynamics of Neurotransmitters With Genetically Encoded Indicators, Lin Tian[1]; *[1]MPFI for Neuroscience, USA.* The dynamic brain is governed by diverse cell types communicating through neurotransmitters and receptors. Advanced optical indicators enable precise measurement of these processes, but further optimization of multicolor FP-based indicators is needed for broader applicability.

08:00 -- 10:00
Room: Las Olas I, II, V, VI
CS1E • Pre-Clinical and Clinical Applications / Medical
Presider: Amy Oldenburg; Univ. of North Carolina at Chapel Hill, USA

CS1E.1 • 08:00
Clinical Translation of Optical Coherence Tomography-Based Detection of Methicillin-Resistant S. Aureus Biofilms in Orthopaedic Trauma Patients, Valentin Demidov[1,2], Natalia Demidova[3], Jason R. Gunn[2], I. A. Vitkin[3], Jonathan T. Elliott[2,1], Ida L. Gitajn[2,1]; *[1]Geisel School of Medicine at Dartmouth, USA; [2]Orthopaedics, Dartmouth-Hitchcock Medical Center, USA; [3]Medical Biophysics, Univ. of Toronto, Canada.* Here we report the methodology development and the first clinical translation of optical coherence tomography-based detection

of Methicillin-resistant Staphylococcus aureus (MRSA) biofilms developed on bone surface after open tibia fracture surgery.

CS1E.2 • 08:15

In Vivo Evaluation of Hydrogel-Mediated Wound Healing Using Optical Coherence Tomography, Shreyas Shah[1], Jiyeon Song[2], Bibek R. Samanta[1], Sohini Sarkar[1], Michael S. Crouch[1], Michael S. Eggleston[1], Sharon Gerecht[2]; *[1]Nokia Bell Labs, USA; [2]Department of Biomedical Engineering, Duke Univ., USA.* We demonstrate *in vivo* monitoring of wound healing dynamics in mice treated with hydrogels of varying stiffness using OCT. Distinct cellular responses were visualized and tracked, revealing the potential of OCT for optimizing hydrogel-based treatments.

CS1E.3 • 08:30

Quantitative Analysis of Cellular Dynamics: Unveiling the Impact of Varying Oxygen Saturations Through High-Speed Optical Interferometric Imaging, Soongho Park[1], Thien Nguyen[1], John Mutersbaugh[1], Amir Gandjbakhche[1]; *[1]National Inst. of Health, USA.* Utilizing dynamic full-field optical coherence microscopy, we analyzed intracellular movement in aerobic cells with varying oxygen saturations. Employing a deep learning algorithm, we classified dynamic activities based on oxygen saturation, revealing insightful trends.

CS1E.4 • 08:45

OCT Viability Imaging of 3D Microtissues, Ahbid Zein-Sabatto[1], Adrian Bico[1], Madison Woo[1], Ramisa Fariha[1], Blanche Ip[1], Diane Hoffman-Kim[1], Jeffrey Morgan[1], Jonghwan Lee[1]; *[1]Brown Univ., USA.* Functional precision medicine directly screens chemotherapeutics in patient tissue; however, technical challenges limit its clinical feasibility. OCT viability imaging in 3D microtissues overcomes these limitations and has shown tissue and treatment specific changes in viability.

CS1E.5 • 09:00 (Invited)

Title to be Determined, Fernando Zvietcovich[1]; *[1]Pontificia Universidad Católica del Perú, Peru.* Abstract not available.

CS1E.6 • 09:30 (Invited)

Clinical in-Vivo Validation of a Forward Viewing Endoscopic System Based on 3D Swept Source Optical Coherence Tomography for Human Urinary Bladder Assessment, Fabian Placzek[1], Ekaterina Laukhtina[2], Gerardo González-Cerdas[3], Cağlar Ataman[4], Bernhard Messerschmidt[5], Dragan Sandic[6], Eva Compérat[7], Nathalie Garstka[2], Julian Veser[2], David D'Andrea[2], Peter E. Andersen[8], Rainer A. Leitgeb[1], Shahrokh F. Shariat[2], Wolfgang Drexler[1]; *[1]Center for Medical Physics and Biomedical Engineering, Medical Univ. of Vienna, Austria; [2]Department of Urology, Medical Univ. of Vienna, Austria; [3]Department of Microsystems Engineering, Univ. of Freiburg, Laboratory for Micro-Optics, Germany; [4]Department of Microsystems Engineering, Univ. of Freiburg, Microsystems for Biomedical Imaging Laboratory, Germany; [5]GRINTECH GmbH, Germany; [6]Blazejewski MediTech Gmbh, Germany; [7]Department of Pathology, Medical Univ. of Vienna, Austria; [8]Department of Health Technology, Technical Univ. of Denmark, Denmark.* A portable, complete endomicroscopy system allowing for fast, three-dimensional, in-vivo optical coherence tomography within the urinary bladder is developed. We present in-vivo results on enhanced assessment of bladder tumors, promising improved accuracy and diagnostic potential.

08:00 -- 10:00
Room: Bonnet
MS1A • Novel Devices and Methods I
Presider: Mihaela Balu; UC Irvine Beckman Laser Inst., USA

MS1A.1 • 08:00 (Invited)
Line-Field Confocal OCT (LC-OCT) for Skin Imaging and Characterization: Technology Overview, Clinical Advances and Future Developments, Jonas Ogien[1], Mariano Suppa[2,7], Véronique Del Marmol[2], Javiera Perez-Anker[4,5], Josep Malvehy[4,5], Elisa Cinotti[3,7], Linda Tognetti[3], Pietro Rubegni[3], Jean-Luc Perrot[6,7], Arnaud Dubois[1,8]; *[1]Damae Medical, France; [2]Department of Dermatology, Hôpital Erasme, Université Libre de Bruxelles, Belgium; [3]Dermatology Unit, Department of Medical, Surgical and Neurological Sciences, Univ. of Siena, Italy; [4]Melanoma Unit, Hospital Clinic Barcelona, Univ. of Barcelona, Spain; [5]CIBER de Enfermedades Raras, Instituto de Salud Carlos III, Spain; [6]Department of Dermatology, Univ. Hospital of St-Etienne, France; [7]Groupe d'Imagerie Cutanée Non Invasive (GICNI), Société Française de Dermatologie (SFD), France; [8]Laboratoire Charles Fabry, Institut d'Optique Graduate School, CNRS, Université Paris-Saclay, France.* LC-OCT enables 3D in vivo skin imaging at the cellular level. It can be used for the characterization of various skin pathologies. New technical developments promise to further augment the diagnostic capabilities of LC-OCT.

MS1A.2 • 08:30
GigaFIBI; Rapid, Large-Format Histology-Resolution Imaging for Intraoperative Assessment of Breast Lumpectomy Margins, Dena Sayrafi[1], Nate Anderson[1], Candice Sauder[1], Diana Miglioretti[1], Richard levenson[1], Alexander Borowsky[1], Farzad Fereidouni[1]; *[1]UC Davis, USA.* GigaFIBI, an advancement of Fluorescence Imitating Brightfield Imaging (FIBI), displays significant promise in reducing positive margins and associated costs by capturing histology-grade images of 100x100 mm^2 area within minutes, offering intraoperative guidance.

MS1A.3 • 08:45
Development and Clinical Testing of Efficient Mounting Using Tissue Compression for Real-Time Histology, Connor Heckman[1], Vincent Ching-Roa[1], Chi Huang[1], Michael Giacomelli[1]; *[1]Univ. of Rochester, USA.* We present a compression system that can flatten irregularly shaped surgical specimens along the image plane and demonstrate imaging during moshes surgery of curved skin excisions.

MS1A.4 • 09:00
Axial de-Scanning Using Remote Focusing in the Detection arm of Light-Sheet Microscopy, Hassan Dibaji[1], Sheng Liu[1], Tonmoy Chakraborty[1]; *[1]Univ. of New Mexico, USA.* A method to de-scan axial focus movement in the detection arm of a microscope. Our method splits the fluorescence signal into S and P-polarized light and lets them pass through the remote focusing module separately and combines them with the camera.

MS1A.5 • 09:15
Miniature Objective Lens for Scattering-Based Light Sheet Microscopy, Jingwei Zhao[1], Yongjun Kim[2], Momoka Sugimura[1], Kenneth Marcelino[1], Rafael Romero[2], Brooke Liang[3], Michelle Khan[4], Eric Yang[3], Dongkyun Kang[1,2]; *[1]James C. Wyant College of Optical Sciences, Univ. of Arizona, USA; [2]Department of Biomedical Engineering, Univ. of Arizona, USA; [3]Department of Pathology, Stanford Univ. School of Medicine, USA; [4]Department of Obstetrics and Gynecology, Stanford Univ. School of Medicine, USA.* We have designed and built a miniature objective lens for scattering-based light sheet microscopy (sLSM). The objective lens achieved a high resolution, large field of view, and small field curvature.

MS1A.6 • 09:30
Multi-Contrast Deep UV Confocal Microscopy With Optical Coherence Tomography for Virtual Histological Imaging, Matthew T. Martell[1], Nathaniel J. Haven[1], Mohammad H. Masoumi[1], Brendyn D. Cikaluk[1], Xingyu Li[1], Roger J. Zemp[1]; *[1]Univ. of Alberta, Canada.* A 266 nm confocal reflectance and fluorescence microscopy system is demonstrated for virtual H&E histology and simultaneous multi-contrast tissue imaging, featuring autofluorescence channels and integrated 1050 nm optical coherence tomography for comprehensive tumor margin analysis.

MS1A.7 • 09:45
Control of Optical Imaging Depth Using Ultrasound-Induced Microbubbles for Deep Optical Microscopy, Jinwoo Kim[1], Hyeongyu Park[1], Haemin Kim[2], Jin Ho Chang[1]; *[1]DGIST, Korea (the Republic of); [2]GIST, Korea (the Republic of).* Control of the ultrasound-induced gas bubble for deep optical microscopy can enable selective deep optical imaging. Changing the ultrasound operating frequency may be a solution for controlling the thickness of the bubble cloud

08:00 -- 10:00
Room: Las Olas IV
OS1D • Novel Methods and Instrumentation in Diffuse Optics
Presider: Sanathana Konugolu Venkata Sekar; Tyndall National Inst., Ireland

OS1D.1 • 08:00 (Invited)
Unifying Diffuse Optics With Interferometry, Vivek J. Srinivasan[1]; *[1]New York Univ., USA.* Interferometric detection is a recent development in diffuse optics. We discuss efforts towards a single interferometric system that provides two widely-used diffuse optical signals, fluctuations related to blood flow and absorption of hemoglobin, with time-of-flight information.

OS1D.2 • 08:30
Novel Frequency-Domain Data Types for Deeper Sensitivity to Tissues, Angelo Sassaroli[1], Fatemeh Tavakoli[1], Giles Blaney[1], Jodee Frias[1], Sergio Fantini[1]; *[1]Tufts Univ., USA.* We carry out a simulation study for the application of novel data types in frequency-domain near-infrared spectroscopy during arterial or venous occlusion of the human forearm.

OS1D.3 • 08:45

Enhanced, Non-Invasive, Blood Flow Measurements Enabled by Coherence Gating, Mitchell B. Robinson[1], Marco Renna[1], Maria Angela Franceschini[1], Stefan Carp[1]; *[1]Massachusetts General Hospital, USA.* Diffuse correlation spectroscopy enables non-invasive measurements of blood flow. Recent advances have enhanced measurement capabilities using interferometric detection. In this work, we report our progress on the development of pathlength selective, interferometric diffuse correlation spectroscopy.

OS1D.4 • 09:00

Assessing Oxygenated Hemoglobin Concentration by Time-Domain Diffuse Optical Spectroscopy at 1064 nm, Laura Di Sieno[1], Alessandro Bossi[1], Francesco Sangalli[1], Alessandro Torricelli[2], Turgut Durduran[3], Ilias Tachtsidis[4], Antonio Pifferi[1,2], Alberto Dalla Mora[1]; *[1]Politecnico di Milano, Italy; [2]Consiglio Nazionale delle Ricerche, Istituto di Fotonica e Nanotecnologie, Italy; [3]Institut de Ciències Fotòniques, Spain; [4]Department of Medical Physics and Biomedical Engineering, Univ. College London, UK.* The assessment of concentration of oxygenated hemoglobin is a crucial parameter for oximetry application. We explore the possibility of using 1064 nm wavelength to assess the concentration of oxygenated, discussing possible advantages and issues.

OS1D.5 • 09:15

Fast Acquisitions of Heartbeat-Induced Absorption Changes With Compact Time-Domain Diffuse Optics System, Elisabetta Avanzi[1], Tuomo Talala[2], Alberto Dalla Mora[1], Ilkka Nissinen[2], Jan Nissinen[2], Laura Di Sieno[1]; *[1]Politecnico di Milano, Italy; [2]Univ. of Oulu, Finland.* This work describes a compact and potentially wearable health monitoring time-domain diffuse optics system. It employs a CMOS driver, a laser diode and a 256-channel SPAD line sensor and detects heartbeat induced absorption changes.

OS1D.6 • 09:30

Performance Assessment Methodologies for Diffuse Optical Flow Technologies, Rodrigo M. Forti[1,2], Joseph B. Majeski[3], McKenna Mason[2], M K. Weeks[2], Nithin V. Ramachandran[3], Kenneth Abramson[3], Santosh Aparanji[4], Mingjun Zhao[4], Tiffany Ko[5,2], Vivek J. Srinivasan[4], Wesley Baker[1,2], Arjun G. Yodh[3]; *[1]Division of Neurology, Children's Hospital of Philadelphia, USA; [2]Resuscitation Science Center of Emphasis, CHOP Research Inst., USA; [3]Department of Physics and Astronomy, Univ. of Pennsylvania, USA; [4]Tech4Health Inst., New York Univ. Langone Health, USA; [5]Department of Anesthesiology and Critical Care, Children's Hospital of Philadelphia, USA.* We propose a reproducible methodology to test the accuracy of diffuse optical flow devices. Absolute accuracy is assessed by comparing to diffusion coefficients in liquid phantoms at different temperatures with polystyrene microspheres of variable size.

OS1D.7 • 09:45

Wearable Broad Bandwidth Frequency-Domain Near Infrared Spectroscopy (fd-NIRS), Shashikant Lahade[1], Siavash Yazdi[2], Michael M. Green[2], Thomas D. O'Sullivan[1]; *[1]Department of Electrical Engineering, Univ. of Notre Dame, USA; [2]Department of Electrical Engineering and Computer Science, Univ. of California, Irvine, USA.*

We present a miniature dual-wavelength fd-NIRS device for wearable real-time physiological monitoring. Based on a custom CMOS circuit, wearable device demonstrates accurate phase and amplitude measurements for modulation frequencies up to 300 MHz.

08:00 -- 10:00
Room: Rio Vista
TS1B • Non-Invasive Optical Imaging for Disease Applications I
Presider: Anabela Da Silva; INSTITUT FRESNEL UMR7249 CNRS, France

TS1B.1 • 08:00 (Invited)
Time Domain Multi-Wavelength Diffuse Optics for Breast Cancer Management, Paola Taroni[1], Rinaldo Cubeddu[1], Alberto Dalla Mora[1], Laura Di Sieno[1], Giulia Maffeis[1], Nikhitha Mule[1,2], Antonio Pifferi[1]; *[1]Politecnico di Milano, Italy; [2]IRCCS San Raffaele, Italy.* Time-domain multi-wavelength diffuse optics (635-1060 nm) can be applied for the estimate of tissue composition, and effectively contribute to different stages of breast cancer management, including diagnosis, monitoring of therapy, and risk assessment.

TS1B.2 • 08:30
Preliminary in Vivo Clinical Validation of a Wide-Field Diffuse Optical Tomography Breast Imaging System, Edward Xu[1], Miguel Mireles[1], Ashlyn McCann[1], Ailis Muldoon[2], Rahul Ragunathan[1], Stefan Carp[2], Mansi Saksena[3], Qianqian Fang[1]; *[1]Northeastern Univ., USA; [2]Athinoula A. Martinos Center for Biomedical Imaging, Massachusetts General Hospital, USA; [3]Breast Imaging Division, Massachusetts General Hospital, USA.* We report preliminary clinical data reconstruction samples of our wide-field diffuse optical tomography breast imaging system in a cohort of subjects consisting of healthy subjects, and those with malignant and benign lesions.

TS1B.3 • 08:45
Investigation of Human Placental Tissue Oxygen Saturation in Uncomplicated and Complicated Pregnancy, Thien Nguyen[1], Soongho Park[1], Asma Sodager[1], Roberto Romero[1], Amir Gandjbakhche[1]; *[1]National Institutions of Health, USA.* This study measured placental tissue oxygen saturation in pregnant women using near-infrared spectroscopy biosensors. Placentas of women with complicated pregnancy were found to express significantly lower tissue oxygen saturation compared to those with uncomplicated pregnancy.

TS1B.4 • 09:00
Combining Tissue Oxygenation and Thermal Maps to Monitor Healing Status of Diabetic Foot Ulcers Using Smartphone-Based Imaging Devices, Fernando S. Chiwo[1], Daniela Leizaola[1], Kacie Kaile[1], Maria Hernandez Hernandez[1], Ricardo A. Avila[1], Renato Sousa[1], Jose P. Ponce[1], Stanley Mathis[3], Alexander L. Trinidad[1], Nikhil Vedere[1], Himaddri Shakhar Roy[1], Manuel I. Leizaola[1], David G. Armstrong[2], Anuradha Godavarty[1]; *[1]Florida International Univ., USA; [2]Department of Surgery, Keck School of Medicine, Univ. of Southern California, USA; [3]White Memorial Medical Group, USA.* Tissue oxygenation and thermal maps together were used to monitor the healing status in diabetic foot ulcers (DFUs) using smartphone-based

NIRS and thermal imaging devices. These combined physiological measurements differentiate healing and non-healing DFUs.

TS1B.5 • 09:15
Wearable Biosensor for Remote Monitoring of Patients With Infectious Respiratory Diseases, Thien Nguyen[1], Soongho Park[1], Tony George[1], Amir Gandjbakhche[1]; *[1]National Institutions of Health, USA.* This study developed a biosensor to monitor skin temperature, tissue oxygenation, respiratory and pulse rate during breath holding, paced breathing, and hypercapnia. Tissue oxygenation corresponds better to a breathing exercise than peripheral blood oxygen saturation.

TS1B.6 • 09:30
MRI Guide NIR Spectral Tomography (NIRST) System for Breast Cancer Detection, Mengyang Zhao[1], Jinchao Feng[1,2], Xu Cao[1,3], Mingwei Zhou[1], Luxi Xia[1], Brian W. Pogue[1], Keith D. Paulsen[1], Shudong Jiang[1]; *[1]Dartmouth College, USA; [2]Information Technology, Beijing Univ. of Technology, China; [3]School of Life Sciences and Technology, Xidian Univ., China.* Phantom and normal subject studies have been carried out to validate the performance of a novel wearable optical breast interface-based MRI-guided near-infrared spectroscopic tomographic (MRg-NIRST) imaging system for breast cancer detection.

TS1B.7 • 09:45
Quantification of Human Skin Biomarkers for Disease Characterization by Optoacoustic Mesoscopy With Machine Learning, Hailong He[2,1], Erik Riedel[2,1], Chiara Fisher[2], Ulf Darsow[2], Vasilis Ntziachristos[1,2]; *[1]Helmholtz Zentrum München GmbH, Germany; [2]Technical Univ. of Munich, Germany.* We introduce optoacoustic mesoscopy with machine learning analysis pipeline to quantify morphological and microvasculature skin features that cannot be achieved before. We found those features can be used for disease characterization, which are strongly correlated to physician observations and histology, demonstrating great clinical potentials.

10:30 -- 12:00
Room: Las Olas I, II, V, VI
JS2A • Joint Plenary Session I

JS2A.1 • 10:30 (Plenary)
Harnessing the Power of Spectroscopy in Early Cancer Detection, Sarah Bohndiek[1]; *[1]Univ. of Cambridge, UK.* Hyperspectral imaging technologies hold promise for revolutionising cancer diagnosis and treatment. By introducing innovations in translational biophotonics, I will demonstrate the power of spectroscopy to enable earlier detection of cancer and democratise access to high quality diagnostics.

JS2A.2 • 11:15 (Plenary)
Raman Spectroscopy: Translation to the Clinic, Gerwin J. Puppels[1]; *[1]RiverD International B.V., Netherlands.* Abstract not available.

13:30 -- 15:30
Room: Las Olas III
BS3C • Novel Imaging Applications and Approaches
Presider: Lin Tian; MPFI for Neuroscience, USA

BS3C.1 • 13:30 (Invited)
Multiscale Computational Neuronal Imaging, Tobias Noebauer[1], Alipasha Vaziri[1,2]; *[1]Rockefeller Univ., USA; [2]Kavli Neural Systems Inst., USA.* Jointly designing computational signal extraction and optics allows scalability to larger fields-of-view, lighter and faster functional neuroimaging devices. We present a mesoscope and two complementary miniscope solutions for fast volumetric neuronal imaging in mammalian cortex.

BS3C.2 • 14:00
Comparison of Capillary Stalling Events Measured by Optical Coherence Tomography and Bessel Beam Two-Photon Microscopy, Shannon Kelley[1], Rockwell P. Tang[1], Gulce Kureli[1], John Giblin[1], John Jiang[1], Shashwat Shah[1], Sreekanth Kura[1], Piergiulio Bressan[1], Emily Long[1], Evren Erdener[1,2], David Boas[1]; *[1]Neurophotonics Center, Boston Univ. Department of Biomedical Engineering, USA; [2]Inst. of Neurological Sciences and Psychiatry, Hacettepe Univ., Turkey.* By comparing two prominent imaging modalities to study cerebral microvasculature, we aim to identify the advantages and limitations of each modality to study capillary stalling dynamics.

BS3C.3 • 14:15
Longitudinal Evolution of Capillary Stalling in Post-Ischemia Stroke Penumbra, Rockwell Tang[1], Emily Long[1], Shannon Kelley[1], Gulce Kureli[1], John Jiang[1], Shashwat Shah[1], Matthew Simkulet[1], Piergiulio Bressan[1], John Giblin[1], Sreekanth Kura[1], Evren Erdener[1,2], David Boas[1]; *[1]Boston Univ., USA; [2]Hacettepe Univ., Turkey.* By characterizing longitudinal changes in microvascular flow disruptions post-stroke, we investigate the significance of capillary stalling in recoverable peri-infarct tissues in connection to long-term outcome with the potential for therapeutics.

BS3C.4 • 14:30
Scaling Functional Brain Imaging With Advanced High-Power Multi-Photon Microscopy, Kolja Kolata[1], Michael Schulz[1], Jan Heye Buß[1], Thomas Braatz[1], Robert Riedel[1]; *[1]Class 5 Photonics GmbH, Germany.* We discuss the scaling of advanced 2- and 3-photon imaging methods with large volume, high framerate and high resolution enabled by the advancement of new high power femtosecond lasers at 960 and 1300 nm.

BS3C.5 • 14:45
Calcium Recording in Hippocampal CA1 Pyramidal Neurons With Enhanced Contrast Using OS-SIM, Forest Speed[1], Catherine A. Saladrigas[2], Alec Teel[3], Sean Vieau[4], Vikrant Kumar[5], Victor Bright[6], Ioannis Kymissis[5], Juliet T. Gopinath[2,7], Cristin G. Welle[4,8], Diego Restrepo[3], Emily A. Gibson[1]; *[1]Bioengineering, Univ. of Colorado Anschutz, USA; [2]Electrical, Computer and Energy Engineering, Univ. of Colorado Boulder, USA; [3]Cellular and Developmental Biology, Univ. of Colorado Anschutz, USA; [4]Neurosurgery, Univ. of Colorado Anschutz, USA; [5]Electrical Engineering, Columbia Univ., USA; [6]Mechanical Engineering, Univ.*

of Colorado Boulder, USA; [7]Physics, Univ. of Colorado Boulder, USA; [8]Physiology and Biophysics, Univ. of Colorado Anschutz, USA. We discuss optical sectioning structured illumination microscopy (OS-SIM) for functional GCaMP8f imaging in the CA1 hippocampal region of awake mice. We demonstrate OS-SIM implementation to reduce out-of-focus signal contamination in recordings taken at 200 Hz.

BS3C.6 • 15:00 (Invited)
Towards two-Photon all-Optical Electrophysiology With Acousto-Optic Scanning, Yannick Goulam Houssen[1], Matteo Pisoni[1], Benjamin Mathieu[2], Pierre Bizouard[2,3], Stéphane Dieudonné[2], Brice Bathellier[1]; *[1]Hearing Inst., France; [2]Institut de Biologie de l'ENS, ENS, France; [3]Karthala System, France.* We explored ultrafast local volume excitation method for multiple neurons investigation. By employing low repetition rate femtosecond lasers and an AOD-based microscope, we achieved precise spatial and temporal photostimulation of neuron ensembles in vivo.

13:30 -- 15:15
Room: Las Olas I, II, V, VI
CS3E • Functional Retinal Imaging
Presider: Martin Villiger; Wellman Center for Photomedicine, USA

CS3E.1 • 13:30 (Invited)
Assessment of Retinal Structure and Function in Healthy and Diseased Eyes Using Optoretinography, Vimal P. Pandiyan[1]; *[1]Department of Ophthalmology, Univ. of Washington, USA.* This talk will present the development and application of high-speed line-scan OCT for measuring retinal structure and function in healthy eyes and those with inherited retinal degenerative disease.

CS3E.2 • 14:00
Clinical Optoretinography for Disease Applications, Christopher S. Langlo[1], Reddikumar Maddipatla[1], Kari V. Vienola[2], Maciej M. Bartuzel[1], Ewelina Pijewska[1], Robert J. Zawadzki[1], Ravi S. Jonnal[1]; *[1]Center for Human Ophthalmic Imaging Research, UC Davis, USA; [2]Univ. of Turku, Inst. of Biomedicine, Finland.* Optoretinography (ORG) is an emerging non-invasive assay of retinal function using phase-sensitive imaging such as OCT. Here we use a novel, proto-clinical, velocity-based ORG method to measure functional changes in patients with retinal disease.

CS3E.3 • 14:15
Pipeline for Computation of Optoretinography Signals From Data Acquired With Spatio-Temporal Optical Coherence Tomography (STOC-T) System, Slawomir Tomczewski[2,1], Piotr F. Wegrzyn[2,1], Katarzyna Komar[2,1], Dawid Borycki[2,1], Maciej Wielgo[2,1], Andrea Curatolo[2,1], Maciej Wojtkowski[2,1]; *[1]Inst. of Physical Chemistry PAS, Poland; [2]International Centre for Translational Eye Research, Poland.* In this work, we present a pipeline for processing data acquired during *in vivo* optoretinograph measurements of human photoreceptors' response to light with Spatio-Temporal Optical Coherence Tomography (STOC-T) setup.

CS3E.4 • 14:30

Pulse Wave Frequency, Phase and Velocity Estimation in the Mouse Retina via STOC-T Hemodynamics Analysis, Wiktor Kulesza[1], Maciej Wielgo[1], Piotr Wegrzyn[1], Slawomir Tomczewski[1], Katarzyna Kordecka[1], Anna Galinska[1], Bartlomiej Balamut[1], Egidijus Auksorius[3], Andrzej Foik[1], Robert J. Zawadzki[2], Maciej Wojtkowski[1], Dawid Borycki[1], Andrea Curatolo[1]; *[1]International Centre for Translational Eye Research, Inst. of Physical Chemistry, Poland; [2]UC Davis, USA; [3]dCenter for Physical Sciences and Technology, Lithuania.* We report on Spatio-Temporal Optical Coherence Tomography (STOC-T) applied to detection of pulsatile blood flow frequency, blood pulse wave propagation and other hemodynamic parameters from retinal and choroidal vessels in the mouse eye.

CS3E.5 • 14:45 (Invited)

Optoretinography Reveals Comprehensive Nanoscopic Dynamics of the Outer Retina in Rodents, Bingyao Tan[1]; *[1]Nanyang Technological Univ., Singapore.* Small animals are attractive options for investigating the intrinsic process of retinal degeneration. We used phase-sensitive optical coherence tomography to explore the comprehensive dynamics of rats' outer retinas in response to visual stimuli.

13:30 -- 15:30
Room: Bonnet
MS3A • Biology and Immunology with Intravital Microscopy I
Presider: Inga Saknite; Univ. of Latvia, Latvia

MS3A.1 • 13:30 (Invited)

In Vivo Flow Cytometry: From Bench to Bedside, Charles P. Lin[1,2]; *[1]Wellman Center for Photomedicine, Massachusetts General Hospital, USA; [2]Harvard Medical School, USA.* The original in vivo flow cytometer was developed for noninvasive detection and quantification of fluorescent cells in the circulation. Here I will present our latest effort for clinical translation using label-free detection.

MS3A.2 • 14:00

In-Line Assessment of Immunotherapy Cell Cultures Using Quantitative Oblique Back-Illumination Microscopy, Caroline E. Filan[1], Paloma Casteleiro Costa[1], Bryan Wang[1], Annie Bowles-Welch[1], Krishnendu Roy[1], Stephen Balakirsky[1], Francisco E. Robles[1]; *[1]Georgia Inst. of Technology, USA.* Cell therapy is a promising approach to treat disease; however, monitoring cell cultures during expansion remains a challenge. Here, we use qOBM to non-invasively monitor T-cell cultures determining culture health and viability in-line.

MS3A.3 • 14:15

Label-Free Multiphoton Microscopy of Immune Cells in Human Skin, Mihaela Balu[1], Alexander Vallmitjana[1], Amanda Durkin[1], Navid Rajil[1], Jessica Shiu[2], Anand Ganesan[2,1]; *[1]UC Irvine Beckman Laser Inst., USA; [2]Department of Dermatology, Univ. of California, Irvine, USA.* This presentation will highlight the latest advances in utilizing a custom-designed clinical multiphoton imaging platform. The goal is to identify and distinguish immune cell populations in human skin using label-free molecular contrast.

MS3A.4 • 14:30 (Invited)
Insights From Peering Into the Tumor Microenvironment, Aditi Sahu[1]; [1]*Memorial Sloan Kettering Cancer Center, USA.* Abstract not available.

MS3A.5 • 15:00 (Invited)
Title to be Determined, Seham Ebrahim[1]; [1]*Univ. of Virginia, USA.* Abstract not available.

13:30 -- 15:30
Room: Las Olas IV
OS3D • Novel Algorithms in Diffuse Optics
Presider: Mitchell Robinson; Massachusetts General Hospital, USA

OS3D.1 • 13:30
Modified Beer-Lambert Algorithm to Improve the Pulsatile Diffuse Correlation Spectroscopy Blood Flow Signal, Wesley Baker[1], Rodrigo Forti[1], Brian R. White[1], Jennifer Lynch[1], Arjun G. Yodh[2], Todd J. Kilbaugh[1], Tiffany Ko[1]; [1]*Children's Hospital of Philadelphia, USA;* [2]*Univ. of Pennsylvania, USA.* We introduce a modified Beer-Lambert scheme to measure pulsatile blood flow with diffuse correlation spectroscopy. Compared to traditional correlation diffusion analysis, the scheme improved accuracy in simulations and in a pig model of hydrocephalus.

OS3D.2 • 13:45
NeuroDOT: a Matlab and Python Toolbox for Optical Brain Mapping, Emma Speh[1], Yash Thacker[1], Ari Segel[1], Daniel Marcus[1], Muriah Wheelock[1], Adam T. Eggebrecht[1]; [1]*Washington Univ. School of Medicine, USA.* NeuroDOT is a Matlab and Python-based toolbox for functional near infrared spectroscopy and diffuse optical tomography with functions, pipelines, and training tutorials for data pre-processing, anatomical light modeling, image reconstruction, analysis, and visualization.

OS3D.3 • 14:00
Optical Estimation of Arterial Compliance, William B. Scammon[1], Jana M. Kainerstorfer[1]; [1]*CMU, USA.* We present a novel method for estimating arterial compliance that relies on a hemodynamic response derived from near-infrared spectroscopy (NIRS) measured during occlusion of the upper arm.

OS3D.4 • 14:15
Calibration of Diffuse Reflectance Probes With Short Source-Detector Separations for Tissue Optical Property Recovery Using Transfer Learning, Md Nafiz Hannan[1], Timothy M. Baran[1]; [1]*Univ. of Rochester, USA.* Artificial neural networks for optical property extraction from diffuse reflectance spectra are probe-specific, requiring lengthy calibration procedures for accurate prediction. A feature-extraction based transfer learning algorithm was developed and validated for rapid probe-to-probe calibration.

OS3D.5 • 14:30
Effects of Matrix Conditioning Strategies on Multifrequency High-Density Diffuse Optical Tomography, Chengfeng Zhang[1], Weihao Fan[1], Adam T. Eggebrecht[1]; *[1]Washington Univ. in St. Louis, USA.* High-frequency modulation has been shown to provide superior image quality over continuous wave high density diffuse optical tomography (HD-DOT). Herein, we evaluated matrix conditioning strategies for multi-frequency HD-DOT for potential improvements in imaging performance.

OS3D.6 • 14:45
Experimental Validation of Multi-Parameter Diffuse Optical Tomography Using Deep-Learning, Robin B. Dale[1], Biao Zheng[1], Thomas D. O'Sullivan[2], Hamid Dehghani[1]; *[1]Univ. of Birmingham, UK; [2]Univ. of Notre Dame, USA.* This study presents experimental validation of a deep-learning (DL) model for simultaneous 3D reconstruction of absolute absorption and reduced scattering. The model improved structural similarity and contrast, but increased cross-talk compared to an analytical algorithm.

OS3D.7 • 15:00
Accelerating 3-D Monte Carlo Photon Transport Simulations by Leveraging Deep-Learning Based Volume Super-Resolution Methods, Matin Raayai-Ardakani[1], David Kaeli[1], Qianqian Fang[1]; *[1]Northeastern Univ., USA.* We present a deep-learning approach to upscale Monte Carlo (MC) simulations for modeling light propagation inside turbid media, surpassing traditional algorithms by offering up to about 4 times additional photons compared to direct MC simulations.

OS3D.8 • 15:15
Comprehensive Dataset of Absorption and Scattering Spectra of *in-Vivo* Biological Tissues Using Time-Domain Diffuse Optical Spectroscopy, Ilaria Bargigia[1], Siënna Karremans[2], Vamshi Damagatla[1], Alessandro Bossi[1], Paola Taroni[1], Antonio Pifferi[1]; *[1]Politecnico di Milano, Italy; [2]Univ. of Twente, Netherlands.* Through time-domain diffuse optical spectroscopy measurements, we present a comprehensive overview of the optical properties (reduced scattering and absorption coefficients) found in in-vivo tissues. Furthermore, this dataset represents a working example of Open Data.

13:30 -- 15:30
Room: Rio Vista
TS3B • Non-Invasive Optical Imaging for Disease Applications II
Presider: Anabela Da Silva; INSTITUT FRESNEL UMR7249 CNRS, France

TS3B.1 • 13:30
Multimodal Fluorescence Lifetime Imaging and Optical Coherence Elastography for Mesoscopic Structural, Biomechanical, and Molecular Imaging, Luis M. Chavez[1], Shan Gao[1], Vikas Pandey[1], Nanxue Yuan[1], Jiayue Li[2], Matt S. Hepburn[2], Percy Smith[1], Caroline Edelheit[1], David T. Corr[1], Brendan F. Kennedy[2,3], Xavier Intes[1]; *[1]Biomedical Engineering, Rensselaer Polytechnic Inst., USA; [2]Univ. of Western Australia, Australia; [3]Nicolaus Copernicus Univ., Poland.* We report on a methodology to manufacture multimodal phantoms with

fluorescence lifetime imaging and optical coherence elastography contrasts. Phantom validation demonstrates the ability to tune fluorescence and strain properties in 3D using biologically relevant matrices.

TS3B.2 • 13:45

Fluorescence Lifetime Parameters Estimation With Transformer-Based Deep Learning Model, Ismail Erbas[1], Vikas Pandey[1], Navid Ibtehaj Nizam[1], Nanxue Yuan[1], Xavier Intes[1]; [1]*Rensselaer Polytechnic Inst., USA.* We introduce MFLI-Net a transformer-based deep learning model that incorporates the pixel-wise instrument response function to correct distance-related offset changes from the camera. MFLI-Net was validated using in vitro fluorescence samples placed on several heights.

TS3B.3 • 14:00

Multimodal Subcellular Imaging of Lipid Metabolism Delineates Anti-Aging Effects of Metformin in Drosophila, Sirasit Prayotamornkul[1], Yajuan Li[1], Yu Ping[1], Matthew Callahan[1], Mary Li[1], Lingyan Shi[1]; [1]*Univ. of California, San Diego, USA.* We developed a non-invasive optical imaging system, coupling deuterium oxide-probed stimulated Raman scattering with two-photon excitation fluorescence microscopies, to unveil decreased de novo lipogenesis and altered optical redox status in *Drosophila* treated with age-retarding metformin.

TS3B.4 • 14:15

Quantifying the Interaction Between Age and Diabetes on Skin Wound Metabolism Using in Vivo Multiphoton Microscopy, Marcos R. Rodriguez[1], Malavika Nidhi[1], Divya M. Gollapalli[1], Kyle P. Quinn[2]; [1]*Biomedical Engineering, Univ. of Arkansas, USA;* [2]*Arkansas Integrative Metabolic Research Center, Univ. of Arkansas, USA.* Through longitudinal, in vivo label-free multiphoton microscopy, an optical redox ratio of FAD/(NADH+FAD) autofluorescence demonstrated how diabetes and advanced age affect skin metabolism during the stages of wound healing.

TS3B.5 • 14:30

Exploring External and Internal Collagen Organization in Edematous Corneas Using Polarization-Sensitive Second Harmonic Generation Microscopy, Juan M. Bueno[1], Rosa M. Martinez-Ojeda[1], Ines Yago[2], Francisco J. Avila[3]; [1]*Universidad de Murcia, Spain;* [2]*Hospital Clinico Universitario Virgen de la Arrixaca, Spain;* [3]*Universidad de Zaragoza, Spain.* Polarization-sensitive second harmonic (PS-SHG) imaging microscopy has been used to explore and quantify the structural changes of temporal corneal edema models. Images and inferred polarimetric calculations reveal significant differences as edema progressively increases.

TS3B.6 • 14:45

Scattering-Based Light Sheet Microscopy Imaging of Fresh Anoscopic Biopsy Specimens, Brooke Liang[2], Jingwei Zhao[1], Yongjun Kim[1], Michelle Khan[2], Dongkyun Kang[1], Eric Yang[2]; [1]*Univ. of Arizona, USA;* [2]*Stanford Univ. School of Medicine, USA.* Anal cancer screening may be improved by in vivo visualization with scattering-based light sheet microscopy (sLSM). Ex vivo sLSM images of fresh anal biopsies exhibit diagnostic features akin to traditional histopathology slides.

TS3B.7 • 15:00 (Invited)

Macroscopic Inelastic Scattering Imaging Techniques for Intraoperative Margins Assessment in Surgical Oncology, Frederic Leblond[1]; [1]*Polytechnique Montréal, Canada.* Advances will be presented developing macroscopic imaging techniques allowing surgical specimens to be analyzed. Proof-of-principle studies will be presented in neurosurgery and breast conserving surgery, demonstrating residual cancer detection on the surface of surgical specimens.

15:30 -- 17:00
Room: Atlantic Ballroom
JS4A • Joint Poster Session I

JS4A.1

Inverse Modeling Approach for Fetal Oxygen Saturation Estimation With Spatial Intensity, Rishad Raiyan Joarder[1], Weijian Yang[1], Vivek J. Srinivasan[2], Soheil Ghiasi[1]; [1]*Electrical and Computer Engineering, Univ. of California, Davis, USA;* [2]*Radiology and Ophthalmology, NYU Langone, USA.* Non-invasive fetal saturation prediction is challenging. We propose a multi-detector, inverse modeling, ML based approach. Trained on a large simulated simple tissue model dataset, our generalized NN can estimate simulation parameters given the simulation results. Our model achieves a 9.2\% overall validation MSE for tissue model parameters.

JS4A.2

Infant Mice Receiving Fractionated Whole-Brain Radiation Exhibit Functional Network Disorganization as Adults, Jiantao Zhu[1], Benjamin Seitzman[2], Francisco Reynoso[2], Timothy Mitchell[2], Annie Bice[1], Jonah Padawer-Curry[3], Xiaodan Wang[4], Stephanie Perkins[2], Adam Q. Bauer[1,3]; [1]*Radiology, Washington Univ. in St. Louis, USA;* [2]*Radiation Oncology, Washington Univ. in St. Louis, USA;* [3]*Imaging Science, Washington Univ. in St. Louis, USA;* [4]*Biomedical Engineering, Washington Univ. in St. Louis, USA.* Infant (p21) mice were subjected to fractionated whole-brain radiotherapy (RT) then evaluated several months later using wide-field optical imaging. While RT broadly altered functional network organization, the largest effects occurred within higher-order cognitive regions.

JS4A.3

Development of Phantoms for Photoacoustic Probing of Intervertebral Discs, Roman Allais[1], Valentin Espinas[2,3], Pauline Brige[3,4], Antoine Capart[2], Anabela Da Silva[2], Olivier Boiron[1]; [1]*IRPHE, France;* [2]*Institut Fresnel, France;* [3]*CERIMED, France;* [4]*LIIE, France.* We created phantoms of intervertebral disc using agarose and TiO_2. Optical absorption and reduced scattering could independently be finely tuned to mimic physiological values while the density and specific heat capacity are within 10% of the target values.

JS4A.4

Sunglasses: Analysis of Ultraviolet Influx Through the Pupil, Mauro Masili[1], Fernanda O. Duarte[1], Liliane Ventura[1]; [1]*Electrical Engineering (EESC), Universidade de Sao Paulo, Brazil.* A study challenges that sunglasses without proper shielding increase ultraviolet exposure, finding pupil dilation minimally impacts UV influx; field of view surpasses pupil size by 314.3%. Sunglasses with UV-A protection below 86% may pose risk.

JS4A.5
Tissue Curvature Correction in NIRS Imaging Using Uniform and Gaussian Light Source Illumination, Himaddri Shakhar Roy[1], Kacie Kaile[1], Fernando S. Chiwo[1], Daniela Leizaola[1], Anuradha Godavarty[1]; *[1]Florida International Univ., USA.* Tissue oxygenation measurements of diabetic foot ulcers are impacted by tissue curvatures. Herein, curvature corrections were developed and tested on simulated diffuse reflected signals obtained from wound models for uniform and Gaussian light source illuminations.

JS4A.6
Multispectral Optical Sensor for Monitoring Psychological Stress, Victoria Barygina[1], Enrico Baria[1], Francesco Goretti[2], Elena Cravero[3], Saquib Hayat[3], Francesco S. Pavone[1,2]; *[1]Univ. of Florence, Italy; [2]European Laboratory for Non-Linear Spectroscopy, Italy; [3]Campus Bio Medico Univ. of Rome, Italy.* We tested the *in vivo* application of different optical techniques (Raman spectroscopy, reflectance spectroscopy and fluorescence spectroscopy) in a multimodal, label-free and non-invasive configuration for identifying possible biomarkers of psychological stress in skin tissue.

JS4A.7
Path3D: a Comprehensive Pipeline for Non-Destructive 3D Pathology, Kevin Bishop[1], Lindsey A. Erion Barner[1], Qinghua Han[1], Elena Baraznenok[1], Lydia Lan[1], Gan Gao[1], Robert Serafin[1], Sarah S. Chow[1], Jonathan T. Liu[1]; *[1]Univ. of Washington, USA.* Consistently generating high-quality datasets across large sample cohorts is necessary for clinical translation of 3D pathology. We present an end-to-end workflow for non-destructive 3D pathology with an emphasis on quality control.

JS4A.8
Data Processing and Analysis Workflow for 3D Microscopy Datasets of Traumatic Brain Injury, Qinghua Han[1], David Brenes[2], Drew Sellers[1], Jonathan T. Liu[2,1]; *[1]Bioengineering, Univ. of Washington, USA; [2]Mechanical Engineering, Univ. of Washington, USA.* We introduce an open-source 3D microscopy image-processing workflow to examine morphological and molecular features in mouse brains after traumatic brain injury.

JS4A.9
Analysis of Crystalline Lens Alterations After Death Using Two-Photon Excitation Fluorescence Microscopy, Juan M. Bueno[1], Rosa M. Martinez-Ojeda[1], Maria D. Perez-Carceles[1]; *[1]Universidad de Murcia, Spain.* The combination of two-photon excitation fluorescence imaging microscopy and a set of objective parameters has been used to explore changes in the crystalline lens as a function of the postmortem interval.

JS4A.10
Computer Vision-Assisted OCT for Geometric Surface Reconstruction, Logan Davis[1,2], Roland Fleddermann[2,1]; *[1]Centre for Gravitational Astrophysics, The Australian National Univ., Australia; [2]Department of Materials Physics, The Australian National Univ., Australia.* We

combine computer vision techniques with optical coherence tomography to create an automated surface profiling system with optimised scan parameters based on a visual hull. The resultant surfaces approach the resolution limit of the system.

JS4A.11

40-nm SPAD-Array Detection System for Ultra-Fast Raman Spectroscopy, Veronica Storari[1], Arianna A. Maurina[1], Henri Haka[1], Francesca Madonini[1], Iris Cusini[1,2], Federica Villa[1]; *[1]Dipartimento di Elettronica, Informazione e Bioingegneria, Politecnico di Milano, Italy; [2]ICFO-Institut de Ciencies Fotoniques, Barcelona Inst. of Science and Technology, Spain.* Raman Spectroscopy for protein sequencing requires fast detection systems able to manage fluorescence rejection. We propose a 40-nm SPAD-Array system-on-chip with an integrated gate generation block to time-filter fluorescence photons. Preliminary characterization shows excellent performances.

JS4A.12

Near Infrared Spectroscopy for Assessing Tissue Hemodynamics in Patients With Sickle Cell Disease, Golnar Mostashari[1], Timothy Quang[1], Helen Parker[1], Dianna Lovins[1], Dina Parekh[1], Andrew Keel[1], Anna Conrey[1], Swee Lay Thein[1], Bruce Tromberg[1]; *[1]National Inst. of Health, USA.* Near infrared spectroscopy was used to quantify tissue hemodynamics in patients with sickle cell disease and compared to ethnic-matched healthy controls. There are significant differences in cerebral and muscle hemodynamics between these cohorts.

JS4A.13

Building a Framework for Quantitatively Assessing Widefield Diffuse Optical Tomography Pattern Selections, Rahul Ragunathan[1], Miguel Mireles[1], Edward Xu[1], Qianqian Fang[1]; *[1]Northeastern Univ., USA.* We investigate metrics for assessing the performance and choices of wide-field patterns in diffuse optical tomography. The performance of a pattern-set is found to be related to its susceptibility to tissue scattering and measurement noise.

JS4A.14

Characterization of Scattering for Whole Blood Oximetry in Sub-Diffuse Regimes, Osama M. Elgabori[1], William B. Scammon[1], Kelly R. Strong[1], Keith Cook[1], Jana M. Kainerstorfer[1,2]; *[1]Biomedical Engineering, Carnegie Mellon Univ., USA; [2]Neuroscience Inst., Carnegie Mellon Univ., USA.* We propose a method for accounting for scattering in oximetry performed on whole blood. In this sub-diffuse regime, the diffusion approximation fails and we use Mie theory for characterization of scattering in whole blood.

JS4A.15

Estimating the Optical Properties of Calf Brain During Thermal Treatment, Alessandro Bossi[1], Leonardo Bianchi[1], Paola Saccomandi[1], Antonio Pifferi[1]; *[1]Politecnico di Milano, Italy.* Thermal therapies are potentially less painful than surgery but lack accurate monitoring. We explore changes in the optical properties of calf brain during treatment, using time-domain diffuse optics and investigate their relation to damage.

JS4A.16

Construction of Statistical Scalp-Cortex Correlation Atlas and Representation Using Augmented Reality as Optode Positioning of Functional Near-Infrared Spectroscopy, Hiroshi Kawaguchi[1,2], Takayuki Obata[2], Eiji Okada[3]; [1]*Human informatics and interaction Research Inst., National Inst. of Advanced Industrial Science and Technology (AIST), Japan;* [2]*Department of Molecular Imaging and Theranostics, National Institutions for Quantum Science and Technology (QST), Japan;* [3]*Department of Electronics and Electrical Engineering, Keio Univ., Japan.* A statistical scalp-cortex correlation atlas was constructed from the non-deformed head anatomy of multiple subjects. The atlas is superimposed on a real-time video of an adult head using augmented reality to attach optodes above regions-of-interest.

JS4A.17

Verification of Fiber-Less Diffuse Correlation Spectroscopy Using Reactive Hyperemia Test, Tomoya Yamamoto[1], Mikie Nakabayashi[1], Masashi Ichinose[2], Yumie Ono[3]; [1]*Graduate School of Science and Technology, Meiji Univ., Japan;* [2]*Human Integrative Physiology Laboratory, School of Business Administration, Meiji Univ., Japan;* [3]*Department of Electronics and Bioinformatics, School of Science and Technology, Meiji Univ., Japan.* Assessing the quality of autocorrelation function and the physiological indices obtained from reactive hyperemia test, this study showed a potential use of fiber-less laser diodes as a light source for diffuse correlation spectroscopy.

JS4A.18

Measurement of Renal Blood Flow in a rat Model Using Diffuse Correlation Spectroscopy, Mikie Nakabayashi[1], Yumie Ono[2]; [1]*Graduate School of Science and Technology, Meiji Univ., Japan;* [2]*School of Science and Technology, Meiji Univ., Japan.* We measured the renal blood flow in a rat model of type 2 diabetes using diffuse correlation spectroscopy to investigate its diagnostic potential for evaluating renal damage.

JS4A.19

Blood Pressure Estimation Using Pulse Transit Time Between two Peripheral Points, Tohko Tabuchi[1], Haruka Mizuno[1], Mikie Nakabayashi[1], Masashi Ichinose[2], Yumie Ono[3]; [1]*Graduate School of Science and Technology, Meiji Univ., Japan;* [2]*Human Integrative Physiology Laboratory, School of Business Administration, Meiji Univ., Japan;* [3]*Department of Electronics and Bioinformatics, School of Science and Technology, Meiji Univ., Japan.* Significantly strong correlations were obtained between blood pressure and pulse wave propagation time between two peripheral points, providing the potential for future continuous blood pressure estimation with pulse wave sensors.

JS4A.20

Comparison of Resting-State Hemodynamic Parameters of the Vastus Lateralis Muscle Measured With TD NIRS in Middle-Aged and Old Population, Marco Nabacino[1], Caterina Amendola[1], Andrea Pilotto[3], Massimiliano Ansaldo[3], Marcello Maggio[4,5], Marco Salvi[4,5], Davide Contini[1], Lorenzo Spinelli[2], Alessandro Torricelli[1,2], Fulvio Lauretani[4,5], Rebecca Re[1,2]; [1]*Department of Physics, Politecnico di Milano, Italy;* [2]*Istituto di Fotonica e Nanotecnologie, Consiglio Nazionale delle Ricerche, Italy;* [3]*Department of Molecular Medicine, Univ. of Pavia, Italy;* [4]*Department of Medicine and Surgery, Univ. of Parma, Italy;* [5]*Geriatric*

Clinic Unit, Univ. Hospital of Parma, Italy. Absolute values of resting-state muscle hemodynamic parameters of 62 volunteers were measured using Time-Domain Near-Infrared Spectroscopy. Significant variations are observed with gender, likely related to adipose tissue thickness, while no differences are found with age.

JS4A.21

Practical Guidelines for the Use of Scaling Relations in Monte Carlo Simulations, Giulia Maffeis[2], Caterina Amendola[2], Andrea Farina[1], Lorenzo Spinelli[1], Alessandro Torricelli[2,1], Antonio Pifferi[2,1], Angelo Sassaroli[3], Duccio Fanelli[4], Federico Tommasi[4], Fabrizio Martelli[4]; *[1]Istituto di Fotonica e Nanotecnologie, Consiglio Nazionale delle Ricerche, Italy; [2]Dipartimento di Fisica, Politecnico di Milano, Italy; [3]Department of Biomedical Engineering, Tufts Univ., USA; [4]Dipartimento di Fisica e Astronomia, Università degli studi di Firenze, Italy.* We study the applicability of scaling relations for Monte Carlo simulations, presenting concrete cases of use in the biomedical field. We retrieve a practical criterion to define their range of efficiency, mainly focusing on scattering.

JS4A.22

Time Domain Broadband Characterization of Human Cadaver Bone (500 -1100nm), Suraj Kumar Kothuri[1,3], Danielle MacMahon[2], Pranav Lanka[1], Stefan Andersson-Engels[1,2], Rekha Gautam[1], Sanathana Konugolu Venkata Sekar[1,2]; *[1]Tyndall National Inst., Ireland; [2]Physics, Univ. College Cork, Ireland; [3]Engineering Sciences, Univ. College Cork, Ireland.* We present optical characterization (500-1100nm) of fresh human bone. We observe the presence of various biomarkers like met-Hb, Hb, lipids, collagen and further discuss the optical properties of cortical bone, trabecular bone, and bone marrow.

JS4A.23

A Comprehensive Assessment of the SOLUS Database for Classifying Breast Lesions, Giulia Maffeis[1], Antonio Pifferi[1,2], Alberto Dalla Mora[1], Laura Di Sieno[1], Alberto Tosi[3], Enrico Conca[3], Andrea Giudice[4], Alessandro Ruggeri[4], Simone Tisa[4], Alexander Flocke[5], Bogdan Rosinski[6], Jean-Marc Dinten[7], Mathieu Perriollat[7], Jonathan Lavaud[8], Simon Arridge[9], Giuseppe Di Sciacca[9], Andrea Farina[2], Pietro Panizza[10], Elena Venturini[10], Peter Gordebeke[11], Paola Taroni[1,2]; *[1]Dipartimento di Fisica, Politecnico di Milano, Italy; [2]Istituto di Fotonica e Nanotecnologie, Centro Nazionale delle Ricerche, Italy; [3]Dipartimento di Elettronica, Informazione e Bioingegneria, Politecnico di Milano, Italy; [4]Micro Photon Devices Srl, Italy; [5]iC-Haus GmbH, Germany; [6]Vermon SA, France; [7]CEA-LETI, France; [8]Hologic Supersonic Imagine SA, France; [9]Department of Computer Science, Univ. College London, UK; [10]Breast Imaging Unit, Scientific Inst. (IRCCS) Ospedale San Raffaele, Italy; [11]European Inst. for Biomedical Imaging Research, Austria.* We evaluate analytical and artificial intelligence strategies to enhance the informative content of the SOLUS multimodal database (Diffuse Optical Tomography, B-mode ultrasounds, Color-Doppler and Shear Wave Elastography images) to discriminate benign and malignant breast lesions.

JS4A.24

Surface Profilometry and Optical Parameter Characterization of a Dual-Channel SFDI Endoscope for Ovarian Cancer, Rasel Ahmmed[1], Ulas Sunar[1]; *[1]Biomedical Engineering, SUNY- Stony Brook, USA.* A dual-channel spatial frequency domain imaging (SFDI) endoscope was optimized to quantify optical parameters and obtain surface profilometry in tissue phantom of ovarian cancer. Our results indicate that optical parameter variations can be significantly reduced after the surface correction.

JS4A.25

Development of Long Wavelength Interferometric Diffuse Correlation Spectroscopy (LW-IDCS) Deep-Learning Model Based on EfficientNet, Yoonho Oh[1,2], Mitchell B. Robinson[2], Stefan Carp[2]; *[1]GIST, Korea (the Republic of); [2]Athinoula A. Martinos Center for Biomedical Imaging, USA.* LW-iDCS can enable robust measurement of cerebral hemodynamics. However, LW-iDCS data requires several pre-processing steps to correct signal distortions. Here, we propose a deep-learning model based on EfficientNet to accelerate and simplify blood flow estimation.

JS4A.26

Multimodal Data-Fusion in Fluorescence Lifetime Imaging Using Deep Learning, Vikas Pandey[1], Ismail Erbas[1], Xavier Intes[1]; *[1]Rensselaer Polytechnic Inst., USA.* We report a novel deep learning (DL)-based multi-modal data-fusion approach in generating high-resolution time-resolved images in fluorescence lifetime imaging (FLI). The performance of this DL model has been demonstrated in phantom and well-plate data.

JS4A.27

Monte-Carlo Based Data Generator for Fluorescence Lifetime Applications, Navid Ibtehaj Nizam[1], Vikas Pandey[1], Ismail Erbas[1], Xavier Intes[1]; *[1]Rensselaer Polytechnic Inst., USA.* We report a novel *in silico* data generator for accurately producing Temporal Point Spread Functions, as functions of depth and lifetime, from fluorescent samples. The suitability of the approach is demonstrated for LIDAR and tomography.

JS4A.28

Validation of a Combined Frequency-Domain and Broadband Diffuse Optical Spectroscopy System for Hyperspectral Estimation of Optical Properties, April M. Hurlock[1], Tiffany Ko[2,3], Wesley Baker[1,3], Rodrigo M. Forti[1,3]; *[1]Division of Neurology, Children's Hospital of Philadelphia, USA; [2]Department of Anesthesiology and Critical Care Medicine, Children's Hospital of Philadelphia, USA; [3]Resuscitation Science Center of Emphasis, CHOP Research Inst., USA.* We used the in vitro MEDPHOT protocol to validate the optical properties measured with a combined frequency-domain and broadband diffuse optical spectroscopy instrument across the near-infrared spectral range (650-1000 nm).

JS4A.29

Statistics of Scattering Events During Photon Migration Inside a Diffuse Medium, Lorenzo Spinelli[2], Giulia Maffeis[1], Caterina Amendola[1], Andrea Farina[2], Alessandro Torricelli[1,2], Antonio Pifferi[1,2], Angelo Sassaroli[3], Duccio Fanelli[4], Federico Tommasi[4], Fabrizio Martelli[4]; *[1]Dipartimento di Fisica, Politecnico di Milano, Italy; [2]Istituto di Fotonica e*

Nanotecnologie, Consiglio Nazionale delle Ricerche, Italy; [3]Department of Biomedical Engineering, Tufts Univ., USA; [4]Dipartimento di Fisica e Astronomia, Università degli Studi di Firenze, Italy. We study the statistics of scattering events occurring along the trajectories travelled by photons in a diffuse media: insight is gained about the possibility of scattering scaling in Monte Carlo simulations.

JS4A.30

Perception of Speech Structures in Six Month-Old Infants: a Multimodal Study, Ibtissam Ghailan Tribak[1], Judit Ciarrusta[2], Chiara Santolin[2], Fen Zhang[1,3], Xavi Mayoral[2], Armando Quetzalcóatl Angulo-Chavira[2], Judit Gervain[4,5], Daniel Senciales[1], Susanna Tagliabue[1], Osman Melih Can[1], Muhammad A. Yaqub[1], Núria Sebastian Gallés[2], Turgut Durduran[1]; *[1]ICFO, Spain; [2]UPF, Spain; [3]VITO health, Belgium; [4]Univ. of Padua, Italy; [5]Université Paris Cité, France.* Functional diffuse correlation spectroscopy (fDCS) and electroencephalography (EEG) based platform is implemented to study language perception in six months-old infants for the first time as an infant-friendly multimodal tool for neuroimaging.

JS4A.31

Evaluating a Machine-Learning Based Fast 3-D Head Shape Acquisition Method From a Single Camera Image, Chu-Hsuan Lin[1], Fan-Yu Yen[1], Qianqian Fang[1]; *[1]Northeastern Univ., USA.* We have incorporated and evaluated a state-of-the-art machine-learning based fast 3-D head shape recovery algorithm for fNIRS applications and developed a software to provide real-time guidance for headgear placement and shortening experiment setup time.

JS4A.32

Exploring Pulse Waveform Characteristic Changes Due to Intracranial Compliance in Hydrocephalus Patients, Carolina Fajardo Vega[1], Susanna Tagliabue[1], Jonas B. Fischer[1], Mónica Torrecilla[1], Gema Piella[4], Diego F. López[2,3], Katiuska Rosas[2,3], Maria Antonia Poca[2,3], Juan Sahuquillo[2,3], Turgut Durduran[1,5]; *[1]ICFO - Institut de Ciencies Fotoniques, Spain; [2]Vall d'Hebron Univ. Hospital, Spain; [3]Vall d'Hebron Research Inst., Spain; [4]Universitat Pompeu Fabra, Spain; [5]Institució Catalana de Recerca i Estudis Avancats (ICREA), Spain.* This paper explores the analysis of the waveform of pulsatile signals obtained through time-resolved spectroscopy and diffuse correlation spectroscopy measures of the brain, for the potential application of identifying changes in intracranial compliance.

JS4A.33

Designing Anatomically Derived, 3-D Printable Head Caps for Functional Neuroimaging, Ashlyn McCann[1], Edward Xu[1], Fan-Yu Yen[1], Qianqian Fang[1]; *[1]Northeastern Univ., USA.* We present a pipeline for generating 3-D printable head caps for neuroimaging studies derived from anatomical head models, directly integrating scalp landmark positions, and permitting user customizations tailored to a wide variety of applications.

JS4A.34

NeuroJSON.io — a Community Portal for Sharing Neuroimaging and Biophotonics Public Datasets, Qianqian Fang[1], Yu-An Lin[1], Edward Xu[1]; *[1]Northeastern Univ., USA.* We announce a new research data dissemination portal, NeuroJSON.io (https://neurojson.io), dedicated to distributing and curating growing public datasets generated from diverse neuroimaging, including fNIRS, and biophotonics research.

JS4A.35
A Line-Scanning Confocal Microscope for Fast, High-Resolution Imaging of Cleared Tissue Samples, Rylie Walsh[1], Matthew Parent[1], Romana Hyde[2], Stefano Lutzo[2], Stephanie Rudolph[2], Abhishek Kumar[1]; *[1]Marine Biological Laboratory, USA; [2]Albert Einstein College of Medicine, USA.* Here we present a newly developed line-scanning confocal microscope that allows imaging large fields of view (up to 20 mm along the sample scan direction), achieving optical sectioning using a virtual slit.

JS4A.36
Physical Activity Mitigates Neuro-Vascular Dysfunction in a Mouse Model of Alzheimer's Disease, Alfredo Cardenas-Rivera[1], Eda Erdogmus[1], Austin Birmingham[1], Chang Liu[1], Mohammad A. Yaseen[1]; *[1]Northeastern Univ., USA.* Routine physical activity showed neuroprotective effects in APPswe/PSEN1dE9 mice and wildtype controls. We found that physical exercise increases the intravascular oxygen pressure in small-caliber vessels and preserves stimulus-induced oxygen transients.

JS4A.37
Beyond Conventional Wisdom: Unveiling Quantitative Insights in Fluorescence Lifetime Imaging via Realistic Simulation of Biological Systems, Pingchuan Ma[1], Yao Chen[1]; *[1]WUSM - Department of Neuroscience, USA.* Fluorescence lifetime's insensitivity to sensor expression levels may not hold true in biological experiments. We simulate to quantify required photon numbers for desired signal-to-noise ratios and the range of expression that doesn't significantly alter lifetime.

JS4A.38
Efficient Template-Based Decoding of Naturalistic Movie Stimuli in Mice, Ziyuan Li[1], Shengxuan Chen[1], Annie Bice[2], Seana H. Gaines[2], Joseph Culver[1,2]; *[1]Washington Univ. in St. Louis, USA; [2]Washington Univ. School of Medicine, USA.* This study introduces an efficient template-based decoding approach for naturalistic movie stimuli in mice, achieving 82% accuracy using wide-field optical imaging. The method demonstrates significant potential in understanding dynamic visual information processing.

JS4A.39
Dissecting Zebrafish Brain Functional Connectivity With Two-Photon All-Optical Electrophysiology, Lapo Turrini[2,1], Michele Sorelli[1], Giuseppe de Vito[1,3], Francesco Vanzi[1,4], Francesco S. Pavone[1,5]; *[1]European Laboratory for Nonlinear Spectroscopy, Italy; [2]National Inst. of Optics, National Research Council, Italy; [3]Department of Neuroscience, Psychology, Drug Research and Child Health, Univ. of Florence, Italy; [4]Departement of Biology, Univ. of Florence, Italy; [5]Department of Physics and Astronomy, Univ. of Florence, Italy.* We present a two-photon system comprising a light-sheet microscope for fast whole-brain imaging and an acousto-optic deflector-based light-targeting unit for 3D optogenetic stimulation. We employed the setup to map habenular functional connectivity in zebrafish larvae.

JS4A.40

Efficient Signal Extraction for Diffuse Correlation Spectroscopy With SPAD Arrays at Low Photon Regimes, Melissa Wu[1], Lucas Kreiss[1], Michael Wayne[3], Mitchell B. Robinson[2], Claudio Bruschini[3], Edoardo Charbon[3], Roarke Horstmeyer[1]; *[1]Duke Univ., USA; [2]Massachusetts General Hospital, USA; [3]École Polytechnique Fédérale de Lausanne, Switzerland.* SPAD arrays have shown potential for improving SNR for diffuse correlation spectroscopy in low photon regimes. Here, we will explore different methods of integrating parallelized DCS signals in such regimes for deep blood flow extraction.

JS4A.41

Extracting 3D Information From Widefield Birefringence Microscopy Images of Sparse Myelinated Fibers in Human Brain Gray Matter, Anna Novoseltseva[1], Ting Xie[1], Irving Bigio[1]; *[1]Boston Univ., USA.* We report the application of widefield birefringence microscopy for 3D rendering of sparse myelinated fibers in human brain gray matter. This inexpensive and simple method offers the potential to inform studies of the brain connectome.

JS4A.42

Birefringence Microscopy for Quantifying Birefringence of Myelin in Thin Brain Section, Ting Xie[1], Anna Novoseltseva[1], Nathan Blanke[1], Irving Bigio[1]; *[1]Boston Univ., USA.* Structural anisotropy of myelin leads to optical birefringence, which can be microscopically imaged quantitatively to assess neurodegenerative diseases. We present a methodology to measure the birefringence refractive index difference in human white matter myelin.

JS4A.43

Blood-Flow Changes in Mice With TBI Assessed by Time-Gated Diffuse Correlation Spectroscopy at 1064 nm, Sahar Sabaghian[1], Ulas Sunar[1], Chien Poon[2], Brandon Foreman[3]; *[1]Stony Brook Univ., USA; [2]Dept. of Biomedical Engineering, Wright State Univ., USA; [3]Dept. of Neurology & Rehabilitation Medicine, Univ. of Cincinnati, USA.* Diffuse correlation spectroscopy was used on mice to resolve non-invasive blood flow within brain tissue after injury. Blood flow dynamics showed a highly significant reduction in TBI within 30 minutes relative to sham animals. Low-frequency oscillations also showed significant changes due to TBI.

JS4A.44

Depth-Sensitive Blood-Flow Changes in Humans During Head of Bed Manipulation, Sahar Sabaghian[1], Ulas Sunar[1], Chien Poon[2], Brandon Foreman[3]; *[1]Stony Brook Univ., USA; [2]Dept. of Biomedical Engineering, Wright State Univ., USA; [3]Dept. of Neurology & Rehabilitation Medicine, Dept. of Neurology & Rehabilitation Medicine, USA.* Time-gated Diffuse correlation spectroscopy was used on humans to resolve depth-sensitive blood flow changes during head-of-bed manipulation. We saw differences in blood flow changes for early-gate and late-gate photons.

JS4A.45

Dynamic Near-Infrared Fluorescence Imaging of CSF Outflow in non-Human Primates, Banghe Zhu[1], Jonathan Hendricks[1], Janelle Morton[1], John Rasmussen[1], Christopher Janssen[1], Manish Shah[1], Eva Sevick[1]; *[1]UT Health Science Center at Houston, USA.* In this study, we perform near-infrared fluorescence tomography and imaging to non-invasively visualize cerebrospinal fluid (CSF) dynamics in non-human primates, demonstrating the feasibility of imaging CSF in the pediatric population with post-hemorrhagic hydrocephalus.

JS4A.46

Design of Ultrasound Transducers for Localized Neuromodulation, Hyeongyu Park[1], Jinwoo Kim[1], Jin Ho Chang[1]; *[1]Department of Electrical Engineering and Computer Science, DGIST, Korea (the Republic of).* Conventional ultrasound transducers have a broad focus that hinders efficient research using small animal models for localized neuromodulation. Acoustic hologram lenses and an increase in operating frequency can be a solution for precise neural targeting.

JS4A.47

Quantitative Birefringence Microscopy for Evaluating the Structure of Cerebral Arteries in Alzheimer's Disease, Mikayla Bradsby[1], Margaret Downs[2], Samuel Halvorsen[3], Jorge Rivera[1], Katherine Zhang[3], Irving Bigio[4,5]; *[1]Department of Physics, Boston Univ., USA; [2]Department of Biochemistry and Cell Biology at BU Chobanain & Avedisian School of Medicine, Boston Univ., USA; [3]Department of Mechanical Engineering, Boston Univ., USA; [4]Neurophotonics Center, Department of Biomedical Engineering, Boston Univ., USA; [5]Department of Electrical Engineering, Boston Univ., USA.* Here we use quantitative birefringence microscopy to examine the relationship between structural changes to cerebral arteries and the progression of neurodegenerative diseases such as Alzheimer's Disease and Chronic Traumatic Encephalopathy

JS4A.48

Psychedelic 5-HT_{2A} Receptor Agonism Alters Neurovascular Coupling in Mice, Jonah Padawer-Curry[1,2], Abraham Z. Snyder[2,5], Annie Bice[2], Xiaodan Wang[5], Ginger Nicol[4], Jordan McCall[6], Joshua Siegel[4], Adam Q. Bauer[1,3]; *[1]Program of Imaging Science, Washington Univ. in Saint Louis, USA; [2]Radiology, Washington Univ. in Saint Louis, USA; [4]Psychiatry, Washington Univ. in Saint Louis, USA; [5]Biomedical Engineering, Washington Univ. in Saint Louis, USA; [6]Anesthesiology, Washington Univ. in Saint Louis, USA.* Thy1-jRGECO1a mice were imaged under awake, resting-state conditions using wide-field optical imaging. Psychedelic 5-HT_{2A} receptor agonism significantly altered neurovascular coupling in a region- and frequency-band-specific manner.

JS4A.49

Intact-Skull Cranial Windows for Widefield Imaging in Juvenile Mice: Complications and Impact on Skull Growth, Temilola E. Adepoju[1], Hayden B. Fisher[1], Brian R. White[1], Chloe Winston[1]; *[1]Childrens Hospital of Philadelphia, USA.* Functional neuroimaging with widefield optical imaging is potentially useful for studying developmental disorders in juvenile mice. Effects of longitudinal cranial window placement are unknown. We studied differences in skull growth and complications of this procedure.

JS4A.50

Vinculin Tension in Three-Dimensional Multicellular Aggregates, Luni Hu[1], Margarida Barroso[2], Nada N. Boustany[1]; *[1]Rutgers Univ., USA; [2]Albany Medical College, USA.* Confocal frequency-domain FLIM-FRET microscopy of Vinculin-TS demonstrates that vinculin is under tension at adhesion sites within multicellular aggregates. The measurements suggest that Vinculin-TS experiences a modified environment in 3D compared with 2D cultures.

JS4A.51

Simultaneous Monitoring of Tissue Blood Volume, Hemoglobin Oxygenation, and Blood Flow Using Full Sampling Frequency Domain Near-Infrared Spectroscopy and Interferometric Diffuse Correlation Spectroscopy, Shakeeb Habash[1], Ailis Muldoon[1], Mitchell B. Robinson[1], Stefan Carp[1]; [1]*MGH, USA.* Frequency domain near-infrared spectroscopy (FD-NIRS) is often synergistically combined with diffuse correlation spectroscopy (DCS) to monitor tissue perfusion and metabolism. We demonstrate an approach for simultaneous FD-NIRS and DCS data acquisition in a realistic environment.

JS4A.52

Contribution of Different Sunglasses Frames to the Protection Against Ultraviolet Radiation: a Suggestion of Adaptation for the Current Standards, Augusto Perez de Andrade[1], Liliane Ventura[1]; [1]*Univerisity of São Paulo, Brazil.* This research has the objective to evaluate the contribution of sunglasses frames to the eye protection against ultraviolet radiation by creating a still ongoing prototype that simulates different conditions of diffuse and direct radiation exposure.

JS4A.53

Can LIDARs Address Skin Color Bias? Sanathana Konugolu Venkata Sekar[1,2], Claudia N. Guadagno[2], Stefan Andersson-Engels[1,3]; [1]*Tyndall National Inst., Ireland;* [2]*BioPixS Ltd., Ireland;* [3]*Physics Department, Univ. College Cork, Ireland.* We evaluated fundamental properties of time-domain near-infrared spectroscopy to overcome color bias in NIRS devices. The Monte Carlo simulations, phantoms, and preliminary in vivo pseudo phantom-human measurements demonstrate how the effect of the superficial layer (skin color layer) can be eliminated to achieve bias-free sensing.

JS4A.54

Red Blood Cell Velocity in Brain Capillaries is Associated With Cerebral Amyloid Angiopathy Load, Yucheng Shen[1], Noah Schweitzer[1], Christopher G. Cover[1], Alberto Vazquez[1,2], Bistra Iordanova[1]; [1]*Bioengineering, Univ. of Pittsburgh, USA;* [2]*Radiology, Univ. of Pittsburgh, USA.* We collected two-photon line-scans along brain capillaries in Alzheimer's and wildtype mice. We applied Radon transform to quantify red blood cell velocity and found it decreasing with increased cerebral amyloid angiopathy but not tissue plaques.

JS4A.55

Measurements of Human Cerebral Blood Flow Changes With Speckle Contrast Optical Spectroscopy, Xiaojun Cheng[1], Tom Cheng[1], Byungchan Kim[1], Mitchell B. Robinson[2], Marco Renna[2], Maria Angela Franceschini[2], David A. Boas[1]; [1]*Boston Univ., USA;* [2]*Athinoula A. Martinos Center for Biomedical Imaging, USA.* We have developed the fiber-based speckle contrast optical spectroscopy (SCOS) system to measure human cerebral blood flow (CBF) and brain functions and demonstrated that SCOS outperforms traditional diffuse correlation spectroscopy (DCS) systems.

JS4A.56

Opto2P-FCM: a MEMS Based Miniature Two-Photon Microscope With Patterned Optogenetic Stimulation, Gregory Futia[1], Mo Zohrabi[2], Connor McCullough[1], Alec Teel[3], Fabio Simoes de Souza[3], Ryan Oroke[4], Victor Bright[4], Diego Restrepo[3], Juliet T. Gopinath[2,5], Emily A. Gibson[1]; *[1]Bioengineering, Univ. of Colorado, Anschutz Medical Campus, USA; [2]Department of Electrical, Computer and Energy Engineering, Univ. of Colorado, USA; [3]Department of Cell and Developmental Biology, Univ. of Colorado, Anschutz Medical Campus, USA; [4]Department of Mechanical Engineering, Univ. of Colorado, USA; [5]Department of Physics, Univ. of Colorado, USA.* Miniaturized microscopes for monitoring neural activity are an indispensable tool for neuroscience research. We present a novel MEMS based miniature microscope with patterned optogenetic stimulation capabilities enabling cell-specific 2-photon optogenetics and 2-photon imaging.

17:00 -- 19:15
Room: Las Olas III
BS5C • Imaging Large Scale Activity

BS5C.1 • 17:00 (Invited)

Rapid Large-Scale Multiphoton Measurement and Manipulation of Neuronal Activity, Spencer Smith[1]; *[1]Univ. of California Santa Barbara, USA.* I will share technological advancements from my lab for large field-of-view multiphoton imaging and optogenetic manipulations, and how they are unlocking new neuroscience experiments. I will also discuss urgent experimental challenges, to motivate new thinking about optics technology that can impact neuroscience research.

BS5C.2 • 17:30

A two-Photon Cellular Resolution Mesoscope for Causal Dissection of Inter-Areal Computations, Lamiae Abdeladim[1], Uday Jagadisan[1], Hyeyoung Shin[1], Mora Ogando[1], Hillel Adesnik[1]; *[1]Univ. of California Berkeley, USA.* We present the first two-photon holographic mesoscope, a system allowing to selectively photostimulate ensembles of neurons with high spatiotemporal resolution while recording from thousands of neurons across several surrounding areas.

BS5C.3 • 17:45

Mesoscopic Oblique Plane Microscopy (Meso-OPM) Platform for Multi-Scale Volumetric Dynamic Imaging, Dominique Meyer[1]; *[1]Johns Hopkins Univ., USA.* Meso-OPM leverages key advantages of traditional light-sheet microscopy while adding high-speed dynamic imaging over a mesoscopic scale. Here we present a Meso-OPM system with switchable FOV and resolution, while achieving >5Hz volumetric rate imaging.

BS5C.4 • 18:00

An Open-top Light-Sheet (OTLS) Microscope for Surveying Gene Expression in Thick Expanded Tissues, David Brenes[1], Qinghua Han[1], Kevin Bishop[1], Adam Glaser[2], Jonathan T. Liu[1]; *[1]Univ. of Washington, USA; [2]Allen Inst. for Neural Dynamics, USA.* We designed a novel non-orthogonal dual-objective open-top light-sheet microscope to resolve individual

genomic/transcriptomic targets in thick hydrogel-based expanded fluorescence in situ hybridization labeled tissues at moderate tissue expansions.

BS5C.5 • 18:15
Simultaneous Two-Photon and Thermal Imaging of Mouse Cortex Enables Optimization of Signal-to-Noise, Shengxuan Chen[1,2], Hunter Banks[2], Jonathan Bumstead[1], Annie Bice[2], Seana H. Gaines[2], Joseph Culver[1,2]; [1]*Washington Univ. in Saint Louis, USA;* [2]*Washington Univ. School of Medicine, USA.* We optimize fast (7Hz) large field-of-view (5mm) two-photon imaging with simultaneous thermal imaging and a curved imaging plane. Improved signal-to-noise is used to map bilateral spontaneous functional connectivity.

BS5C.6 • 18:30 (Invited)
Bio-FlatScopeNHP: a Miniaturized Lensless Microscope for Mesoscopic Calcium Imaging in Head-Unrestrained Non-Human Primates, Jimin Wu[1], Yuzhi Chen[2,3], Ashok Veeraraghavan[4,5], Eyal Seidemann[2,3], Jacob Robinson[1,4]; [1]*Dept. of Bioengineering, Rice Univ., USA;* [2]*Dept. of Neuroscience, Univ. of Texas at Austin, USA;* [3]*Dept. of Psychology, Univ. of Texas at Austin, USA;* [4]*Dept. of Electrical and Computer Engineering, Rice Univ., USA;* [5]*Dept. of Computer Science, Rice Univ., USA.* We describe a miniaturized lensless microscope for mesoscopic calcium imaging in head-unrestrained non-human primates (NHPs), and show the extracted orientation columns map from the primary visual cortex (V1) of a head-unrestrained NHP.

BS5C.7 • 19:00 Postdeadline Submission
Imaging Neuronal Activities With a Large Field-of-View Two- and Three-Photon Microscope in the Deep Tissue, Aaron Mok[1], Tianyu Wang[2,1], Shitong Zhao[1], Kristine E. Kolkman[1], Danni Wu[3], Dimitre Ouzounov[1], Changwoo Seo[4], Chunyan Wu[1], Joseph Fetcho[1], Chris Xu[1]; [1]*Cornell Univ., USA;* [2]*Boston Univ., USA;* [3]*New York Univ., USA;* [4]*Harvard Univ., USA.* We developed a two- and three- photon microscope that enables high-resolution imaging with a large field-of-view of ~3.5 mm diameter at > 1 mm depth of mouse brains.

17:00 -- 18:30
Room: Las Olas I, II, V, VI
CS5E • OCT in Biology
Presider: Xingde Li; Johns Hopkins Univ., USA

CS5E.1 • 17:00 (Invited)
Advances in Dynamic Full-Field Optical Coherence Tomography for in Vitro and Ex Vivo Imaging, Tual Monfort[1]; [1]*The Vision Inst. Sorbonne Univ., France.* Abstract not available.

CS5E.2 • 17:30 (Invited)
Utilizing Optical Coherence Angiography to Assess the Acute and Persistent Effects of Prenatal Alcohol Exposure on Fetal Brain Vasculature in Utero, Jessica Gutierrez[1], Manmohan Singh[1], Rajesh Miranda[2], Kirill Larin[1]; [1]*Department of Biomedical Engineering, Univ. of Houston, USA;* [2]*Department of Neuroscience & Experimental Therapeutics, Texas A&M Univ., USA.* Prenatal alcohol exposure diminishes cerebrovascular blood flow, impairing

development. We analyze the acute and persistent effects of different alcohol dosages (1.5g/kg, 3g/kg, and 4.5g/kg) on fetal brain vasculature by utilizing correlation mapping optical coherence angiography.

CS5E.3 • 18:00
Noninvasive Evaluation of Mouse Embryo Development Using Time-Lapse Optical Coherence Microscopy, Fei Wang[1], Senyue Hao[1], Kibeom Park[1], Ali Ahmady[1], Chao Zhou[1]; *[1]Washington Univ. in St. Louis, USA.* Optical coherence microscopy (OCM) offers volumetric imaging for non-invasive evaluation of embryo quality in in-vitro fertilization (IVF). Time-lapse OCM images of cryopreserved mouse embryos revealed development milestones, blastocyst grading, and stage timing inside the incubator.

CS5E.4 • 18:15
Tracking the Effect of PFOA Exposure on Mammary Epithelial Organoids Longitudinally by OCT-Structural Functional Imaging (OCT-SFI), Lin Yang[1], Pan Ji[1], Amy L. Oldenburg[1], Matthew R. Lockett[1], Abel A. Miranda Buzetta[1]; *[1]Univ. of North Carolina Chapel Hill, USA.* Utilizing OCT-SFI, this study uncovers substantial morphological alterations and inhibition of intracellular motility in mammary epithelial organoids exposed to PFOA over 12 days, introducing a novel long-term research tool to prioritize PFAS for carcinogenic potential.

17:00 -- 17:45
Room: Bonnet
MS5A.1 • Biology and Immunology with Intravital Microscopy II
Presider: Nada Boustany; Rutgers Univ., USA and Milind Rajadhyaksha; Memorial Sloan Kettering Cancer Center, USA

MS5A.1 • 17:00 (Invited)
Visualizing Dynamic Interactions Within the Tumor Microenvironment Using Label-Free Intravital Imaging, Suzanne Ponik[1]; *[1]Univ. of Wisconsin-Madison, USA.* Abstract not available.

MS5A.2 • 17:30
Blood Flow Velocity in Skin Microvasculature by Line-Field Confocal Optical Coherence Tomography (LC-OCT) at Two Different Acquisition Speeds, Jonas Ogien[3], Juliana Fuller[1], Arnaud Dubois[3,4], Eric Tkaczyk[2,5], Inga Saknite[1,2]; *[1]Univ. of Latvia, Latvia; [2]Dermatology, Vanderbilt Univ. Medical Center, USA; [3]DAMAE Medical, France; [4]Université Paris-Saclay, France; [5]Department of Veterans Affairs, USA.* LC-OCT enabled manual tracking of individual cell motion in the upper dermal microvessels. Blood flow velocity was on average 2.5 times higher (173 vs 70 µm/s) when measured at 40 vs 8 frames per second.

17:00 -- 19:00
Room: Las Olas IV
OS5D • Diffuse Optics: Translational Studies
Presider: Mark Niedre; Northeastern Univ., USA

OS5D.1 • 17:00 (Invited)
Adventures in (Neuro-)Critical Care Towards Theranostics With Hybrid Diffuse Optics, Turgut Durduran[1]; *[1]ICFO - Institut de Ciencies Fotoniques, Spain.* Hybrid diffuse optical devices combining blood oxygenation and flow measurements have been reaching increasingly higher technology-readiness-levels while improving portability, cost, speed, accuracy and precision. I will describe our experiences in (neuro-)critical care.

OS5D.2 • 17:30 (Invited)
Optical Monitoring of Muscle Health: Hemodynamic Signatures of Age-Related Functional Decline, Yumie Ono[1], Mikie Nakabayashi[1], Masashi Ichinose[1]; *[1]Meiji Univ., Japan.* Combined functional near-infrared spectroscopy and diffuse correlation spectroscopy in over 200 participants revealed age-related changes in hemodynamic responses during exercise, potentially providing a novel biomarker of muscle health and predicting sarcopenia risk.

OS5D.3 • 18:00
Longitudinal Hemodynamic Characterization of Patients With Sickle Cell Disease With Multi-Modal Optical Techniques, Timothy Quang[2], Ingrid Frey[1], Julia Xu[1], Golnar Mostashari[2], Helen Parker[2], Anna Conrey[1], Dina Parekh[1], Ruth Charles[1], Brian Hill[2], Swee Lay Thein[1], Bruce Tromberg[2,3]; *[1]National Heart, Lung, and Blood Inst., National Inst. of Health, USA; [2]National Inst. of Child Health and Human Development, National Inst. of Health, USA; [3]National Inst. of Biomedical Imaging and Bioengineering, National Inst. of Health, USA.* We optically characterize hemodynamic changes influenced by mitapivat, an oral pyruvate kinase activator, in 15 patients with sickle cell disease. Cerebral oxygen saturation increased above baseline within the first month of treatment and remained elevated.

OS5D.4 • 18:15
Longitudinal Monitoring of Response to Neoadjuvant Chemotherapy for Breast Cancer Using Diffuse Optical Tomography, Ailis Muldoon[1], Jayne Cormier[2], Mansi Saksena[2,3], Elizabeth Niehoff[4], Steven Isakoff[4], Stefan Carp[1,3], Bin Deng[1,3]; *[1]Athinoula A. Martinos Center for Biomedical Imaging, Massachusetts General Hospital, USA; [2]Department of Radiology, Division of Breast Imaging, Massachusetts General Hospital, USA; [3]Harvard Medical School, USA; [4]Cancer Center, Massachusetts General Hospital, USA.* We present analysis showing the utility of functional diffuse optical tomography for monitoring tumor response to neoadjuvant chemotherapy. We demonstrate that optical imaging markers outperform mammographic imaging in differentiating between outcome groups.

OS5D.5 • 18:30
Diffuse Optical Spectroscopy of Lactating and Non-Lactating Mammary Physiology, Ana Boamfa[1], Caitlin Coverstone[2], Ola Abdalsalam[2], Ana F. Borges de Almeida Barreto[2], Alicia Wei[2], Johanna R. de Wolf[1], Sjoukje M. Schoustra[1], Thomas D. O'Sullivan[2], Nienke

Bosschaart[1]; *[1]Univ. of Twente, Netherlands; [2]Univ. of Notre Dame, USA.* We apply broadband Diffuse Optical Spectroscopy (DOS) to investigate optical and physiological differences between i) lactating and non-lactating breasts, ii) the areolar and non-areolar breast region, and iii) lactating breasts prior and post milk extraction.

OS5D.6 • 18:45
Hemodynamic Monitoring of Bone Healing With Diffuse Correlation Tomography and Spatial Frequency Domain Imaging, Regine Choe[1], Youngjoo Lee[2], Joseph B. Majeski[1,3], Alyson March[1], Zihao Li[1], Irfaan Dar[1], Jingxuan Ren[1], Songfeng Han[1]; *[1]Univ. of Rochester, USA; [2]Gwangju Inst. of Science & Technology, Korea (the Republic of); [3]Univ. of Pennsylvania, USA.* The effects of age and parathyroid hormone treatment on bone healing were investigated using non-invasive longitudinal diffuse correlation tomography and spatial frequency domain imaging of bone injury in murine femurs.

17:00 -- 19:00
Room: Rio Vista
TS5B • Intra-Surgical Imaging
Presider: Ioan Notingher; Univ. of Nottingham, UK

TS5B.1 • 17:00 (Invited)
Fluorescence Lifetime Imaging in Robotic Surgery, Laura Marcu[1]; *[1]Univ. of California Davis, USA.* Abstract not available.

TS5B.2 • 17:30
Fluorescence Lifetime (FLT)-Enhanced Tumor Imaging With Biomarker-Targeted Agents, Hannah Collins[1], Rahul Pal[1], Murali Krishnamoorthy[1], Thinzar Lwin[2], Eben Rosenthal[3], Patrick Wagner[4], Anand T. Kumar[1]; *[1]Otolaryngology, Massachusetts Eye and Ear, Harvard Medical School, USA; [2]Surgical Oncology, City of Hope, USA; [3]Otolaryngology - Head and Neck Surgery, Vanderbilt Univ. Medical Center, USA; [4]Surgical Oncology, Allegheny Health Network, USA.* Fluorescence lifetime (FLT) imaging of biomarker-targeted probes enhances tumor identification accuracy compared to fluorescence intensity. We demonstrate using microscopy that FLT of diverse probes, acting via molecular expression or physiological biomarkers, enables cellular-resolution tumor identification.

TS5B.3 • 17:45
Patient-Specific Arterial Input Function for Accurately Assessing Intraoperative Bone Blood Perfusion, Yue Tang[1], Ida L. Gitajn[2], Xu Cao[1], Jonathan T. Elliott[2], Joseph S. Sottosanti[2], Logan M. Bateman[1,2], Bethany S. Malskis[2], Lillian A. Fisher[2], Eric R. Henderson[2], Shudong Jiang[1]; *[1]Dartmouth College, USA; [2]Dartmouth-Hitchcock Medical Center, USA.* Arterial input functions obtained from 110 patients were applied in a simulation study to evaluate the accuracy of kinetic parameters critical for perfusion assessment during open orthopedic surgeries with indocyanine green-based dynamic contrast-enhanced fluorescence imaging.

TS5B.4 • 18:00

Novel Optical Neuromonitoring of Cerebral Oxygen Delivery During Antegrade Cerebral Perfusion in Neonates, Nicolina Ranieri[1], Rodrigo M. Forti[1], Tiffany Ko[1], Alyssa Seeney[1], Constantine Mavroudis[1], Wesley Baker[1], Susan Nicolson[1], Jennifer Lynch[1]; *[1]Children's Hospital of Philadelphia, USA.* We demonstrate the feasibility of novel diffuse optical neuromonitoring to continuously quantify cerebral blood flow and oxygenation during antegrade cerebral perfusion in neonates with hypoplastic left heart syndrome during the Norwood procedure.

TS5B.5 • 18:15

A Dual-Camera Device for Continuous Monitoring of Endotracheal Tube Displacement, Tongtong Lu[1,2], Pawjai Khampang[2], Ahmed Beydoun[2], Anna Berezovsky[2], Rebecca Rhode[2], Wenzhou Hong[2], Joseph Kerschner[2], Bing Yu[1,2]; *[1]Marquette Univ., USA; [2]Medical College of Wisconsin, USA.* Accidental endotracheal tube (ETT) displacement can cause moderate to severe complications or fatality. Timely ETT position monitoring and correction is crucial. We present a near-infrared (NIR) and visible dual-camera device for continuous monitoring of ETT.

TS5B.6 • 18:30

Artificial Intelligence-Enabled Label-Free Multispectral Imaging for Detrusor Muscle Identification in Transurethral Resection of Bladder Tumor Procedure, Rishikesh Pandey[1], David Fournier[1], Timothy OConnor[1], Kaylea Grandpre[1], Gary Root[1], Aditya Shirvalkar[1], Katie Tolkacheva[1], Anoop Meraney[2], Ronald Araneta, III[2], Jonathan Earle[2]; *[1]CytoVeris Inc., USA; [2]Hartford HealthCare, USA.* The identification of detrusor muscle (DM) in bladder specimens is crucial for the successful TURBT procedure. This study conducted on 103 patients demonstrates the potential of multispectral imaging in accurately identifying DM during surgery.

TS5B.7 • 18:45

HyperProbe Consortium: Transforming Neuronavigation in Glioma Surgery With Hyperspectral Imaging, Luca Giannoni[5], Anam Toaha[1], Marta Marradi[1], Duccio Rossi Degl'Innocenti[3], Ivan Ezhov[2], Charly Caredda[4], Arthur Gautheron[4], Fernand Fort[4], Fabien Schneider[4], Moncef Berhouma[4], Camilla Bonaudo[5], Frederic Lange[6], Angelos Artemiou[6], Katharina Krischak[7], Peter Gordebeke[7], Domenico Alfieri[3], Daniel Rueckert[2], Bruno Montcel[4], Alessandro Della Puppa[5], Thiebaud Picart[4], Ilias Tachtsidis[6], Francesco S. Pavone[5]; *[1]European Lab for Non-Linear Spectroscopy, Italy; [2]TUM, Germany; [3]EMOLED, Italy; [4]Univ. of Lyon, France; [5]Univ. of Florence, Italy; [6]UCL, UK; [7]EIBR, Austria.* We present the HyperProbe consortium: a five-years, multinational, EU-funded project started in October, 2022, that aims at developing innovative hyperspectral imaging technologies for clinical translation. HyperProbe works towards providing highly enhanced neuronavigation during glioma resection.

Optica Biophotonics Congress: Biomedical Optics Session Guide

Disclaimer: this guide is limited to technical program with abstracts and author blocks as of 2 April. For updated and complete information with special events, reference the online schedule or mobile app.

08:00 -- 10:00
Room: Las Olas III
BM1C • Nonlinear Deep Imaging of Living Tissue
Presider: Damian Wallace; Dept. of Behaviour and Brain Organization, MPINB, Germany

BM1C.1 • 08:00 (Invited)
Pushing the Limits of Multiphoton Imaging in Living Brains, Chris Xu[1]; *[1]Cornell Univ., USA.* We will discuss the limits of imaging depth and speed of multiphoton microscopy of living brains, and describe a few directions for continued development, such as laser sources, spectral windows, and optimum illumination schemes.

BM1C.2 • 08:30
Imaging Partial Pressure of Oxygen Using Three-Photon Microscopy at 1670 nm, Mohammed Alfadhel[1,2], Thomas Troxler[3,4], Srinivasa R. Allu[3,4], Luca Ravotto[3,4], Qi Pian[1], Buyin Fu[1], Steven S. Hou[5], David R. Miller[1], Abbas Yaseen[2], Sergei Vinogradov[3,4], Sava Sakadzic[1]; *[1]Department of Radiology, Athinoula A. Martinos Center for Biomedical Imaging, Massachusetts General Hospital, Harvard Medical School, USA; [2]Department of Bioengineering, Northeastern Univ., USA; [3]Department of Biochemistry and Biophysics, Perelman School of Medicine, Univ. of Pennsylvania, USA; [4]Department of Chemistry, School of Arts and Sciences, Univ. of Pennsylvania, USA; [5]Department of Neurology, Inst. of Neurodegenerative Diseases, Massachusetts General Hospital and Harvard Medical School, USA.* Three-photon microscopy shows potential to probe much deeper brain structures than previously possible with two-photon microscopy. Here we demonstrate the first intravascular measurements of pO_2 in subcortical vasculature in awake mice using three-photon phosphorescence lifetime microscopy (3PLM) and a phosphorescent probe Oxyphor 2P.

BM1C.3 • 08:45 (Invited)
Label-Free Tracking of Myelin Dynamics in Subcortical White Matter of a Mouse Model of Multiple Sclerosis Using Third Harmonic Generation Microscopy, Nicole E. Chernavsky[1], Nuri Hong[1], Michael Lamont[1], Lianne Trigiani[1], Nozomi Nishimura[1], Chris B. Schaffer[1]; *[1]Cornell Univ., USA.* Third harmonic generation with 1320-nm, femtosecond pulses can visualize individual myelinated axons in subcortical white matter through intact cortex of live mice. In a cuprizone multiple sclerosis model, this enabled longitudinal tracking of myelin damage.

BM1C.4 • 09:15
Subcortical Two-Photon Microscopy of Hippocampal Function in Rodents Using a Removable GRIN Lens, Zhengyi Lu[1], Priya Shah[1], Chang Liu[1], Alfredo Cardenas-Rivera[1], Abbas Yaseen[1]; *[1]Northeastern Univ., USA.* We demonstrate subcortical measurements of microvascular hemodynamics, tissue oxygen, and neuronal activity using a GRIN lens and implanted, customized cannula. Our methods show promise for studying risk factors of Alzheimer's disease.

BM1C.5 • 09:30 (Invited)
Deep Two-Photon Imaging of the Live Mouse Brain Using an Array of Quantum Detectors, Amr Tamimi[2], Martin Caldarola[1], Niels Noordzij[1], Johannes N. Los[1], Antonio Guardiani[1], Hugo Kooiman[1], Juan Carlos Boffi[2], Sebastian Hambura[2], Ling Wang[2], Christian

Kieser[2], Andreas Fognini[1], Robert Prevedel[2]; *[1]Single Quantum, Netherlands; [2]Cell Biology and Biophysics Unit, European Molecular Biology Laboratory, Germany.* We developed an array of quantum detectors to allow two-photon excited fluorescence in-vivo imaging of mouse brain vasculature in the short wave infrared (SWIR) region, achieving an imaging depth of up to ~900 µm.

Optica Biophotonics Congress: Biomedical Optics Session Guide

Disclaimer: this guide is limited to technical program with abstracts and author blocks as of 2 April. For updated and complete information with special events, reference the online schedule or mobile app.

Monday, 8 April

08:00 -- 09:30
Room: Las Olas I, II, V, VI
CM1E • OCT in Ophthalmology
Presider: Maciej Wojtkowski; Nicolaus Copernicus Univ., Poland

CM1E.1 • 08:00 (Invited)
Regulatory Science of Ophthalmic Adaptive Optics and OCT: Phantom and Biomarker Development at the FDA, Anant Agrawal[1]; *[1]FDA Ctr Devices & Radiological Health, USA.* We are developing physical tools and clinical methods which reveal the capabilities and limits of advanced retinal imaging techniques, to promote their standardized performance and broader clinical translation as medical devices.

CM1E.2 • 08:30
Age-Related Changes in Morphology, Transparency and Biomechanics of the Crystalline Lens Assessed With in-Vivo Swept-Source OCT, Ireneusz Grulkowski[1], Keerthana Soman[1], Vasantha Kumar Kathirvelu[1], Ashish Gupta[1], Daniel Ruminski[1], Alfonso Jimenez Villar[1], Raul Duarte Toledo[2], Barbara Pierscionek[3], Pablo Artal[2]; *[1]Uniwersytet Mikolaja Kopernika, Poland; [2]Laboratorio de Óptica, Universidad de Murcia, Spain; [3]Faculty of Health, Education, Medicine, and Social Care, Anglia Ruskin Univ., UK.* We determined the geometry, transparency and natural vibrations of the crystalline lens in healthy subjects at different ages using optical coherence tomography. High-speed imaging enables visualization of optical signal discontinuity zones during accommodation response.

CM1E.3 • 08:45
Data Bandwidth Improved Optical Coherence Tomography Angiography via Learnable Spectral-Spatial Sub-Sampling, Hang Su[1], Jianing Mao[1], Yuye Ling[1], Yikai Su[1]; *[1]Shanghai Jiao Tong Univ., China.* We demonstrated a highly-compressive optical coherence tomography angiography framework. Our deep learning-enabled strategy can achieve satisfactory OCTA image quality with much lower data bandwidth than existing methods, facilitating real-time OCTA imaging.

CM1E.4 • 09:00 (Invited)
OCT-Based, Multi-Spot Assessment of Corneal Biomechanical Asymmetries – Clinical Results, Karol M. Karnowski[1,2], Jadwiga Milkiewicz[1,2], Ewa Maczynska-Walkowiak[3], Patryk Mlyniuk[4], Onur Cetinkaya[1,2], Bartlomiej Kaluzny[4], Andrea Curatolo[1,2], Ireneusz Grulkowski[3], Maciej Wojtkowski[1,2]; *[1]Inst. of Physical Chemistry, Polish Academy of Sciences, Poland; [2]International Center for Translational Eye Research, Polish Academy of Sciences, Poland; [3]Inst. of Physics, Nicolaus Copernicus Univ., Poland; [4]Collegium Medicum, Nicolaus Copernicus Univ., Poland.* Our system delivers accurate 9-point air-puff corneal deformation readings, substantiated by rigorous ex vivo and in vivo testing, demonstrating significant efficacy in identifying keratoconus-linked biomechanical irregularities for clinical diagnostic use and ongoing patient monitoring.

Optica Biophotonics Congress: Biomedical Optics Session Guide

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08:00 -- 10:00
Room: Bonnet
MM1A • Novel Devices and Methods II
Presider: Nicusor Iftimia; Physical Sciences Inc., USA

MM1A.1 • 08:00 (Invited)
Listening for Cancer at the Sub-Cellular Level With GHz-Ultrasound, Salvatore La Cavera, III[1]; *[1]Univ. of Nottingham, UK.* This talk introduces a new way to investigate and potentially diagnose disease down to the single cellular level. Phonon imaging is a new microscopy and endoscopy technique that probes the abnormal mechanical properties of cancer.

MM1A.2 • 08:30
Shortwave Infrared Photothermal Spectroscopy and Microscopy, Yuhao Yuan[1], Hongli Ni[1], Mingsheng Li[1], Yifan Zhu[2], Xiaowei Ge[1], Jiaze Yin[1], Chinmayee V. Prabhu Dessai[3], Le Wang[1], Ji-Xin Cheng[1,2]; *[1]Department of Electrical and Computer Engineering, Boston Univ., USA; [2]Department of Chemistry, Boston Univ., USA; [3]Department of Biomedical Engineering, Boston Univ., USA.* Current vibrational imaging methods either have limited penetration depth or poor spatial resolution. We developed a shortwave infrared photothermal (SWIP) microscope for deep-tissue chemical imaging with sub-micron resolution and demonstrated SWIP imaging with biological tissues.

MM1A.3 • 08:45
Comprehensive Vibrational Photothermal Microscopy, Jianpeng Ao[1], Jiaze Yin[1], Haonan Lin[1], Yifan Zhu[1], Ji-Xin Cheng[1]; *[1]Boston, Univ., USA.* Acquiring complete infrared and Raman vibrational information is designed for precise chemical analysis. We report a comprehensive vibrational photothermal (VIP) microscope that detects IR and Raman active modes with a single shot.

MM1A.5 • 09:00
Multifocus Speckle Illumination HiLo Microscopy With non-Local Means Denoising, Shuqi Zheng[1], Jerome Mertz[1]; *[1]Boston Univ., USA.* HiLo microscopy achieves optical sectioning from two images with uniform and speckle illuminations. We present multifocus HiLo imaging with a computational approach based on non-local means to reduce speckle noise in the reconstruction.

MM1A.6 • 09:15
Speckle Noise Reduction in Portable Confocal Microscopy for in Vivo Human Skin Imaging, Momoka Sugimura[1], Kenneth Marcelino[1], Rafael Romero[5], Jingwei Zhao[1], Kyungjo Kim[1], Ameer Nessaee[2], Yongjun Kim[5], Delaney Stratton[3], Clara Curiel-Lewandrowski[3], Jason Garfinkel[4], Gene Rubinstein[4], Dongkyun Kang[1,5]; *[1]James C. Wyant College of Optical Sciences, Univ. of Arizona, USA; [2]Department of Electrical and Computer Engineering, Univ. of Arizona, USA; [3]College of Medicine, Univ. of Arizona, USA; [4]ArgosMD, USA; [5]Department of Biomedical Engineering, Univ. of Arizona, USA.* Portable Confocal Microscopy (PCM) is a low-cost reflectance confocal microscopy designed for *in vivo* imaging of skin at cellular resolution. We developed a Speckle-Modulating PCM (SM-PCM) which reduces speckle noise while achieving high-speed imaging.

MM1A.7 • 09:30

A Compact and low-Cost Solution for Rapid Frequency Domain Lifetime Imaging, Lakhvir Singh[1], Linghao Hu[1], Alex Walsh[1]; *[1]Department of Biomedical Engineering, Texas A&M Univ., USA.* A cost friendly and compact frequency domain fluorescent lifetime microscope (FD-FLIM), with the potential of capturing lifetimes with resolution of a few nanoseconds, has been theorized and designed using detection interferometry to determine the phase shift of fluorescence emission.

MM1A.4 • 09:45

Expansion-Assisted Selective Plane Illumination Microscopy, Adam Glaser[1]; *[1]Allen Inst. for Neural Dynamics, USA.* We present a new light-sheet microscopy platform that enables nanoscale imaging of centimeter-scale tissues at a speed of nearly 1 gigavoxel/sec.

08:00 -- 10:00
Room: Las Olas IV
OM1D • Advances in Fluorescence Imaging Techniques
Presider: Chulhong Kim; Pohang Univ. of Science & Technology

OM1D.1 • 08:00 (Invited)

Next-Generation Image-Guided Single-Cell ‘Omics Analysis, Christa Haase[1,2], Qi Yu[3], Debra Van Egeren[4], Karin Gustafsson[5], David Sykes[2], David Scadden[2], Fernando Camargo[6], Charles P. Lin[2], Shen Mei[2]; *[1]Bioengineering and Physics, Northeastern Univ., USA; [2]Massachusetts General Hospital, USA; [3]Univ. of Washington, USA; [4]Stanford Univ., USA; [6]Boston Children's Hospital, USA.* To discover how cellular organization and dynamics direct tissue function, we developed a technology for image-guided single cell transcriptional analysis. We present its application to stem cell and leukemia biology and discuss future technological advancements.

OM1D.2 • 08:30 (Invited)

Translational Fluorescence Lifetime Imaging, Anand T. Kumar[1]; *[1]Harvard Univ., USA.* Abstract not available.

OM1D.3 • 09:00

Deep Learning Aided Fluorescence Lifetime Tomography, Navid Ibtehaj Nizam[1], Vikas Pandey[1], Ismail Erbas[1], Jason T. Smith[1], Xavier Intes[1]; *[1]Rensselaer Polytechnic Inst., USA.* We report a novel two-stage Deep Neural Network architecture, AUTO-FLI, for carrying out simultaneous 3D intensity and fluorescence lifetime reconstructions. The performance of the network is validated *in silico* and with experimental phantoms.

OM1D.4 • 09:15

Temporal Point Spread Function Deconvolution in Time-Resolved Fluorescence Lifetime Imaging Using Deep Learning Model, Vikas Pandey[1], Ismail Erbas[1], Xavier Michalet[3], Arin Ulku[2], Claudio Bruschini[2], Edoardo Charbon[2], Xavier Intes[1]; *[1]Rensselaer Polytechnic Inst., USA; [2]EPFL, Switzerland; [3]Univ. of California at Los Angeles, USA.* We report a deep RNN model for temporal point spread function (TPSFs) deconvolution in multimodal imaging systems to extract true sample fluorescence decay rate. It's performance has been demonstrated in phantom and well-plate data.

OM1D.5 • 09:30
In Vivo Labeling and Detection of Circulating Tumor Cells With Fluorescent Molecular Contrast Agents, Josh Pace[3], Junxiong Ma[3], Jane Lee[3], Madduri Srinivasarao[2], Shivakrishna Kallepu[2], Lei Wang[4], Grace Hubbell[4], Gauri Malankar[4], Riley Whalen[4], Melissa Wong[4], Summer Gibbs[4], Philip Low[2], Mark Niedre[1]; *[1]Northeastern Univ., USA; [2]Chemistry, Purdue Univ., USA; [3]Bioengineering, Northeastern Univ., USA; [4]Knight Cancer Inst., Oregon Health and Science Univ., USA.* The goal of this research is to develop a method to label, detect, and count circulating tumor cells *in vivo* with different types of injectable receptor targeted fluorescent molecular probes and near infrared (NIR) light.

OM1D.6 • 09:45
In-Vivo Fluorescence Lifetime Tomography for Detection and Quantification of Programmed Death Ligand-1, Rahul Pal[2], Murali Krishnamoorthy[2], Aya Matsui[1], Satoru Morita[1], Hajime Taniguchi[1], Homan Kang[1], Hak Soo Choi[1], Dan Duda[1], Anand T. Kumar[2]; *[1]Massachusetts General Hospital, USA; [2]Otolaryngology - Head and Neck Surgery, Mass Eye and Ear, USA.* Cancer immunotherapy relies on PD-L1 expression, often assessed through immunohistochemistry, offering limited insights. In-vivo fluorescence lifetime (FLT) imaging, utilizing PD-L1-targeted probes, provides quantitative estimates of PD-L1 heterogeneity across tumors, showing promise for clinical translation of FLT imaging.

08:00 -- 10:00
Room: Rio Vista
TM1B • Clinical Spectroscopy
Presider: Radu Boitor; Univ. of Nottingham, UK

TM1B.2 • 08:00
A Broadband Spectrum Wearable Device for Multiple Physiological Parameters Monitoring, Anabela Da Silva[1,4], Laurent Alacoque[3], Jean-Michel Tualle[2], Valentin Espinas[1,4], Julien Wojak[1], Dominique Ettori[2], Solène Couturier[1,4], Gaëtan Cherel[1], Xavier Alacoque[5]; *[1]Aix Marseille Univ, CNRS, Centrale Méditerranée, Institut Fresnel, France; [2]LPL, UMR 7538 Univ. Sorbonne Paris-Nord, France; [3]DOPT Department, Univ. Grenoble Alpes, CEA, Leti, France; [4]Aix-Marseille Univ, Centre Européen de Recherche en Imagerie Médicale (CERIMED), France; [5]Anesthesia, intensive care Oncopole Claudius Regaud, France.* We propose a broadband (Si and InGaAS sensors,500-2500 nm) wearable integrated optical device designed with to monitor multiple physiological parameters. The sensors are spatially distributed to access the depth information.

TM1B.3 • 08:15
Investigation of Skin Pigmentation Influence on the Diffuse Reflectance Signal and Oxygen Saturation, Katarzyna Komolibus[1], Baptiste Jayet[1], Paul Stetson[2], Stefan Andersson-Engels[1]; *[1]Tyndall National Inst., Ireland; [2]Raydiant Oximetry Ireland Ltd., Ireland.* Using Monte Carlo simulations we show the effect of different melanin concentrations in epidermal layer on

the diffuse reflectance signal and the relationship of the double ratio with oxygen saturation levels.

TM1B.4 • 08:30

Tissue Oxygenation Changes With Debridement in DFUs Using a Smartphone-Based NIRS Imaging Device, Daniela Leizaola[1], Kacie Kaile[1], Maria Hernandez Hernandez[1], Renato Sousa[3], Jose P. Ponce[3], Stanley Mathis[3,4], Alexander L. Trinidad[1], Nikhil Vedere[1], Himaddri Shakhar Roy[1], Manuel I. Leizaola[1], David G. Armstrong[2], Anuradha Godavarty[1]; *[1]Biomedical Engineering, Florida International Univ., USA; [2]Surgery, Keck School of Medicine of Univ. of Southern California, Southwestern Academic Limb Salvage Alliance, USA; [3]White Memorial Medical Group, USA; [4]Clemente Clinical Research, USA.* Pre- and post-debridement spatial tissue oxygenation of diabetic foot ulcers were acquired using a smartphone-based NIRS device. Upon removing unviable tissue around the wounds, the tissue oxygenation increased, as objectively observed in this study.

TM1B.5 • 08:45 (Invited)

Hybrid Diffuse Optical Monitoring Based Study of Cerebral Autoregulation Indices in Hyperventilation Therapy for Traumatic Brain Injury Management, Susanna Tagliabue[1], María Martorell Ruiz[1], Jonas B. Fischer[1], Federica Maruccia[1], Anna Rey-Perez[2], Lourdes Exposito[2], Marcelino Baguena[2], Maria Antonia Poca[3], Turgut Durduran[1,4]; *[1]ICFO-Institut de Ciències Fotòniques, Spain; [2]Neurotrauma Intensive Care Unit, Vall d'Hebron Univ. Hospital, Spain; [3]Department of Neurosurgery, Vall d'Hebron Univ. Hospital, Spain; [4]Institucio Catalana de Recerca i Estudis Avancats (ICREA), Spain.* Cerebral autoregulation (CAR) assessment in traumatic brain injury during hyperventilation can be multimodally assessed by hybrid diffuse optical device combined with physiological parameters. Results indicate a heterogeneous and complex response in CAR indices.

TM1B.6 • 09:15 (Invited)

Lighting Up the Brain: Neurosurgical Technologies for Imaging Brain Structure and Function, Pablo A. Valdes[1]; *[1]UTMB Health, USA.* Abstract not available.

TM1B.1 • 09:45

Infrared Spectroscopy-Based Classification of Oral pre-Cancer, Pranab J. Talukdar[1], Kartikeya Bharti[1], Moushumi Pal[2], Ranjan Rashmi Paul[2], Pooja Lahiri[1], Basudev Lahiri[1]; *[1]IIT Kharagpur, India; [2]Oral and Maxillofacial, Gurunanak Inst. of Dental Science and Research, India.* A model was constructed to distinguish between different oral pre-cancerous conditions using FTIR spectra. The model achieved an accuracy of 95.72% using the amide III region in distinguishing between normal and oral pre-cancer stages.

10:30 -- 12:00
Room: Las Olas I, II, V, VI
JM2A • Joint Plenary Session II

JM2A.1 • 10:30 (Plenary)
Dynamic OCT for in Vivo Investigation of the Fallopian Tube Physiology: Eggs, Sperm, and Cilia, Irina Larina[1]; [1]*Baylor College of Medicine, USA.* Abstract not available.

JM2A.2 • 11:15 (Plenary)
Fluorescence Agents and Surgical Guidance, Samuel Achilefu[1]; [1]*UT Southwestern Medical Center at Dallas, USA.* Abstract not available.

13:00 -- 15:00
Room: Las Olas III
BM3C • Optics in Naturalistic Settings: Animal Models
Presider: Jason Kerr

BM3C.1 • 13:00 (Invited)
Naturalistic Brain Imaging: Imaging the Brain Under Freely Moving and Ethological Conditions, Damian J. Wallace[1], Alexandr Klioutchnikov[1], Juergen Sawinski[1], Kay-Michael Voit[1], Yvonne Groemping[1], Jason Kerr[1]; [1]*Behavior and Brain Organization, MPI for Neurobiology of Behavior, Germany.* We present here a 2g miniaturized head-mounted three-photon microscope with remote z-drive and resilient miniaturized detector system suitable for imaging from any cortical layer in freely moving mice in a fully lit environment.

BM3C.2 • 13:30
Time-Multiplexed Miniaturized Two-Photon Microscopy, Shing-Jiuan Liu[1], Zixiao Zhang[1], Ben Mattison[1], Weijian Yang[1]; [1]*Univ. of California, Davis, USA.* We propose a time-multiplexed miniaturized two-photon microscope (TM-MINI2P), enabling a two-fold increase in imaging speed while maintaining a high spatial resolution. Using TM-MINI2P, we conducted high-speed in-vivo calcium imaging in mouse cortex.

BM3C.3 • 13:45
Technologies to Alleviate Rotating and Weight Burdens for Neural Imaging in Freely-Moving Mice, Yuehan Liu[1], Haolin Zhang[1], Cheng-Yu Lee[1], Jing Zhang[1], Wenhe Jing[1], Xingde Li[1]; [1]*Johns Hopkins Univ., USA.* We investigate the effects of rotational resistance and the weight of head-mounted two-photon imaging devices on mouse behavior and neural activities and propose technologies to alleviate rotational and weight burdens, enabling neuroimaging in freely-moving mice.

BM3C.4 • 14:00
Simultaneous Dual-Region Functional Imaging in Miniaturized Two-Photon Microscopy, Zixiao Zhang[1], Shing-Jiuan Liu[1], Ben Mattison[1], Weijian Yang[1]; [1]*Univ. of California, Davis, USA.* We demonstrate simultaneous dual-region in-vivo imaging of brain activity in mouse cortex through a miniaturized spatial-multiplexed two-photon microscope

platform, which doubles the imaging speed. Neuronal signals from the two regions are computationally demixed and extracted.

BM3C.5 • 14:15
Two-Photon Fiberscope of a Large Field of View for Exploring Neurons Responsive to Specific Behavior in Freely-Behaving Mice, Haolin Zhang[1], Yuehan Liu[1], Hyeon-Cheol Park[1], Zhenyu Lu[1], Ming-Jun Li[2], Hui Lu[3], Xingde Li[1]; *[1]Johns Hopkins Univ., USA; [2]Corning Incorporated, USA; [3]George Washington Univ., USA.* We developed a large field-of-view (FOV) two-photon fiberscope for identifying turn-responsive neurons in freely-behaving mice. The expansive FOV significantly advances our understanding of neural dynamics during turning behaviors, making it a vital tool in neuroscience research.

BM3C.6 • 14:30
Micro-Camera Arrays for Ultra-Widefield, Multi-Site Cellular Resolution Calcium Imaging Across the Dorsal Cortex of Behaving Mice., Arun Cherkkil[1], Jia Hu[1], Ibrahim Oladepo[1], Skylar Fausner[2], Daniel Surinach[1], Ryan Peters[1], Kapil Saxena[1], Roarke Horstmeyer[2], Suhasa B. Kodandaramaiah[1]; *[1]Univ. of Minnesota, USA; [2]Biomedical Engineering, Duke Univ., USA.* Here, we introduce a miniaturized multi camera microscope that can simultaneously capture cellular resolution neural activity from multiple large fields of view of the cortex in a freely moving mouse.

BM3C.7 • 14:45
MiCe-µScope to Conduct Hyperscanning Experiment in Awake Freely Moving Animals, Jessica Lucchesi[1], Alessandro Scaglione[1,2], Giovanni Barbera[3], Alessia Mazzucato[1,2], Anna Letizia Allegra Mascaro[1,4], Da-Ting Lin[3,5], Francesco S. Pavone[1,6]; *[1]LENS - European Laboratory for Non-Linear Spectroscopy, Italy; [2]Department of Physics and Astronomy, Univ. of Florence, Italy; [3]Intramural Research, Program National Inst. on Drug Abuse, National Inst. of Health, USA; [4]Neuroscience Inst., CNR - National Research Council, Italy; [5]The Solomon H. Snyder Department of Neuroscience, Johns Hopkins Univ. School of Medicine, USA; [6]National Inst. of Optics, National Research Council, Italy.* We introduce the "MiCe-µScope", a miniaturized head-mounted optical system designed for large-scale imaging of both hemispheres on the intact skull. It is capable of recording fluorescence and reflectance signals in awake freely moving mice.

13:00 -- 14:30
Room: Las Olas I, II, V, VI
CM3E • Contrast Enhancement in OCT Imaging
Presider: Robert Zawadzki; Univ. of California Davis, USA

CM3E.1 • 13:00 (Invited)
Combining Spectral Domain and Full Field Optical Coherence Tomography for Macro-to-Micro in Vitro Imaging, Salvatore Azzollini[1], Tual Monfort[1], Nate Norberg[1], Olivier Thouvenin[2], Kate Grieve[1,3]; *[1]Vision Inst., Sorbonne Univ., France; [2]Institut Langevin, France; [3]CHNO des Quinze-Vingts, France.* We present a novel approach combining dynamic spectral domain and

dynamic full field OCT coupled to a commercial microscope. We show the custom-made setup built and we introduce the possible applications in high content screening.

CM3E.2 • 13:30

Mueller Matrix Decomposition for Polarization-Sensitive Optical Coherence Tomography, Martin Villiger[1], Georgia Jones[1], Norman Lippok[1], Brett Bouma[1]; *[1]Wellman Center for Photomedicine, USA.* Fully polarized, coherent measurements offer insight into depolarization effects through incoherent ensemble averaging. Here, we present a framework for Mueller matrix decomposition that preserves the intrinsic symmetry present in measurements performed in the backscattering direction.

CM3E.3 • 13:45

Developing Methods for Characterizing Nuclear Signatures of Colon Polyps via Spectroscopic Optical Coherence Tomography, Erin O'Kane[1], Wan Wang[1], Robert E. Highland[1], David Miller[1], Adam Wax[1]; *[1]Duke Univ., USA.* We propose the use of spectroscopic OCT to characterize nuclear signatures of colon polyps *ex vivo* for early colorectal cancer detection. We justify using SOCT by accurately measuring the size of 4.78 µm polystyrene beads.

CM3E.4 • 14:00 (Invited)

Wide-Field and High-Resolution OCTA of Rodent Retinas, Yali Jia[1]; *[1]Oregon Health and Science Univ., USA.* A wide-field and high-resolution OCT system and a high-sensitive OCTA algorithm will be introduced and demonstrated on oxygen-induced retinopathy rats and age-matched healthy controls.

13:00 -- 15:00
Room: Bonnet
MM3A • Computational and Machine Learning Advances I
Presider: Kivanc Kose; Memorial Sloan Kettering Cancer Center, USA

MM3A.1 • 13:00 (Invited)

Integration of AI in Clinical Practice: Trustworthy Automation in Disease Marker Quantification, Ahmed Abdulkadir[1,2]; *[1]Centre for Artificial Intelligence, ZHAW School of Engineering Winterthur, Switzerland; [2]Univ. Hospital of Old Age Psychiatry and Psychotherapy, Univ. of Bern (UPD), Switzerland.* This talk explores the challenges of integrating artificial intelligence into clinical settings and presents an example of embedding the quantification of disease markers into clinical processes, ensuring the automated process is verifiable, without disrupting existing workflows.

MM3A.2 • 13:30

Automatic Detection of Prostate Cancer via 3D Microscopy and Deep Learning, Robert B. Serafin[1], Rui Wang[1], Sarah Chow[1], Kevin Bishop[1], Elena Baraznenok[1], Lydia Lan[1], Lawrence D. True[1], Jonathan T. Liu[1]; *[1]Univ. of Washington, USA.* We present an annotation free deep-learning-assisted segmentation pipeline to automatically identify healthy and malignant glands in 3D microscopy images of prostate biopsies stained with fluorescent analogs of H&E.

MM3A.3 • 13:45

Direct 3D Segmentation for Prostate Cancer Gland Analysis With nnU-Net, Rui Wang[1], Sarah S. Chow[1], Robert Serafin[1], Jonathan T. Liu[1]; [1]*Univ. of Washington, USA.* A deep learning-model based on the nnU-Net framework was trained for 3D prostate gland segmentation. Compared to our previous ITAS3D pipeline, nnU-Net operation is simpler, faster, and can maintain good accuracy with lower-resolution inputs.

MM3A.4 • 14:00

Deep-Learning Triage of 3D Pathology Data for Improved Disease Detection While Reducing Pathologist Workloads, Gan Gao[1], Fiona Wang[1,2], David Brenes[1], Andrew Song[3,4], Sarah Chow[1], Faisal Mahmood[3,4], Jonathan T. Liu[1,5]; [1]*Department of Mechanical Engineering, Univ. of Washington, USA;* [2]*Department of Computer Science, Univ. of Washington, USA;* [3]*Department of Pathology, Brigham and Women's Hospital, USA;* [4]*Department of Pathology, Massachusetts General Hospital, USA;* [5]*Department of Bioengineering, Univ. of Washington, USA.* 3D pathology can potentially improve disease detection, but the datasets are too large to review. We're developing a deep-learning-based triage method to identify the highest-risk 2D sections within 3D pathology datasets for rapid pathologist review.

MM3A.5 • 14:15

Contrastive Deep Encoding Enables Uncertainty-Aware Machine-Learning-Assisted Histopathology, Dushan N. Wadduwage[1]; [1]*Harvard Univ., USA.* Neural networks can learn features from millions of histopathology images. However, curating high-quality annotations for training is laborious. In this work, we show how such models can be trained with only 1-10% of annotated data.

MM3A.6 • 14:30

Deep Neural Network-Based Classification of Spectrally Encoded Confocal Microscopy Images of Breast Cancer Tissue, Ameer Nessaee[3], Kivanc Kose[1], Elena Brachtel[2], DongKyun Kang[4,5]; [1]*Dermatology Service, Memorial Sloan Kettering Cancer Center, USA;* [2]*Department of Pathology, Thomas Jefferson Univ., USA;* [3]*Department of Electrical and Computer Engineering, Univ. of Arizona, USA;* [4]*James C. Wyant College of Optical Sciences, Univ. of Arizona, USA;* [5]*Department of Biomedical Engineering, Univ. of Arizona, USA.* Spectrally Encoded Confocal Microscopy (SECM) previously demonstrated the ability to visualize cellular features of malignant breast tissues. In this paper, we developed a deep neural network-based method for automatically classifying SECM breast images.

MM3A.7 • 14:45

Organelle Topology Profiling of Metastatic Cancer Cells Using Machine Learning Classification, Margarida Barroso[1], Fatma Awadalla[1], Dancan Oruko[1], Joshua Goldwag[1], Kailie Matteson[2], Jose Javier Bravo-cordero[2], Harrison Yee[3], Xavier Intes[3], Uwe Kruger[3], John Lamar[1]; [1]*Molecular and Cellular Physiology, Albany Medical College, USA;* [2]*Division of Hematology and Oncology, Department of Medicine, Icahn School of Medicine at Mount Sinai, USA;* [3]*Department of Biomedical Engineering, Rensselaer Polytechnic Inst., USA.* Organelle Topology-based Cell Classification Pipeline can discriminate between metastatic cell lines with very high accuracy (>90%) using mitochondria or endosome immunolabeling, confocal microscopy and 3D rendering followed by several machine learning classifiers.

13:00 -- 15:00
Room: Las Olas IV
OM3D • Diffuse Optics in Brain
Presider: Stefan Carp; Massachusetts General Hospital, USA

OM3D.1 • 13:00 (Invited)
Open-Source FlexNIRS: Current Applications and the Latest Developments of a Low-Cost Wireless Wearable Cerebral Oximeter, Kuan Cheng Wu[1], Marco Renna[1], John Sunwoo[1], Alyssa Martin[1], Zachary Starkweather[1], Mitchell Robinson[1], Mehrdad Dadgostar[1], Zahra Einalou[1], Stefan Carp[1], David Salat[1], Maria Angela Franceschini[1]; *[1]Massachusetts General Hospital, Athinoula A. Martinos Center for Biomedical Imaging, USA.* The second generation FlexNIRS provides a 266 Hz sampling rate and hardware modifications for better form factor, wearability, and multi-modal acquisition. It is currently adopted in multiple clinical measurement campaigns focusing on pulsatile component analysis.

OM3D.2 • 13:30
Hematocrit Correction for Diffuse Optical Monitoring of Cerebral Blood Flow and Oxygen Metabolism During Cardiopulmonary Bypass, Arjun G. Yodh[2], Emilie J. Benson[2,1], Danielle I. Aronowitz[1], Rodrigo M. Forti[1], Alec Lafontant[1], Nicolina Ranieri[1,3], Jonathan P. Starr[1], Richard W. Melchior[1], Alistair Lewis[1,2], Jharna Jahnavi[1], Jake Breimann[1], Bohyun Yun[1], Gerard H. Laurent[1], Jennifer Lynch[1], Brian R. White[1], J. W. Gaynor[1], Daniel J. Licht[1], Todd J. Kilbaugh[1], Constantine Mavroudis[1], Wesley Baker[1], Tiffany Ko[1]; *[1]Children's Hospital of Philadelphia, USA; [2]Univ. of Pennsylvania, USA; [3]Drexel Univ., USA.* We demonstrate theoretical methods to correct diffuse correlation spectroscopy estimation of cerebral blood flow for hematocrit variation in a study of neonatal swine during cardiopulmonary bypass.

OM3D.3 • 13:45
Noninvasive Cerebral Blood Flow Sensing in Humans in Vivo Using Spatial Correlations in Parallel Near-Infrared Spectroscopy, Klaudia Nowacka[1], Saeed Samaei[2], Michal Dabrowski[1], Dawid Borycki[1]; *[1]Inst. of Physical Chemistry PAS, Poland; [2]Nalecz Inst. od Biocybernetics and Biomedical Engineering, Poland.* Optical methods enable noninvasive cerebral blood flow monitoring. Our study proposes a novel approach using continuous-wave parallel interferometric near-infrared spectroscopy, decoding blood flow through speckle contrast. This streamlined method enhances feasibility by minimizing data processing while maintaining accuracy.

OM3D.4 • 14:00
Investigating Cerebral Biomarkers of Neonates in Risky Periods of Cardiac Repair Surgery With Diffuse Optical Monitor, Osman Melih Can[1], Nishigandha Patil[1], Georgina Tresanchez[1], Debora C. Vazquez[2], Cristina Ruiz Herguido[2], Alba Rivas[2], Anurag Behera[1], Jonas B. Fischer[1], Lisa Kobayashi Frisk[1], Muhammad A. Yaqub[1], Marta Camprubí[2], Joan Sanchez S. de Toledo[2], Turgut Durduran[1,3]; *[1]ICFO, Spain; [2]FSJD, Spain; [3]ICREA, Spain.* Hybrid diffuse optics was utilized to monitor infants born with severe congenital heart defects during cardiac surgery. We have characterized the cerebral hemodynamics and oxygen metabolism during the cannulation and the initiation of the cardiopulmonary bypass (CPB).

OM3D.5 • 14:15

Non-Invasive, Cerebral Blood Volume Measurements During Sleep: Toward Naturalistic Measurements of Glymphatic Flux, Nikola Otic[2,1], Marco Renna[1], Laura Lewis[3,1], Maria Angela Franceschini[1], Mitchell B. Robinson[1]; *[1]Massachusetts General Hospital, USA; [2]Biomedical Engineering, Boston Univ., USA; [3]Electrical Engineering and Computer Science, Inst. for Medical Engineering and Sciences, Massachusetts Inst. of Technology, USA.* The hemodynamic sources of glymphatic flow are typically measured using MRI. In this work, we demonstrate the feasibility of measuring cerebral hemodynamics through NIRS toward the goal of estimating glymphatic flux in a naturalistic setting.

OM3D.6 • 14:30

Effect of Neural Source Depth on Diffuse Optical Tomography Enhanced Electroencephalography Reconstruction, Yutian Qin[1], Jingyi Wu[1], Eli Bulger[1], Jiaming Cao[2], Hamid Dehghani[2], Barbara Shinn-Cunningham[1,3], Jana M. Kainerstorfer[1,3]; *[1]Department of Biomedical Engineering, Carnegie Mellon Univ., USA; [2]School of Computer Science, Univ. of Birmingham, UK; [3]Neuroscience Inst., Carnegie Mellon Univ., USA.* DOT-enhanced EEG localization has high spatiotemporal resolution but the resolution decreases for deep neural sources. We analyzed the reconstruction of neural sources at different depths.

OM3D.7 • 14:45

MCX-LLM: an Experiment in Bridging Natural Language Problem Descriptions With Quantitative Scientific Simulations, Fan-Yu Yen[1], Qianqian Fang[1]; *[1]Northeastern Univ., USA.* We explored large language models (LLM) in converting natural language descriptions into machine-readable inputs to run Monte Carlo simulations. Albeit limited success, LLM shows the potential to simplify scientific software interfaces.

13:00 -- 15:00
Room: Rio Vista
TM3B • Biophotonics in the Clinic I
Presider: Ioan Notingher; Univ. of Nottingham, UK

TM3B.1 • 13:00 (Invited)

Clinical Translation of Autofluorescence-Raman Spectroscopy Device for Intra-Operative Detection of Residual Basal Cell Carcinoma During Mohs Micrographic Surgery, Radu Boitor[1], Sandeep Varma[2], Hywel Williams[3], Ioan Notingher[1]; *[1]Univ. of Nottingham, UK; [2]NUH Nottingham Treatment Centre, UK; [3]Centre for Evidence Based Dermatology, UK.* An autofluorescence-Raman spectroscopy-based prototype device was developed and utilised to detect basal cell carcinoma on the margins of skin specimens removed via surgery. This lecture will present the clinical integration of the device and results obtained intra-operatively.

TM3B.2 • 13:30

Colorectal Polyp Assessment With Label-Free Fluorescence Lifetime Imaging, Alba Alfonso Garcia[1], Lisanne Kraft[1], Xiangnan Zhou[1], Julien Bec[1], Laura Marcu[1], Dongguang Wei[1], Shiro Urayama[1], Asha Cogdill[1]; *[1]Univ. of California Davis, USA.* Standard colonoscopy fails to distinguish malignant from benign colorectal tissue in real-time. Colonoscopy-compatible label-

free fluorescence lifetime imaging (FLIm) in 15 patients identified malignant lesions, encouraging a non-invasive screening method for colorectal cancer.

TM3B.3 • 13:45
Endoscopic Photon Time-of-Flight System for Monitoring Chemotherapy Response, Hasti Yavari[1], Suraj Kumar Kothuri[1]; *[1]Tyndall National Inst., Ireland.* We present a hybrid micro-camera time of flight endoscopy system to assess tumor response both at superficial and deep below the mucosa layer. System design and preliminary results are presented.

TM3B.4 • 14:00
Low-Frequency Oscillations in Cerebral Macro- and Microvascular Perfusion, Oxygenation, and Metabolism in Mild-Cognitive Impairment Patients During Stroop Task, Farah Kamar[1,2], Daniel Milej[1,2], Rasa Eskandari[1,2], Laura K. Fitzgibbon-Collins[3,4], Jaspreet Bhangu[3], J. Kevin Shoemaker[4,5], Keith St. Lawrence[1,2], Leena N. Shoemaker[1,2]; *[1]Department of Medical Biophysics, Western Univ., Canada; [2]Imaging Program, Lawson Health Research Inst., Canada; [3]Department of Medicine, Western Univ., Canada; [4]School of Kinesiology, Western Univ., Canada; [5]Department of Physiology and Pharmacology, Western Univ., Canada.* Low-frequency oscillations, reflecting neurogenic and myogenic regulation of cerebral vasculature in mild cognitive impairment and cognitively normal participants were recorded with transcranial Doppler, time-resolved near-infrared spectroscopy, and diffuse correlation spectroscopy.

TM3B.5 • 14:15
Real-Time, in-Vivo, Volumetric Skin Imaging Using Quantitative Oblique Back-Illumination Microscopy, Srinidhi Bharadwaj[1,2], Zhe Guang[1], Zhenmin Li[1], Paloma Casteleiro Costa[1], Richard Chen[2], Francisco E. Robles[1]; *[1]Wallace H. Coulter Department of Biomedical Engineering, Georgia Inst. of Technology, USA; [2]Department of Medicine, Emory Univ. School of Medicine, USA.* Currently, dermatologic diagnosis requires lengthy histopathologic analysis, elongating a patient's time to diagnosis. We present quantitative oblique back-illumination microscopy (qOBM) as a label-free, low-cost, compact solution providing real-time epidermal diagnostic information at the dermatologist's bedside.

TM3B.6 • 14:30
Enhancing Computer-Aided Detection of Breast Lesions Using Multi-Modal Fusion With Prior-Guided Diffuse Optical Tomography, Gloria Singleton[1], Edward Xu[1], Qianqian Fang[1]; *[1]Northeastern Univ., USA.* We report a multi-modal approach for automatically detecting breast lesions, evaluating regions of suspicion generated by computer-aided detection algorithms for x-ray mammography using tumor-prior-guided optical reconstructions for enhanced risk-assessment of breast mammograms.

TM3B.7 • 14:45
Monitoring Cerebral Autoregulation and Hemodynamics Over the Evolution of Cerebral Edema in Patients With Intracerebral Hemorrhage., Jacqueline Martínez García[1], Ana Aguilera-Simón[2], Pol Camps-Renom[2], Garbiñe Ezcurra[2], Carolina Fajardo Vega[1], Jonas B. Fischer[1], Cristina Gallego-Fabrega[2], Marina Guasch-Jiménez[2], Marta Izura-Gómez[2], Lisa Kobayashi-Frisk[1], Álvaro Lambea-Gil[2], Rebeca Marín-Bueno[2], Alejandro Martínez-Domeño[2], Indalecio Morán-Chorro[2], Luis Prats-Sánchez[2], Anna Ramos-Pachón[2], Juan José Sánchez-

Fernández[2], Marta Zanoletti[1], Joan Martí-Fabregas[2], Turgut Durduran[1,3]; *[1]ICFO - The Inst. of Photonic Science, Spain; [2]Hospital de la Santa Creu i Sant Pau, Spain; [3]Institució Catalana de Recerca i Estudis Avançats (ICREA), Spain.* Chronological and evolutive study of the impact of perihematomal edema in patients with intracerebral hemorrhage using a hybrid diffuse optical device combining DCS and TD-NIRS.

15:00 -- 16:30
Room: Atlantic Ballroom
JM4A • Joint Poster Session II

JM4A.1
Wide-Field Optical Imaging of Astrocyte and Neural Dynamics Using Complex Principal Components Analysis, Harrison N. Watters[1], Shella Keilholz[1]; *[1]Emory Univ., USA.* The neural correlates of dynamic spatiotemporal patterns of brain activity are poorly understood. In this study, we compare dynamic activity of astrocytes and excitatory cortical neurons using complex principal components analysis.

JM4A.2
Peripheral Hemodynamic Correlation Changes in Mice With Vascular Calcification Using NIRS Imaging Approach, Aasma Dahal[1], Daniela Leizaola[1], Faiza Nazir[1], Valentina Dargam[1], Joshua Hutcheson[1], Anuradha Godavarty[1]; *[1]Florida International Univ., USA.* Hemodynamic correlation maps were obtained from the murine tail using NIRS imaging approach in response to vascular occlusion. These correlation maps differed in mice with chronic kidney disease(CKD) from those with CKD-induced vascular calcification.

JM4A.3
Silicon Photonics MEMS Platform-Based Optomechanical Ultrasound Sensor Array for 3D Photoacoustic Deep Brain Region Imaging, Sangwoo Nam[1], Dongju Choi[1], Sangyoon Han[1], Jaesok Yu[1]; *[1]Robotics and Mechatronics Engineering, DGIST, Korea (the Republic of).* We propose a silicon photonic optomechanical ultrasound sensor array for 3D photoacoustic imaging of a mouse brain's deep region. The performance evaluation and 3D photoacoustic in-vitro imaging were conducted for the feasibility study.

JM4A.4
Visualizing Age-Related Lipid Metabolic Changes: a Multimodal Microscopy Exploration of Senolytic Drug Effects, Yu Ping[1], Zhi Li[1], Sahran Hussain[1], Yajuan Li[1], Mary Li[1], Hongje Jang[1], Lingyan Shi[1]; *[1]UCSD, USA.* Aging-related senescent cell accumulation, targeted by senolytics like Dasatinib and Quercetin, was studied using multimodal bioorthogonal metabolic imaging microscopy in Drosophila. Results show these drugs restore lipid metabolism in aged flies, indicating improved healthspan.

JM4A.5
Early Caries Enamel Detection Through Dual-Spectrometer Raman Polarized System, Fang Chen[1], Shan Yang[1]; *[1]Jackson State Univ., USA.* Investigating dental hard tissues, we designed a dual-spectrometer Raman polarized system with CCD and InGaAs

detectors. This innovative tool assesses enamel properties, aiding early caries detection and linking them to dental issues.

JM4A.6
Functional Connectivity Changes in Mouse Models of Maple Syrup Urine Disease, Sarah Lavery[1], Temilola Adepoju[1], Hayden B. Fisher[1], Claudia Chan[1], Aurora Yuan[1], Amanda Kuhs[2], Rebecca C. Ahrens-Nicklas[2], Brian R. White[1]; *[1]Division of Cardiology, Department of Pediatrics, The Children's Hospital of Philadelphia, USA; [2]Division of Human Genetics, Department of Pediatrics, The Children's Hospital of Philadelphia, USA.* Using optical intrinsic signaling, we investigated resting state functional connectivity in mouse models of Maple Syrup Urine Disease before and after experimental metabolic crisis. We observed significant changes between control and experimental groups.

JM4A.7
Monitoring Changes in Biomolecules of HIV-Infected TzMBL Cells Using Raman Microscopy., Setumo Lebogang Thobakgale[1], Luleka Mngwengwe[1], Zenande Mcotshana[1], Moratoa Tlomatsane[1], Lungile Thwala[1], Patience Mthunzi-Kufa[1]; *[1]Biophotonics, CSIR, South Africa.* HIV remains one of the leading causes of secondary illness throughout the years. We present in depth analysis of changes in proteins, nucleic acids and fatty acids of HIV infected cells using Raman Microscopy.

JM4A.8
Improved Sensitivity and Imaging Speeds of Fluorescent Imaging Using Silicon Photomultipliers, Michael G. Giacomelli[1]; *[1]Univ. of Rochester, USA.* Photomultiplier tubes (PMTs) are the standard for high sensitivity detection of fluorescence signals, but are costly, fragile, and have limited quantum efficiency. Newer detectors based on silicon photomultiplier (SiPM) technology can greatly improve sensitivity and imaging rates.

JM4A.9
A Comprehensive Model of Depth-Resolved Polarization Gating Imaging, Julien Fade[1], Valentin Espinas[1], Julien Wojak[1], Jana El Zaher[1], Laure Siozade[1], Carole Deumié[1], Anabela Da Silva[1]; *[1]Aix Marseille Univ, CNRS, Centrale Marseille, Institut Fresnel, France.* A simplified Mueller Matrix decomposition model is proposed to describe depth probing of biological tissues using wide-field polarization gating. The model, with elliptically polarized light, facilitates quantitative retrieval of polarization-maintained contributions in gated image measurements amid multiple scattering.

JM4A.10
In Vivo Localization of a Breast Cancer Targeting Molecular Probe for Fluorescence Imaging and Photodynamic Therapy, Zihao Li[1], Anakin de la Cruz Flecha[1], JT Lapham[2], Christopher DeNyse[2], Shannon Fung[1], Elaina Stafford[2], Regine Choe[1], Hans F. Schmitthenner[2], Timothy M. Baran[1]; *[1]Univ. of Rochester, USA; [2]Rochester Inst. of Technology, USA.* We introduce a peptide-based targeted molecular imaging probe for breast cancer imaging and photodynamic therapy treatment. This work presents results of *in vitro* and *in vivo* localization of the probe relative to an untargeted fluorophore.

JM4A.11

Prostate Cancer Risk Stratification via 3D Pathology With Deep Learning-Assisted Nerve and Vessel Analysis, Sarah Chow[1], Robert Serafin[1], Rui Wang[1], Weisi Xie[1], Jonathan T. Liu[1,2]; *[1]Department of Mechanical Engineering, Univ. of Washington, USA; [2]Department of Laboratory Medicine & Pathology, Univ. of Washington, USA.* We implement a 3D segmentation workflow on volumetric prostate cancer datasets that involves training a deep learning model to generate synthetic immunofluorescence images highlighting vessels or nerves. The 3D analysis of prostate cancer cells in relation to vessels and nerves is being explored for patient risk assessment.

JM4A.12

Deep Learning-Based Automated Cell Viability Measurement in Tissue Scaffold Using OCT, Meijie Shi[1], Jiaying Wang[1], Xiaojun Yu[1], Yu Gan[1]; *[1]Stevens Inst. of Technology, USA.* We proposed a deep learning-based approach to analyze cell viability from tissue scaffold images obtained from optical coherence tomography. Experimental results demonstrated the distinct viability patterns between active and dead cells and 3D visualization of cell distribution.

JM4A.13

Auto-Calibrated Method Recovers Absolute Optical Properties of Turbid Media in a Cuvette Geometry, Giles P. Blaney[1], Angelo Sassaroli[1], Jodee Frias[1], Fatemeh Tavakoli[1], Sergio Fantini[1]; *[1]Tufts Univ., USA.* Measuring scattering samples' absolute optical properties (absorption and reduced scattering coefficients) is valuable in bio-medicine and beyond. This work presents experimental results recovering these properties in a standard cuvette volume with less than 3% error.

JM4A.14

Computational Model for Blood Pressure Estimation Using Pulse Wave Transit Time, Haruka Mizuno[1], Tohko Tabuchi[1], Mikie Nakabayashi[1], Masashi Ichinose[2], Yumie Ono[3]; *[1]Graduate School of Science and Technology, Meiji Univ., Japan; [2]Human Interactive Physiology Laboratory, School of Business Administration, Meiji Univ., Japan; [3]Department of Electronics and Bioinformatics, School of Science and Technology, Meiji Univ., Japan.* The squared value of pulse transit time data measured between two photoplethysmography sensors placed on the upper limb showed a potential for non-invasive, cuff-less, and continuous blood pressure estimation.

JM4A.15

Simulation of UV-Visible Photoacoustic Imaging Using Metalenses, Byullee Park[1]; *[1]Biophysics, Sungkyunkwan Univ., Korea (the Republic of).* High numerical aperture and micron-thick metal lenses solve the challenges of ultraviolet-visible photoacoustic microscopy, enabling simultaneous imaging of cellular DNA/RNA and blood vessels. Our simulation results show that these lenses hold promise for miniaturization for the advancement of portable photoacoustic microscopy.

JM4A.16

Assessing Image Reproducibility in Free-Form Raster Scan FdNIRS Imaging, Gerardo A. Silva-Oelker[1], Roy Stillwell[1], Eric Sheeder[1], Lyla Senn[1], Adam Longoria[1], Thomas D.

O'Sullivan[2]; [1]*NearWave, Chile;* [2]*Electrical Engineering, Univ. of Notre Dame, USA.* This study develops reliable and reproducible imaging practices using a free-form raster scan based on fdNIRS. We propose a study and investigate the reproducibility of images, finding a minimum correlation coefficient of 0.789 between scans.

JM4A.17
Multidimensional Compressive Microscopy, Andrea Farina[1], Alberto Ghezzi[2], Armin M. Lenz[3], Fernando Soldevila[4], Enrique Tajahuerce[3], Vito Vurro[5], Cosimo D'Andrea[2,6]; [1]*Consiglio Nazionale delle Ricerche, Italy;* [2]*Dip. di Fisica, Politecnico di Milano, Italy;* [3]*Inst. of New Imaging Technologies (INIT), Universitat Jaume I (UJI), Spain;* [4]*Laboratoire Kastler Brossel, ENS-Université PSL, CNRS, Sorbonne Université, College de France, France;* [5]*Dipartimento di Fisica e Astronomia, Università di Bologna, Italy;* [6]*Center for Nano Science and Technology, Istituto Italiano di Tecnologia, Italy.* A system for multispectral lifetime imaging based on single-pixel camera and compressed-sensing is presented together with two algorithms devoted to the improvement of the spatial resolution and the global reconstruction time

JM4A.18
In-Process Monitoring of Bioreactors via Diffuse Optical Tomography With Genetically Encoded Fluorescent Tags, Jon Gorecki[1], Jiaming Cao[2], Chileab Redwood Sawyerr[1], Rowan Lindeque[1], Karen Polizzi[1], Cleo Kontoravdi[1], Hamid Dehghani[2], Christopher Rowlands[1]; [1]*Imperial College London, UK;* [2]*Univ. of Birmingham, UK.* Here we propose to use fluorescent tags which are genetically modified to respond to various cell stimuli, such as lactate concentration, in combination with diffuse optical tomography to reconstruct 3D maps of in-situ cell behavior.

JM4A.19
Label-Free Imaging With Photonic Crystal Surface for Hematopoietic Stem Cell Differentiation, Yue Zhuo[1,2], Ji Sun Choi[3], Thibault Marin[1], Hojeong Yu[1,4], Brendan A. Harley[3], Brian Cunningham[2,4]; [1]*Department of Radiology, Massachusetts General Hospital and Harvard Medical School, USA;* [2]*Department of Bioengineering, Univ. of Illinois at Urbana-Champaign, USA;* [3]*Department of Chemical and Biomolecular Engineering, Univ. of Illinois at Urbana-Champaign, USA;* [4]*Department of Electrical and Computer Engineering, Univ. of Illinois at Urbana-Champaign, USA.* With the Photonic Resonator Outcoupler Microscopy (PROM), it is possible to detect and monitor weak-adhesive HSC adhesion without labeling. These findings indicate that PROM can be used to quantitatively and dynamically study HSC adhesion.

JM4A.20
Muscle Hemodynamic and Metabolic Response to Blood Flow Restriction, Manish Verma[1], Umut Karadeniz[1], Muhammad A. Yaqub[1], Blai Ferrer-Uris[2], Albert Busquets[2], Nathan Mbuyamba[2], Sjors Arnold[2], Raquel Martínez-Reviejo[2], Turgut Durduran[1,3]; [1]*ICFO- The Inst. of Photonic Sciences, Spain;* [2]*Institut Nacional d'Educació Física de Catalunya (INEFC), Spain;* [3]*Institució Catalana de Recerca i Estudis Avançats (ICREA), Spain.* Hybrid diffuse optical measurements on the calf muscle during different levels of blood flow restriction is presented.

JM4A.21

Rapid Characterization of Single Bioaerosol Particles by Differential Circular Polarization, Yongle Pan[1], Aimable Kalume[1], Joshua Santarpia[2]; *[1]DEVCOM Army Research Laboratory, USA; [2]Global Center for Health Security, Univ. of Nebraska Medical Center, USA.* An innovative method was developed to record the phase functions of circular intensity differential scattering from individual single flowing through micron size particles, it has the ability to rapidly detect and characterize bioaerosol particles, such s cells.

JM4A.22

FastMOT: Enabling Multi-Functional Deep Body Imaging With Time-Domain Diffuse Optical Tomography, Laura Di Sieno[1], Antonio Pifferi[1], Alberto Dalla Mora[1], Turgut Durduran[2], Ilias Tachtsidis[3], Iman Esmaeil Zadeh[4], Ramona Landgraf[5], Marina Fischer[5], Daniela Stozno[5], Sander Dorenbos[6], Martin Caldarola[6]; *[1]Politecnico di Milano, Italy; [2]Institut de Ciències Fotòniques, Spain; [3]Department of Medical Physics and Biomedical Engineering, Univ. College London, UK; [4]Department of Imaging Physics, Technische Universiteit Delft, Netherlands; [5]LASERLAB-EUROPE AISBL, Belgium; [6]Single Quantum B.V., Netherlands.* The fastMOT consortium is developing a multifunctional diffuse optical tomograph to enable deep body imaging by expanding the capabilities of superconducting nanowires devising a fast-gated kilopixel detector that will be the tomograph's core.

JM4A.23

High Throughput Evanescent-Wave Biosensor for the Early-Stage Detection of Biomarkers in Liquid Biopsies, Caterina Dallari[1,2], Laura Perego[2,1], Lucia Gardini[3,1], Chiara Falciani[4], Caterina Credi[3,1], Francesco S. Pavone[2,1]; *[1]European Laboratory for Non-Linear Spectroscopy, Italy; [2]Physics, Univ. of Florence, Italy; [3]National Council of Research (CNR-INO), Italy; [4]Department of Medical Biotechnology, Univ. of Siena, Italy.* Innovative liquid biopsy technologies, exploiting total internal reflection spectroscopy, enable highly sensitive biomarkers detection. A compact, low-cost microscope exhibiting impressive detection limits and reproducibility was built, making it a promising diagnostic tool for real-time disease monitoring, applicable to human biofluids.

JM4A.24

Back-Propagation Neural Network-Based Guidance Algorithm for Photo-Magnetic Imaging, Maha Algarawi[2,1], Janaki S. Saraswatula[1], Gyanesh Shah[1], Rajas R. Pathare[1], Hakan Erkol[4], Gultekin Gulsen[1,3], Farouk Nouizi[1,3]; *[1]Radiological Sciences, Univ. of California Irvine, USA; [2]Department of Physics, Imam Mohammad Ibn Saud Islamic Univ., Saudi Arabia; [3]Chao Family Comprehensive Cancer Center, USA; [4]Department of Physics, Bogazici Univ., Turkey.* We present an AI-based method to directly detect tumor boundaries from MRT maps and use them as soft-a-priori in the standard PMI algorithm. Evaluation on phantoms demonstrates a nine-fold image reconstruction acceleration, reducing artifacts by 15%, absorption reconstruction error ~2%.

JM4A.25

Non-Invasive Cerebral Hemodynamic Monitoring in a Porcine Cardiac Arrest Model, Shakeeb Habash[1], Ailis Muldoon[1], Dibbyan Mazumder[1], Mitchell B. Robinson[1], Bryce Carr[1], Ki-Tae Jung[2], Bonsung Koo[2], Ekaterina Creed[2], Kichang Lee[2], Michael Silverman[2],

Stefan Carp[1]; [1]*Athinoula A. Martinos Center for Biomedical Imaging, USA;* [2]*Massachusetts General Hospital, USA.* Non-invasive optical monitoring holds potential for assessing cerebral hemodynamics post-cardiac arrest, as shown in a porcine cardiac arrest model, highlighting its potential to enhance patient care and outcomes.

JM4A.26

Towards High-Quality Fluorescence DOT (FDOT) Reconstruction of Bioreactors Using UNet, Jiaming Cao[1], Jon Gorecki[2], Christopher Rowlands[2], Hamid Dehghani[1]; [1]*Univ. of Birmingham, UK;* [2]*Imperial College London, UK.* A two-step fDOT reconstruction algorithm is developed where classical reconstruction is followed by UNet-based artifact removal. The approach is evaluated for improved quantitative accuracy as applied for high-quality cell growth monitoring within bioreactors.

JM4A.27

Long-Term Monitoring of an Aneurysmal Subarachnoid Hemorrhage Patient Using Diffuse Correlation Spectroscopy, Ailis Muldoon[1], Mitchell B. Robinson[1,2], Shakeeb Habash[1], Joanna Yang[3], John Sunwoo[1], Justin Gelman[2], Andrew Webb[3], Eric Rosenthal[3,2], Maria Angela Franceschini[1,2], David Chung[3,2], Stefan Carp[1,2]; [1]*Athinoula A. Martinos Center for Biomedical Imaging, Massachusetts General Hospital, USA;* [2]*Harvard Medical School, USA;* [3]*Division of Neurocritical Care, Department of Neurology, Massachusetts General Hospital, USA.* We present a case study for long-term DCS monitoring of an SAH patient. This case study demonstrates that DCS is suitable for continuous bedside monitoring and that MAP is a poor marker of cerebral perfusion.

JM4A.28

FREEnet: a Dynamic Deep-Learning Model for Freehand Diffuse Optical Tomography, Robin B. Dale[1], Thomas D. O'Sullivan[2], Hamid Dehghani[1]; [1]*Univ. of Birmingham, UK;* [2]*Univ. of Notre Dame, USA.* A deep-learning (DL) model for handheld diffuse optical tomography is presented. The fully convolutional network can reconstruct 3D absorption and scattering from arbitrarily undersampled scan data at a rate of 18.5Hz, enabling real-time imaging.

JM4A.29

Predicting Cerebral Partial Pathlength and Absorption Changes Using a Deep Learning Model: a Phantom Study, Jingyi Wu[1], Jiachen Dou[1], Jana M. Kainerstorfer[1]; [1]*Carnegie Mellon Univ., USA.* We trained a deep learning model for predicting partial-pathlength and absorption changes in the brain. Evaluation on two-layer phantom experiments demonstrated the model's efficacy in determining the partial-pathlength and absorption changes in the bottom layer.

JM4A.30

Increasing Acquisition Speed and Spatial Resolution in Optically Super-Resolved Infrared Imaging Micro-Spectroscopy (OSIRIS), Robert Furstenberg[1], Tyler Huffman[1], Chris A. Kendziora[1], R. Andrew McGill[1]; [1]*U.S. Naval Research Laboratory, USA.* We are developing a novel infrared microscopy technique for label-free chemical imaging and tomography with high spatial resolution (~100 nm). We explore means to increase speed and resolution by exploiting temporal and spatial information.

JM4A.31

Time of Flight Improves Depth Sampling While Reducing Data Uncertainty in Diffuse Optical Tomography, Biao Zheng[1], Robin B. Dale[1], Adam T. Eggebrecht[3], Thomas D. O'Sullivan[2], Hamid Dehghani[1]; *[1]Univ. of Birmingham, UK; [2]Univ. of Notre Dame, USA; [3]Washington Univ. in St. Louis, USA.* Time of flight measurements are known to provide information regarding optical path length and depth in diffuse imaging. Experimental data shows that it also provides data stability while reducing artifacts compared to intensity-only measurements.

JM4A.32

Integrated Phase Resolved Optical Coherence Tomography and Laser Speckle Imaging for Enhanced Cerebral Blood Flow Analysis in Mice Under Hypercapnic Stress, Wenqi He[1,2], Christian Crouzet[2], Saijun Qiu[1,2], Fengyi Zhang[1,2], Bernard Choi[1,2], Zhongping Chen[1,2]; *[1]Univ. of California, Irvine, USA; [2]Beckman Laser Inst., USA.* Cerebral blood flow dynamics are crucial in understanding neurovascular disease. Here we proposed an integrated imaging system combining Optical Coherence Tomography (OCT) and Laser Speckle Imaging (LSI), offering detailed insights into cerebrovascular hemodynamic changes.

JM4A.33

Diffuse Optical Metrics of Mitochondrial Complex I Dysfunction in Swine, Alistair Lewis[1,2], Lucas J. Hobson[3], Yuxi Lin[3], Karli S. Wulwick[3], Anthony M. Davis[3], Takayuki Sueishi[3], Shannon L. Morton[3], Sarah Morton[3], Kate G. Stumpf[3], Jonathan P. Starr[3], Hunter Gaudio[3], Nicholas Fagan[3], Todd J. Kilbaugh[3], Rodrigo Forti[2], Tiffany Ko[3], Arjun G. Yodh[4], Meagan J. Mcmanus[5], Wesley Baker[2]; *[1]Department of Chemistry, Univ. of Pennsylvania, USA; [2]Division of Neurology, Children's Hospital of Philadelphia, USA; [3]Division of Anesthesiology and Critical Care Medicine, Children's Hospital of Philadelphia, USA; [4]Department of Physics, Univ. of Pennsylvania, USA; [5]Center for Mitochondrial and Epigenomic Medicine, Children's Hospital of Philadelphia, USA.* We compared non-invasive diffuse optical measurements of cerebral oxygen extraction fraction and oxidized cytochrome-c-oxidase against invasive microdialysis measurements of cerebral tissue lactate-to-pyruvate ratio in a swine model of acute mitochondrial complex I dysfunction.

JM4A.34

Quantifying Myelin Degradation Using Quantitative Birefringence Microscopy and Deep Learning, Alexander J. Gray[1], Rhiannon Robinson[2], Anna Novoseltseva[1], Shuying Li[1,3], Samer A. Berghol[1], Logan Packard[1], Tara Moore[2], Doug Rosene[2], Irving Bigio[1,3]; *[1]Biomedical Engineering, Boston Univ., USA; [2]Anatomy and Neurobiology, Boston Univ., USA; [3]Electrical Engineering, Boston Univ., USA.* We report on an object detection network for automatically identifying structurally altered myelin in the brain tissue of a rhesus monkey model of limited cortical injury to be used for direct quantification of myelin damage.

JM4A.35

Full-Head FNIRS Data Generator Coupled With a Neural Posterior Estimation, Condell Eastmond[1], Suvranu De[2], Stefan T. Radev[1], Xavier Intes[1]; *[1]Rensselaer Polytechnic Inst., USA; [2]FAMU-FSU School of Engineering, USA.* We generate synthetic fNIRS time series data with preserved spatiotemporal information, including systemic physiology, using Mesh-based

Monte Carlo modeling. To replicate experimental data features, we iteratively calibrate the parameter space of the simulator with BayesFlow.

JM4A.36

Fundamental Effects of Array Density and Modulation Frequency on Image Quality of Diffuse Optical Tomography, Weihao Fan[1], Jason Trobaugh[3], Joseph Culver[2,1], Adam T. Eggebrecht[2,1]; *[1]Department of Biomedical Engineering, Washington Univ. in St. Louis, USA; [2]Mallinckrodt Inst. of Radiology, Washington Univ. in St. Louis, USA; [3]Department of Electrical and Systems Engineering, Washington Univ. in St. Louis, USA.* Effects of array density and modulation frequency on spatial accuracy, resolution, and penetration of diffuse optical tomography were investigated. These metrics were improved by using higher array densities or an optimized modulation frequency.

JM4A.37

Cytochrome c Oxidase as a Novel Predictor of Resuscitation Success After Cardiac Arrest: Preliminary Data, Tiffany Ko[1], Kumaran Senthil[1], Akshatha Krishna[1], Alistair Lewis[1,2], Nicolina Ranieri[1,3], Alyssa Seeney[1], April M. Hurlock[1], Rika Goto[1], Sarah Morton[1], Hunter Gaudio[1], Luiz E. Silva[1], Arjun G. Yodh[2], Todd J. Kilbaugh[1], Ryan W. Morgan[1], David Jang[1], Wesley Baker[1], Rodrigo M. Forti[1]; *[1]Children's Hospital of Philadelphia, USA; [2]Univ. of Pennsylvania, USA; [3]Drexel Univ., USA.* We present preliminary measurements of the change in oxidized cytochrome c oxidase concentration in cerebral tissue during asphyxia and cardiopulmonary resuscitation in a pediatric swine model of asphyxia-associated cardiac arrest.

JM4A.38

Image the Effect of Systemic Inflammation on Neurovascular Coupling in a Mouse Model of Alzheimer's Disease, Chang Liu[1], Alfredo Cardenas-Rivera[1], Jaime Anton Arnal[1], Abbas Yaseen[1]; *[1]Northeastern Univ., USA.* We investigated how systemic inflammation affects vascular response and astrocyte Ca2+ signaling during functional activation in rodent brain using two-photon imaging. We demonstrate that inflammation elevates astrocyte Ca2+ release and changes arteriole diameter.

JM4A.39

Physiology and Behavior Monitor for Intravital Imaging in Small Mammals, Yuntao Li[1], Alfredo Cardenas-Rivera[1], Chang Liu[1], Zhengyi Lu[1], Abbas Yaseen[1]; *[1]Northeastern Univ., USA.* We demonstrate a device that measures pupillary and behavioral signals to observe neural responses in real time, providing complementary information of brain alertness and detecting bulk motion during imaging.

JM4A.40

Non-Invasive Continuous Monitoring of Cerebral Blood Flow After Traumatic Brain Injury in Mice Using Fiber Camera-Based Speckle Contrast Optical Spectroscopy, Dharminder Langri[2], Ulas Sunar[1]; *[1]SUNY Stony Brook, USA; [2]Wright State Univ., USA.* We implemented a laser speckle contrast imaging technique with a fiber camera-based approach to monitor blood flow changes in a mouse model post-closed head injury, revealing a significant decrease within 30 minutes. This suggests the potential of blood flow as an early biomarker for head injuries.

JM4A.41

Angular Dependence of Scattering Coefficients in the Brain by Wide-Field Time-of-Flight Measurements, Pascal Tijkorte[1], Gijs Hannink[1], Martin Frenz[1], André Stefanov[1]; *[1]Inst. of Applied Physics, Univ. of Bern, Switzerland.* We present the angle-resolved determination of the scattering coefficients of white and gray matter from wide-field time-of-flight measurements with a time-resolved single-photon camera.

JM4A.42

Updated Recommendations of Optical Properties for Cerebrospinal Fluid in Diffusion-Based Models of the Brain, Aiden Lewis[1], Qianqian Fang[1]; *[1]Northeastern Univ., USA.* We re-examine widely-adopted equivalent optical properties for cerebrospinal-fluid in diffusion-based fNIRS analyses by minimizing modeling errors under various metrics. Our new recommendations, μ_a = 0.004/mm and μ_s' = 0.14/mm, largely eliminate mismatches against Monte-Carlo-based reference solutions.

JM4A.43

Super-Resolution Localization Microscopy in the SWIR to Uncover Nanoscale Structures of Living Brain Tissue, Somen Nandi[1], Quentin Grésil[1], Juan Estaun Panzano[2], Ivo Caralesu[3], Evelyne Doudnikoff[2], Erwan Bezard[2], Laurent Groc[3], Laurent Cognet[1]; *[1]Inst. of Optics, CNRS-Univ. Bordeaux, France; [2]Inst. for Neurodegenerative Diseases, Univ. of Bordeaux, France; [3]Interdisciplinary Inst. for Neuroscience, Univ. of Bordeaux - CNRS, France.* By combining single particle tracking of near-infrared-emitting carbon nanotubes with analytical methods derived from single-molecule localization microscopy, we reveal the nanoscale organization of the extracellular space of living brain tissue in healthy and pathological conditions.

JM4A.44

Training Materials and Documentation Methods in NeuroDOT, a Toolbox for Optical Brain Mapping, Ari Segel[1]; *[1]Washington Univ. in St. Louis, USA.* Multiple training methods are essential to facilitate global engagement and harmonization in optical brain mapping. We detail the methodology employed by NeuroDOT for creating documentation and trainings for use by the broader optical neuroimaging community.

JM4A.45

A Multi-Atlas Machine Learning Approach for Automated Segmentation of Widefield Optical Imaging in Mice, Hayden B. Fisher[1,2], Aurora Yuan[1,2], Brian R. White[1,2]; *[1]Childrens Hospital of Philadelphia, USA; [2]Univ. of Pennsylvania, USA.* Widefield optical imaging segmentation is traditionally performed with a single baseline false-color or fluorescence image. We propose and evaluate a novel segmentation approach, retaining individual wavelength information for use in a multi-atlas machine learning model.

JM4A.46

An Independent Replicability Study of MesoNet for Automated Segmentation and Landmark Identification in Functional Widefield Optical Imaging in Mice, Aurora Yuan[1], Hayden B. Fisher[1], Jonah Padawer-Curry[2], Adam Q. Bauer[3], Brian R. White[1]; *[1]Childrens Hospital of Philadelphia, USA; [2]Electrical and Systems Engineering, Washington Univ. in St.*

Louis, USA; [3]Department of Biomedical Engineering, Washington Univ. in St. Louis, USA. MesoNet is an automated landmark identification and segmentation program for widefield optical imaging in mice. Using a multi-institutional dataset to assess external reliability we find promising results, but errors that prevent use without retraining.

JM4A.47
Neurovascular Coupling During Cortical Slow Wave Activity in the Neocortex, Sumana Chetia[1], Diana Casas-Torremocha[3], Alejandro Suárez-Pérez[3], Tanja Dragojevic[1], Maria V. Sanchez-Vives[3,2], Turgut Durduran[1,2]; *[1]ICFO - Institut de Ciencies Fotoniques, Spain; [2]ICREA-Institució Catalana de Recerca i Estudis Avançats, Spain; [3]IDIBAPS-Institut d'Investigacions Biomèdiques August Pi i Sunyer, Spain.* Slow wave activity is an intrinsic brain activity, and its investigation is relevant in both research and clinical domains. This work focusses on probing spatio-temporal aspects of neurovascular coupling during this cortical activity.

JM4A.48
Monitoring of Brain Oxygenation With NIRS Under Lower Body Negative Pressure, Michal Kacprzak[1], Piotr Sawosz[1], Mariusz Krej[2], Anna Gerega[1], Aleh Sudakou[1], Kamil Lipinski[1], Lukasz Dziuda[2], Stanislaw Wojtkiewicz[1], Adam Liabert[1]; *[1]Nalecz Inst. of Biocybernetics and Biomedical Engineering, Poland; [2]Military Inst. of Aviation Medicine, Poland.* The study investigated cerebral oxygenation in healthy volunteers using in-house developed NIRS, focusing on hemodynamic responses to position of a membrane of the in-house developed lower body negative pressure (LBNP) chamber

JM4A.49
Neuroinflammation and Autoregulation During Pediatric Extracorporeal Life Support, Margherita Tabet[1], Annabel M. McAtee[2], Chasity Custer[3], Ethan Sanford[1,3], RyanCole Weldon-Carroll[1], Jayesh Sharma[1], Aliya Abioye[1], Deepa Sirsi[4], Sumit Singh[5], Michael C. Morriss[5], Jadwiga T. Turchan-Cholewo[2], DaiWai Olson[4], Lakshmi Raman[3], Ann Stowe[2], David R. Busch[1,6]; *[1]Anesthesiology and Pain Management, UT Southwestern Medical Center, USA; [2]Neurology and Neuroscience, Univ. of Kentucky College of Medicine, USA; [3]Pediatrics, critical care, UT Southwestern medical center, USA; [4]Neurology, UT Southwestern medical center, USA; [5]Radiology, UT Southwestern medical center, USA; [6]Biomedical Engineering, UT Southwestern medical center, USA.* Extracorporeal life support is lifesaving; however, many survivors suffer neurological injury and current monitoring tools are insufficient to guide therapy. We demonstrate continuous monitoring and serial neuroinflammatory assessment in the first 48 hours, comparing results to neuroimaging.

JM4A.50
Compact, Multiwavelength, Multidistance Speckle Contrast Spectroscopy (SCOS) for the Critical Care, Andres F. Quiroga Sota[1], Manish Verma[1], Faruk Beslija[1], Lisa Kobayashi Frisk[1], Sumana Chetia[1], Daniel Senciales[1], Muhammad A. Yaqub[1], Siddharth Dave[2], Sreekanth Cheruku[2], Christopher Choi[2], Peiman Lahsaei[2], DaiWai Olson[3], Margherita Tabet[2], RyanCole Weldon-Carroll[2], William Little[6], David R. Busch[4], Turgut Durduran[1,5]; *[1]Inst. of Photonic Sciences, Spain; [2]Anesthesiology & Pain Management, Univ. of Texas Southwestern Medical Center, USA; [3]Neurology, Univ. of Texas Southwestern Medical Center, USA; [4]Anesthesiology & Pain Management, Neurology, and Biomedical Engineering, Univ. of Texas Southwestern*

Medical Center, USA; [5]Institució Catalana de Recerca i Estudis Avançats, Spain; [6]Medical School, Univ. of Texas Southwestern Medical Center, USA. A multidistance multiwavelength compact speckle contrast optical spectroscopy (SCOS) system is presented as a novel non-invasive monitor of blood flow and tissue oxygenation for critical care.

JM4A.51

Towards Translational Biomedical Optics in the Philippines, Phoebe Nicole Perez[1,2]; *[1]Philippine Council for Health Research and Development, Department of Science and Technology, Philippines; [2]Faculty of Education, Univ. of the Philippines Open Univ., Philippines.* Advancements in biomedical optics have high potential in addressing major diseases. However, limited resources in developing Southeast Asian countries curtail its potential. This paper discusses these challenges along with corresponding avenues for mitigation and progress.

JM4A.52

Optical Imaging of HIF-1α Mediated Metabolic Changes in the Radio-Resistant Head and Neck Squamous Carcinoma Cells, Jing Yan[1], Pranto Soumik Saha[1], Carlos Frederico Lima Gonçalves[1], Caigang Zhu[1]; *[1]Univ. of Kentucky, USA.* We demonstrate that an optical microscope can be a cost-effective tool for non-destructive characterization of HIF-1α induced metabolic reprogramming under RT stress in the acquisition of radio-resistance in HNSCC for therapeutic discovery.

JM4A.53

Portable Multiparametric Microscope for Functional Imaging of Tongue Tumors in Small Animals in Vivo, Pranto Soumik Saha[1], Jing Yan[1], Caigang Zhu[1]; *[1]Univ. of Kentucky, USA.* We report a portable multiparametric microscope for simultaneous imaging of the key metabolic and vascular endpoints of tongue tumors in small animals in vivo.

JM4A.54

Cerebral Perfusion Monitoring During Acute Stroke Therapy With Diffuse Correlation Spectroscopy, Vishnukumar Raghu[1], Penaz Parveen Sultana Mohammad[1], Amy Arianna Letavay[1], Sheyar Wala Amin[1], Maxim Mokin[1], Ashwin B. Parthasarathy[1]; *[1]Univ. of South Florida, USA.* We report cerebral blood flow (CBF) measurements utilizing Diffuse Correlation Spectroscopy (DCS) carried out on patients undergoing revascularization therapy for acute ischemic strokes.

JM4A.55

Stochastic Proof by Contradiction Complements Machine-Learning-Driven Biomarker Discovery in Image Data, Dushan N. Wadduwage[1]; *[1]Harvard Univ., USA.* Given image data, machine-learning-based classifiers "discover" biomarkers under the hypothesis they exist; This is suspectable to confirmation bias. Instead, we propose an approach to disprove the null hypothesis of non-existence, countering bias in biomarker discovery.

JM4A.56

Multimodal Imaging Platform Integrating Quantitative Phase Microscopy and Fluorescence Live-Cell Imaging, Rosario G. Porras Aguilar[1], Natalith Palacios

Ortega[2]; [1]*Department of Physics & Optical Science, Univ. of North Carolina at Charlotte, USA;* [2]*Instituto Tecnológico y de Estudios Superiores de Occidente, Mexico.* This study presents a cost-effective, multimodal imaging platform using liquid crystals for dynamic, high-specificity cellular analysis, merging label-free quantitative phase microscopy with fluorescence imaging.

16:30 -- 18:30
Room: Las Olas III
BM5C • Stimulation and Imaging of Neural Pathways

Presider: Luke Lavis; Howard Hughes Medical Inst., USA

BM5C.1 • 16:30 (Invited)
Scanless Two-Photon Voltage Imaging, Eirini Papagiakoumou[1]; [1]*Institut de la Vision, Paris, France.* We demonstrate that parallel excitation approaches enable high SNR two-photon voltage imaging with recordings from neurons expressing the soma-targeted GECI, JEDI-2P-kv, in vitro and in vivo in the barrel cortex of head-fixed, anesthetized mice.

BM5C.2 • 17:00
Mapping Local and Global Interactions Between Parvalbumin Inhibitory Neurons and Excitatory Neurons Over the Cortex in Awake Mice, Xiaodan Wang[1], Annie Bice[1], Adam Q. Bauer[1]; [1]*Washington Univ. in St. Louis, USA.* We created a novel method for mapping the interactions between parvalbumin inhibitory interneurons (PV-INs) and excitatory neurons over the cortex in mice. Local and distant influences of PV-INs are region-specific and can span hemispheres.

BM5C.3 • 17:15
Concurrent Light-Based Motor Mapping of Multiple Limbs Using Deep-Learning-Driven Pose Estimation, Nischal Khanal[1], Jonah Padawer-Curry[1], Annie Bice[1], Adam Q. Bauer[1]; [1]*Washington Univ. in St. Louis, USA.* Light-based motor mapping and DeepLabCut (DLC-LBMM) were used to map cortical representations of multiple limbs concurrently in 3D. Motor representations of fine, articulated movements, and multi-limb movement trajectories resided within overlapping representations of individual limbs.

BM5C.4 • 17:30
Cortical Organization of Ethological-Like, Multi-Limb Movements, Jonah Padawer-Curry[1,2], Nischal Khanal[1,2], Evan W. Morris[2,3], Annie Bice[2], Adam Q. Bauer[2,3]; [1]*Imaging Science Program, Washington Univ. in Saint Louis, USA;* [2]*Radiology, Washington Univ. in Saint Louis, USA;* [3]*Biomedical Engineering, Washington Univ. in Saint Louis, USA.* We performed optogenetic motor mapping in combination with a markerless pose estimation algorithm, DeeplabCut (DLC) to characterize unrestricted motor responses. Assessment of multi-limb movements revealed ethological-like behaviors, topographically organized on the cortex.

BM5C.5 • 17:45
Spatiotemporal Properties of Stimulus-Evoked Responses in Mice Following Single Whisker Stimulation, Kaelyn H. Schloss[1], Xiaodan Wang[1], Jonah Padawer-Curry[1], Annie

Bice[1], Adam Q. Bauer[1]; *[1]Washington Univ. in St. Louis, USA.* We used novel peripheral stimulation methods to achieve highly precise single whisker targeting to examine spatiotemporal relationships between stimulus-evoked neuronal, metabolic, and hemodynamic activity in awake mice using wide-field optical imaging.

BM5C.6 • 18:00

High-Speed Wide-Field Optical Imaging of Voltage and Hemodynamics, Lisa M. Meyer-Baese[1], Yuyang Bian[2], Yunmiao Wang[2], Dieter Jaeger[2], Shella Keilholz[1]; *[1]Georgia Inst. of Technology & Emory, USA; [2]Emory Univ., USA.* Through-skull wide-field imaging in awake mice was used to compare functional connectivity in neuronal voltage signals across different frequencies to those obtained from a red reference fluorophore used to track optical fluctuations due to hemodynamics.

BM5C.7 • 18:15

Dynamic Connectivity of Mouse Cortex Observed With Wide Field Optical Imaging, Yuyang Bian[1], Lisa M. Meyer-Baese[1,2], Yunmiao Wang[1], Dieter Jaeger[1], Shella Keilholz[2]; *[1]Biology, Emory Univ., USA; [2]Biomedical Engineering, Emory Univ./Georgia Inst. of Technology, USA.* Widefield optical imaging allows for novel methods of network-level functional connectivity analysis of neuronal voltage and hemodynamic signals to aid the interpretation of metabolic activation across mouse cortex.

16:30 -- 18:00
Room: Las Olas I, II, V, VI
CM5E • Novel Technology, Methods and Models

Presider: Ireneusz Grulkowski; Uniwersytet Mikolaja Kopernika, Poland

CM5E.1 • 16:30 (Invited)

Circular-Ranging Optical Coherence Tomography, Benjamin J. Vakoc[1], Norman Lippok[1], Jongyoon Joo[1], Yongjoo Kim[1], Danielle Harper[1], Hyun-Sang Park[1], Yong-Chul Yoon[1]; *[1]Harvard Medical School, USA.* Circular Ranging (CR) uses novel optical frequency comb light sources to extend the speed and range capabilities of optical coherence tomography. We summarize the current state of CR technology and describe early efforts to translate CR to the clinic.

CM5E.2 • 17:00 (Invited)

Tailored Noise-Suppressed STOC-T System for in Vivo Cellular-Level Imaging of the Human Retina, Marta Mikula-Zdankowska[1], Dawid Borycki[1,2], Piotr F. Wegrzyn[1,2], Maciej Wojtkowski[1,2]; *[1]Inst. of Physical Chemistry, Polish Academy of Science, Poland; [2]International Centre for Translational Eye Research, Poland.* Introducing modified STOC-T system with ~3µm improved lateral resolution, a high-speed phase modulator optimizing illumination. Integration with numerical averaging notably improves SNR, showcased via volumetric imaging of scattering objects and the human retina.

CM5E.3 • 17:30

Computational Aberration Correction Enables Full-Thickness, Neuronal-Level Human Retinal Imaging With Spatio-Temporal Optical Coherence Tomography (STOC-T), Dawid M. Borycki[1], Marta Mikula-Zdankowska[1], Piotr Wegrzyn[1], Maciej Wojtkowski[1]; *[1]Inter Centre Translational Eye Research, Poland.* We demonstrate that spatio-temporal optical coherence tomography (STOC-T) supported by computational aberration correction provides neuronal-level imaging of the human retina. We show *en face* images depicting the amacrine cells, the multipolar retinal neurons.

CM5E.4 • 17:45

Cellular-Level Analysis of Retinal Blood Vessel Walls Based on Phase Gradient Images, Mircea Mujat[1], Konstantina Sampani[2,3], Ankit Patel[1], Jennifer Sun[2], Nicusor Iftimia[1]; *[1]Physical Sciences Inc., USA; [2]Department of Ophthalmology, Harvard Medical School, USA; [3]Department of Medicine, Harvard Medical School, USA.* We describe an imaging method and analysis procedure for characterization of the retinal vessel walls with cellular-level resolution. Segmentation of blood vessel walls provides quantitative measures of vessel and lumen diameters, wall thickness, and wall-to-lumen ratio.

16:30 -- 18:30
Room: Bonnet
MM5A • Biological and Laboratory Studies I
Presider: Nada Boustany; Rutgers Univ., USA

MM5A.1 • 16:30 (Invited)

Optically Resonant Metasurfaces for Biosensing and Spectrochemical Imaging, Filiz Yesilkoy[1]; *[1]Univ. of Wisconsin-Madison, USA.* Resonant metasurfaces present extraordinary subwavelength light trapping capabilities critical to developing high-performance biochemical sensors and surface-enhanced spectroscopy techniques. In this talk, I will present results from projects: 1) On the use of plasmonic metasurfaces for quantitative mid-infrared spectrochemical tissue imaging. 2) On the development of multiplexed biosensors for high-throughput antibody detection and COVID-19 immunity screening at the community level.

MM5A.2 • 17:00

Analysis of Multiplexed Single-Molecule Localization Microscopy of Chromatin and Transcription, Ruyi Gong[1], Nicolas Acosta[1], Yuanzhe Su[1], Luay Almassalha[1], Vadim Backman[1]; *[1]Northwestern Univ., USA.* We developed a protocol on staining and imaging of three-color single-molecule localization microscopy of constitutive heterochromatin (H3K9me3), euchromatin (H3K27ac) and RNA polymerase II and proposed analysis methods to show their functional coupling.

MM5A.3 • 17:15

Supercontinuum Intrinsic Fluorescence Imaging (SCIFI) Empowers Biomarker Discovery, Haohua Tu[1]; *[1]Department of Electrical and Computer Engineering, Univ. of Illinois at Urbana-Champaign, USA.* In contrast to other forms of fluorescence microscopy, SCIFI maximizes the information content beyond fluorescence intensity while minimizing the harm to fragile living systems, resulting in abundant label-free cellular/molecular biomarkers in biology and medicine.

MM5A.4 • 17:30

Three-Dimensional Quantitative Phase Imaging for the Assessment of Glioblastoma Multiforme Treatment Efficacy in Human Spheroids, Caroline E. Filan[1], Amin Davarzani[2], Dan Cappabianca[3,4], Anna Tommasi[3,4], Lauren Sarko[3,4], Nina La Vonne Denne[3,4], Leidong Mao[2], Krishanu Saha[3,4], Lohitash Karumbaiah[2], Francisco E. Robles[1]; *[1]Georgia Inst. of Technology, USA; [2]Univ. of Georgia, USA; [3]Animal Science Complex, Univ. of Wisconsin-Madison, USA.* Spheroids offer a unique opportunity to study personalized disease treatment; however, monitoring of these spheroids relies on time-consuming, end-point analyses. Here we apply qOBM to monitor glioblastoma spheroids treated with radiation, immunotherapies, and chemotherapies.

MM5A.5 • 17:45

Quantifying Drug-Receptor Engagement Using Macroscopic Fluorescence Lifetime FRET in Vivo Imaging, Amit Verma[1], Vikas Pandey[2], Nanxue Yuan[2], Catherine Sherry[1], Taylor Humphrey[1], Christopher James[1], Tynan Young[3], John C Williams[3], Xavier Intes[2], Margarida Barroso[1]; *[1]Albany Medical College, USA; [2]Department of Biomedical Engineering, Rensselaer Polytechnic Inst., USA; [3]Department of Molecular Medicine, Beckman Research Inst. of City of Hope, USA.* Our study demonstrates the utility of macroscopic fluorescence lifetime (MFLI) fluorescence resonance energy transfer (FRET) imaging to non-invasively monitor targeted drug tumor delivery via quantitative assessment of meditope-labeled antibody-receptor engagement in intact, live tumor xenografts.

MM5A.6 • 18:00

An Image Based Real-Time 3D Particle Tracking Fluorescence Lifetime Imaging Microscope to Follow Lipid Nanoparticles, Thomas Kellerer[1,2], Tanja Grawert[1], Florian Schorre[1], Lukas Moser[1], Patrick Byers[1], Joachim Rädler[2], Thomas Hellerer[1]; *[1]Munich Univ. of Applied Sciences, Germany; [2]Faculty of Physics, Soft Condensed Matter, Ludwig Maximilians-Univ., Germany.* A modified Two-Photon Microscopy setup tracks freely diffusing nanoparticles in 3D and in real-time. It can measure fluorescence lifetime and microenvironmental properties, such as pH, for applications in drug delivery systems based on lipid nanoparticles.

MM5A.7 • 18:15

A Multiscale Multimodal Imaging Platform for High-Throughput Morphodynamics and Spatial Biology, Hongqiang Ma[1,2], Maomao Chen[1], Jianquan Xu[1], Yang Liu[1,2]; *[1]Departments of Medicine and Bioengineering, Univ. of Pittsburgh, USA; [2]Department of Bioengineering, Univ. of Illinois Urbana-Champaign, USA.* Spatiotemporal biology is essential in biomedical research, linking large-scale spatial data, microenvironment, dynamic cell behaviors, and their underlying molecular characteristics. Our platform integrates dynamic quantitative phase imaging with hyper-plex fluorescence microscopy, enabling multiscale insights from mesoscale to nanoscale.

16:30 -- 18:30
Room: Las Olas IV
OM5D • Laser Speckle Imaging
Presider: Bin Deng; Massachusetts General Hospital, USA

OM5D.1 • 16:30
Speckle-Plethysmography Waveform Analysis Predicts Continuous Hemodynamic Changes, Helen E. Parker[1], Golnar Mostashari[1], Timothy Quang[1], Brian Hill[1], Andrea Bowling[1], John Perreault[1], Yogendra Kanthi[3], Bruce Tromberg[1,2]; *[1]National Inst. of Child Health and Human Development (NICHD), National Inst. of Health (NIH), USA; [2]National Inst. of Biomedical Imaging and Bioengineering (NIBIB), National Inst. of Health (NIH), USA; [3]National Heart, Lung, and Blood Inst. (NHLBI), National Inst. of Health (NIH), USA.* Wearable optical sensors can be used for non-invasive hemodynamic monitoring. Speckle-plethysmography (SPG) measures blood flow. We report on the use of SPG for tracking changes in hemodynamic state in an adult healthy population.

OM5D.2 • 16:45
Impact of the β Correction Factor on the Accuracy of Laser Speckle Contrast Imaging Measurements, Nataliya Makeeva[1,2], Christian Crouzet[1], Thinh Phan[1], Bernard Choi[1,2]; *[1]Beckman Laser Inst. and Medical Clinic, Univ. of California, Irvine, USA; [2]Biomedical Engineering, Univ. of California, Irvine, USA.* We investigate a method for correcting laser speckle imaging (LSI) measurements, enabling consistent Speckle Flow Index (SFI) comparison across LSI systems. Implementing β correction significantly reduces SFI differences in identical samples analyzed with different setups.

OM5D.3 • 17:00
Development of Speckle Contrast Line Scanner for Estimation of Coagulation Depth in Burn Wounds, Johannes D. Johansson[1], Martin Hultman[1], Rolf B. Saager[1]; *[1]Department of Biomedical Engineering, Linköping Univ., Sweden.* A novel system and method for 3D laser speckle imaging of coagulation depth in partial thickness burn wounds using a line laser to provide depth-varying imaging is presented.

OM5D.4 • 17:15
A Comparative Study of Blood Flow Monitoring Using Interferometric Diffusing Wave Spectroscopy, Speckle Contrast Optical Spectroscopy, and Diffuse Correlation Spectroscopy, Joseph B. Majeski[1], Rodrigo M. Forti[2], Sanghoon Chong[1], Nithin V. Ramachandran[1], Kenneth Abramson[1], Santosh Aparanji[3], Mingjun Zhao[3], Vivek J. Srinivasan[3], Wesley Baker[2,4], Arjun G. Yodh[1]; *[1]Physics & Astronomy, Univ. of Pennsylvania, USA; [2]Division of Neurology, Children's Hospital of Pennsylvania, USA; [3]Tech4Health Inst., New York Univ., USA; [4]Perelman School of Medicine, Univ. of Pennsylvania, USA.* We compared blood flow index measurements and their coefficients of variation obtained with three diffuse optical blood flow monitoring techniques on intralipid phantoms and on the forearm during an arm-cuff ischemia protocol.

OM5D.5 • 17:30

A Real-Time FPGA-Based DCS System for Blood Flow Monitoring, Christopher H. Moore[1], Ulas Sunar[1], Wei Lin[1]; [1]*Biomedical Engineering, Stony Brook Univ., USA.* A field-programmable gate array design was created to perform all diffuse correlation spectroscopy (DCS) computations necessary to derive a blood flow index on a single chip. A good match was observed between cuff ischemia results from our FPGA system and a reference standard DCS system.

OM5D.6 • 17:45

Validation of Diffuse Correlation Spectroscopy Measurements of Cerebral Blood Flow Against Perfusion MRI in Adults, Hongting Zhao[1,2], Vidisha Goyal[1,2], Qixiang Lin[2], Grace McIlvain[2], Rowan Brothers[2,1], Sydney Triplett[2], Lei Zhou[2], Deqian Qiu[2], Erin Buckley[1,2]; [1]*Georgia Inst. of Technology, USA;* [2]*Emory Univ., USA.* We quantify the accuracy of cerebral blood flow measurements of diffuse correlation spectroscopy estimated with different analytical models by comparing against arterial spin labeled perfusion MRI.

OM5D.7 • 18:00 (Invited)

Laser Speckle Imaging Applications in Critical Care Medicine, Bernard Choi[1], Christian Crouzet[1], Anthony Durkin[1]; [1]*Beckman Laser Inst., Univ. of California, Irvine, USA.* Laser speckle imaging (LSI) is routinely used for multiple biological and clinical applications. We will discuss ongoing LSI research for critical care medicine, focusing on topics including burn wound triage and vital sign monitoring.

16:30 -- 18:30
Room: Rio Vista
TM5B • Biophotonics in the Clinic II
Presider: Narasimhan Rajaram; Univ. of Arkansas, USA

TM5B.1 • 16:30 (Invited)

Quantitative, Noninvasive Monitoring of Cerebral Blood Perfusion With Diffuse Correlation Spectroscopy, Ashwin B. Parthasarathy[1]; [1]*Univ. of South Florida, USA.* This talk will highlight the clinical potential recent instrumentation advances to Diffuse Correlation Spectroscopy that facilitate robust, depth-sensitive, and wearable measurement of cerebral blood flow in patients with ischemic stroke.

TM5B.2 • 17:00

Point-of-Care Device for INR Screening From Whole Blood Using a Smartphone, Weiming Xu[2,3], Majed Althumayri[2,3], Amin Mohammad[4,1], Hatice Ceylan Koydemir[2,3]; [1]*Department of Pathology, Baylor Scott & White Medical Center, USA;* [2]*Department of Biomedical Engineering, Texas A&M Univ., USA;* [3]*Center for Remote Health Technologies and Systems, Texas A&M Engineering Experiment Station, USA;* [4]*Texas A&M Health Science Center, USA.* We developed a cost-effective, portable 3D-printed smartphone platform with dedicated microfluidic cartridges for testing blood coagulation at the point of care

TM5B.3 • 17:15

Rapid Optical Sensing of Infection in Joint Fluids, Erin Drewke[1], Narasimhan Rajaram[1]; *[1]Univ. of Arkansas, USA.* Quickly determining critical patient infection level can impact treatment. We created a model for determining optical properties using spectroscopy measurements of fluid phantoms inside a syringe. The results are consistent with a traditional Lookup-table.

TM5B.4 • 17:30

Experimental Study of Fluorescence Lifetime Uncertainty in Time-Gated ICCD-Based Macroscopic Fluorescence Lifetime Imaging, Nanxue Yuan[3], Vikas Pandey[2], Xavier Intes[3,2], Xavier Michalet[1]; *[1]Department of Chemistry & Biochemistry, UCLA, USA; [2]Center for Modeling, Simulation and Imaging in Medicine, RPI, USA; [3]BME, RPI, USA.* We studied the influence of different parameters on the measured fluorescence lifetime uncertainty in ICCD-based-MFLI. Our results are helpful for practitioners to provide the measured uncertainty in a broad range of experimental conditions.

TM5B.5 • 17:45

Fast Fluorescence Lifetime Imaging System for Intraoperative Surgical Guidance, Murali Krishnamoorthy[1,2], Rahul Pal[1,2], Hannah Collins[1,2], Anand T. Kumar[1,2]; *[1]Department of Otolaryngology, Mass Eye and Ear, USA; [2]Harvard Medical School, USA.* We present a novel fast fluorescence lifetime imaging (FLT) system for high-resolution real-time intraoperative guidance, showcasing surgeries in pre-clinical mouse tumor models and ex-vivo clinical specimens for contrast-enhanced tumor identification.

TM5B.6 • 18:00

In-Vivo Validation of VASCOVID Device, a Hybrid Diffuse Optical Platform for the Assessment of Microvasculature Health in the Intensive Care., Marta Zanoletti[1], Muhammad A. Yaqub[1], Caterina Amendola[2], Mauro Buttafava[3], Talyta Carteano[4], Davide Contini[2], Lorenzo Cortese[1], Luc Demarteau[6], Lorenzo Frabasile[2], Claudia N. Guadagno[5], Tijl Houtbeckers[6], Umut Karadeniz[1], Sanathana Konugolu Venkata Sekar[5], Michele Lacerenza[3], Jacqueline Martínez García[1], Jaume Mesquida[7], Marco Pagliazzi[1], Sharzad Parsa[8], Diego Sanoja García[4], Jakub Tomanik[6], Alessandro Torricelli[2,9], Alberto Tosi[10], Tessa Wageenar[6], Udo M. Weigel[8], Turgut Durduran[1,11]; *[1]ICFO - Institut de Ciencies Fotoniques, Spain; [2]Physics, Politecnico di Milano, Italy; [3]PIONIRS, s.r.l., Italy; [4]ASPHALION, s.l., Spain; [5]BioPixS-Biophotonics Standards Ltd., Ireland; [6]SPLENDO, Netherlands; [7]Critical Care Department, Parc Taulí Hospital Universitari, Spain; [8]Hemophotonics, s.l., Spain; [9]Consiglio Nazionale delle Ricerche, istituto di Fotonica e Nanotecnologie, Italy; [10]Dipartimento di Elettronica, Informazione e Bioingegneria, Politecnico di Milano, Italy; [11]Institució Catalana de Recerca i Esudis AvanÇats (ICREA), Spain.* We present preliminary in-vivo validation of VASCOVID device, a hybrid diffuse optical platform designed for automatized microvasculature health assessment in the intensive care. The in-vivo validation was run on more than hundred subjects.

TM5B.7 • 18:15

Secondary Ischemia Prevention: a Hybrid Diffuse Optical Assessment of Misery Perfusion Risk in the Context of Hyperventilation, Susanna Tagliabue[1], Michal Kacprzak[1,2], Isabel Serra[3], Federica Maruccia[1], Jonas B. Fischer[1], Anna Rey-Perez[4], Lourdes Exposito[4], Marcelino Baguena[4], Maria Antonia Poca[5,6], Turgut Durduran[1,7]; *[1]ICFO-Institut de Ciències Fotòniques, Spain; [2]Polish Academy of Sciences, Nalecz Inst. of Biocybernetics and Biomedical Engineering, Poland; [3]Barcelona Supercomputing Centre, Spain; [4]Neurotrauma Intensive Care Unit, Vall d'Hebron Univ. Hospital, Spain; [5]Department of Neurosurgery, Vall d'Hebron Univ. Hospital, Spain; [6]Universitat Autònoma de Barcelona, Spain; [7]Institucio Catalana de Recerca i Estudis Avancats (ICREA), Spain.* Hyperventilation (HV) can lower intracranial pressure to prevent secondary injuries in traumatic brain injury patients. Hybrid diffuse optics can detect misery perfusion, precursor of ischemia, to help guiding personalized therapy during HV. 22/27 measurement sessions (18 patients) showed MP risk.

Disclaimer: this guide is limited to technical program with abstracts and author blocks as of 2 April. For updated and complete information with special events, reference the online schedule or mobile app.

Tuesday, 9 April

10:00 -- 10:45
Room: Las Olas I, II, V, VI
JTu2A.1 • Joint Industry Keynote
Presider: Caroline Boudoux; Polytechnique Montréal, Canada

13:00 -- 15:00
Room: Las Olas III
BTu3C • Clinical Translation
Presider: Ulrike Hoffmann; UT Southwestern Medical Center, USA

BTu3C.1 • 13:00 (Invited)
Clinical Translation, Disease States, Jennifer Lynch[1]; *[1]Children's Hospital of Philadelphia, USA.* Abstract not available.

BTu3C.2 • 13:30
Neuromonitoring of Cerebral Oxygenation and Cortical Networks in Pediatric ECMO Patients Using High-Density Diffuse Optical Tomography, Sophia R. McMorrow[1], Tessa G. George[1], Chloe M. Sobolewski[1], Dalin Yang[1], Sung Min Park[1], Kelsey T. King[2], Ahmed S. Said[3], Adam T. Eggebrecht[1]; *[1]Mallinckrodt Inst. of Radiology, Washington Univ. School of Medicine, USA; [2]Department of Psychology, Roosevelt Univ., USA; [3]Division of Pediatric Critical Care, Washington Univ. School of Medicine, USA.* We measured cortical hemodynamics in pediatric patients on extracorporeal membrane oxygenation using high-density diffuse optical tomography. Results demonstrate the feasibility of this technology for continuous bedside neuromonitoring of cerebral oxygenation and functional connectivity.

BTu3C.3 • 13:45
Stand-Alone Segmentation of Blood Flow Pulsatility Measured With Diffuse Correlation Spectroscopy, Srinidhi Bharadwaj[1,2], Tara M. Urner[2,1], Kyle R. Cowdrick[2,1], Rowan Brothers[2,1], Tisha Boodooram[2,1], Hongting Zhao[2,1], Vidisha Goyal[2,1], Ayesha Quadri[2], Katherine Turrentine[2], Mariam Akbar[2], Sydney Triplett[2], Erin Buckley[2,1]; *[1]Georgia Inst. of Technology, USA; [2]Emory Univ., USA.* We develop and test a signal processing method for extracting individual cardiac pulses of microvascular cerebral blood flow assessed with diffuse correlation spectroscopy without the use of an exogenous physiological reference signal.

BTu3C.4 • 14:00
Cerebral Autoregulation Analysis Using Diffuse Correlation Spectroscopy on Adults Undergoing Extracorporeal Membrane Oxygenation Therapy, Irfaan Dar[1], Imad R. Khan[1], Ross K. Maddox[1], Mark A. Marinescu[1], David R. Busch[2], Regine Choe[1]; *[1]Univ. of Rochester, USA; [2]Univ. of Texas Southwestern Medical Center, USA.* Here, we use DCS and MAP to analyze wavelet coherence and Pearson correlation coefficient in ECMO patients to evaluate neurological injuries. Results show neurologically injured patients had higher values compared to non-injured patients.

BTu3C.5 • 14:15

Diffuse Optical Monitoring of Cerebral Hemodynamics and Oxygen Metabolism After Pediatric Out-of-Hospital Cardiac Arrest: Case Studies, April M. Hurlock[1], Alyssa Seeney[1], Nicolina Ranieri[1,2], Ryan H. Burnett[3], Rebecca L. Douglas[3], Tanmay Majmudar[4], Akshatha Krishna[1], Rika Goto[1], Rodrigo M. Forti[1], Jennifer Lynch[3], Wesley Baker[1], Matthew P. Kirschen[3], Tiffany Ko[3]; *[1]Division of Neurology, Children's Hospital of Philadelphia, USA; [2]School of Biomedical Engineering, Science and Health Systems, Drexel Univ., USA; [3]Department of Anesthesiology and Critical Care Medicine, Children's Hospital of Philadelphia, USA; [4]College of Medicine, Drexel Univ., USA.* We present two preliminary case studies of diffuse optical monitoring of cerebral hemodynamics and oxygen metabolism within 48 hours after out-of-hospital cardiac arrest in a 12-month-old and in a 15-year-old patient.

BTu3C.6 • 14:30

Investigating Pulsatile Cerebral Blood Flow Waveforms After Subarachnoid Hemorrhage With Diffuse Correlation Spectroscopy, Tara M. Urner[2,1], Eashani Sathialingam[2,1], Tisha Boodooram[2,1], Vidisha Goyal[2], Kyle R. Cowdrick[2], Seung Yup Lee[2], Feras Akbik[2], Owen B. Samuels[2], Prem A. Kandiah[2], Ofer Sadan[2], Erin Buckley[2,1]; *[1]Georgia Inst. of Technology, USA; [2]Emory Univ., USA.* We quantified cardiac pulsatility in DCS-derived cerebral blood flow waveforms from subarachnoid hemorrhage patients with vasospasm during treatment with a vasodilator. The waveform response was seen to be consistent with our previous measurements in healthy adults undergoing a vasodilatory stimulus.

BTu3C.7 • 14:45

Hybrid Convolutional and Recurrent Neural Network for Non-Invasive Intracranial Pressure Estimation From Cerebral Blood Flow, Mónica Torrecilla[1], Viacheslav Danilov[2], Susanna Tagliabue[1], Jonas B. Fischer[1], Carolina Fajardo Vega[1], Federica Maruccia[3], Anna Rey-Perez[3], Paola Cano[3], Marcelino Baguena[3], Juan Sahuquillo[3], Maria Antonia Poca[3], Gema Piella[2], Turgut Durduran[1]; *[1]ICFO - Institut de Ciències Fotòniques, Spain; [2]UPF - Department of Information and Communication Technologies, Spain; [3]Vall d'Hebron Univ. Hospital, Spain.* A new hybrid convolutional and recurrent neural network model, trained on data acquired by fast diffuse correlation spectroscopy (DCS) from children and adults with different pathologies is proposed to estimate intracranial pressure from cerebral blood flow time-traces.

13:00 -- 14:30
Room: Las Olas I, II, V, VI
CTu3E • Signal and Image Processing
Presider: Irina Larina; Baylor College of Medicine, USA

CTu3E.1 • 13:00 (Invited)
Advancing OCT Research and Practice Through Physics-Based Simulation, Peter Munro[1]; [1]*Univ. College London, UK.* I will discuss how realistic simulation of OCT image formation is emerging as a novel way to improve image interpretation, develop new imaging techniques, generate AI model training sets and to train researchers and practitioners.

CTu3E.2 • 13:30 (Invited)
Dual Spectrometer Alignment, Optimization, and Phantom-Based Recalibration Towards Retinal Measurement via Balanced Detection Low-Cost Optical Coherence Tomography, Hillel Price[1], Evan Jelly[1], Kechao Lu[1], Erin O'Kane[1], Brian Cox[1], David Miller[1], Adam Wax[1]; [1]*Duke, USA.* Low-cost OCT has point-of-care diagnostic potential for retinal measurements related to neurodegenerative diseases in low resource environments. We present methods for improved retinal imaging in low-cost OCT via implementation of balanced detection.

CTu3E.3 • 14:00
Classification of Reconstructed Breast Optical Coherence Tomography Volumes via Compressed Sensing, Arielle Joasil[1], Diego M. Song Cho[1], Manuel J. Jerome[1], Hanina Hibshoosh[2], Christine P. Hendon[1]; [1]*Columbia Univ., USA;* [2]*Columbia Univ. Irving Medical Center, USA.* Identifying cancerous lesions in reconstructed optical coherence volumes using compressed sensing is imperative to deploying OCT to the clinical breast pathology workflow. We find that classification does not vary greatly with the sampling rate.

CTu3E.4 • 14:15
High Resolution in Vivo 4D-OCT Fish Eye Imaging Using Deep Learning, Ruizhi Zuo[1], Shuwen Wei[1], Yaning Wang[1], Kristina Irsch[2,1], Jin U. Kang[1]; [1]*Johns Hopkins Univ., USA;* [2]*Vision Inst., France.* Optical coherence tomograph (OCT) volumetric imaging is slow and prone to involuntary motion. To acquire motion-free *in vivo* tissue images, a deep-learning based 4D-OCT system is developed with 10Hz C-scan rate and high resolution.

13:00 -- 15:00
Room: Bonnet
MTu3A • Novel Devices and Methods III
Presider: Anna Yaroslavsky; Univ. of Massachusetts Lowell, USA

MTu3A.1 • 13:00 (Invited)
Blood-Cell ‘Lens’ for High-Resolution, High-Throughput Ptychographic Microscopy on a Chip, Guoan Zheng[1]; [1]*Univ. of Connecticut, USA.* This talk presents the use of blood cells as computational lenses for high-resolution, high-throughput coded ptychographic microscopy, and explores its extensions including optofluidic ptychography, synthetic aperture ptychography,

depth-multiplexed imaging, among others. The combination of high phase sensitivity, high spatiotemporal resolution, intrinsic molecular contrast, and ultra-large field of view is unique among existing microscopy techniques.

MTu3A.2 • 13:30

Development of a Multi-Slit Based Non-Contact Portable in Vivo Confocal Ophthalmoscope for Corneal Imaging, Kenneth Marcelino[1], Momoka Sugimura[1], Rafael Romero[1], Jingwei Zhao[1], Kayma Konecny[1], Kyungjo Kim[1], Milind M. Rajadhyaksha[2], Jaya Chidambaram[3], Dongkyun Kang[1]; *[1]Univ. of Arizona, USA; [2]Memorial Sloan Kettering Cancer Center, USA; [3]Univ. of Manchester, UK.* The current standard of care for diagnosing corneal ulcers involves corneal scrapes and multi-day waits for tissue pathogen culture development. We developed a multi-slit based portable *in vivo* confocal ophthalmoscope for high-speed, non-contact cornea imaging.

MTu3A.3 • 13:45

Open-top Light-Sheet Microscopy of Densely Labeled Clinical Specimens Enabled by Axially Swept Illumination, Kevin Bishop[1], Lindsey A. Erion Barner[1], Elena Baraznenok[1], Lydia Lan[1], Chetan Poudel[1], David Brenes[1], Robert Serafin[1], Joshua C. Vaughan[1], Adam Glaser[1], Jonathan T. Liu[1]; *[1]Univ. of Washington, USA.* High-quality optical sectioning is required for volumetric imaging of densely labeled clinical tissues. We describe an optimized open-top light-sheet (OTLS) microscope with axially swept illumination to provide improved optical sectioning over large fields of view.

MTu3A.4 • 14:00

On-Chip Quantitative Phase Microscopy Without Support Constraint, Sibi Chakravarthy Shanmugavel[1], Shwetadwip Chowdhury[1]; *[1]Univ. of Texas at Austin, USA.* We present a novel imaging system that combines an on-chip imaging sensor with a computational phase-retrieval framework that does not utilize any support constraint. This system represents a cost-effective and straightforward strategy for phase-imaging over large fields-of-view and with off-the-shelf components.

MTu3A.5 • 14:15

Image Reconstruction for Still Image Capture Using Wireless CMOS Imaging Device., Thanaree Treepetchkul[1], Ronnakorn Siwadamrongpong[1], Renzo Roel P. Tan[4], Hironari Takehara[1], Yoshinori Sunaga[1], Makito Haruta[1,2], Hiroyuki Tashiro[1,3], Kiyotaka Sasagawa[1], Jun Ohta[1]; *[1]Division of Materials Science, Nara Inst. of Science and Technology, Japan; [2]Opto-Electronic System Engineering, Chitose Inst. of Science and Technology, Japan; [3]Health Science, Kyushu Univ., Japan; [4]Division of Information Science, Nara Inst. of Science and Technology, Japan.* We introduce a wireless system for lensless imaging devices. By reconstructing the low-resolution image acquired by dividing the image into sub-pixel arrays, a high-resolution still image was acquired on a low-transfer rate system.

MTu3A.6 • 14:30 (Invited)

Transscleral Multiphoton Imaging and Flowmetry, Tyson Kim[1]; *[1]Univ. of California San Francisco, USA.* We develop transscleral imaging and analytical methods employing optimized multiphoton excitation microscopy directed through the opaque scleral wall of the eye to resolve and quantify previously inaccessible intraocular structure and flows with subcellular resolution.

13:00 -- 15:00
Room: Las Olas IV
OTu3D • Advances in Photoacoustic Imaging
Presider: Manojit Pramanik; Iowa State Univ., USA

OTu3D.1 • 13:00 (Invited)
From Technology to Discovery: Deeper, Faster, and Colorful Photoacoustic Imaging in Life Sciences, Junjie Yao[1]; *[1]Duke Univ., USA.* Several technological advancements in PAI have collectively enabled fast, deep, and high-sensitivity biomedical applications and discoveries in life sciences, such as functional stroke imaging, drug testing, cancer detection, and interventional therapy.

OTu3D.2 • 13:30
Photoacoustic Imaging of Dental Samples, Vijitha Periyasamy[1], Katherine Gisi[1], Manojit Pramanik[1]; *[1]Iowa State Univ., USA.* We discuss the photoacoustic computed tomography (PACT) imaging of teeth using a clinical system which has light emitting diode (LED) as an illumination source. It is demonstrated that the caries and demineralization can be imaged using LED-PACT.

OTu3D.3 • 13:45
Reconstruction of the Opto-Mechanical Properties of the Intervertebral Disc With Photoacoutic Imaging, Antoine Capart[1], Roman Allais[2], Olivier Boiron[2], Anabela Da Silva[1]; *[1]Aix Marseille Univ, CNRS, Centrale Marseille, Institut Fresnel, France; [2]Aix Marseille Univ, CNRS, Centrale Marseille, IRPHE, France.* The intervertebral disc undergoes degeneration, resulting in its dehydration and the development of degenerative diseases. This study introduces quantitative photoacoustic imaging as a method for assessing the state of the disc.

OTu3D.4 • 14:00
Photoacoustic Imaging of Perfusion Kinematics Using Transparent Ultrasound Transducer and 1064 nm Laser, Seonghee Cho[1], Minsu Kim[2], Joong ho Ahn[2], Junha Lim[3], Jeongwoo Park[2], Hyung Ham Kim[2], Won Jong Kim[3], Chulhong Kim[2]; *[1]Electrical Engineering, Pohang Univ. of Science and Technology, Korea (the Republic of); [2]Convergence IT Engineering, Pohang Univ. of Science and Technology, Korea (the Republic of); [3]Chemistry, Pohang Univ. of Science and Technology, Korea (the Republic of).* NIR-II window (1000–1700 nm) photoacoustic contrast agents offer deep tissue imaging potential. We examined whole-body perfusion kinematics monitoring in photoacoustic imaging by dispersing the commercial NIR-II dye IR-1048 using a transparent ultrasound transducer.

OTu3D.5 • 14:15 (Invited)
Exploring Metalens-Based Photoacoustic Microscopy: a Study of Simulation and Experimentation, Byullee Park[1]; *[1]Biophysics, Sungkyunkwan Univ., Korea (the Republic*

of). Metalenses boast high numerical aperture and extended depth-of-field while maintaining a compact form factor. This presentation introduces the development of a metalens-based photoacoustic microscope, showcasing advancements in optical imaging capabilities. Specifically, we present simulation and experimental results to provide comprehensive insights into the technology's performance.

OTu3D.6 • 14:45
Approaching Optical Rotation Through the Lens of Near-Infra -Red -II Photoacoustics, Swathi Padmanabhan[1], Jaya Prakash[1]; *[1]Indian Inst. of Science, India.* A photoacoustic sensing method to explore the dynamics of optical rotation of chiral biomolecules is explored. The diattenaution obtained from the photoacoustic signal with different polarized illumination was analyzed.

13:00 -- 15:00
Room: Rio Vista
TTu3B • Intravital Microscopy for Clinical Applications
Presider: Jessica Ramella-Roman; Florida International Univ., USA

TTu3B.1 • 13:00 (Invited)
Virtual Staining of Label-Free Tissue Using Deep Learning, Aydogan Ozcan[1]; *[1]Univ. of California Los Angeles, USA.* We will report deep learning-based virtual staining techniques to generate various histological stains, including immunohistochemical (IHC) stains, from label-free microscopic images of tissue samples by using autofluorescence microscopy, quantitative phase imaging (QPI) and reflectance confocal microscopy.

TTu3B.2 • 13:30
Fluorescence Lifetime Signature in Oropharyngeal Cancer in Transoral Robotic Surgery, Katjana Ehrlich[2], Kelsey T. Hadfield[2], Mohamed Hassan[2], Lisanne Kraft[2], Jinyi Qi[2], Dorina Gui[1], Marianne Abouyared[3], Arnaud F. Bewley[3], Gregory Farwell[4], Andrew C. Birkeland[3], Laura Marcu[2]; *[1]Department of Pathology and Laboratory Medicine, Univ. of California, Davis, USA; [2]Department of Biomedical Engineering, Univ. of California, Davis, USA; [3]Department of Otolaryngology – Head & Neck Surgery, Univ. of California, Davis, USA; [4]Department of Otorhinolaryngology – Head and Neck Surgery, Univ. of Pennsylvania, USA.* Mesoscopic fluorescence lifetime imaging (FLIm) was performed on 75 patients diagnosed with oropharyngeal squamous cell carcinoma (OPSCC) undergoing transoral robotic surgery (TORS). This study investigates the effect of risk factors on the fluorescence lifetimes signature.

TTu3B.3 • 13:45
Autofluorescence Lifetime Imaging Resolves Metabolic Abnormalities in T Cells From Lupus Patients, Kathy J. Wiech[1,2], Shreya Godishala[1,2], Dan Pham[1,2], Shivani Garg[1], Melissa Skala[1,2]; *[1]Univ. of Wisconsin-Madison, USA; [2]Morgridge Inst. for Research, USA.* Optical metabolic imaging of T cells from patients with Systemic Lupus Erythematosus (SLE), a chronic autoimmune disorder, shows metabolic differences compared to healthy donors and reveals a moderate correlation to disease severity.

TTu3B.4 • 14:00
High Resolution Microendoscope With Extended Imaging Depth for in Vivo Cancer Detection, Huayu Hou[1], Alex Kortum[1], Jennifer Carns[1], Richard Schwarz[1], Rebecca Richards-Kortum[1]; *[1]Rice Univ., USA.* We developed a low-cost, portable microendoscope to characterize abnormal microvascular changes for cancer detection. High spatial resolution in a large depth range in tissue can be achieved by using miniature probes with different imaging depths.

TTu3B.5 • 14:15
Optismaition of Diffuse Raman Spectroscopy: From Computer Modeling to in-Vivo Measurements., Max J. Dooley[2,1], Jeni Luckett[4], Morgan Alexander[6], Pavel Matousek[3], Amir Ghaemmaghami[4], Hamid Dehghani[5], Ioan Notingher[2]; *[1]Universtiy of Nottingham, UK; [2]School of Physics and Astronomy, Univ. of Nottingham, UK; [3]Central Laser Facility, STFC Rutherford Appleton Laboratory, UK; [4]School of Life Sciences, Univ. of Nottingham, UK; [5]School of Computer Sciences, Univ. of Birmingham, UK; [6]School of Pharmacy, Univ. of Nottingham, UK.* By optimising instrumentation design using computational modelling of diffuse optics, we have developed a diffuse Raman instrument capable of monitoring fibrotic tissue growth, first in phantoms, then cadavers, and finally progressing to in-vivo measurements.

TTu3B.6 • 14:30
Depth Resolved Mueller Matrix Analysis of Cervical Remodeling in Murine Models, Ajmal Ajmal[1], JunZhu Pei[1], Amanda Sanchez[1], Jessica C. Ramella-Roman[1]; *[1]Florida International Univ., USA.* Early softening of the uterine cervix leads to Preterm Birth. Mueller matrix of mice ecto-cervix to endo-cervix at different pregnancy time points were assessed. Changes in the micro-structural organization of the cervical ECM are quantified.

TTu3B.7 • 14:45
Evaluating the Effect of Pupil Diameter Change on AOSLO Image Quality Without Pupil Dilation, Jiahe Cui[1], Maria Villamil[2], Samuel Ponting[2], Martin J. Booth[1], Hannah E. Smithson[2]; *[1]Department of Engineering Science, Univ. of Oxford, UK; [2]Department of Experimental Psychology, Univ. of Oxford, UK.* We performed imaging with an adaptive optics scanning laser ophthalmoscope (AOSLO) with a full-field intensity-modulated stimulus and no pupil dilation, and analysed how changes in pupil diameter affect AOSLO image quality.

15:30 -- 17:30
Room: Las Olas III
BTu4C • Cerebral Blood Flow
Presider: Ashwin Parthasarathy; Univ. of South Florida, USA

BTu4C.1 • 15:30 (Invited)
Illuminating Biomarkers of Stroke With Diffuse Optical Spectroscopies, Erin Buckley[1]; *[1]Emory/Georgia Inst. of Technology, USA.* Abstract not available.

BTu4C.2 • 16:00
Measurements of Slow Tissue Dynamics With Microlens Array-Based Laser Speckle Contrast Imaging, Bingxue Liu[1], Zahid Yaqoob[1], David A. Boas[1], Xiaojun cheng[1]; *[1]Boston*

Univ., USA. We present a microlens array-based laser speckle contrast imaging (mla-LSCI) system with multi-point illumination and wide field detection, which will give us a map of slow tissue dynamics across the mice cortex.

BTu4C.3 • 16:15

Speckle Visibility Spectroscopy Laser-Device for Cerebral Blood Flow Measurement, Simon Mahler[1], Yu Xi Huang[1], Maya Dickson[1], Changhuei Yang[1]; *[1]California Inst. of Technology, USA.* Non-invasive measurement of cerebral blood flow presents a persistent challenge. This study endeavors to introduce a compact device for non-invasive cerebral blood flow measurements via speckle visibility spectroscopy device with remarkable sensitivity and temporal resolution.

BTu4C.4 • 16:30

A 16-Channel Time-Multiplexed System for Functional Time-Domain Diffuse Correlation Spectroscopy With SNSPDs, Marco Renna[1], Mitchell B. Robinson[1], Zachary Starkweather[1], Ailis Muldoon[1], Maria Angela Franceschini[1], Stefan Carp[1]; *[1]Martinos Center for Biomedical Imaging, USA.* We present a novel 16-channel system for multiplexed time-domain functional diffuse correlation spectroscopy based on a custom amplified 1064 nm laser source and SNSPD detection. We demonstrate measurements of motor and prefrontal cortex activity.

BTu4C.5 • 16:45

Interferometric Near-Infrared Spectroscopy (INIRS) Reveals That Blood Flow Index Depends on Wavelength, Dibbyan Mazumder[1], Oybek Kholiqov[2], Vivek J. Srinivasan[1]; *[1]Tech4Health, Radiology, New York Univ. Langone Health, USA; [2]Biomedical Engineering, Univ. of California Davis, USA.* Blood flow index (BFI) is an optically accessible parameter that is a proxy for tissue perfusion. With interferometric near-infrared spectroscopy, we find that the dynamic scattering probability is wavelength-dependent, cautioning against comparing BFI across wavelengths.

BTu4C.6 • 17:00

Exploring Intracranial Pressure Variations Through Transcranial Hybrid Diffuse Optical Measurements in Benign External Hydrocephalus, Susanna Tagliabue[1], Federica Maruccia[1], Veronika Parfentyeva[1], Jonas B. Fischer[1], Katiuska Rosas[2], Ignacio Delgado Alvarez[3], Marcelino Baguena[4], Paola Cano[4], Maria Antonia Poca[5], Turgut Durduran[1]; *[1]ICFO-Institut de Ciències Fotòniques, Spain; [2]Department of Neurosurgery and Pediatric Neurosurgery Unit, Vall d'Hebron Univ. Hospital, Spain; [3]Department of Pediatric Neuroradiology, Vall d'Hebron Hospital Universitari, Vall d'Hebron Barcelona Hospital Campus, Spain; [4]Neurotrauma Intensive Care Unit, Vall d'Hebron hospital, Spain.* Alterations in microvascular cerebral blood flow, oxygenation and metabolism measured by diffuse optical spectroscopies, provide insights into intracranial pressure alterations.

15:30 -- 17:30
Room: Las Olas I, II, V, VI
CTu4E • New OCT Devices
Presider: Audrey Bowden; Vanderbilt Univ., USA

CTu4E.1 • 15:30 (Invited)
Robotic Optical Coherence Tomography to Image Complex Anatomical Features in the eye, Hao F. Zhang[1]; *[1]Northwestern Univ., USA.* We developed a robotic OCT to conformally acquire multiple OCT volumes from different locations and orientations. Using a newly developed point-cloud-based method, we registered these individual volumes and reconstructed the digital twin of the sample.

CTu4E.2 • 16:00
High-Performance, low-Cost Optical Coherence Tomography (OCT) Digital Fourier Transform (dFT) Spectrometer on a Silicon Photonic Platform, Diana Mojahed[1], Maarten Peters[1], Juejun Hu[1]; *[1]Materials Science & Engineering, Massachusetts Inst. of Technology, USA.* Optical Coherence Tomography (OCT) is limited by cost and size. We've developed a compact, chip-integrated OCT system with a spectrometer, delay line, and beam scanning. It features a 1310nm central wavelength, 100nm bandwidth, 0.0977nm resolution, 108.45dB sensitivity, and 8.8µm axial resolution.

CTu4E.3 • 16:15 (Invited)
Towards Affordable Ophthalmic Devices for Optical Biometry, OCT and OCT Angiography: a VCSEL-Based SS-OCT System, Milana Kendrisic[1,2], Stefan Georgiev[1], Jonas Nienhaus[1], Vladislav Agafonov[1], Matthias Salas[1], Hemma Resch[3], Clemens Vass[3], Wolfgang Drexler[1], Tilman Schmoll[4,1], Rainer A. Leitgeb[1,2]; *[1]Center for Medical Physics and Biomedical Engineering, Medical Univ. of Vienna, Austria; [2]Christian Doppler Laboratory for Innovative Optical Imaging and its Translation to Medicine, Austria; [3]Department of Ophthalmology and Optometry, Vienna General Hospital, Austria; [4]Carl Zeiss Meditec, Inc., USA.* The suitability of a thermally-tunable VCSEL diode as a low-cost swept source for OCT was investigated. We present in-vivo results of a VCSEL-based system for optical biometry, OCT and OCTA.

CTu4E.4 • 16:45
Real-Time OCT Cross-Section Display via Robotic Arm-Guided Surgical Tool Tracking, Karol M. Karnowski[1,2], Krzysztof Gromada[2,1], Tomasz Piesio[2,1], Piotr Ciacka[2,1], Adam Kurek[2,1], Andrea Curatolo[2,1]; *[1]Inst. of Physical Chemistry of PAS, Poland; [2]International Center for Translational Eye Research, Poland.* We introduce an OCT system designed for integration with a surgical microscope. Innovative hardware and software solutions facilitate robotic arm-based tracking of surgical tool, ensuring OCT cross-scans remain precisely aligned with the tool's tip position.

CTu4E.5 • 17:00 (Invited)
Title to be Determined, Julia Walther[1]; *[1]Technische Universität Dresden, Germany.* Abstract not available.

15:30 -- 17:30
Room: Bonnet
MTu4A • Computational and Machine Learning, Advances II
Presider: Milind Rajadhyaksha; Memorial Sloan Kettering Cancer Center, USA

MTu4A.1 • 15:30
Comparison of De-Noising Methods Applied to Intravital Imaging, Suryansh Shukla[1,2], Yookyung Jung[1,2], David Entenberg[1,2]; *[1]Department of Pathology, Albert Einstein College of Medicine, USA; [2]Integrated Imaging Program for Cancer Research, Montefiore-Einstein Comprehensive Cancer Center, Albert Einstein College of Medicine, USA.* Intravital imaging (IVI), used for revealing real-time dynamics of biological systems, often suffers from noise. Here, we, for the first time, compare various denoising methods to determine the best algorithms for IVI in several tissues.

MTu4A.2 • 15:45
Automated Segmentation of Nucleus in Scattering-Based Light Sheet Microscopy Images, Yongjun Kim[1], Jingwei Zhao[2], Ameer Nessaee[3], Eungjoo Lee[3], Brooke Liang[4], Michelle Khan[5], Eric Yang[4], Dongkyun Kang[2,1]; *[1]Biomedical Engineering, Univ. of Arizona, USA; [2]James C. Wyant College of Optical Sciences, Univ. of Arizona, USA; [3]Electrical and Computer Engineering, Univ. of Arizona, USA; [4]Pathology, Stanford Univ. School of Medicine, USA; [5]Obstetrics and Gynecology, Stanford Univ. School of Medicine, USA.* Scattering-based light sheet microscopy (sLSM) could visualize nucleus that are readily appreciable by pathologists. We developed an algorithm that automatically segments sLSM images for nucleus, which could be used for quantitative morphometric analysis.

MTu4A.3 • 16:00
Resolution Enhancement in Fluorescence Microscopy With Deblurring by Pixel Reassignment (DPR), Bingying Zhao[1], Jerome Mertz[1]; *[1]Boston Univ., USA.* Improving resolution in fluorescence microscopy remains a challenge. Here, we present a deblurring algorithm based on pixel reassignment that avoids noise, preserves local intensity, and aids single-molecule localization microscopy in dense samples.

MTu4A.4 • 16:15
Optimization and Application of a Pathology Computer Assisted Microscope (PathCAM) for Real-Time Slide Digitization and Analysis, Max S. Cooper[5], Kimberly Ashman[5], Cooper Maira[4], Shams Halat[3], Andrew Sholl[1], Carola Wenk[4], Sharon Fox[2], Brian Summa[4], J Q. Brown[5]; *[1]Delta Pathology Group, Touro Hospital, USA; [2]Pathology and Laboratory Medicine Service, Southeast Louisiana Veterans Healthcare System, USA; [3]Pathology and Laboratory Medicine, Tulane Medical School, USA; [4]Computer Science, Tulane Univ., USA; [5]Biomedical Engineering, Tulane Univ., USA.* We describe the development and optimization of PathCAM, a system for real-time slide digitization during clinical glass slide review, and initial real-time “expert-in-the-loop” applications including assessment of completeness of review, and annotation, segmentation, and computation.

MTu4A.5 • 16:30

Rapid Optical Cytology With Deep Learning-Based Cell Segmentation for Diagnosis of Thyroid Lesions, Peter R. Jermain[2,1], Martin Oswald[3], Tenzin Langdun[3], Santana Wright[2], Ashraf Khan[4], Thilo Stadelmann[3,5], Ahmed Abdulkadir[3], Anna N. Yaroslavsky[2]; *[1]MedStar Georgetown Univ. Hospital, USA; [2]Advanced Biophotonics Laboratory, UMass Lowell, USA; [3]Centre for Artificial Intelligence, Zurich Univ. of Applied Sciences, Switzerland; [4]Pathology, Baystate Medical Center, USA; [5]European Centre for Living Technology, Italy.* We have developed and implemented a rapid, robust, and clinically viable protocol for fluorescence polarization cytopathology of thyroid nodules. The proposed approach utilizes rapid sample preparation and automated image analysis to accurately diagnose thyroid cancer.

MTu4A.6 • 16:45

Single Source Label-Free Virtual Histopathology Using 266nm Pulsed Light, Nathaniel J. Haven[1], Matthew T. Martell[1], Brendyn D. Cikaluk[1], Roger J. Zemp[1]; *[1]Univ. of Alberta, Canada.* A label-free approach is presented capable of generating virtual histopathology supplemented with metabolic and structural contrast in freshly resected thick tissues using autofluorescence and reflectance contrast from a single 266 nm source.

MTu4A.7 • 17:00 (Invited)

Real-Time Label-Free 3D Histopathology Driven by Optics and AI-Assisted Nonlinear Microscopy, Sixian Y. You[1]; *[1]Massachusetts Inst. of Technology, USA.* Abstract not available.

15:30 -- 17:30
Room: Las Olas IV
OTu4D • Algorithms and Applications in Photoacoustic Imaging
Presider: Srivalleesha Mallidi; Tufts Univ., USA

OTu4D.1 • 15:30 (Invited)

New Algorithm Strategies in Structural and Functional Photoacoustic Computational Tomography, Rongkang Gao[1], Chengbo Liu[1]; *[1]Chinese Academy of Sciences, China.* This work presents new tools for high dynamic, high-resolution, and deep biological 3D structural and functional imaging research and applications.

OTu4D.2 • 16:00 (Invited)

Transportable Photoacoustic Imaging Platform for Preclinical Biomedical Applications, Jeesu Kim[1]; *[1]Pusan National Univ., Korea (the Republic of).* Demonstrating transportable photoacoustic imaging approaches through in vitro phantom and in vivo small animal results, including multispectral analyses for functional visualization of biological tissues.

OTu4D.3 • 16:30

An Ultrasensitive and Broadband Transparent Ultrasound Transducer for Ultrasound and Photoacoustic Tomography, Minsu Kim[1], Seonghee Cho[1], Joong ho Ahn[1], Jeongwoo Park[1], Hyung Ham Kim[1], Chulhong Kim[1]; *[1]POSTECH, Korea (the Republic of).* We develop materials for acoustic impedance matching of transparent ultrasound transducers (TUTs). Now, the performance of TUT is equivalent to that of opaque transducers, and ultrasound and photoacoustic tomography using TUT surpasses existing technologies.

OTu4D.4 • 16:45
Ultrasound-Guided Breath Compensation for Whole-Body Photoacoustic Imaging of Small Animals in Vivo, Haeni Lee[1], Seongyi Han[1], Hyunjun Kye[1], Yuon Song[1], Tsedendamba Ninjbadgar[1], Jeesu Kim[1]; [1]*Pusan National Univ., Korea (the Republic of).* From the structural information of ultrasound images, we compensated the respiratory distortions in photoacoustic images. The volumetric hemoglobin oxygen saturation maps in whole-body mice were successfully visualized.

OTu4D.5 • 17:00 (Invited)
Spatial Impulse Response of Ultrasound Transducer Correction Using Deep Learning in Photoacoustic Tomography, Isha Munjal[1], Jaya Prakash[1]; [1]*Indian Inst. of Science, Bengaluru, India.* Photoacoustic tomography (PAT) image quality is degraded by transducer-related distortions. This study employed conventional l_1-norm based deconvolution and deep learning based deconvolution to compensate spatial impulse response, achieved 40/81% improvement in terms of SSIM/PSNR over backprojection reconstruction.

15:30 -- 17:30
Room: Rio Vista
TTu4B • Maternal Health with Panel Discussion
Presider: Jessica Ramella-Roman; Florida International Univ., USA

TTu4B.1 • 15:30 (Invited)
Wireless low-Cost Laser Speckle-Based Wearable Perfusion Sensor Detects Significant Changes in Peripheral Perfusion During Physiologic Challenges With Human Subjects, Francesca Bonetta-Misteli[1], Madison Carlgren[1,2], Kelly Liang[3], Xiyan Li[3], Miranda Bagar[1], Laura Brown[1], Antonina Frolova[2], Leonid Shmuylovich[4,5], Christine O'Brien[1,2]; [1]*Biomedical Engineering, Washington Univ. in St. Louis, USA;* [2]*Obstetrics & Gynecology, Washington Univ. in St. Louis, USA;* [3]*Electrical and Systems Engineering, Washington Univ. in St. Louis, USA;* [4]*Dermatology, Washington Univ. in St. Louis, USA;* [5]*Radiology, Washington Univ. in St. Louis, USA.* A wireless, low-cost (<$150), wearable device that continuously monitors peripheral perfusion via laser speckle flow index (LSFI) was used to measure changes in blood flow in human subjects during a set of physiological challenges.

Wednesday, 10 April

08:00 -- 10:00
Room: Las Olas III
BW1C • Optics in Naturalistic Settings: Human Brain
Presider: Adam Eggebrecht; Washington Univ. in St. Louis, USA

BW1C.1 • 08:00
Repeatability of Default Mode and Dorsal Attention Networks Measured With Whole Head FNIRS, Samuel Montero[1], Yuanyuan Gao[1], Yiwen Zhang[1], David Beeler[1], David Somers[1], Meryem Yucel[1], David A. Boas[1]; [1]*Boston Univ., USA.* We show the repeatability of the functional connectivity default mode and dorsal attention networks in 15 human subjects measured with whole head functional near infrared spectroscopy.

BW1C.2 • 08:15
Mapping Brain Function During Motor Imitation and Observation in Autistic and Non-Autistic Adults and Children, Tessa G. George[1], Dalin Yang[1], Chloe M. Sobolewski[1], Sophia R. McMorrow[1], Sung Min Park[1], Mary Beth Nebel[2], Bahar Tunçgenç[3], René Vidal[4], Natasha Marrus[5], Stewart Mostofsky[2], Adam T. Eggebrecht[1]; [1]*Mallinckrodt Inst. of Radiology, Washington Univ. School of Medicine, USA;* [2]*Kennedy Krieger Inst., USA;* [3]*Univ. of Nottingham, UK;* [4]*Univ. of Pennsylvania, USA;* [5]*Psychiatry, Washington Univ. School of Medicine, USA.* We successfully leveraged HD-DOT to map brain function in autistic and non-autistic adults and children during motor observation and imitation. Multiple cortical regions are differentially activated in autistic adults and children.

BW1C.3 • 08:30
Evaluating Functional Connectivity During Motor Imitation Using Diffuse Optical Tomography, Sung Min Park[1], Tessa G. George[1], Chloe M. Sobolewski[1], Sophia R. McMorrow[1], Dalin Yang[1], Mary Beth Nebel[3], Bahar Tunçgenç[2], René Vidal[4], Natasha Marrus[1], Stewart Mostofsky[3], Adam T. Eggebrecht[1]; [1]*Washington Univ. in St. Louis, USA;* [2]*Univ. of Nottingham, UK;* [3]*Johns Hopkins Univ. School of Medicine, USA;* [4]*Univ. of Pennsylvania, USA.* High-density diffuse optical tomography assessed brain activity in neurotypical individuals during complex motor imitation. Functional connectivity derived from independent component analysis with reference varied between motor observation and imitation, correlating with behavior and imitation fidelity.

BW1C.4 • 08:45
Multi-Faceted Approach to Naturalistic Functional Neuromonitoring Through a Wearable, Easy-to-Setup, and 3-D Aware Modular FNIRS System, Edward Xu[1], Morris Vanegas[1], Ashlyn McCann[1], Miguel Mireles[1], Michael Nguyen[1], Erin L. Meier[1], Joshua Stefanik[1], Qianqian Fang[1]; [1]*Northeastern Univ., USA.* We present an ultra-lightweight wearable fNIRS system equipped with a suite of features, such as bendable modules, 3-D optode tracking, anatomically-derived head-caps, and real-time mounting guidance, specifically tailored towards simplifying measurements in naturalistic settings.

BW1C.5 • 09:00

Mapping Brain Function Underlying Coherent and Scrambled Biological Motion Processing in Autistic School-Age Children Using HD-DOT, Dalin Yang[1], Alexandra Svoboda[1], Tessa G. George[1], Muriah Wheelock[1], Mariel Schroeder[1], Sean Rafferty[1], Arefeh Sherafati[1], Joseph Culver[1], Adam T. Eggebrecht[1]; *[1]Washington Univ. in St. Louis, USA.* We used HD-DOT to image brain function in ninety-five school-age children with and without autism as they performed a passive biological motion perception task. Results show HD-DOT is sensitive to autism-associated differences in brain function.

BW1C.6 • 09:15

Real-Time Guidance for FNIRS Headgear Placement Using Augmented Reality, Fan-Yu Yen[1], Yu-An Lin[1], Qianqian Fang[1]; *[1]Northeastern Univ., USA.* An intuitive open-source augmented reality software was developed to facilitate the real-time guidance of fNIRS headgear placement during experiments. It computes head 10-20 landmarks in real-time and overlays those on a camera video stream.

BW1C.7 • 09:30 (Invited)

CoMind One: Interferometric Optical Sensing for Multi-Parameter Clinical Neuromonitoring, Claus Lindner[1], Rob Cooper[1]; *[1]CoMind, UK.* Abstract not available.

08:00 -- 10:00
Room: Bonnet
MW1A • Novel Devices and Methods IV

Presider: DongKyun Kang; Univ. of Arizona, College of Optical Sciences, USA

MW1A.1 • 08:00

Full-Surface Gigapixel Structured Illumination Microscopy of Prostate Tumor Margins: Results From a 172 Patient Series, Ivan Bozic[1], Madeline R. Behr[1], Max S. Cooper[1], Shams Halat[3], Sharon Fox[2], Andrew Sholl[4], L S. Krane[5,6], Stephen J. Freedland[7,8], J Q. Brown[1]; *[1]Department of Biomedical Engineering, Tulane Univ., USA; [2]LSU Health Science Center, USA; [3]Department of Pathology and Laboratory Medicine, Tulane Univ., USA; [4]Department of Pathology, Touro Infirmary, USA; [5]Department of Urology, Southeast Louisiana Veterans Health Care System, USA; [6]Department of Urology, Tulane Univ., USA; [7]Samuel Oschin Comprehensive Cancer Inst., Cedars-Sinai Medical Center, USA; [8]Durham VA Medical Center, USA.* Real-time surgical margin detection can improve cancer treatment by facilitating complete tumor tissue removal. We present results from a 172-patient series on the use of structured illumination microscopy for comprehensive positive prostate tumor margin detection.

MW1A.2 • 08:15

Rapid Histology of Fresh Tissue Samples Using a Clinical-Compatible Stimulated Raman Imaging Device, Maximilian Brinkmann[1], Maryam Rezaei[1], Ramon Droop[1], Christoph Engwer[1], Felix Neumann[1], Niklas Lüpken[1], Sven Dobner[1], Tim Hellwig[1]; *[1]Refined Laser Systems, 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.

MW1A.3 • 08:30

Cross-Polarized Microscopy of Pigmented Cells in Vivo, Rafael Romero[1], Yongjun Kim[1], Jingwei Zhao[2], Delaney Stratton[3], Momoka Sugimura[2], Kenneth Marcelino[2], Clara Curiel-Lewandrowski[3], DongKyun Kang[2,1]; *[1]Biomedical Engineering, Univ. of Arizona, USA; [2]James C. Wyant College of Optical Sciences, Univ. of Arizona, USA; [3]College of Medicine, Univ. of Arizona, USA.* We have developed a cross-polarized microscope (CPM) that could visualize pigmented cells in human skin in vivo. The CPM device allowed for visualization of pigmented cells over a relatively large skin area (2.6 mm^2), which could facilitate the spatial registration between CPM and standard dermatoscopy.

MW1A.4 • 08:45

Label-Free 3D Microscopy Platform Confirms and Uncovers Biomarkers of Kidney Nephropathy and Liver Cancer, Anthony Fung[1], Lingyan Shi[1], Sanjay Jain[2]; *[1]Univ. of California, San Diego, USA; [2]Washington Univ. St. Louis, USA.* Limited tissue availability makes multiplexed biomedical imaging a challenge due to spectral and chromatic overlap. Combining SRS, SHG, and TPF microscopies, we analyzed biomolecular and morphological biomarkers in diabetic kidney disease and liver cancer.

MW1A.5 • 09:00 (Invited)

'Leap-Frogging' Sub-Saharan Africa's Cancer Diagnosis Challenges With Innovation, Aggrey Semeere[1]; *[1]Infectious Diseases Inst., Uganda.* Abstract not available.

MW1A.6 • 09:30 (Invited)

Optical Microscopy for Non-Invasive Examination of Conjunctival Goblet Cells in Humans, Ki Hean Kim[1], Jungbin Lee[1], Seonghan Kim[1], Jieun Yun[1], Chang Ho Yoon[2]; *[1]Pohang Univ. of Science & Technology, Korea (the Republic of); [2]Department of Ophthalmology, Seoul National Univ. Hospital, Korea (the Republic of).* We developed a surface-tracking integrated extended depth-of-field fluorescence microscopy with moxifloxacin labeling for non-contact non-invasive imaging of conjunctival goblet cells in humans for precision diagnosis of ocular surface diseases. Significance, development, and verification will be presented.

08:00 -- 10:00
Room: Las Olas IV
OW1D • Raman Spectroscopy

Presider: Narasimhan Rajaram; Univ. of Arkansas, USA

OW1D.1 • 08:00

Analysis of Salivary Biomarkers for Point-of-Care Sensors Detecting Head and Neck Cancer and Infections by SERS/MD Approach, Edoardo Farnesi[1,2], Silvia Rinaldi[3], Chen Liu[1,2], Jonas Ballmaier[4], Orlando Guntinas Lichius[4], Michael Schmitt[1], Dana Cialla-May[2,1], Juergen Popp[1,2]; *[1]Friedrich-Schiller-Universität Jena, Germany; [2]Leibniz Inst. of Photonic Technology, Germany; [3]CNR-ICCOM, Italy; [4]Jena Univ. Hospital, Germany.* We propose a proof-of-concept study combining SERS and MD simulations, which give leave to explore the biomolecular absorption mechanism on nanoparticle surfaces, to detect salivary interleukin-8 and lysozyme, implicated in oropharyngeal carcinoma and oral infections.

OW1D.2 • 08:15

Exploring Subsurface Raman Spectroscopy for Non-Invasive Sex Determination of Chicken Eggs, Lennard van den Tweel[1,3], Freek Ariese[2], Carla van der Pol[3], Henry van den Brand[1]; [1]*Adaptation Physiology Group, Wageningen Univ. and Research, Netherlands;* [2]*LaserLaB, Department of Physics and Astronomy, Vrije Universiteit Amsterdam, Netherlands;* [3]*Research, HatchTech B.V., Netherlands.* Raman spectroscopy of extra-embryonic blood vessels confirmed sex-specific differences in hemoglobin levels and NIR-fluorescence intensity. These insights incited ongoing development of non-invasive methods for in-ovo sex determination of chicken eggs using diffuse spectroscopy techniques.

OW1D.3 • 08:30

Depth Sensitivity With Time Domain Diffuse Raman Spectroscopy, Valerio Gandolfi[1], Alessandro Bossi[1], Ilaria Bargigia[1], Fabrizio Martelli[2], Antonio Pifferi[1]; [1]*Politecnico di Milano, Italy;* [2]*Università degli Studi di Firenze, Italy.* Time Domain Diffuse Raman Spectroscopy permits extraction of Raman spectra from deep (cm) tissues non-invasively. We propose a model to quantify the probed depth and experimental measurements to test its validity.

OW1D.4 • 08:45

Detection of Structural Changes in DNA due to Methylation Using Raman Spectroscopy, Haruki Kanae[1], Terumasa Ito[1], Kaori Tsukakoshi[1], Shintaro Inaba[1], Mizuki Tomizawa[1], Kaustav Das[1], Kazunori Ikebukuro[1], Kazuhiko Misawa[1]; [1]*Tokyo Univ. of Agriculture and Technology, Japan.* Steric conformational changes in the guanine quadruplex (G4) structure due to DNA methylation are associated with cancer. We show that Raman spectroscopy can be used to detect the conformational changes in the G4 structure.

OW1D.5 • 09:00

Citrate Stabilized Nanoparticles for Improved Drug Sensing of Lamivudine Using Surface Enhanced Raman Spectroscopy, Setumo Lebogang Thobakgale[1], Lungile Thwala[1], Patience Mthunzi-Kufa[1]; [1]*CSIR Biophotonics, South Africa.* Chemical sensors for substandard HIV medication are important for quality control purposes. In this study, we show improved detection of Lamivudine using citrate stabilized nanoparticles, by observing the molecular bands.

OW1D.6 • 09:15

Optically Super-Resolved InfraRed Imaging Micro-Spectroscopy (OSIRIS) – Consistent Contrast for Chemical Visualization, Tyler Huffman[1], Robert Furstenberg[1], Chris A. Kendziora[1], R A. McGill[1]; [1]*US Naval Research Laboratory, USA.* We present a microscopy technique for chemical tomography with high spatial resolution (~100 nm). Unlike similar prior approaches, the imaging modality and instrument hardware strive to enable the extraction of the chemical makeup of the sample as well as the infrared spectrum of each chemical component.

OW1D.7 • 09:30 (Invited)

Title to be Determined, Hee-Kyung Na[1]; [1]*Korea Research Inst of Standards & Sci, Korea (the Republic of).* Abstract not available.

Disclaimer: this guide is limited to technical program with abstracts and author blocks as of 2 April. For updated and complete information with special events, reference the online schedule or mobile app.

08:00 -- 10:00
Room: Rio Vista
TW1B • Pre-Clinical Disease Research I
Presider: Srivalleesha Mallidi; Tufts Univ., USA

TW1B.1 • 08:00 (Invited)
Non-Contact Optical Spectroscopy for Tumor-Sensitive Diffuse Reflectance and Fluorescence Measurements on Murine Subcutaneous Tissue Models, Caigang Zhu[1]; *[1]Univ. of Kentucky, USA.* We reported a novel Monte Carlo method to simulate a non-contact setup for both diffuse reflectance and fluorescence measurements on murine subcutaneous tissue models. Tissue-mimicking phantom studies were further conducted to solidify the key numerical findings.

TW1B.2 • 08:30
Unveiling the Metabolic Diversity in Cancer: Quantifying Cancer Stem Cells and Bulk Cancer Cells Through FLIM Imaging and Computational Analysis, Vidhya Shree Ravi[1]; *[1]Texas A&M Univ., USA.* This study focusses on Fluorescence Lifetime Imaging Microscopy (FLIM) of the endogenous metabolic co-enzymes (nicotinamide adenine dinucleotide (NADH) and flavin adenine dinucleotide (FAD)) to provide insights into the metabolic signatures of Cancer Stem Cells and Bulk tumor cells to decode the intra-tumor heterogeneity.

TW1B.3 • 08:45
Assessing Progressive Microvascular Dysfunction in Early Sepsis With Non-Invasive Optical Spectroscopy, Rasa Eskandari[1], Stephanie Milkovich[2], Farah Kamar[1], Donald G. Welsh[2,3], Daniel Goldman[1], Christopher G. Ellis[1,2], Mamadou Diop[1,4]; *[1]Medical Biophysics, Western Univ., Canada; [2]Robarts Research Inst., Western Univ., Canada; [3]Physiology and Pharmacology, Western Univ., Canada; [4]Imaging Program, Lawson Health Research Inst., Canada.* Peripheral microvascular dysfunction is an early indicator of sepsis, a life-threatening host response to an infection. Peripheral and cerebral microvascular oscillations were continuously monitored in septic rats with non-invasive optical spectroscopy to detect impaired vasomotion.

TW1B.4 • 09:00
Wide-Field Optical Imaging of Evolving Cortical Activity During Operant Motor Tasks: Applications in Models of Stroke Recovery, Evan W. Morris[1], Jonah Padawer-Curry[1], Zachary Lieske[1], Annie Bice[1], Adam Q. Bauer[1]; *[1]Washington Univ. in St. Louis, USA.* We developed a novel method to map cortical neuronal and hemodynamic activity in mice during operant motor tasks. Neural activity in visual, sensorimotor, and cognitive regions correspond to cue presentation followed by executed motor output.

TW1B.5 • 09:15
Extraction Physiologically Significant Information of PPG Signals, Saraí Domínguez[1], Gonzalo Paez[1]; *[1]Centro de Investigaciones en Optica, Mexico.* We propose method to extract systolic cycle and closure of aortic valve using Photopletysmography, which is relevant for

cardiac physiology. We show the correspondence of extracted information with electrocardiogram waves and pressure cardiac in PPG.

TW1B.6 • 09:30
Transcutaneous Red-Light and Low-Power Density Optogenetic Control of a ReaChR-Expressing Mouse Heart, Marcello Magri Amaral[1,2], Abigail Matt[1], Fei Wang[1], Elena Gracheva[1], Hongwu Liang[1], Attila Kovacs[3], Carla Weinheimer[3], Abhinav Diwan[3,4], Jianmin Cui[1], Stacey Rentchler[5], Jeanne Nerbonne[5,6], Christian Zemlin[7], Chao Zhou[1]; *[1]Biomedical Engineering, Washington Univ. in St. Louis, USA; [2]Biomedical Engineering, Universidade Brazil, Brazil; [3]Medicine, Washington Univ. in St. Louis, USA; [4]Cell Biology and Physiology, Washington Univ. in St. Louis, USA; [5]Medicine, Cardiovascular Division, Washington Univ. in St. Louis, USA; [6]Medicine, Developmental Biology, Washington Univ. in St. Louis, USA; [7]Medicine, Cardiothoracic Surgery, Washington Univ., USA.* Cardiac optogenetics is an emerging tool to treat and model arrythmia noninvasively using light. Mice expressing ReaChR in cardiac tissue are optically stimulated using novel LED array design, providing noninvasive, tunable cardiac pacing in vivo.

TW1B.7 • 09:45
Phacoemulsification of Cataracts Through a Low-Cost Optical System Utilizing Laser Diodes, Mitchell Harrah[1], Abdul M. Safi[1], Sadhu Moka[1], Ramesh Ayyala[1], Ashwin B. Parthasarathy[1]; *[1]Univ. of South Florida, USA.* Phacoemulsification is the preferred method of treatment for the removal of cataracts, but the current technology limits healthcare accessibility. With this submission, we show our diode-based system used within gelatin models to show acceptable preliminary results.

13:00 -- 15:00
Room: Las Olas III
BW3C • Optical Imaging of the Human Brain
Presider: Mauro Buttafava; PIONIRS S.r.l., Italy

BW3C.1 • 13:00
Cerebral and Peripheral Tissue Oximetry in Pediatric Population: Establishing Expected Values in TD-NIRS Measurements, Michele M. Lacerenza[1], Virginia Rossi[2], Sara Zanelli[2], Caterina Amendola[3], Mauro Buttafava[1], Davide Contini[3], Lorenzo Spinelli[4], Alessandro Torricelli[3,4], Gian V. Zuccotti[2,5], Valeria Calcaterra[2,6]; *[1]PIONIRS s.r.l., Italy; [2]Pediatric Department, Buzzi Children's Hospital, Italy; [3]Dipartimento di Fisica, Politecnico di Milano, Italy; [4]Istituto di Fotonica e Nanotecnologie, Consiglio Nazionale delle Ricerche, Italy; [5]Department of Biomedical and Clinical Science, Univ. of Milan, Italy; [6]Pediatric and Adolescent Unit, Department of Internal Medicine, Univ. of Pavia, Italy.* A large cohort of pediatric subjects has been studied to define percentile distribution of oxygen saturation and hemoglobin concentration in prefrontal cortex and upper arm via time-domain near-infrared spectroscopy. Results on the first 240 subjects are presented.

BW3C.2 • 13:15

Broadband NIRS Assessment of Cerebral Water Content in Adults, Vidisha Goyal[1], Michael D. Arrington[1], Hongting Zhao[1], Rodrigo Forti[2], LaBeausha H. Harris[1], Tara M. Urner[1], Tisha S. Boodooram[1], Shasha Bai[4], Owen B. Samuels[3], Prem A. Kandiah[3], Ofer Sadan[3], Erin Buckley[1,4]; [1]*Wallace H. Coulter Department of Biomedical Engineering, Georgia Inst. of Technology and Emory Univ., USA; [2]Division of Neurology, Children's Hospital of Philadelphia, USA; [3]Department of Neurology and Neurosurgery, Division of Neurocritical Care, Emory Univ. Hospital and Emory School of Medicine, USA; [4]Department of Pediatrics, School of Medicine, Emory Univ., USA.* The sensitivity of broadband near-infrared spectroscopy (bbNIRS) to obtain cerebral water content in adults was assessed by quantifying measurement repeatability and demonstrating feasibility to detect alterations in neurocritical patients.

BW3C.3 • 13:30

Test-Retest Reliability of a Time-Domain Functional Near-Infrared Spectroscopy System, Julien Dubois[1], Ryan M. Field[1], Sami Jawhar[1], Erin M. Koch[1], Zahra M. Aghajan[1], Naomi Miller[1], Katherine Perdue[1], Moriah Taylor[1]; [1]*Kernel, USA.* We validate that Kernel Flow2 TD-fNIRS system is capable of measuring robust neural activity, during rest and sensory tasks, that is reliable across time and devices; thus enabling applications that require neuroimaging at scale.

BW3C.4 • 13:45

Light-Sheet Fluorescence Microscopy for 3D Reconstruction of Human Brain, Irene Costantini[1], Danila Di Meo[1], Josephine Ramazzotti[1], Franco Cheli[1], Giacomo Mazzamuto[2], Curzio checcucci[3], Paolo Frasconi[3], Francesco S. Pavone[1]; [1]*European Lab for Non-Linear Spectroscopy, Italy; [2]CNR-INO, Italy; [3]Univ. of Florence, Italy.* Using the SHORT clearing method in combination with an advanced double-view light-sheet fluorescence microscope and an automated machine-learning-based tool we performed 3D reconstruction of a whole human Broca's area at micrometer resolution.

BW3C.5 • 14:00

Implanted FNIRS Sensors – Model and Phantom, Netaniel Rein[2,3], Yael Avni[1], Revital Shechter[1], Mordekhay Medvedovsky[3,2], Michal Balberg[1]; [1]*Holon Inst. of Technology, Israel; [2]Faculty of Medicine, Hebrew Univ., Israel; [3]Neurology, Hadassah Medical Organization, Israel.* An implanted fNIRS sensor, integrated within a depth electrode applied during stereo-EEG, was developed. A Monte-Carlo simulation and a phantom model demonstrate the ability to sense deeper into the brain than with non-invasive sensors.

BW3C.6 • 14:15

Reliability of Diffuse Optical Spectroscopies for Evaluation of Cerebral Hemometabolic Stress in Children With Sickle Cell Anemia, Rowan Brothers[1], Kristin Wubbena[1], Mariam Akbar[1], Michael D. Arrington[1], Katherine Turrentine[1], Sydney Triplett[1], Hongting Zhao[1], Tara Urner[1], Shasha Bai[2], Amy Tang[3,4], Kirshma Khemani[3,4], Beatrice Gee[3,4], R. C. Brown[3,4], Erin Buckley[1,5]; [1]*Wallace H. Coulter Department of Biomedical Engineering, Georgia Inst. of Technology & Emory Univ., USA; [2]Pediatric Biostatistics Core, Emory Univ. School of Medicine, USA; [3]Department of Pediatrics, Children's Healthcare of Atlanta and Emory Univ., USA; [4]Aflac Cancer and Blood Disorders Center, Children's Healthcare of Atlanta, USA; [5]Department of*

Pediatrics, Emory Univ., USA. We quantify the reliability of frequency-domain near-infrared spectroscopy with diffuse correlation spectroscopy as a point-of-care tool to evaluate cerebral hemometabolic stress in children with sickle cell anemia.

BW3C.7 • 14:30 (Invited)
From Proofs-of-Principle to Multi-Site Studies: Tools for Collaborative Optical Human Brain Mapping, Adam T. Eggebrecht[1]; [1]*Washington Univ. in St. Louis, USA.* Abstract not available.

13:00 -- 15:00
Room: Bonnet
MW3A • Biological and Laboratory Studies II
Presider: Yang Liu; Univ. of Illinois at Urbana-Champaign, USA

MW3A.1 • 13:00 (Invited)
Characterization of Subsurface Molecular Changes in Bone Through Raman Spectroscopy, Rekha Gautam[1], Hui Ma[1], Pranav Lanka[1], Imanda Jayawardena[1], Carrie O'Flynn[2], Patrick Henn[2], Sanathana Konugolu Venkata Sekar[1], Stefan Andersson-Engels[1]; [1]*Biophotonics@Tyndall, IPIC, Tyndall National Inst., Ireland;* [2]*ASSERT Center, College of Medicine and Health, Univ. College Cork, Ireland.* Raman spectroscopy detects tissue quality changes through light scattering. We explored its feasibility for identifying molecular changes in bone beneath turbid media, validating protocols for altering mineral density and collagen matrix in cadaveric bones.

MW3A.2 • 13:30
A Combined Theoretical and Computational Model for Predicting the SHG Spatial Emission Pattern Due to the Collagen Fibril Assembly, Emily Shelton[1], Paul Campagnola[1]; [1]*Univ. of Wisconsin - Madison, USA.* We demonstrate a new combined theoretical and computational model, based on quasi-phase-matching theory, of the how the three-dimensional second harmonic generation spatial emission pattern is determined by the collagen fibril organization.

MW3A.3 • 13:45
Polarization-Resolved Second Harmonic Generation Quantification of the Uterine Cervix Remodeling Process, Jessica C. Ramella-Roman[1], Mala Mahendroo[2], Clothilde Raoux[3], Gaël Latour[3], Marie-Claire Schanne-Klein[3]; [1]*Florida International Univ., USA;* [2]*Univ. of Texas Southwestern Medical Center, USA;* [3]*Laboratory for Optics and Biosciences, École Polytechnique, CNRS, Inserm, Institut Polytechnique de Paris, France.* We have utilized Polarization Resolved Second Harmonic Generation to image the remodeling uterine cervix in a murine model. We have developed a fully automatic and unbiased process to quantify collagen remodeling at the pixel level (420 nm). We observe a distinct change in collagen fiber arrangement between days 12 and 15 of pregnancy.

MW3A.4 • 14:00
Label-Free Microscopy for Biophysical and Biochemical Profiling of Live Organoids, Mark Coughlan[1], Umar Khan[1], Paul Upputuri[1], Xuejun Zhang[1], Yuri Zakharov[1], Lei Zhang[1], Le Qiu[1], Lev Perelman[1]; *[1]BIDMC, Harvard Univ., USA.* Organoids are a simplified version of an organ produced in vitro in three dimensions. CLASS microscopy and Raman spectroscopy, two complementary label-free techniques, can be used for comprehensive non-destructive profiling of live organoids.

MW3A.5 • 14:15
Utilizing Quantitative Phase Microscopy to Localize Fluorescence Imaging Using the Transport of Intensity Equation, Deven K. Gupta[1], Robert E. Highland[1], David Miller[1], Adam Wax[1]; *[1]Department of Biomedical Engineering, Duke Univ., USA.* We demonstrate the use of quantitative phase microscopy to localize defocused fluorescent images with the transport of intensity equation. Specifically, we demonstrate a technique for digitally refocusing images from three-dimensional cell cultures.

MW3A.6 • 14:30
Effects of Laser Treatment on Cartilage Diffusion Properties, Tyler Iorizzo[1,2], Santana Wright[1], James Childs[2], Ilya Yaroslavsky[2], Gregory Altshuler[2], Anna N. Yaroslavsky[1]; *[1]Univ. of Massachusetts Lowell, USA; [2]IPG Medical, USA.* Nuclear Magnetic Resonance and optical imaging experiments were used to compare diffusion through cartilage samples before and after laser treatment.

MW3A.7 • 14:45
Real-Time Chemical Visualization With Optically Super-Resolved InfraRed Imaging Micro-Spectroscopy (OSIRIS), Tyler Huffman[1], Robert Furstenberg[1], Chris A. Kendziora[1], R A. McGill[1]; *[1]US Naval Research Laboratory, USA.* We've developed a microscopy technique for chemical imaging and tomography with high spatial resolution (~100 nm). Data analysis reveals the chemical makeup of the sample as well as the infrared spectrum of each chemical component in quasi real-time.

13:00 -- 15:00
Room: Las Olas IV
OW3D • Diffuse Optics: Phantoms, Skin Tone Bias and Commercialization
Presider: Darren Roblyer; Boston Univ., USA

OW3D.1 • 13:00 (Invited)
Commercialization of Photonic Technologies: a View From Corporate Venture Capital (CVC), Robert V. Warren[1]; *[1]Hamamatsu Ventures USA, USA.* Exploring the journey from lab to market, this talk will elucidate Hamamatsu's CVC mechanisms, assessment criteria, and support strategies for commercializing innovative photonics technologies in the biomedical field.

OW3D.2 • 13:30
Light-Guided Dynamic Phantom to Mimic Microvascular for Biomedical Applications, Hui Ma[1,2], Dario Angelone[1,2], Claudia N. Guadagno[3], Rekha Gautam[1], Stefan Andersson-Engels[1,4],

Sanathana Konugolu Venkata Sekar[1,3]; *[1]Tyndall National Inst., Ireland; [2]Engineering Science, Univ. College Cork, Ireland; [3]BioPixS Ltd., Ireland; [4]Physics, Univ. College Cork, Ireland.* Wabe presented a dynamic phantom to mimic vascular changes in human body. The photoplethysmogram was simulated and validated on a multispectral imaging system. The phantom has promising applications to standardize biomedical technologies.

OW3D.3 • 13:45
Creating Tunable Complex Light-Emitting Optical Phantoms Utilizing Multifilament Mixing Based 3-D Printing, Rahul Ragunathan[1], Victoria Simmons[1], Miguel Mireles[1], Aiden Lewis[1], Qianqian Fang[1]; *[1]Northeastern Univ., USA.* We report initial results for direct 3-D printing of heterogeneous optical phantoms with tunable light emitting levels using a multi-color mixing filament extruder. We report preliminary characterizations of the emitted light temporal and spatial profiles.

OW3D.4 • 14:00
Addressing Skin Pigmentation Bias in NIRS Tissue Oximetry, Michele M. Lacerenza[1], Virginia Rossi[2], Sara Zanelli[2], Caterina Amendola[3], Davide Contini[3], Lorenzo Spinelli[4], Alessandro Torricelli[3,4], Gian V. Zuccotti[2,5], Valeria Calcaterra[2,6], Mauro Buttafava[1]; *[1]PIONIRS s.r.l., Italy; [2]Pediatric Department, Buzzi Children's Hospital, Italy; [3]Physics Department, Politecnico di Milano, Italy; [4]Consiglio Nazionale delle Ricerche, Istituto di Fotonica e Nanotecnologie, Italy; [5]Biomedical and Clinical Science, Univ. of Milan, Italy; [6]Pediatric and Adolescent Unit, Department of Internal Medicine, Univ. of Pavia, Italy.* Tissue oximeters may show measurements bias and reduced accuracy related to diverse skin pigmentations. The possibility to overcome this issue with time-domain near-infrared spectroscopy is assessed in-vivo, on a large cohort of pediatric subjects.

OW3D.5 • 14:15
Skin Color Classification by Deep Learning and Traditional Thresholding Techniques During NIR Imaging, Daniela Leizaola[1], Nikhil Vedere[1], Shelley Sinclair[1], Kacie Kaile[1], Alexander L. Trinidad[1], Wensong Wu[2], Abderrachid Hamrani[3], Robert Kirsner[4], Anuradha Godavarty[1]; *[1]Biomedical Engineering, Florida International Univ., USA; [2]Mathematics and Statistics, Florida International Univ., USA; [3]Mechanical and Materials Engineering, Florida International Univ., USA; [4]Dermatology & Cutaneous Surgery, Univ. of Miami Miller School of Medicine, USA.* Skin color impacts the accuracy of the calculated tissue oxygenation maps with our inhouse NIR optical imager. Skin color was classified by FST using deep learning and thresholding techniques to allow for appropriate color corrections.

OW3D.6 • 14:30 (Invited)
Title to be Determined, Amaan Mazhar[1]; *[1]Modulim, USA.* Abstract not available.

13:00 -- 15:00
Room: Rio Vista
TW3B • Pre-Clinical Disease Research II

TW3B.1 • 13:00 (Invited)
Ultrasound-Guided Photoacoustic Functional Imaging to Assess Regional Variations in Response to Vascular Targeted Therapies, Allison Sweeney[1], Skye Edwards[1], Andrew Langley[1], Patrick Solomon[1], Srivalleesha Mallidi[1]; *[1]Tufts Univ., USA.* We investigate vascular therapy induced regional variations in vascularization and oxygenation using Ultrasound-guided photoacoustic imaging where a custom regional segmentation algorithm revealed that sunitinib is preferentially targeting areas of low vascular density while PDT is agnostic of vascular density when administered at optimal dose.

TW3B.2 • 13:30
Miniature Syringe-Injectable Wireless Light Source for Photodynamic Therapy With Rose Bengal, Sunghoon Rho[1], Hailey Sanders[1], Janeala J. Morsby[1], Bradley D. Smith[1], Thomas D. O'Sullivan[1]; *[1]Univ. of Notre Dame, USA.* We present a wirelessly powered implantable device that emits 573 nm visible light for deep tissue photodynamic therapy. This device can generate sufficient singlet oxygen to effectively eliminate cancer cells in vitro.

TW3B.3 • 13:45
Assessment of Endothelial Functions by Power Spectral Density of Hemodynamic Parameters in Skeletal Muscles, Caterina Amendola[1], Mauro Buttafava[2], Talyta Carteano[3], Letizia Contini[1], Lorenzo Cortese[4], Turgut Durduran[4,5], Lorenzo Frabasile[1], Claudia N. Guadagno[6], Umut Karadeniz[4], Michele Lacerenza[2], Jaume Mesquida[7], Shahrzad Parsa[8], Rebecca Re[1,9], Diego Sanoja García[3], Sanatana Konugolu Venkata Sekar[6], Lorenzo Spinelli[9], Alessandro Torricelli[1,9], Alberto Tosi[1], Udo M. Weigel[8], Muhammad A. Yaqub[4], Marta Zanoletti[4], Davide Contini[1]; *[1]Politecnico di Milano, Italy; [2]PIONIRS s.r.l., Italy; [3]ASPHALION S.L., Spain; [4]ICFO - Institut de Ciències Fotòniques, The Barcelona Inst. of Science and Technology, Spain; [5]Institució Catalana de Recerca i Estudis Avançats (ICREA), Spain; [6]BioPixS Ltd – Biophotonics Standards, Ireland; [7]Critical Care Department, Parc Taulí Hospital Universitari. Institut D'Investigació i Innovació Parc Taulí I3PT, Spain; [8]HemoPhotonics S.L., Spain; [9]Istituto di Fotonica e Nanotecnologie, Consiglio Nazionale delle Ricerche, Italy.* We assessed in 14 healthy volunteers and one septic patient low and very low frequency oscillations in hemodynamic parameters of muscles by studying their power spectra density exploiting time domain near-infrared and diffuse correlation spectroscopies.

TW3B.4 • 14:00
Physiological Mechanisms Underlying Plasmonic Photothermal Therapy Response, Clara Vilches[1], Pablo Fernández-Esteberena[1], Turgut Durduran[1,2]; *[1]ICFO, Spain; [2]ICREA, Spain.* Cancer physiology variability demands personalization for effective treatment strategies. We demonstrate the utility of diffuse optical tools to monitor differential responses to plasmonic photothermal therapy and move towards developing optimized treatment plans.

TW3B.5 • 14:15
Nano-Liter Precision Flow Velocity Meter Using a Smartphone, Weiming Xu[1,2], Abdulkadir Yasin Atik[3], Levent Beker[3], Hatice Ceylan Koydemir[1,2]; *[1]Department of Biomedical Engineering, Texas A&M Univ., USA; [2]Center for Remote Health Technologies and Systems, Texas A&M Univ., USA; [3]Department of Mechanical Engineering, Koç Univ., Turkey.* We introduced a 3D-printed smartphone-based flow velocity meter with transparent flow visualization ability. The device demonstrated versatility in measuring flow velocities across different channel types, making it a valuable tool for optimizing microfluidic designs.

TW3B.6 • 14:30
Peak Power Dependence in Bacterial Inactivation Using UV-C Pulsed Light Irradiation, Shuri Kozuka[1], Shundai Yamamoto[1], Terumasa Ito[1], Kazuhiko Misawa[1]; *[1]Tokyo Univ. of Agriculture and Tech, Japan.* Pulsed UV-C irradiation is an efficient method for bacterial inactivation. A comparative UV-C irradiation experiment with femtosecond and microsecond pulses reveals that high peak power is one of the key factors for effective inactivation.

TW3B.7 • 14:45
Design and Validation of a Multimodal Spatially Offset System Comprising Diffuse Reflectance Spectroscopy and Raman Spectroscopy, April Mordi[1], Varsha Karunakaran[1], Narasimhan Rajaram[1]; *[1]Univ. of Arkansas, USA.* A multimodal spectroscopy system combining diffuse reflectance spectroscopy and Raman spectroscopy and a probe designed with spatial offsets for both modalities were developed, and sampling depth of the probe was validated.

ThD1 • On Demand Session

ThD1.1 • 07:00
Focusing on Anterior Retinal Layers With Adaptive Optics Optical Coherence Tomography, Elisabeth Brunner[1], Laura Eva Kunze[2], Ursula Schmidt-Erfurth[2], Wolfgang Drexler[1], Andreas Pollreisz[2], Michael Pircher[1]; *[1]Center for Medical Physics and Biomedical Engineering, Medizinische Universität Wien, Austria; [2]Department of Ophthalmology and Optometry, Medizinische Universität Wien, Austria.* Changes of the neurosensory part of the retina, for example in the thickness of vessel walls or the presence of microglia may serve as early biomarker for diseases such as diabetic retinopathy. This study investigates the ability of AO-OCT to visualize microstructural details on a cellular level in single volume scans and on a large field of view.

ThD1.2 • 07:00
Synchronization-Free Light Sheet Microscopy for 3-Dimensional Tissue Imaging, William Zhang[1]; *[1]TJHSST, USA.* Light sheet microscopy is an advanced imaging technique in biomedical research. To improve its capability in volumetric imaging, we propose a novel synchronization-free remote axial scanning method using a simple yet robust design.

ThD1.3 • 07:00
Photoacoustic Viscoelasticity Can Differentiate Tumors From Normal Tissues; a Computationally Modelling Analysis on Breast Tissue, Zahra Hosseindokht[1], Mohammadreza Kolahdouz[1], Pezhman Sasanpour[2]; *[1]Univ. of Tehran, Iran (the Islamic Republic of); [2]Medical Physics and Biomedical Engineering, Shahid Beheshti Medical Univ., Iran (the Islamic Republic of).* Based on the challenges in non-invasive detection of tumors in early stages, we proposed photoacoustic viscoelasticity system and evaluated its performance computationally in COMSOL. The results revealed appropriate capability for breast cancer detection.

ThD1.4 • 07:00
A D-Shaped Circular Photonic Crystal Fiber Based Surface Plasmon Resonance Biosensor, Akshat Agarwal[1], Piyush Shrivastava[1], Ankur Saharia[1], Manish Tiwari; *[1]Manipal Univ. Jaipur, India.* A d-shaped PCF-based SPR biosensor design comprising four circular rings of air holes and 90 nm plasmonic gold layer is proposed for precise detection of chemicals of specific RI(refractive index) range from 1.33 to 1.48.

ThD1.5 • 07:00
All-Optical Recording and Manipulating Neural Activities Across Cortical Layers in Functional Columns in Vivo, Chi Liu[1], Lingjie Kong[1]; *[1]Tsinghua Univ., China.* We propose across-layer all-optical physiology, for the first time, to simultaneously record and manipulate neural activities at different depths spanning 0~620 μm, for deciphering neural circuits in functional columns *in vivo*.

JD6A • Joint Poster Session (On Demand)

JD6A.1
Development of a Handheld Optical Scanner, Jeeva J B[1], Sumaiya Mohamed Rafi[1]; *[1]Vellore Inst. of Technology, India.* A handheld optical imager with dual-source operating at 660 and 940 nm and photodiode detectors is developed. The images obtained show the inhomogeneity embedded inside the paraffin wax phantom. The FWHM matches with the actual.

JD6A.2
Monitoring and Evaluation of Chronic Leg Ulcers Using a Novel Multispectral Imaging Device, Marta Marradi[2,1], Luca Giannoni[2,1], Domenico Alfieri[3], Lorenzo Targetti[4], Aldo Conti[5], Stefano Falini[5], Stefano Gasperini[6], Francesco S. Pavone[2,1]; *[1]European Laboratory for Non-Linear Spectroscopy, Italy; [2]Department of Physics and Astronomy, Univ. of Florence, Italy; [3]Light4Tech S.r.l., Italy; [4]EmoLED S.r.l., Italy; [5]Ospedale della Misericordia, Italy; [6]Medical Advisor, Italy.* A novel multispectral imaging (MSI) system composed of light emitting diodes (LEDs) and a CMOS camera is going to be presented and used for the evaluation of oxygenation and haemodynamics in chronic leg wounds.

JD6A.3
Bioluminescence Tomography-Guided System for pre-Clinical Pancreatic Cancer Radiation Research, Zijian Deng[1], Xiangkun Xu[1], Juvenal Reyes[2], Ken Kang-Hsin Wang[1]; *[1]UT Southwestern Medical Center at Dallas, USA; [2]Johns Hopkins School of Medicine, USA.* We innovated bioluminescence tomography(BLT)-guided system for orthotopic pancreatic ductal adenocarcinoma(PDAC) radiotherapy research. Our BLT localized PDAC with 1.25±0.19mm accuracy. BLT-guided conformal plan covered 100% of tumor with limited normal tissue involvement, consistent across inter-fraction case.

JD6A.4
A Novel Hyperspectral Imaging Tool for Preclinical and Translational Investigations of Brain Tissue Physiology and Pathology, Luca Giannoni[1,2], Anam Toaha[1,2], Marta Marradi[1,2], Camilla Bonaudo[3], Alessandro Della Puppa[3], Francesco S. Pavone[1,2]; *[1]Department of Physics and Astronomy, Univ. of Florence, Italy; [2]European Laboratory for Non-Linear Spectroscopy, Italy; [3]Neurosurgery, Department of Neuroscience, Psychology, Pharmacology and Child Health, Azienda Ospedaliero Universitaria Careggi, Italy.* We present a novel hyperspectral imaging setup enabling high-resolution, fast reconstruction of large spectral datasets of brain tissue reflectance and fluorescence, with flexibility in the wavelengths selection, for in vivo and ex vivo preclinical applications.

JD6A.5
Rapid Detection of Different Types of Influenza-a Strain Using Raman Spectroscopic Technique, Subhanita Roy[1], Souvik Das[1]; *[1]Indian Inst. of Technology Kharagpur, India.* Raman spectroscopy is a powerful technique that provides the molecular fingerprint of a sample, allowing accurate identification and analysis. This study proposes Raman spectroscopy for the detection of two different types of Influenza-A strains.

JD6A.6

Fourier Transform Infrared Microscopy Based Differentiation Between Healthy and Infected Cerebrospinal Fluid in Meningitis., Kartikeya Bharti[1], Pranab J. Talukdar[1], Pooja Lahiri[1], Basudev Lahiri[1]; [1]*Indian Inst. of Technology Kharagpur, India.* We presented vibrational spectroscopy-based differentiation of healthy and infected cerebrospinal fluid in meningitis using FTIR micro-spectroscope. Differentiation was mostly observed between 800-1750 cm^{-1}.

JD6A.7

Laser-Induced Fluorescence Combined With Artificial Neural Network for the Identification of Liver Tissue Coagulation, Omnia H. Abd El-Rahman Nematallah[1], Zienab Abdel-Salam[1], Mohamed Abdel-Harith[1]; [1]*Cairo Univ., Egypt.* Coagulated liver was distinguished from normal liver based on the difference in its fluorescence emission. The experimentally measured data was evaluated using an artificial neural network providing a 99%-differentiation accuracy rate for all data sets.

JD6A.8

Spiral-Shaped SPR-PCF Biosensor With Circular Ring, Shweta Mittal[1], Ankur Saharia[1], Manish Tiwari[1]; [1]*Manipal Univ. Jaipur, India.* This work presented a Spiral-Shaped SPR-PCF biosensor with a Circular Ring. This work possesses the phase matching condition at 790 nm for the refractive index of analyte (na) is 1.40 having a peak of confinement loss of 2.001553 dB/cm.

JD6A.9

Deep Brain Monitoring for Extremely low-Birth-Weight Infants Utilized Time-Domain Diffuse Optical Spectroscopy in Transmittance Mode, Hiroaki Suzuki[1], Toshiyuki Imanishi[2], Norihiro Suzuki[1], Teruhiro Okuyama[3], Shu Homma[1], Kenji Yoshimoto[1], Tomomi Iida[1], Tetsuya Mimura[1], Hiroko Wada[1], Etsuko Ohmae[1], Masaki Shimizu[2], Yukio Ueda[1]; [1]*Hamamatsu Photonics K.K., Japan;* [2]*Saitama Children's Medical Center, Japan;* [3]*Univ. of Tokyo, Japan.* We developed a time-domain diffuse optical spectroscopy system for monitoring deep brain hemodynamics in premature infants in transmittance mode in the clinical setting and showed the system can measure the premature head in transmittance mode.

JD6A.10

Universally Achieving Crisp Imaging in Phone Camera With Field-Dependent Deconvolution in Raw Format, Ruxin Zhang[2], Xiaofei Song[2], Yuanlong Zhang[1], Haoqian Wang[2]; [1]*Tsinghua Univ., China;* [2]*Automation, Tsinghua Shenzhen International Graduate School, China.* We present Raw2raw, an innovative image reconstruction pipeline to mitigate blurriness caused by under-optimized smartphone systems. Our style effectively preserves data structure and underscores the potential of portable biomedical data capture and smartphone camera applications.

JD6A.11

Advanced Synthesis and Applications of Uniform $NaGdF_4$ Nanorods in Biophotonics and Imaging, Shahriar Esmaeili[1], Navid Rajil[1], Ayla HazratHosseini[1], Philip Hemmer[1]; [1]*Texas A&M Univ., USA.* This study presents the synthesis of uniform $NaGdF_4$:Yb, Er nanorods, highlighting their potential in biophotonics. Their unique properties offer advancements in non-invasive imaging, enhanced contrast in OCT, and potential in high-resolution technologies.

JD6A.12
Advancements in Microscopy Image Analysis: a MATLAB-Based Histogram Segmentation Approach for Particle Detection, Shahriar Esmaeili[1]; [1]*Texas A&M Univ., USA.* This paper presents a MATLAB-based method for particle detection in microscopy images using histogram segmentation. It enhances accuracy in identifying particle clusters, offering significant applications in biomedical imaging and material science research.

JD6A.13
Characterization of Functional Groups of Olive Leaves Adopting Fourier Transform Infrared Spectroscopy, Amal Khedr[2,1]; [1]*Department of Laser Applications in Metrology, Photochemistry and Agriculture (LAMPA), National Inst. of laser enhanced sci, Egypt;* [2]*Physics Department, Faculty of Science, Jouf Univ., P.O. Box 2014 Sakaka, Saudi Arabia, Saudi Arabia.* Vibrational spectroscopic known as Fourier transform infrared spectroscopy (FTIRS) has been utilized for detection of active groups in two varieties of olive leaves. The samples are from two farms in Jouf city in the north of the Kingdom of Saudi Arabia. Phenolic compounds employed in various functional food and folk medicine were investigated.

JD6A.14
Optical Image Encryption and Classification Using Deep Neural Networks for IoT Applications, Poonam Yadav[1]; [1]*Northcap Univ., India.* Optical image encryption via DRPE, securely stored in the cloud sans decryption. Deep CNN classifies encrypted images, ensuring privacy. Ideal for medicine and transportation, combining high-speed encryption, secure cloud storage, and top-tier image classification.