Disclaimer: this guide is limited to technical program with abstracts and author blocks as of 13 June. For updated and complete information with special events, reference the online schedule.

Sunday, 22 June

Room: ICM Room 11Wesn
08:30 -- 10:00
S1F • Clinical and Preclinical Applications of Diffuse Optics I
Presider: Wesley Baker; Children's Hospital of Philadelphia, USA

S1F.1 • 08:30 (Invited)
Non-Invasive Evaluation of Microvascular Impairment in Intensive Care Patients Through Near-Infrared Spectroscopy - the Multicenter HEMOCOVID-19 Trial: a Spotlight on Recruitment Center Effect on Measured Biomarkers, Lorenzo Cortese[1], Axel Masó[2], Marcel Morillas[2], David Busch[3], Pedro Castro[4], Antonio Luis Eiras Falcão[5], Ricard Ferrer[6], Giacomo Grasselli[7], Umut Karadeniz[1], Judith Marin Corral[8], Rickson Mesquita[9,10], Argelia Pérez Pacheco[11], Andrés Quiroga Soto[1,9], Leandro Utino Taniguchi[12], Marta Zanoletti[1], Jaume Mesquida[13], David Romero[2], Turgut Durduran[1,14]; *[1]ICFO -Institut de Ciencies Fotoniques, Spain; [2]CRM - Centre de Recerca Matemàtica, Spain; [3]Department of Anesthesiology & Pain Management, Department of Neurology, Department of Biomedical Engineering, Univ. of Texas Southwestern, USA; [4]Hospital Clínic De Barcelona, Spain; [5]Clinical Hospital, Univ. of Campinas, Brazil; [6]Vall D'Hebron Barcelona Hospital, Spain; [7]Fondazione IRCCS Ca' Granda Ospedale Maggiore Policlinico, Italy; [8]Hospital del Mar-IMIM, Spain; [9]Inst. of Physics, Univ. of Campinas, Brazil; [10]School of Computer Science, Univ. of Birmingham, UK; [11]"Dr. Eduardo Liceaga", Hospital General De México, Mexico; [12]Univ. of São Paulo Medical School, Hospital Das Clínicas, Brazil; [13]Parc Taulí Hospital Universitari, Spain; [14]Institució Catalana de Recerca i Estudis Avançats - ICREA, Spain.* We present the latest results of the HEMOCOVID-19 trial, carried out in ten hospitals with the aim of measuring microvascular impairment through NIRS in intensive care COVID-19 patients. Here, we reveal the effects of recruitment site on measured parameters, and correlate microvascular health with mortality and early antiviral treatments

S1F.2 • 09:00
Measurement of Systolic and Diastolic Blood Pressure with Near Infrared Spectroscopy, Anna Gerega[1], Stanislaw Wojtkiewicz[1]; *[1]IBIB PAN, Poland.* The proposed method meets requirements to be the standard for measuring blood pressure due to its accuracy, robustness, pulse wave independence and implementation simplicity, making it ideal for all blood pressure devices, especially personal ones.

S1F.3 • 09:15
Estimation of Arterial Blood Volume Using Spatially Resolved Continuous-Wave NIRS, Martin Goessweiner[1], Jingyi Wu[1], Jana M. Kainerstorfer[1]; *[1]Carnegie Mellon Univ., USA.* We present a novel approach for estimating arterial blood volume contributions to the differential path length factor using NIRS. By analyzing the slope of optical density at the heart rate, arterial pathlength changes are estimated.

S1F.4 • 09:30
Exploratory Study on Time Domain Approach for Pulse Oximetry Application, Suraj Kumar Kothuri[1,2], Pranav Lanka[1], Claudia Guadagno[4], Stefan Andersson-Engels[1,3], Sanathana Konugolu Venkata Sekar[1,4]; *[1]Tyndall National Inst., Ireland; [2]Engineering Sciences, Univ. College Cork, Ireland; [3]Physics, Univ. College Cork, Ireland; [4]BioPixS Ltd, Ireland.* This work is aimed to explore and assess the feasibility of time domain approach for pulse oximetry application. We employ high density, NIRS device (Kernel Flow) to record PPG signals from

various parts of human body.

S1F.5 • 09:45
Assessment of Lung and Peripheral Hemodynamics Through Time Domain Diffuse Optical Spectroscopy During Forced Breathing, Nicola Serra[1], Giulia Maffeis[1], Alessandro Bossi[1], Rinaldo Cubeddu[1], Antonio Pifferi[1], Paola Taroni[1]; *[1]Politecnico di Milano, Italy.* In a pioneering attempt at probing lungs *in-vivo* with time-resolved diffuse optics, we investigated how deep breathing causes synchronous blood volume-related absorption oscillations locally (lungs) and in peripheral circulation (forearm).

Room: ICM Room 2
08:30 -- 10:00
S1A • Multiphoton Microscopy I
Presider: Robert Szipocs; R&D Ultrafast Lasers Kft., Hungary

S1A.1 • 08:30 (Invited)
Widefield and Optically Sectioned Two-Photon Imaging of Biological Samples Using Random Illumination Microscopy (2P-RIM), Assia Benachir[1], Xiangyi Li[1], Eric M. Fantuzzi[1], Guillaume Giroussens[1], Thomas Mangeat[2], Luca Genchi[1], Federico Vernuccio[1], Hervé Rigneault[1], Anne Sentenac[1], Sandro Heuke[1]; *[1]Institut Fresnel, France; [2]Centre de Biologie Intégrative, France.* We present a widefield two-photon fluorescence technique for biological imaging. Using a random illumination microscopy scheme, we achieve 2?m axial resolution and a 1.7x improvement in lateral resolution over a field of view of 250?m.

S1A.2 • 09:00
High-Frame Rate Wide-Field Multiphoton Microscopy With a Temporal Focusing Scheme, Federico Vernuccio[1], Michal Marynowski[1], Xiangyi Li[1], Assia Benachir[1], Luca Genchi[1], Sandro Heuke[1], Anne Sentenac[1], Hervé Rigneault[1]; *[1]CNRS, France.* We propose a temporal focusing scheme with galvo scanners to perform two-photon fluorescence and CARS microscopy of biological samples over an unprecedently large field of view (>300x300μm^2) at >10 frames/s with 3.8μm optical sectioning ability.

S1A.3 • 09:15
Double-Clad Tapered Multi-Core Fibers for two-Photon Lensless Endoscopy, Luca Genchi[1], Matthias Hofer[1], Adrien Carron[2], Fatima El Moussawi[2], Aymeric Pastre[2], Remy Bernard[2], Damien Labat[2], Andy Cassez[2], Rosa Cossart[3], Olivier Vanvincq[2], Geraud Bouwmans[2], Siddharth Sivankutty[2], Esben Ravn Andresen[2], Hervé Rigneault[1]; *[1]Aix-Marseille Univ., CNRS, Centrale Med, Institut Fresnel, Marseille, France., France; [2]Univ. Lille, CNRS, UMR 8523 PhLAM-Physique des Lasers, Atomes et Molécules, F-59000 Lille, France., France; [3]INSERM, Aix-Marseille Univ., CNRS, INMED, Marseille, France, France.* We present a lensless endoscope based on a double-clad tapered multi-core fiber (MCF) that enables high-speed endoscopic multiphoton imaging. We compare different MCF designs and demonstrate two-photon excited fluorescence imaging on biological samples.

S1A.4 • 09:30
SLIDE Multiphoton Microscopy of Green Fluorescent Dyes With 640 Frames per Second, Stefan Meyer[1,2], Kimberley L. Goodwin[1], Tonio F. Kutscher[1], Sebastian Karpf[1]; *[1]Inst. of Biomedical Optics, Universität zu Lübeck, Germany; [2]Medical Lasercenter Lübeck, Germany.* This work presents first images of green fluorescent samples with an ultra-fast SLIDE multiphoton microscope. A new swept-source FDML-MOPA laser at 978 nm enables frame rates of 640 Hz and line rates of 160 kHz.

S1A.5 • 09:45
Noise Tolerant Inversion in Single Pixel Imaging for Biological Imaging, Avinash Upadhya[1,2], Emi C. Hughes[1], megan lim[1,2], Philip Wijesinghe[3], Kylie Dunning[1,2], Kishan Dholakia[1,3]; *[1]Centre of Light for Life, School of Biological Sciences, Univ. of Adelaide, Australia; [2]Robinson Research Inst., School of Biomedicine, The Univ. of Adelaide, Australia; [3]SUPA, School of Physics and Astronomy, Univ. of St Andrews, UK.* Compressive sensing (CS) in optical microscopy promises imaging with fewer samples and thus lower photodamage. However, microscopy is often challenged by noise. We explore the effects of noise on CS reconstruction across various sampling schemes.

Room: ICM Room 3
08:30 -- 10:00
S1B • Ocular Imaging
Presider: Yoshiaki Yasuno; Univ. of Tsukuba, Japan

S1B.1 • 08:30 (Invited)
Transmission Interference Microscopy of the in Vivo Anterior Human eye, Samer Alhaddad[1,2], Wajdene Ghouali[3], Christophe BAUDOUIN[3], Albert Claude Boccara[1], Viacheslav Mazlin[1,3]; *[1]Langevin Inst., ESPCI, France; [2]SharpEye, France; [3]Quinze Vingts National Ophthalmology Hospital, France.* We demonstrate E. Abbe's interference principle in transmission microscopy for in vivo human eye imaging by controlling illumination at the back of the eye. This reveals high-contrast cellular details of the anterior eye and lens.

S1B.2 • 09:00
Bandwidth-Efficient Signal Acquisition for 21mm FOV Retinal OCTA, Sunhong Jeong[1,2], ByungKun Lee[1,2], Gyounghwan Kim[1,2], Tae Shik Kim[3], Benjamin J. Vakoc[3], William Oh[1,2]; *[1]Mechanical Engineering, Korea Advanced Inst of Science & Tech, Korea (the Republic of); [2]KI for Health Science and Technology, Korea Advanced Inst of Science & Tech, Korea (the Republic of); [3]Wellman Center for Photomedicine, Massachusetts General Hospital and Harvard Medical School, USA.* We present wide-field retinal OCTA acquired with a 1 GHz signal bandwidth. A 4.73 MHz SPML-OCT system with concentric-circular scanning and automatic reference arm length adjustment enabled high-quality 21 mm FOV OCTA in five seconds.

S1B.3 • 09:15
Oblique Illumination Holographic OCT for Improving Resolution, Reducing Speckles and Objectively Correcting Aberrations, Nelson P. Klooster[1], Sarvesh A. Thakur[1], Dierck Hillmann[1]; *[1]VU Amsterdam, Netherlands.* We demonstrate oblique illumination in a holographic full-field Fourier-domain optical coherence tomography (FF-FD-OCT) system. This approach allows us to determine and correct aberrations objectively, reduce speckle noise, and increase

the lateral resolution.

S1B.4 • 09:30
Optical Signal Discontinuity Zones of the Crystalline Lens in the Accommodating Eye, Keerthana Soman[1], Grzegorz Gondek[1], Bartlomiej J. Kaluzny[2], Karol Karnowski[3], Daniel Ruminski[1], Pablo Artal[4], Ireneusz Grulkowski[1]; *[1]Inst. of Physics, Faculty of Physics, Astronomy and Informatics, Nicolaus Copernicus Univ., Poland; [2]Department of Ophthalmology, Collegium Medicum, Nicolaus Copernicus Univ., Poland; [3]Inst. of Physical Chemistry, Polish Academy of Sciences, Poland; [4]Univ. of Murcia, Spain.* The study explores the morphological changes in the accommodating eye, using full-eye-length swept-source optical coherence tomography (SS-OCT) intergrated with an accommodation unit. We identify and analyze structural modifications to optical signal discontinuity (OSD) zones offering new insights into the dynamic behavior of the crystalline lens.

S1B.5 • 09:45
Towards Assessment of Retinal Morphological Changes via Instrument-Integrated OCT in Endo-Photocoagulation in a Porcine Eye Model, Dongyue Wu[2,1], Kevin T. George[3,2], Philipp Matten[2], Eleonora Tagliabue[2], Caglar Ataman[1]; *[1]Department of Microsystems Engineering, Univ. of Freiburg, Germany; [2]Carl Zeiss AG, Germany; [3]Leibniz Univ. Hannover, Germany.* This study evaluates local retinal tissue thickness changes in ex vivo porcine eyes in endolaser photocoagulation using an instrument-integrated OCT sensor and compares results with conventional microscope-integrated OCT measurements.

Room: ICM Room 4a
08:30 -- 10:00
S1C • Optical Coherence Elastography
Presider: Frederique Vanholsbeeck; Univ. of Auckland, New Zealand

S1C.1 • 08:30 (Invited)
Rapid Volumetric Strain Imaging Using Full-Field Swept-Source Optical Coherence Elastography, Seweryn Morawiec[1], Matt Hepburn[1,2], Marta Skrok[1], Mateusz Maniewski[3,4], Lukasz Szylberg[3,4], Maciej Szkulmowski[1], Brendan F. Kennedy[1,2]; *[1]Inst. of Physics, Nicolaus Copernicus Univ., Poland; [2]BRITElab, Harry Perkins Inst. of Medical Research, The Univ. of Western Australia, Australia; [3]Department of Obstetrics, Gynaecology and Oncology, Collegium Medicum in Bydgoszcz, Nicolaus Copernicus Univ., Poland; [4]Department of Tumor Pathology and Pathomorphology, Oncology Centre, Prof. Franciszek Lukaszczyk Memorial Hospital, Poland.* We demonstrate full-field swept-source optical coherence elastography system achieving volumetric strain imaging rate of 2 Hz at 4 µm lateral sampling. Validation reveals notable mechanical contrast in silicone inclusion phantom and human prostate carcinoma tissue.

S1C.2 • 09:00
Visualization of Breast Cancer Using Multi-Parametric Optical Coherence Elastography, Jiayue Li[2,1], Ken Foo[2,1], Rowan W. Sanderson[2,1], Renate Zilkens[2,4], Mireille Hardie[3], Laura Gale[3], Yen Yeow[5], Celia Green[6], Farah Abdul-Aziz[7], Juliana Hamzah[8], James Stephenson[9], Ammar Tayaran[9], Jose Cid Fernandez[9], Lee Jackson[9], Synn Chin[9], Saud Hamza[9], Anmol Rijhumal[3], Christobel Saunders[10,4], Brendan F. Kennedy[2,11]; *[1]Department of Electrical, Electronic & Computer Engineering, The Univ. of Western Australia,*

Australia; [2]BRITElab, Harry Perkins Inst. of Medical Research, Australia; [3]PathWest, Fiona Stanley Hospital, Australia; [4]Medical School, The Univ. of Western Australia, Australia; [5]Systems Biology and Genomics Laboratory, Harry Perkins Inst. of Medical Research, Australia; [6]PathWest, QEII Medical Centre, Australia; [7]Hollywood Private Hospital, Australia; [8]Targeted Drug Delivery, Imaging & Therapy, Harry Perkins Inst. of Medical Research, Australia; [9]Breast Surgery Unit, Fiona Stanley Hospital, Australia; [10]Melbourne Medical School, The Univ. of Melbourne, Australia; [11]Faculty of Physics, Astronomy and Informatics, Nicolaus Copernicus Univ. in Torun, Poland. Optical coherence elastography (OCE) shows promise in intraoperative tumor margin assessment, but is limited by imaging artefacts. We demonstrate multi-parametric OCE, comprising four distinct OCE contrast mechanisms, for improved visualization of breast cancer.

S1C.3 • 09:15
Optical Coherence Elastography of Excised Human Prostate, Szymon Tamborski[1], Marta K. Skrok[1], Matt S. Hepburn[1,2], Jiayue Li[2], Mateusz Maniewski[3,4], Marek Zdrenka[4], Adam Kowalewski[4,5], Lukasz Szylberg[3,4], Brendan F. Kennedy[1,2]; *[1]Inst. of Physics, Nicolaus Copernicus Univ. in Torun, Poland; [2]Department of Electrical, Electronic and Computer Engineering, Univ. of Western Australia, Australia; [3]Department of Obstetrics, Gynaecology and Oncology, Nicolaus Copernicus Univ. in Torun, Poland; [4]Department of Tumor Pathology and Pathomorphology, Oncology Centre Prof. Franciszek Lukaszczyk Memorial Hospital, Poland; [5]Faculty of Medicine, Bydgoszcz Univ. of Science and Technology, Poland.* We applied compression optical coherence elastography to obtain elastograms of entire cross-sections of a fresh human prostate. Images of stress, strain, and Euler angle of principal compression reveal important details of the tissue micro-architecture and allow for tumor differentiation.

S1C.4 • 09:30
The Development of Anatomical Breast Tissue-Mimicking Phantoms for Optical Coherence Elastography, Farzan Navaeipour[1,2], Rowan W. Sanderson[1,2], Jiayue Li[1,2], Scarlett Rawlins[1,2], Matt Hepburn[1,2], Brendan F. Kennedy[1,2]; *[1]BRITElab, Harry Perkins Inst. of Medical Research, Australia; [2]Department of Electrical, Electronic and Computer Engineering, The Univ. of Western Australia, Australia.* We present novel breast tissue-mimicking phantoms for OCE that accurately replicate invasive carcinoma and ductal networks at micro-scale resolution. Unlike existing phantoms, our phantoms enable studies of mechanical contrast formation in complex tissue structures.

S1C.5 • 09:45
Towards Combined Raman Spectroscopy and Polarisation-Sensitive Optical Coherence Tomography for Integrated Biochemical and Biomechanical Testing of Cartilage, Darven Murali Tharan[1,2], Cushla McGoverin[1,2], Marco Bonesi[1,2], Daniel Everett[2,3], Matthew Goodwin[1,2], Sue McGlashan[4], Ashvin Thambyah[3], Frederique Vanholsbeeck[1,2]; *[1]Department of Physics, The Univ. of Auckland, New Zealand; [2]The Dodd Walls Centre for Quantum and Photonic Technology, New Zealand; [3]Department of Chemical and Materials Engineering, The Univ. of Auckland, New Zealand; [4]Department of Anatomy and Medical Imaging, The Univ. of Auckland, New Zealand.* Cartilage behaviour under load involves a complex interplay of biomechanical and biochemical responses. We demonstrate the effectiveness of PS-OCT and Raman spectroscopy independently for studying cartilage under load and have developed a multimodal configuration.

Room: ICM Room 4b
08:30 -- 10:00
S1D • Clinical Imaging
Presider: Chulhong Kim; Pohang Univ of Science & Technology

S1D.1 • 08:30 (Invited)
Automatic Quantification of Human Skin Anatomy and Microvasculature Biomarkers by Optoacoustic Mesoscopy With Machine Learning, Hailong He[1], Johannes Paetzold[2], Erik Riedel[2], Ulf Darsow[2], Vasilis Ntziachristos[1]; *[1]Helmholtz Zentrum München GmbH, Germany; [2]Technical Univ. of Munich, Germany.* We developed a deep learning-based framework to analyze and quantify morphological skin features recorded by RSOM (raster-scan optoacoustic mesoscopy) and extract imaging biomarkers for disease characterization. The automatic featurus were found to be strongly correlated to physician observations and histology.

S1D.2 • 09:00
Towards Obtaining Reliable Spectral Biomarkers of Breast Cancer in Multispectral Optoacoustic Tomography, Maximilian Bader[2,1], Benedict E. Mc Larney[3], Katja Pinker[5,6], Jan Grimm[3,4], Dominik Jüstel[1,2], Vasilis Ntziachristos[2,1]; *[1]Inst. of Biological and Medical Imaging, Bioengineering Center, Helmholtz Zentrum München, Germany; [2]Chair of Biological Imaging, Central Inst. for Translational Cancer Research (TranslaTUM), School of Medicine and Health & School of Computation, Information and Technology, Technical Univ. of Munich, Germany; [3]Molecular Pharmacology Program, Memorial Sloan Kettering Cancer Center, USA; [4]Department of Pharmacology, Weill Cornell Medicine, USA; [5]Department of Radiology, Memorial Sloan Kettering Cancer Center, USA; [6]Department of Radiology, Columbia Univ. Vagelos College of Physicians and Surgeons, USA.* Multispectral optoacoustic tomography (MSOT) allows non-invasive spectroscopic imaging of human tissue. We analyze the stability of MSOT spectra and investigate effects of spectral coloring to pave the way for in-vivo breast cancer monitoring with MSOT.

S1D.3 • 09:15
High Resolution Photoacoustic Imaging for Quantitative Severity Assessment and Treatment Monitoring in Inflammatory Skin Diseases Using Structural and Functional Biomarkers, Xiuting Li[1], Yik Weng Yew[2], Steven Tien Guan Thng[2], Malini Olivo[1], Dinish U.S[1]; *[1]A*STAR Skin Research Labs, Singapore; [2]National Skin Center, Singapore.* We report the integration of photoacoustic imaging derived biomarkers into clinical practice, offering a non-invasive, objective tool for assessing the severity of inflammatory skin diseases (atopic dermatitis and psoriasis) and monitoring its treatment efficacy.

S1D.4 • 09:30
Peripheral Vascular Photoacoustic Imaging Using a Portable Laser Diode, Anjali Thomas[1], Gijs van Soest[1], Francis Kalloor Joseph[1]; *[1]Erasmus MC, Netherlands.* Portable, low-power photoacoustic imaging systems can be effective for clinical translation. We integrated a laser diode with a commercial system and successfully demonstrated in vivo peripheral artery imaging in human volunteers.

S1D.5 • 09:45
Multimodal Spectral Photoacoustic and Ultrasound Imaging for Endarterectomy Plaque Characterization, Eline Veldhuijzen[1], Camilo Cano[1], Marc van Sambeek[1,2], Richard G. Lopata[1], Min Wu[1]; *[1]Eindhoven Univ. of Technology, Netherlands; [2]Catharina Ziekenhuis Eindhoven,*

Netherlands. This work presents a multimodal spectral photoacoustic-ultrasound tomographic imaging framework to improve carotid plaque vulnerability assessment through tissue characterization. Integrating enhanced blind spectral unmixing with US-based calcification detection enables accurate identification of plaque components.

Room: ICM Room 5
08:30 -- 10:00
S1E • Light Sources and More
Presider: Lothar Lilge; Univ. Health Network, Canada

S1E.1 • 08:30
Fluorescence Method to Assess Aspiration Risk, Goro Nishimura[1], Kaito Wakamatsu[2], Takuji Koike[2], Yukio Yamada[2], Haruki Niwa[2], Yukihiro Michiwaki[3]; *[1]Hokkaido Univ., Japan; [2]The Univ. of Electro-Communications, Japan; [3]Toho Univ., Japan.* One major cause of death in highly aged people is pneumonia induced by pulmonary aspiration. Some exercises can reduce the aspiration risk, but there is no simple method to evaluate the performance of such exercises. In this study, we propose a simple fluorescence method to detect food residues in the pyriform sinus to assess the aspiration risk.

S1E.2 • 08:45
Validating Optoacoustic Temperature Determination for Retinal Laser Treatments With the Fluorescence dye ERthermAC, Eric Seifert[3], Leonie Hoffmann[3], Xi Zhang[3], Lisa-Marie Frühauf[3], Yoko Miura[2,1], Ralf Brinkmann[3,2]; *[1]Ophthalmology, Univ. of Lübeck, Germany; [2]Inst. of Biomedical Optics, Univ. of Lübeck, Germany; [3]Medical Laser Center Lübeck, Germany.* Temperature dependent fluorescence of the dye ERthermAC was used to measure laser induced temperature rise on RPE/choroid/sclera explants during simultaneous optoacoustic temperature determination, already being in clinical approval. Both methods didn't show significant differences.

S1E.3 • 09:00
Eraser-Sized Broadband (3-20µm) Mid-Infrared Passive Spectroscopic Imager for Every Life Space, Hibiki Yano[1], Daichi Anabuki[1], Ichiro Ishimaru[2]; *[1]Graduate School of Science for Creative Emergence, Kagawa Univ., Japan; [2]Faculty of Engineering and Design, Kagawa Univ., Japan.* A phase shifter with a drive system combining a voice coil motor and a spring is proposed. We confirmed that this system can drive the motor at constant velocity and low speed.

S1E.4 • 09:15
Efficacy and Safety of 1940nm Fiber-Guided Diode Laser, Young-Seok Seo[1], Hong-Ju Han[1]; *[1]WONTECH Co., Ltd., Korea (the Republic of).* In this study, we analyzed the penetration depth of tissues, photothermal effects, tissue denaturation, and thermal effects according to output power and irradiation time through preclinical studies applied to a 1940 nm diode laser using the developed fiber-optic catheter.

S1E.5 • 09:30
Ultrashort Laser Pulses for Application in Cancer Surgery, Rainer J. Beck[1], Tatiana Malikova[1], Ioannis Bitharas[1], Andrew Moore[1], Robert R. Thomson[1], Jonathan D. Shephard[1]; *[1]Heriot-Watt Univ., UK.* We present the successful laser ablation of clinically

relevant tissue models using ultrashort laser pulses. The correlation of high-speed imaging of the ablation process with a histopathological analysis of the tissue morphology enables the optimisation of the tissue removal.

S1E.6 • 09:45
Influence of Fiber Diameter on Thulium Fiber Laser Lithotripsy, Kimberley Lühring[1], Natalie Bruhn[2], Lion Schützeck[1], Birgit Lange[1], Ralf Brinkmann[1,2]; *[1]Medical Laser Center Lübeck, Germany; [2]Inst. of Biomedical Optics, Univ. of Lübeck, Germany.* The influence of fiber diameter on stone dusting and retropulsion during lithotripsy was investigated in single-pulse experiments with BegoStones and a pendulum-setup. It was found that thinner fibers ensure less retropulsion without reducing material removal.

Room: ICM Room 11
10:30 -- 12:00
S2F • Clinical and Preclinical Applications of Diffuse Optics II
Presider: Yoko Hoshi; Hamamatsu Univ. School of Medicine, Japan

S2F.1 • 10:30 (Invited)
Validation of a Simultaneous Cerebral Blood Flow and Electrophysiology Monitor for Language Acquisition in six-Month old Infants, Ibtissam Ghailan Tribak[1], Judit Ciarrusta Monzon[2], Chiara Santolin[3], Fen Zhang[4], Daniel Senciales[1], Susanna Tagliabue[5], Osman Melih Can[1], M. Atif Yaqub[1], Judit Gervain[6,7], Nuria Sebastian Galles[2], Turgut Durduran[1,8]; *[1]ICFO - Institut de Ciencies Fotoniques, Spain; [2]Universitat Pompeu Fabra, Spain; [3]Fundació de recerca Sant Joan de Déu, Spain; [4]KU Leuven Libraries, Belgium; [5]NIRx, Germany; [6]CNRS and Université Paris Cité, France; [7]Univ. of Padova, Italy; [8]ICREA, Spain.* Functional diffuse correlation spectroscopy (fDCS) and electroencephalography (EEG) is proposed as a robust method to monitor neurovascular coupling underlying language acquisition in six-month-old infants, and, is validated.

S2F.2 • 11:00
Non-Invasive Optical Assessment of Central Venous Pressure in Children with Single-Ventricle Heart Defects, Wesley Baker[1], April Hurlock[1], Crystal Mcintosh[1], Hongting Zhao[1], Caitlyn Davis[1], Darci Anderson[1], Briston Bayle[1], Rika Goto[1], Caitlyn Mulvihill[1], Rodrigo Forti[1], Tiffany Ko[1], Brian White[1], Jennifer Lynch[1]; *[1]Children's Hospital of Philadelphia, USA.* Children with single-ventricle heart defects experience elevated superior venous pressure after their Glenn surgery. We used diffuse correlation spectroscopy to measure a concurrent increase in intracranial pressure (ICP); ICP correlated with invasively measured venous pressure.

S2F.3 • 11:15
Monitoring Cerebral Vasoreactivity and Hemodynamics in Patients With Intracerebral Hemorrhage Over Time, Jacqueline Martínez García[1], Anna Ramos Pachón[2], Ana Aguilera Simón[2], Pol Camps Renom[2], Garbiñe Ezcurra Díaz[2], Carolina Fajardo Vega[1], Joan Miquel Fernández Vidal[2], Jonas Fischer[2], Cristina Gallego Fabrega[2], Marina Guasch Jiménez[2], Marta Izura Gómez[2], Lisa C. Kobayashi Frisk[1], Álvaro Lambea Gil[2], Alejandro Martínez Domeño[2], Indalecio Morán Chorro[2], Luis Prats Sánchez[2], Nuria Puig Grifol[2], Juan José Sánchez Fernández[2], Marta Zanoletti[1], Joan Martí Fabregas[2], Turgut Durduran[1,3]; *[1]ICFO - Institut de Ciències Fotòniques, Spain; [2]Hospital de la Santa Creu i Sant Pau, Spain; [3]Institució Catalana de Recerca i Estudis Avançats (ICREA), Spain.* This study investigates the use of hybrid diffuse

optics combining diffuse optical spectroscopy and time-domain near-infrared spectroscopy in patients with intracerebral hemorrhage to evaluate the association of optically derived parameters with clinical data and outcomes.

S2F.4 • 11:30
Diffuse Optical Spectroscopy to Study Changes in Mammary Physiology During Pregnancy, Ana Boamfa[1], Thomas D. O'Sullivan[2], Nienke Bosschaart[1]; *[1]Univ. of Twente, Netherlands; [2]Univ. of Notre Dame, USA.* This study employs broadband Diffuse Optical Spectroscopy (DOS) to study the temporal haemodynamic changes in the breast during pregnancy. Findings reveal variations in tissue oxygenation and haemoglobin concentration, offering deeper insights into breast development.

S2F.5 • 11:45
Initial Non-Invasive in Vivo Assessment of Breast Density with Time Resolved Diffuse Reflectance, Nicola Serra[1], Giulia Maffeis[1], Vamshi Damagatla[1], Rinaldo Cubeddu[1], Antonio Pifferi[1], Paola Taroni[1]; *[1]Politecnico di Milano, Italy.* Breast composition of 11 volunteers is measured using reflectance, broadband time-domain diffuse optical spectroscopy to optimize measurement protocols for breast density estimation, aiming to develop a non-invasive optical device for breast cancer risk assessment.

Room: ICM Room 2
10:30 -- 12:00
S2A • FLIM and Adaptive Optics
Presider: Irene Georgakoudi; Thayer Engineering at Dartmouth, USA

S2A.1 • 10:30 (Invited)
A Comprehensive Strategy for Ultra-Fast FLIM: Up to 2 Photons per Period Without Distortion, Gennaro Fratta[1], Valerio Gandolfi[2], Piergiorgio Daniele[1], Federico Simoni[2], Ivan Labanca[1], Andrea Farina[3], Giulia Acconcia[1], Alberto Gola[4], Cosimo D'Andrea[2,5], Ivan Rech[1]; *[1]Dipartimento di Elettronica, Informazione e Bioingegneria, Politecnico di Milano, Italy; [2]Dipartimento di Fisica, Politecnico di Milano, Italy; [3]Istituto di Fotonica e Nanotecnologie, Consiglio Nazionale delle Ricerche, Italy; [4]Fondazione Bruno Kessler, Italy; [5]Istituto Italiano di Tecnologia, Italy.* By combining a pile-up correction methodology and a custom ultra-low dead time photodetector as Single-Pixel Camera, we achieve 20 fps in Fluorescence Lifetime Imaging Microscopy with photon count rates exceeding 200% of the excitation frequency.

S2A.2 • 11:00
Multispectral Fast FLIM Based on Compressive Sensing Single-Pixel Camera for Imaging of Biological Dynamic Processes, Federico Simoni[1], Valerio Gandolfi[1], Elisabetta Avanzi[1], Shivaprasad Varakkoth[1], Alberto Ghezzi[1], Andrea Costa[2], Nicola Lusardi[2], Fabio Garzetti[2], Enrico Ronconi[2], Gabriele Bonanno[2], Angelo Geraci[2], Stefano Santabarbara[3], Anna Bosc[1,4], Andrea Pianetti[4], Giuseppe Paternò[1,4], Guglielmo Lanzani[1,4], Alberto Dalla Mora[1], Laura Di Sieno[1], Andrea Farina[5], Cosimo D'Andrea[1,4]; *[1]Department of Physics, Politecnico di Milano, Italy; [2]Department of Electronics, Politecnico di Milano, Italy; [3]Istituto di Biologia e Biotecnologia Agraria, Consiglio Nazionale Delle Ricerche, Italy; [4]Center for Nano Science and Technology, Istituto Italiano di Tecnologia, Italy; [5]Istituto di Fotonica e Nanotecnologie, Consiglio Nazionale delle Ricerche, Italy.* A fast fluorescence lifetime imaging microscopy (FLIM) system using compress sensing and a single-pixel camera enables real-time imaging of biological dynamics.

Dual detection paths provide high-speed (20 fps) or multispectral measurements, enhancing biomedical analysis.

S2A.3 • 11:15
Multispectral Depth-Resolved Fluorescence Lifetime Microscopy Using Computational Imaging, Shivaprasad Varakkoth[1], Valerio Gandolfi[1], Federico Simoni[1], Serban C. Tudosie[2], Simon Arridge[2], Andrea Farina[3], Cosimo D'Andrea[1,4]; *[1]Dipartimento di Fisica, Politecnico di Milano, Italy; [2]Department of Computer Science, Univ. College London, UK; [3]Istituto di Fotonica e Nanotecnologie, Consiglio Nazionale delle Ricerche, Italy; [4]Center for Nano Science and Technology, Istituto Italiano di Tecnologia, Italy.* We present a wide-field 3D multispectral fluorescence lifetime imaging (λFLIM) microscope combining compressive sensing, single-pixel camera, structured illumination and data fusion techniques in an integrated computational imaging approach to acquire multidimensional optically sectioned images faster.

S2A.4 • 11:30
Wavelens: a Novel Wavefront Shaping Assisted Illumination Device for in Vivo Fluorescence Imaging of Biological Specimens, Mikis Mylonakis[1,2], Evangelos Marakis[1], Athanasios Zacharopoulos[1], Maria Tampakaki[3,4], Angela Pasparaki[5], Nektarios Tavernarakis[5,4], Dimitrios G. Papazoglou[1,2], Zacharakis Giannis[1]; *[1]Inst. of Electronic Structure and Laser, FORTH, Greece; [2]Materials Science and Engineering, Univ. of Crete, Greece; [3]Inst. of Computer Science, Foundation for Research and Technology-Hellas, Greece; [4]School of Medicine, Univ. of Crete, Greece; [5]Inst. of Molecular Biology and Biotechnology, Foundation for Research and Technology-Hellas, Greece.* We present Wavelens, a compact, microscope objective-like wavefront-shaping optical device for tailored illumination in Light-Sheet Fluorescence Microscopy (LSFM). We characterize its performance and demonstrate superior in vivo imaging of fluorescent specimens compared to conventional optics.

S2A.5 • 11:45
A Practical Approach to Aberration Correction Using Deep Transfer Learning and Phase Diversity with Limited Experimental Data, Alexander Bentley[1], Janet Kok[1], Bowen Deng[1], Andrew Parkes[1], Michael Somekh[1], Amanda Wright[1], Michael Pound[1]; *[1]Univ. of Nottingham, UK.* Adaptive Optics is a technique to improve image quality in the presence of optical aberrations. This study demonstrates the application of deep transfer learning to predict and correct aberrations with limited phase diverse experimental data.

Room: ICM Room 3
10:30 -- 12:00
S2B • Optoretinography
Presider: Marinko Sarunic; Univ. College London, UK

S2B.1 • 10:30 (Invited)
Depth-Resolved Temporal Photoreceptors' Transfer Function Measured With Photopic Flicker Optoretinography (f-ORG), Piotr F. Wegrzyn[1,2], Slawomir Tomczewski[1], Maciej Wojtkowski[1]; *[1]ICTER, Poland; [2]Faculty of Physics, Univ. of Warsaw, Poland.* We present depth-resolved study of the temporal transfer function for cones and rods, derived by flicker optoretinography (f-ORG) combined with Spatio-Temporal Optical Coherence Tomography (STOC-T).

S2B.2 • 11:00
Progress on Clinical Optoretinography Using Dual-Spectrometer OCT in Healthy Eyes and Eyes with Birdshot Chorioretinopathy, Arman Athwal[2], Colin Chu[4], Ringo Ng[3], Joey Huang[1], Yifan Jian[3], Myeong Jin Ju[5], Marinko Sarunic[2,4]; *[1]Simon Fraser Univ., Canada; [2]Medical Physics and Biomedical Engineering, Univ. College London, UK; [3]Casey Eye Inst., USA; [4]Inst. of Ophthalmology, Univ. College London, UK; [5]Univ. of British Columbia, Canada.* We present progress on translating optoretinography (ORG) into the ophthalmic clinic. We have extracted ORGs from multiple patients with Birdshot Chorioretinopathy using a dual-spectrometer, clinically analogous OCT and aim to correlate ORG with disease features.

S2B.3 • 11:15
Progress in ORGs Acquisition by FF-SS-OCT Systems, Robert J. Zawadzki[1], Ewelina Pijewska[1,2], Denise Valente[1,3], Kari Vienola[1,4], Ratheesh K. Meleppat[1], Ravi S. Jonnal[1]; *[1]Univ. of California Davis, USA; [2]Nicolaus Copernicus Univ., Poland; [3]Universidade de Pernambuco, Brazil; [4]Univ. of Turku, Finland.* Progress in optoretinography (ORG), measurements of the light-evoked changes in retinal morphology, will be presented with a focus on the development and implementation of the FF-SS-OCT for humans and experimental animals (mice).

S2B.4 • 11:30
OCT Split-Spectrum Amplitude-Decorrelation Optoretinography in Age-Related Macular Degeneration, David Huang[1], Siyu Chen[1], Steve Bailey[1]; *[1]Oregon Health and Science Univ., USA.* We provide initial demonstration of OCT split-spectrum amplitude-decorrelation optoretinography to map photoreceptor dysfunction over the central 3x3-mm macular area for the clinical evaluation of early to intermediate age-related macular degeneration.

S2B.5 • 11:45
Influence of Color Blindness on Intensity-Based Optoretinograms Recorded with Adaptive Optics Scanning Laser Ophthalmoscope, Julia Granier[1,2], Elena Gofas Salas[1,2], Kate Grieve[1,2]; *[1]Institut De La Vision Paris, France; [2]CHNO des Quinze-Vingts, France.* We recorded iORG on healthy volunteers using an Adaptive-Optics Scanning Laser Ophthalmoscope and showed that age and color blindness are two important factors that need to be taken into account.

Room: ICM Room 4a
10:30 -- 12:00
S2C • Brillouin Microscopy and Acoustical Methods
Presider: Giuliano Scarcelli; Univ. of Maryland at College Park, USA

S2C.1 • 10:30
BIPD-Assisted Brillouin Microscopy Reveals Altered Bone Biomechanics in Osteopetrosis, Renzo Vanna[2], Morteza Behrouzitabar[3,1], Marco Ventura[2], Victor Alcolea-Rodriguez[2], Maria Lucia Schiavone[4], Cristina Sobacchi[4], Dario Polli[5], Cristian Manzoni[2], Giulio Cerullo[5], Giuseppe Antonacci[1]; *[1]Specto Photonics, Italy; [2]IFN - CNR, Italy; [3]Università degli Studi Bicocca, Italy; [4]Humanitas Hospital, Italy; [5]Politecnico di Milano, Italy.* Osteopetrosis is a rare genetic disorder characterized by excessive bone density and fragility. We investigated the mechanical changes associated with this disease using a custom confocal Brillouin microscope integrating a birefringent-induced phase delay (BIPD) filter to suppress unwanted Rayleigh

scattering by >60 dB.

S2C.2 • 10:45
Biomechanics of Glioblastoma Tissue: Insights From in Vitro Models Using Brillouin and Raman Spectroscopy, Roberta Galli[1], Tina Leonidou[1], Jan Rix[1], Katrin Kirsche[1], Edmund Koch[1], Ilker Eyüpoglu[1], Ortrud Uckermann[1]; *[1]Dresden Univ. of Technology, Germany.* Brillouin microscopy retrieved the viscoelastic properties of different biochemical components in glioblastoma organoids derived from human brain tumor tissue, which are an in vitro model recapitulating the biological characteristics and heterogeneity of tumor tissue.

S2C.3 • 11:00
Investigation of the Microscopic and Molecular Processes Underlying the Corneal Cross-Linking Therapy, Jan Rix[1], Svea Steuer[2], Jonas Golde[1,3], Fadi Husein[4], Felix Lochmann[4], Steven Melcher[2], Gerald Steiner[2], Julia Walther[1], Frederik Raiskup[4], Ramin Khoramnia[4], Robert Herber[4]; *[1]TU Dresden, Faculty of Medicine Carl Gustav Carus, Medical Physics and Biomedical Engineering, Fetscherstrasse 74, Germany; [2]TU Dresden, Faculty of Medicine Carl Gustav Carus, Department of Anesthesiology and Intensive Care Medicine, Clinical Sensoring and Monitoring, Fetscherstrasse 74, Germany; [3]Fraunhofer Inst. for Material and Beam Technology IWS, Winterbergstrasse 28, Germany; [4]Department of Ophthalmology, Univ. Hospital Carl Gustav Carus, TU Dresden, Fetscherstrasse 74, Germany.* Investigations on porcine eyes by Brillouin-Raman spectroscopy and polarization-sensitive optical coherence tomography revealed that mechanical stiffening of corneal cross-linking therapy is based on fiber alignment and hydration, but not on changes in the molecular structure.

S2C.4 • 11:15
Ultra-Fast Pathogen Identification in Sepsis Diagnosis Using an Optomechanical Sensor Assisted by Artificial Intelligence., Irene Colomar Marí[1,2], Alejandro Iregui[1], Casilda Muñoz[1], Carolina Heras[1], Matthieu Duperron[1], Daniel Ramos[2], Blanca Caballero[1]; *[1]Nanological S.L., Spain; [2]Inst. of Material Science of Madrid (ICMM), CSIC, Spain.* An optomechanical platform is presented enabling ultra-fast, label-free pathogen identification from whole blood, using biophysical properties. By using deep learning algorithms, it achieves over 96% accuracy in 1mL sample volume within 20 minutes.

S2C.5 • 11:30
Study on the Pump and Probe Beam Overlap in Stimulated Brillouin Scattering Microscopy, Meng Xu[1], Zixuan Du[1], Jinrui Zhang[1], Shuai Yao[1], yun qi[1], Fan Yang[1]; *[1]Shanghai Inst of Optics and Fine Mech, China.* We present, for the first time, a theoretical and experimental investigation into the effect of sample heterogeneity on the overlap between the pump and probe beams and the resulting Brillouin signal in stimulated Brillouin microscopy.

S2C.6 • 11:45
Angle and Polarization Dependence of Spontaneous Brillouin Scattering, Ye Bo[1], Shuai Yao[1], Yun Qi[1], Fan Yang[1]; *[1]Shanghai Inst of Optics and Fine Mech, China.* We designed an off-axis Brillouin spectroscopy system to study the angle and polarization dependence of spontaneous Brillouin scattering, using Rayleigh scattering as a reference.

Room: ICM Room 4b
10:30 -- 12:00
S2D • Molecular Imaging
Presider: Jeesu Kim; Pusan National Univ.

S2D.1 • 10:30 (Invited)
Development and Validation of a Novel Photoacoustic Calcium-Sensitive Probe for Functional Neuroimaging in Mice, Nikita Kaydanov[1], Alexander Cook[1], Gretel Kamm[1], Juan Boffi[1], Claire Deo[1], Robert Prevedel[1,2]; [1]*European Molecular Biology Laboratory, Germany;* [2]*Interdisciplinary Center of Neurosciences, Heidelberg Univ., Germany.* Photoacoustic tomography with calcium probes could enable functional imaging of the whole brain. This work develops and characterizes novel far-red calcium reporters outperforming existing sensors, demonstrating successful in vivo labeling of mouse brain tissue and in vitro characterization of a calcium-sensitive probe.

S2D.2 • 11:00
Neuromelanin Imaging in Entire Human Midbrain Organoids Using Optoacoustic Mesoscopy, Ludwig Englert[1,2], María Lacalle-Aurioles[3], Nguyen-Vi Mohamed[3], Paula Lépine[3], Meghna Mathur[3], Vasilis Ntziachristos[1,2], Thomas Durcan[3], Juan Aguirre[1,4]; [1]*Inst. of Biological and Medical Imaging, Helmholtz Zentrum München, Germany;* [2]*Chair of Biological Imaging, Central Inst. for Translational Cancer Research (TranslaTUM), School of Medicine and Health & School of Computation, Information and Technology, Technical Univ. of Munich, Germany;* [3]*The Neuro's Early Drug Discovery Unit (EDDU) Department of Neurology and Neurosurgery, McGill Univ., Canada;* [4]*Departamento de Tecnología Electrónica y de las Comunicaciones, Universidad Autonoma de Madrid, Spain.* Human midbrain organoids (hMOs) provide new research avenues for patient-specific therapies in the field of Parkinson's disease but imaging organoids intact remains challenging. Raster scanning optoacoustic mesoscopy enables a rapid, tissue-clearing and label-free analysis of hMOs.

S2D.3 • 11:15
Calibrated Photoacoustic Spectroscopy as a New Tool for Quantitative Characterization of Imaging Contrast Agent, Clément Linger[1,2], Nicolas Tsapis[2], Jèrôme Gateau[1]; [1]*Laboratoire d'Imagerie Biomédicale, Sorbonne Univ., France;* [2]*Institut Galien Paris-Saclay, Univ. Paris-Saclay, France.* A calibrated photoacoustic (PA) spectrometer based on a conventional PA imaging system allows quantitative characterization of contrast agents. We illustrate that it can evaluate the photoacoustic generation efficiency and reveal spectral variation within one agent.

S2D.4 • 11:30
A Numerical Photoacoustic Forward Model for PA Signals Generated in Fluorophores, Marzieh Ezzatpour[1], Farzin Ghane Gholmohamadi[1], Jan Laufer[1]; [1]*Martin-Luther Univ.,Halle, Germany.* A numerical photoacoustic (PA) forward model to predict time-resolved PA signals in fluorophores under a cuvette-based setup was developed and validated with CuSO4 and R6G solutions. It enables fluorophore characterization for PA molecular imaging.

S2D.5 • 11:45
Non-Invasive Precision Mapping of Skin Cancer With Automated Segmentation Assisted Photoacoustic Imaging, Xiuting LI[1], Valerie Xinhui Teo[1], Steven Tien Guan Thng[2], Malini Olivo[2], Dinish U.S[3]; [1]*Agency for Science, Technology and Research (A*STAR), Singapore;* [2]*National Skin Centre, Singapore;* [3]*A*STAR Skin Research Labs, Singapore.* We

present a photoacoustic imaging (PAI) approach with automated segmentation for real-time, non-invasive mapping of pigmented basal cell carcinoma (BCC). This technique enhances preoperative assessment and surgical planning, improving precision, efficiency, and overall patient outcomes.

Room: ICM Room 5
10:30 -- 12:00
S2E • Pre-Clinical and Clinical Studies Tissue Ablation
Presider: Fake Lu; State Univ. of New York, USA

S2E.1 • 10:30
Advanced Label-Free SERS Detection of DNA Using Optofluidic Fibre Probe, Sathi Das[1], Frederic Amiard[2], Dinish U.S[4], Marc Lamy de la Chapelle[2,3], Georges Humbert[1]; *[1]Photonics, XLIM Research Inst., CNRS Limoges Univ., France; [2]Institut des Molécules et Matériaux du Mans (IMMM - UMR6283), Université du Mans, avenue Olivier Messiaen, 72085 Cedex 9 Le Mans, France, France; [3]Nanobiophotonics and Laser Microspectroscopy Center, Interdisciplinary Research Inst. in BioNano-Sciences, Babes-Bolyai Univ., 42 T. Laurian Str., 400271, Cluj-Napoca, Romania, Romania; [4]A*STAR Skin Research Labs, Singapore.* We have demonstrated the excellent SERS sensitivity of suspended core photonic crystal fibre (SuC-PCF) for the label-free detection of Poly A nucleotide, highlighting its potential for highly sensitive, SERS-based nucleic acid sensing applications.

S2E.2 • 10:45
Advancements in Laser Endodontic Sterilization: Bacterial Eradication and Penetration Depth in Dentinal Tubules, Ayse Sena Sarp[1]; *[1]Dentistry Faculty, Bahcesehir Univ., Turkey.* This study explores laser technology's potential in endodontic sterilization, focusing on bacterial eradication and penetration depth in dentinal tubules. Various laser wavelengths were analyzed for effectiveness and safety, optimizing parameters for enhanced disinfection and minimal tissue damage.

S2E.3 • 11:00
Automatic Temperature-Controlled Retinal Laser Therapy: First Clinical Study Results, Ralf Brinkmann[2,1], Christopher Kren[2], Veit Danicke[2], Dirk Theisen-Kunde[2], Hossam Abbas[3], Johann Roider[4], Claus von der Burchard[4]; *[1]Inst. of Biomedical Optics, Univ. of Lübeck, Germany; [2]Medical Laser Center Lübeck, Germany; [3]Inst. for Electrical Engineering in Medicine, Univ. of Lübeck, Germany; [4]Department of Ophthalmology, Christian-Albrechts-Univ. of Kiel, Germany.* This is the first clinical study on automatic optoacoustic temperature guided retinal laser treatments. The method and set-up as well as first results of the controller performance during irradiation and clinical outcome is presented.

S2E.4 • 11:15
Therapeutic Modification of Biochemical Atherosclerotic Plaque Composition as Serially Assessed by Intravascular Fluorescence Lifetime Imaging Integrated With OCT, Hyeong Soo Nam[1], Dong Oh Kang[2], Sunwon Kim[3], Jeongmoo Han[1], Soohyung Park[2], Eun Jin Park[2], Jin Won Kim[2], Hongki Yoo[1]; *[1]Korea Advanced Inst of Science & Tech, Korea (the Republic of); [2]Korea Univ. Guro Hospital, Korea (the Republic of); [3]Korea Univ. Ansan Hospital, Korea (the Republic of).* We utilized OCT-FLIm for serial in vivo assessment of coronary plaques following drug-coated balloon (DCB) angioplasty. This multimodal system enabled quantitative

imaging of inflammation and healed plaque burden, revealing DCB-induced structural and biochemical stabilization.

S2E.5 • 11:30
Optimising Deep-UV Femtosecond Laser Parameters for High-Precision Ablation of Soft Biological Tissue, Tatiana Malikova[1], Rainer J. Beck[1], Robert R. Thomson[1], Jonathan D. Shephard[1]; *[1]Heriot-Watt Univ., UK.* Achieving precise, damage-free ablation remains a challenge in laser surgery. We demonstrate high-precision ablation of a brain tissue model using deep-UV femtosecond radiation and investigate the role of laser parameters in the ablation process.

S2E.6 • 11:45
Limited Laser-Induced Esophageal Ablation Using Radial Fiber in an Ex-Vivo Rabbit Model, Seval Unal[1,2], Merve Türker Burhan[1,2], Serhat Tozburun[1,2]; *[1]Izmir Biomedicine and Genome Center, Turkey; [2]Izmir International Biomedicine and Genome Inst., Dokuz Eylul Univ., Turkey.* We presented a new endoscopy head with radial fiber to limit laser mucosal ablation and tested it in an ex-vivo model. The preliminary results confirmed superficial laser ablation without affecting the muscle layer.

Room: ICM Room 11
16:00 -- 18:00
S4F • Cerebral Hemodynamics and Neural Activity
Presider: Ilias Tachtsidis; Univ. College London, UK

S4F.1 • 16:00 (Invited)
Impact of Severe Hypoglycemia on Cerebral Hemodynamics in Very Preterm Neonates, Sabrina Brigadoi[1], Guy A. Perkins[1], Silvia Guiducci[2], Giulia Res[2], Federica Savio[2], Daniele Trevisanuto[2], Elena Priante[2], Alfonso Galderisi[3], Eugenio Baraldi[2]; *[1]Department of Developmental Psychology and Socialization, Univ. of Padova, Italy; [2]Department of Women' and Children's Health, Univ. of Padova, Italy; [3]Yale School of Medicine, Yale Univ., USA.* There is no consensus on how severe hypoglycemia impacts the very preterm brain. We used continuous DOT and blood glucose monitoring to investigate whether there is spatially consistent coupling between hemodynamics and glucose concentration.

S4F.2 • 16:30
Intracranial Pressure and Cerebral Blood Flow Pulse Dynamics in Patients With Idiopathic Normal Pressure Hydrocephalus During Katzman Infusion Test: a Pilot Optical Monitoring Study, Carolina Fajardo Vega[1], Monica Torrecilla[1], Murad Al Nusaif[1,3], Susanna Tagliabue[1], Jonas Fischer[1], Viacheslav Danilov[4], Gemma Piella[4], Paula Duch-Vega[3], Aasma Sahuquillo-Muxi[3], Ivette Chocrón[5], Juan Sahuquillo[3,6], Maria Poca[3,6], Turgut Durduran[1,2]; *[1]ICFO -Institut de Ciencies Fotoniques, Spain; [2]Institució Catalana de Recerca i Estudis Avançats (ICREA), Spain; [3]Neurotraumatology and Neurosurgery Research Unit, Vall d'Hebron Research Inst., Spain; [4]Department of Engineering, Universitat Pompeu Fabra, Spain; [5]Department of Anesthesiology, Vall d'Hebron Univ. Hospital, Spain; [6]Department of Neurosurgery, Vall d'Hebron Univ. Hospital, Spain.* This pilot study explores the correlation between intracranial pressure and cerebral blood flow pulse amplitudes during Katzman tests in four iNPH patients, highlighting the potential of non-invasive optical monitoring to improve shunt outcome

prediction.

S4F.3 • 16:45
Measuring Respiration-Driven Perturbations of Intra- and Extra- Cerebral Hemodynamics During Slow Breathing: a TD-NIRS Study, Rebecca Re[1,2], Letizia Contini[1], Caterina Amendola[1], Davide Contini[1], Alessandro Torricelli[1,2], Lorenzo Spinelli[2]; *[1]Dipartimento di Fisica, Politecnico di Milano, Italy; [2]Istituto di Fotonica e Nanotecnologie, Consiglio Nazionale delle Ricerche, Italy.* We investigated the impact of slow breathing on the cerebral hemodynamics of 16 subjects using TD-NIRS. Results show increased respiratory-associated oscillations and suggest a possible change in strategy for vascular tone control at low frequencies.

S4F.4 • 17:00
TD-FNIRS for Auditory-Inspired Speech and Music Hemodynamic Response Function, Biao Zheng[1,2], Hyojin Park[1,3], Hamid Dehghani[1,2]; *[1]Univ. of Birmingham, UK; [2]School of Computer Science, UK; [3]School of Psychology, UK.* This study uses TD-fNIRS to examine auditory cortex responses to speech and music. Results show the left cortex responds more to speech, while the right favours music. Overall, speech elicits a stronger response than music.

S4F.5 • 17:15
Assessing the Brain Response to the Rotating Snake Illusion by TD-FNIRS, Alessandro Lia[2], Augusto Bonilauri[1], Giuseppe Baselli[1], Lorenzo Spinelli[3], Fabrizio Martelli[4], Paolo Antonino Crasso[4], Massimo Gurioli[4], Alessandro Torricelli[2,3], Davide Contini[2]; *[1]Dipartimento di Elettronica Informazione e BioIngegneria, Politecnico di Milano, Italy; [2]Dipartimento di Fisica, Politecnico di Milano, Italy; [3]Istituto di Fotonica e Nanotecnologie, Consiglio Nazionale delle Ricerche, Italy; [4]Dipartimento di Fisica e Astronomia, Università degli Studi di Firenze, Italy.* We assessed the cortical hemodynamic activity induced by static illusory-motion image, detected using a multichannel TD-fNIRS device. Differences in the hemodynamic response function seem located around the motion sensitive area of the visual cortex V5.

S4F.6 • 17:30
Mapping Brain Function Underlying Motor Observation and Naturalistic Imitation Using High-Density Diffuse Optical Tomography, Dalin Yang[1], Tessa George[1], Chloe Sobolewski[1], Sophia McMorrow[1], Carolina Pacheco[2], Kelsey King[1], Rebecca Rochowiak[2], Evan Daniels-Day[1], Sungmin Park[1], Emma Speh[1], Daniel Lidstone[2], Romila Santra[2], Deana Crocetti[2], Alice Sperry[2], Mary Nebel[2], Bahar Tuncgenc[3], Rene Vidal[4], Natasha Marrus[1], Stewart Mostofsky[2], Adam T. Eggebrecht[1]; *[1]Washington Univ. School of Medicine, USA; [2]Kennedy Krieger Inst., USA; [3]Nottingham Trent Univ., UK; [4]Univ. of Pennsylvania, USA.* We used high-density diffuse optical tomography and computer-vision-based imitation assessments to simultaneously map brain activity and assess imitation fidelity in autistic and non-autistic adults, and identified brain-behavior associations related to autistic traits and imitation fidelity.

S4F.7 • 17:45
Measuring Cerebral Blood Flow at Late Times-of-Flight With CoMind R1: a Multichannel Interferometric Optical Neuromonitoring System, Stella Avtzi[1], Veronika Parfentyeva[1], Octave Etard[1], Alexandra Tran-Van-Minh[1], Anurag Behera[1], Tanvi Tambe[1], Ali Mehmed[1], Artur Istufaj[1], Jan Goodrich[1], Youssef Ibrahim[1], Saeed Darabi[1], Pablo Villar Sanjurjo[1], Taimoor Ali[1], Yoojin Kim[1], Clarissa Lin[1], Simone Sturniolo[1], Alexandar Ruesch[1], Dominic Hill[1], Amir Salehi Lashkajani[1], Jan Andersen[1], Gordon McCabe[1], Matt Thackrah[1], Dawid Borycki[1], Chloe Maine[1], Tanja Dragojević[1], Claus Lindner[1], Robert J Cooper[1]; *[1]CoMind Technologies Ltd., UK.* CoMind

R1 is a multichannel interferometric system that measures time-of-flight resolved blood flow index (BFi) with high cerebral sensitivity. It enables non-invasive, high-fidelity pulsatile BFi measurements, making it ideal for clinical neuromonitoring.

Room: ICM Room 2
16:00 -- 18:00
S4A • Phase-, Holographic-, Absorption-, Polarization-Based Microscopy
Presider: Pietro Ferraro; Inst. of Intelligent Systems ISASI, Italy

S4A.1 • 16:00 (Invited)
Enhancing Incoherent Holographic Lattice Light-Sheet Microscopy Through Phase Mask Optimization, Mariana Potcoava[1], Zackary Zurawski[1], Simon Alford[1], Christopher Mann[2,3]; *[1]Anatomy and Cell Biology, Univ. of Illinois at Chicago, USA; [2]Department of Applied Physics and Materials Science, Northern Arizona Univ., USA; [3]Center for Materials Interfaces in Research and Development, Northern Arizona Univ., USA.* We present quantitative 3D live nerve cell imaging with subcellular resolution and extended FOV using incoherent holographic lattice light-sheet system with an optimized SLM phase mask modulation for shaping the light collected from the sample.

S4A.2 • 16:30
Modulated Optically Computed Phase Microscopy for High-Resolution, High-Sensitivity Label-Free Imaging, Xuan Liu[1], Rupak Bhakta[1], Emily Kryvorutsky[1], Yuanwei Zhang[1]; *[1]New Jersey Inst. of Technology, USA.* To study cell-nanoparticle interactions, we developed and validated the modulated optically computed phase microscopy technology which utilizes optical computation to perform Fourier transform and impose temporal modulation to achieve high resolution and high phase sensitivity.

S4A.3 • 16:45
Clinically-Driven QPI-Based Hierarchical Classification of Ovarian Circulating Tumor Cells in Flow Cytometry, Daniele Pirone[1], Beatrice Cavina[2], Martina Mugnano[1], Vittorio Bianco[1], Lisa Miccio[1], Anna Myriam Perrone[2], Anna Maria Porcelli[2], Giuseppe Gasparre[2], Ivana Kurelac[2], Pasquale Memmolo[1], Pietro Ferraro[1]; *[1]CNR-ISASI, Italy; [2]Univ. of Bologna, Italy.* We present a hierarchical machine learning approach based on quantitative phase imaging flow cytometry for label-free classification of ovarian circulating tumor cells. Exploiting *a priori* clinical information, our method enhances patient follow-up in liquid biopsy.

S4A.4 • 17:00
The Mueller Matrix Analysis of Articular Cartilage Tissue Using Liquid Crystal Modules, Chi-Hsiang Lien[1], Chun-Yu Lin[2], Shu-Chun Chuang[3], Yi-Shan Lin[3], Chung-Hwan Chen[3], Shean-Jen Chen[2]; *[1]National United Univ., Taiwan; [2]College of Photonics, National Yang Ming Chiao Tung Univ., Taiwan; [3]Orthopaedic Research Center, Kaohsiung Medical Univ., Taiwan.* This study uses Mueller matrix imaging with liquid crystal modulators to analyze articular cartilage polarization properties, extracting birefringence parameters for collagen characterization and structural assessment.

S4A.5 • 17:15
Nanotoxicity Assessment by Digital Holographic Quantitative Phase Microscopy with Downstream Biochemical Analysis, Anne Marzi[1], Kai M. Eder[1], Björn Kemper[1], Jürgen Schnekenburger[1]; [1]*Univ. of Muenster, Germany.* Colorimetric in-vitro cytotoxicity approaches are often limited applicable to nanomaterials. We combined label-free digital holographic microscopy (DHM) with downstream biochemical nanotoxicity testing. The results demonstrate the data quality enhancement potential of DHM in cytotoxicity assessment.

S4A.6 • 17:30
Real-Time Automatic Reconstruction of Digital Holograms, Müge Topcu[1,2], Serhat Tozburun[1,2]; [1]*Izmir Biomedicine and Genome Center, Turkey;* [2]*Izmir International Biomedicine and Genome Inst., Dokuz Eylul Univ., Turkey.* A Python based real-time reconstruction algorithm independent of telecentricity and sample scattering was proposed for Digital Holographic Microscopy (DHM).

S4A.7 • 17:45
Features of a Calibration Procedure for a Back-Scattering Scanning Polarimetric Setup, Vladislav Stefanov[1], Bhanu P. Singh[1], André Stefanov[1]; [1]*Inst. of Applied Physics, Switzerland.* We address the problem of calibrating a polarimetric back-scattering setup which inculdes a beamsplitter. Using Fisher information, we justify a specific configuration for the maximum likelihood method and demonstrate its effectiveness through Monte Carlo simulations.

Room: ICM Room 3
16:00 -- 18:00
S4B • Dynamic OCT
Presider: Dierck Hillmann; Vrije Universiteit Amsterdam, Netherlands

S4B.1 • 16:00 (Invited)
Investigating DOCT Signal Origins and Bringing a new Contrast to Fluorescence Imaging, Noah Heldt[1,2], Martin Ahrens[1,2], Mario Pieper[2,3], Robert Schönherr[2,3], Lucie Jeschke[1], Peter König[2,3], Marko Lampe[4,5], Gereon Hüttmann[1,2]; [1]*Inst. of Biomedical Optics, Universität zu Lübeck, Germany;* [2]*Airway Research Center North (ARCN), German Center of Lung Research (DZL), Germany;* [3]*Inst. of Anatomy, Universität zu Lübeck, Germany;* [4]*Advanced Light Microscopy Facility, European Molecular Biology Laboratory, Germany;* [5]*German Cancer Reasearch Center, Germany.* We investigated the dynamic optical coherence tomography (dOCT) signal origins by correlative measurements together with spinning disk confocal microscopy (SDM). Furthermore, we propose dynamic contrasting for detecting organelle movement signatures in the sub-second range.

S4B.2 • 16:30
Comprehensive Imaging of *in Vitro* Intratissue Activity by Quantitative- and Multi-Dynamics Optical Coherence Tomography, Rion Morishita[1], Ibrahim Abd El-Sadek[1,2], Shumpei Fujimura[1], Atsuko Furukawa[3], Satoshi Matsusaka[3], Shuichi Makita[1], Yoshiaki Yasuno[1]; [1]*Computational Optics Group, Univ. of Tsukuba, Japan;* [2]*Department of Physics, Faculty of Science, Damietta Univ., Egypt;* [3]*Clinical Research and Regional Innovation, Faculty of Medicine, Univ. of Tsukuba, Japan.* We propose a quantitative and comprehensive dynamic OCT (DOCT) method. The proposed method estimates the speed and occupancy of the intratissue/intracellular dynamic scatterers and provides comprehensive visualization of

functional structures that were previously obscured.

S4B.3 • 16:45
Non-Equidistant Temporal Scanning in Dynamic MHz-OCT for Higher Speed, Sazgar Burhan[1], Madita Göb[1], Gereon Hüttmann[1,2], Robert Huber[1,2]; *[1]Universität zu Lübeck, Inst. of Biomedical Optics, Germany; [2]Medical Laser Center Lübeck GmbH, Germany.* We investigate advanced scanning strategies to improve speed in dynamic MHz-OCT, demonstrating that temporally non-uniform sampling outperforms uniform scanning by achieving faster imaging speeds while largely preserving image clarity.

S4B.4 • 17:00 (Invited)
Structural and Metabolic Imaging of Cancer Spheroids by Zero-NA Full-Field Optical Coherence Microscope With Computational Augmentations, Suzuyo Komeda[1], Nobuhisa Tateno[1], Ann M. Detje[2], Xibo Wang[1], Yue Zhu[3,1], Atsuko Furukawa[4], Rion Morishita[1], Ibrahim Abd El-Sadek[1,5], Shuichi Makita[1], Yoko Miura[2], Satoshi Matsusaka[4], Yoshiaki Yasuno[1]; *[1]Computational Optics Group, Univ. of Tsukuba, Japan; [2]Univ. of Lübeck, Germany; [3]Nanjing Univ. of Science and Technology, China; [4]Faculty of Medicine, Univ. of Tsukuba, Japan; [5]Department of Physics, Faculty of Science, Damietta Univ., Egypt.* High-resolution and functional imaging of in vitro samples including cancer spheroids is demonstrated with a full-field swept-source optical coherence tomography device, where computational augmentations enable long imaging depth, speckle-free imaging, and label-free cellular activity imaging.

S4B.5 • 17:30
Non-Invasive, Label-Free Imaging of Trophoblast Organoids With Dynamic Optical Coherence Microscopy, Kimiya Mousavi[1,2], Yujie Hu[2], Adrian Tanskanen[1], Gina McNeill[3,4], Alexander Beristain[3,4], Myeong Jin Ju[2,5], Pierre Lane[1,2]; *[1]Integrative Oncology, BC Cancer Research Inst., Canada; [2]School of Biomedical Engineering, The Univ. of British Columbia, Canada; [3]The British Columbia Children's Hospital Research Inst., Canada; [4]Obstetrics & Gynecology, The Univ. of British Columbia, Canada; [5]Ophthalmology & Visual Sciences, The Univ. of British Columbia, Canada.* Trophoblast organoids model placental development; Traditional imaging requires invasive sectioning and staining. Optical coherence microscopy enables label-free imaging. Dynamic OCM enhances image contrast by detecting metabolic activity, providing visualization of intracellular motion and organoid structure.

Room: ICM Room 4a
16:00 -- 18:00
S4C • Novel Methods and Applications
Presider: Brendan Kennedy; Nicolaus Copernicus Univ., Poland

S4C.1 • 16:00 (Invited)
Sensing Biological Forces With Deformable Microlasers, Eleni Dalaka[2], Joseph S. Hill[2], Jonathan H. Booth[3], Anna Popczyk[1], David Ripp[1], Stefan R. Pulver[3], Malte C. Gather[1,2], Marcel Schubert[1]; *[1]Humboldt Centre for Nano and Biophotonics, Univ. of Cologne, Germany; [2]School of Physics and Astronomy, Univ. of St Andrews, UK; [3]School of Psychology and Neuroscience, Univ. of St Andrews, UK.* Microlasers are bright, monochromatic, and short-pulsed optical devices that can be detected deep inside biological tissue. Here, we demonstrate their use as

force sensors for various biological samples, including organoids and small animals.

S4C.2 • 16:30
Kilohertz Fluorescence Imaging Flow Cytometry, Christan Stock[1], Matthea Thielking[1], Sebastian Karpf[1]; *[1]Universität zu Lübeck, Germany.* We present a one-photon fluorescence imaging flow cytometer based on high-speed Spectro-Temporal Laser Imaging by Diffractive Excitation. By combining fluorescence and transmission imaging in a microfluidic chip this enables high-speed imaging flow cytometry.

S4C.3 • 16:45
Compact, Hybrid Near Infrared and Speckle Contrast Optical Spectroscopy Device, Andres F. Quiroga Soto[1], Manish Verma[1], Mirko Fornasier[1], Faruk Beslija[1], Lisa Kobayashi Frisk[1], Sumana Chetia[1], M. Atif Yaqub[1], José M. Beato[1], Juan Fernandez[1], Valenti Bosch[1], Xavier Menino[1], Daniel Senciales[1], Christian Garcia[1], Oscar Alcaine[1], Jose Carlos Cifuentes[1], Siddharth Dave[2], Sreekanth Cheruku[2], Christopher Choi[2], Peiman Lahsaei[2], Margherita Tabet[2], RyanCole Weldon-Carroll[2], DaiWai Olson[3], Will Little[4], David Busch[5], Turgut Durduran[1,6]; *[1]inst. Of Photonic Sciences, Spain; [2]Anesthesiology & Pain Mgmt, UT Southwestern Medical Center, USA; [3]Neurology, UT Southwestern Medical Center, USA; [4]Medical Center, UT Southwestern Medical Center, USA; [5]Pain Management, Neurology, and Biomedical Engineering, UT Southwestern Medical Center, USA; [6]Institució Catalana de Recerca i Estudis Avançats, Spain.* A compact, hybrid near-infrared and speckle contrast optical spectroscopy system is presented for monitoring microvascular blood flow and tissue oxygen saturation. High-speed acquisition (16.7 Hz) and signal-to-noise ratios (19-32 dB) were achieved.

S4C.4 • 17:00
Optical Microrheology of Blood Clots, Simon Kouba[1], Lionel Lartigue[2], Nathalie Westbrook[2], Julien Moreau[1], Jean-Marc Allain[1]; *[1]Laboratoire de Mécanique des Solides, France; [2]Laboratoire Charles Fabry, France.* A passive microrheology setup based on Brownian motion of polystyrene beads is presented. Local storage and loss moduli of artificial blood clots were measured and correlated with fibrinogen concentration.

S4C.5 • 17:15
Self- Supervised Scattering Pattern Classification of Peripheral Blood Stream Cells, David Dannhauser[2], Paolo Antonio Netti[2,1], Filippo Causa[2]; *[1]Istituto Italiano di Tecnologia (IIT), Italy; [2]Interdisciplinary Research Centre on Biomaterials (CRIB), Univ. of Naples, Italy.* Identifying specific cell classes without labelling is challenging. We show a deep learning method using single-cell microfluidic data, offering fast, operator-free identification of rare cells like tumour cells, even without training data for the target class.

S4C.6 • 17:30
Spectroscopic Motion Imaging of Particle Adhesion to Cells Using Optically Computed Phase Microscopy, Xuan Liu[1], Don Bonifacio[1], Leonardo Pena[1], Sara Gad[1], Joseph Zimmer[1], Laterriean Minaya[1], John Oldziej[1], Kevin Paredes Nieves[1], Yuanwei Zhang[1]; *[1]New Jersey Inst. of Technology, USA.* To study particle adhesion to cells, we developed and validated a novel spectroscopic motion imaging technology that quantifies particle motion under different adhesion conditions and characterizes the time profile of the adhesion process.

S4C.7 • 17:45
Surface Roughness Effects on Surface Acoustic Wave Detection in Pump-Probe Microscopy, Felix Wäger[1,3], Matthias Domke[1], Fadi Dohnal[1], Alexander Buchner[2], Heinz P. Huber[4], Ronald Sroka[2,3]; *[1]Research Center for Microtechnology, Vorarlberg Univ. of Applied Sciences, Austria; [2]Department of Urology, Hospital of Univ. of Munich, Germany; [3]LIFE-Zentrum, Hospital of Univ. of Munich, Germany; [4]Lasercenter, Munich Univ. of Applied Sciences, Germany.* This study investigates the correlation between sample surface roughness and SAW visibility in pump-probe microscopy using hard biological samples, like dentin and enamel. Further adjustments are presented to improve the excitation of surface acoustic waves.

Room: ICM Room 4b
16:00 -- 18:00
S4D • Image Reconstruction and Analysis
Presider: Jan Laufer; Martin Luther Univ Halle Wittenberg, Germany

S4D.1 • 16:00
***Skin Flattening of Raster-Scan Optoacoustic Mesoscopy (RSOM) Reconstructions Based on Polynomial Fitting*,** Manuel Gehmeyr[1,2], Maria Begona Rojas Lopez[2,1], Suhanyaa Nitkunanantharajah[1,2], Hubert Preißl[3,4], Andreas Vosseler[4,3], Reiner Jumpertz von Schwartzenberg[3,4], Andreas Birkenfeld[3,4], Dominik Jüstel[1,5], Vasilis Ntziachristos[2,1]; *[1]Helmholtz Munich, Germany; [2]Chair of Biological Imaging, Technical Univ. Munich, Germany; [3]German Center for Diabetes, Germany; [4]Department of Diabetology, Endocrinology and Nephrology, Universtiy Tübingen, Germany; [5]Inst. of Computational Biology, Helmholtz Munich, Germany.* We present a flattening technique for raster-scan optoacoustic mesoscopy using iterative polynomial fitting and outlier exclusion, that aligns the skin surface in three-dimensional reconstructions. This technique enhances visualizations and can be used in post-processing.

S4D.2 • 16:15
Comparative Analysis of Acoustic Reconstruction Methods for Chromophore and Oxygenation Quantification in Limited-View 3D Quantitative Photoacoustic Tomography, Guo Tang[1], Felix Lucka[2], Teemu Sahlström[3], Benjamin T. Cox[4], Tanja Tarvainen[3], Jan Laufer[1]; *[1]Inst. of Physics, Martin-Luther-Universität, Germany; [2]Computational Imaging Group, Centrum Wiskunde & Informatica, Netherlands; [3]Univ. of Eastern Finland, Finland; [4]Department of Medical Physics and Biomedical Engineering, Univ. College London, UK.* Three-dimensional quantitative photoacoustic tomography is challenged by uncertainties in light fluence distribution and artifacts from limited view problem. This study evaluates advanced acoustic reconstruction algorithms using model-based inversion schemes to improve chromophore and oxygenation quantification.

S4D.3 • 16:30
Self-Supervised Sparse-Dense Optical Resolution Photoacoustic Microscopy, Benjamin Walder[1], Daniel Toader[2], Robert Nuster[2], Guenther Paltauf[2], Gregor Langer[3], Peter Burgholzer[3], Lukas Krainer[4], Markus Haltmeier[1]; *[1]Leopold-Franzens-Universität Innsbruck, Austria; [2]Universität Graz, Austria; [3]Research Center for Non Destructive Testing GmbH, Austria; [4]Prospective Instruments LK OG, Austria.* Acquiring a fully sampled high-resolution image in OR-PAM is time-consuming and costly. To reduce costs, we propose a sparse-dense sampling strategy, where both fully sampled and sparsely sampled regions are collected, along

with a self-supervised learning strategy to extract relevant image structures.

S4D.4 • 16:45
Transformer-Based Dual SwinUNet With Contrastive Loss for Enhanced Photoacoustic Imaging, Isha Munjal[1], Jaya Prakash[1]; *[1]Indian Inst. of Science, India.* This study introduces a transformer-based dual SwinUNet for Photoacoustic Imaging, leveraging image and sinogram domains with multiple loss functions, including contrastive loss. It shows an 18% UIQI improvement over FD-UNet using 100 transducers at 135° coverage.

S4D.5 • 17:00
Matricial Model-Based Reconstruction for Compressed All-Optical Photoacoustic Imaging, Ege Küçükkömürcü[1], Simon Labouesse[2], Marc Allain[1], Julien Lumeau[1], Antonin Moreau[1], Thomas Chaigne[1]; *[1]Aix Marseille Univ, CNRS, Centrale Med, Institut Fresnel, Marseille, France, France; [2]Rimeo, Montpellier, 34000, France., France.* We introduce a matrix-based reconstruction framework for photoacoustic imaging that employs Tikhonov regularization for stable inversion and Hadamard compressed acquisitions for a tenfold speedup. Preliminary experimental and simulation results validate our method.

S4D.6 • 17:15
An Efficient Gauss-Newton Filter Based Pointwise Reconstruction Scheme for Fully Non-Linear Pharmacokinetic Fluorescence Photoacoustic Tomography, Bharadwaj B. Jampu[1], Naren Naik[1,2], Omprakash Gottam[3], Prabodh K. Pandey[4], Sanjay Gambhir[5]; *[1]Electrical Engineering, Indian Inst. of Technology, Kanpur, India; [2]Center for Lasers and Photonics, Indian Inst. of Technology, Kanpur, India; [3]Electronics and Communication, Koneru Lakshmaiah Education Foundation, India; [4]Radiological Sciences, Univ. of Irvine, California, USA; [5]Nuclear Medicine, Sanjay Gandhi Postgraduate Inst. of Medical Sciences, India.* We demonstrate first fully-nonlinear pointwise pharmacokinetic fluorescence-photoacoustic tomography (PK-FPAT) reconstructions in literature via an efficient scalable Gauss-Newton filter algorithm in a blob basis and two-compartment model framework. Preliminary numerical studies on cancer-mimicking phantoms validate the proposed algorithm.

S4D.7 • 17:30
Automatic Real-Time Quality Assessment for Optoacoustic Mesoscopy Data, Maria Begona Rojas Lopez[1,2], Manuel Gehmeyr[1,2], Suhanyaa Nitkunanantharajah[1,2], Hubert Preißl[4,5], Andreas Vosseler[4,5], Reiner Jumpertz von Schwartzenberg[4,5], Andreas Birkenfeld[4,5], Dominik Jüstel[2,3], Vasilis Ntziachristos[1,2]; *[1]Chair of Biological Imaging, Technical Univ. Munich, Germany; [2]Inst. of Biological and Medical Imaging, Helmholtz Munich, Germany; [3]Inst. of Computational Biology, Helmholtz Munich, Germany; [4]Department of Diabetology, Endocrinology and Nephrology, Eberhard-Karls Univ. Tübingen, Germany; [5]German Center for Diabetes Research, Germany.* Due to its novelty, the quality of raster-scan optoacoustic mesoscopy (RSOM) clinical images is conventionally evaluated subjectively, hampering RSOM's scalability. We tackle this by developing an automatic quality assessment method validated on large RSOM datasets.

S4D.8 • 17:45
Spatiotemporal Feature Extraction in Phonon Microscopy Using Dual Attention for Cancer Cell Classification, Md Raihan Goni[1], Yijie Zheng[1,2], Rafael Fuentes-Dominguez[1], Fernando Perez-Cota[1], George S. Gordon[1]; *[1]Univ. of Nottingham, UK; [2]Department of Physics, Univ. of Cambridge, UK.* This study explores spatiotemporal feature extraction using dual

attention for cancer cell classification in phonon microscopy, examining the impact of spatial information on time-series data while reducing noise and enhancing feature representation for improved classification.

Room: ICM Room 5
16:00 -- 18:00
S4E • Pre-Clinical and Clinical Studies I
Presider: Xuan Liu; New Jersey Inst. of Technology, USA

S4E.1 • 16:00
Tethered Instrument for Continuous Fluorescence Detection and Counting of Circulating Tumor Cells in Awake, Freely Moving Mice, Mark Niedre[1], Jane Lee[1], Mehrnoosh Emamifar[1], Chiara Bellini[1]; *[1]Bioengineering, Northeastern Univ., USA.* Circulating tumor cells (CTCs) play a critical role in hematogenous cancer metastasis. Here, we describe a new fiber-optic tethered instrument for fluorescence enumeration of CTCs in awake, freely moving mice.

S4E.2 • 16:15
Monitoring Embryonic Development in Eggs Through Time-Domain Diffuse Optical Spectroscopy, Lennard van den Tweel[1,2], Vamshi Damagatla[4], Ilaria Bargigia[4,5], Carla van der Pol[3], Freek Ariese[2], Antonio Pifferi[4,6]; *[1]Adaptation Physiology Group, Wageningen Univ. & Research, Netherlands; [2]LaserLaB, Department of Physics and Astronomy, Vrije Universiteit Amsterdam, Netherlands; [3]Research department, HatchTech B.V., Netherlands; [4]Dipartimento di Fisica, Politecnico di Milano, Italy; [5]Center for Nano Science and Technology@PoliMi, Istituto Italiano di Tecnologia, Italy; [6]Istituto di Fotonica e Nanotecnologie, Consiglio Nazionale delle Ricerche, Italy.* Time-domain diffuse optical spectroscopy was used to determine optical properties of chicken eggs during incubation. Results show the integrating sphere effect, heterogeneity, and embryonic development as challenges in the development of optical techniques for eggs.

S4E.3 • 16:30
Terahertz Spectroscopy-Based Characterization of Human Urinary Stones ex Vivo, Soumyajyoti Mallick[1,2], Haolian Shi[2,5], David Citrin[2,5], Clarice Perrin-Mozet[1], Arnaud Marotel[3], Ma'atem Béatrice Caillierez[4], Jacques Hubert[4], Walter Blondel[1], Marine Amouroux[1], Alexandre Locquet[2,5]; *[1]Université de Lorraine, CNRS, CRAN, France; [2]Georgia Tech-CNRS IRL 2958, France; [3]Ecole Nationale Supérieure de Géologie, France; [4]Centre Hospitalier Régional et Universitaire de Nancy, France; [5]Georgia Inst. of Technology, USA.* This contribution presents preliminary results of a Terahertz Time-Domain-Spectroscopy-based characterization of four different types of urinary stones ex vivo and their potential differentiation based on estimated optical parameters.

S4E.4 • 16:45
Diffuse Optical Monitoring of Cerebral and Peripheral Hemodynamics During Pediatric Venoarterial Extracorporeal Membrane Oxygenation, Tiffany Ko[1], Alyssa M. Seeney[1], Darci Anderson[1], Briston Bayle[1], Alexis Schultz[1], Elizabeth Malick[1], Aidan Crozier[1], Jamie Weller[1], Pilar Anton-Martin[1], Kristen Coletti[1], Matthew P. Kirschen[1], Susan B. Williams[1], James T. Connelly[1], Meg E. Cates[1], Ashley A. Kilday[1], Natalie E. Rintoul[1], Holly L. Hedrick[1], Maryam Y. Naim[1], Todd J. Kilbaugh[1], Rodrigo Forti[1], Wesley Baker[1], Jennifer Lynch[1]; *[1]Children's Hospital of Philadelphia, USA.* We summarize physiologic changes in cerebral and peripheral

hemodynamics detected by diffuse optical tissue monitoring in three pediatric patients during weaning from venoarterial extracorporeal membrane oxygenation (VA-ECMO) support.

S4E.5 • 17:00
Remote Physiological Monitoring of Neck Blood Vessels with a High-Speed Camera, Meiyun Cao[2], Gennadi Saiko[1], Alexandre Douplik[1,3]; *[2]Toronto Metropolitan Univ., Canada; [3]iBest, Keenan Research Centre, St. Michael Hospital of the LKS Knowledge Inst., Canada.* This study uses a high-speed camera for rPPG with cross-correlation method to map neck vessels distribution and calculate their PWV, addressing the limitations of costly, contact-based methods and demonstrating its potential to assist CVD detection.

S4E.6 • 17:15
Diffuse Optics for Non-Invasive Endothelial Function Monitoring in ICU Patients, Caterina Amendola[1], Marta Zanoletti[3], Mauro Buttafava[2], Talyta Carteano[4], Letizia Contini[1], Lorenzo Cortese[3], Turgut Durduran[3,5], Claudia Guadagno[6], Umut Karadeniz[3], Michele Lacerenza[2], Jaume Mesquida[7], Shahrzad Parsa[8], Rebecca Re[1], Diego Sanoja Garcia[4], Sanathana Konugolu Venkatsekar[6], Lorenzo Spinelli[9], Alessandro Torricelli[1,9], Alberto Tosi[1], Udo Weigel[8], M. Atif Yaqub[3], Davide Contini[1]; *[1]Politecnico di Milano, Italy; [2]PIONIRS s.r.l., Italy; [3]ICFO - Institut de Ciències Fotòniques, Spain; [4]ASPHALION S.L., Spain; [5]Institució Catalana de Recerca i Estudis Avançats (ICREA), Spain; [6]BioPixS Ltd – Biophotonics Standards, IPIC, 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 analyzed very-low-frequency signals of hemodynamic parameters in a distal muscle of 14 healthy volunteers and 10 ICU patients, measured using time-domain near-infrared and diffuse correlation spectroscopies. Significant differences were observed in their power spectral density.

S4E.7 • 17:30
Suppressing High-Intensity Surgical Light in Multispectral Imaging, Stefan Kray[1], Moritz Gerlich[1], Andreas Schmid[1], Thomas Greiner[1]; *[1]Inst. of Smart Systems and Services, Pforzheim Univ., Germany.* Multispectral Imaging (MSI) is a promising technology for assessing tissue oxygenation. However, MSI systems with integrated illumination suffer from surgical light in clinical settings. We demonstrate surgical light suppression by exploiting modulated light for MSI.

Monday, 23 June

Room: ICM Room 11
08:30 -- 10:00
M1B • Advances in Instrumentation and Technology I
Presider: Caterina Amendola; Politecnico di Milano, Italy

M1B.1 • 08:30
Design and Characterization of a Fast Multi-Channel Time-Domain NIRS and DCS Device for Clinical Applications, Marco Nabacino[1], Caterina Amendola[1], Davide Contini[1], Rebecca Re[1,2], Lorenzo Spinelli[2], Alessandro Torricelli[1,2]; *[1]Politecnico di Milano, Italy; [2]Istituto di Fotonica e Nanotecnologie, Consiglio Nazionale delle Ricerche, Italy.* We present a device for combined Time-Domain NIRS and DCS measurements, featuring two detection channels and working at up to 50 Hz acquisition rates. Laboratory and in-vivo characterization shows its capability to make robust and reliable measurements.

M1B.2 • 08:45
PROMETEUS: Hybrid TD-NIRS and SCOS Instrument for Real-Time Monitoring of Brain Metabolism in Preterm Neonates - System Architecture and Characterization, Fabio Negretti[1], Caterina Amendola[1], Sabrina Brigadoi[2], Mauro Buttafava[3], Robert J. Cooper[4], Chiara Dalla Man[5], Turgut Durduran[6,7], Flora Faure[4], Mirko Fornasier[6], Alfonso Galderisi[8], Michele Lacerenza[3], Hadija Marchiori[5], Alberto Scarpa[9], Lorenzo Spinelli[10], Alessandro Torricelli[1,10], Davide Contini[1]; *[1]Dipartimento di Fisica, Politecnico di Milano, Italy; [2]Department of Developmental and Social Psychology, Univ. of Padua, Italy; [3]PIONIRS S.r.l, Italy; [4]DOT-HUB, Department of Medical Physics and Biomedical Engineering, Univ. College London, UK; [5]Department of Information Engineering, Univ. of Padua, Italy; [6]ICFO - Institut de Ciències Fotòniques, The Barcelona Inst. of Science and Technology, Spain; [7]Institució Catalana de Recerca i Estudis Avançats (ICREA), Spain; [8]Department of Pediatrics, Yale Univ., USA; [9]Dave S.r.l, Italy; [10]Istituto di Fotonica e Nanotecnologie, Consiglio Nazionale delle Ricerche, Italy.* Prometeus project aims at enabling personalized nutrition in preterm neonates: by combining a hybrid diffuse optics metabolic sensing system with metabolic modeling, it optimizes brain health, reducing prematurity-related disabilities and enhancing NICU care.

M1B.3 • 09:00
Characterization and in Vivo DCS Measurements with Compact 1064 nm Laser, Tommaso Palo[1], Lisa C. Kobayashi Frisk[2], Alessandro Bossi[1], Ilaria Bargigia[1], Laura Di Sieno[1], Alberto Dalla Mora[1], Turgut Durduran[2,3], Antonio Pifferi[1]; *[1]Politecnico di Milano, France; [2]ICFO-Institut de Ciències Fotòniques, Spain; [3]Institució Catalana de Recerca i Estudis Avançats (ICREA), Spain.* We investigated a 1064nm compact laser as a potential TD-DCS source. Through BFI stability measures, studies on phantoms of varying viscosity and an in-vivo measurement we found that it is sufficiently accurate for future work.

M1B.4 • 09:15
The TinyBrains Prototype - a High-Density Hybrid Diffuse Optics Tomography System With Integrated Electroencephalography for Functional Studies in Neonates, Georgina Tresanchez[1], Nishigandha Patil[1], Osman Melih Can[1], M Atif Yaqub[1], Anurag Behera[1], Daniel Senciales[1], Mirko Fornasier[1], Moises Dominguez[2], Sanathana Konugolu Venkata Sekar[3], Claudia Guadagno[3], Ali Rajabi[4], Alba Rivas[5], Joan Sanchez de Toledo[5], Thomas Fontaine[2], Marta Camprubi Camprubi[5], Fabrice Wallois[4], Turgut Durduran[1,6]; *[1]ICFO - Institut de Ciències Fotòniques, Spain; [2]Seenel Imaging, France; [3]Biopixs limited, Ireland; [4]UPJV - Université*

Picardie Jules Verne, France; [5]FSJD - Fundació Sant Joan de Déu, Spain; [6]Institució Catalana de Recerca i Estudis Avançats, Spain. We have built a prototype integrating continuous wave near infrared spectroscopy and diffuse correlation spectroscopy with EEG apt for bilateral sensing in functional studies in neonates. We present its ex-vivo characterization and specifications.

M1B.5 • 09:30
A Compact, Self-Contained Module for Fast and Non-Invasive Blood Flow Monitoring, Mirko Fornasier[1], Manish Verma[1], Faruk Beslija[1], Andres Quiroga[1], Lisa C. Kobayashi Frisk[1], Sumana Chetia[1], Marta Zanoletti[1], M Atif Yaqub[1], Daniel Senciales[1], Arnau Cobes Orteu[1], Jose Carlos Cifuentes[1], Youcef Lebour[3], Fernando Linares[3], Josep Maria Silvestre[3], Turgut Durduran[1,2]; *[1]ICFO-Institut de Ciéncies Fotóniques, Spain; [2]Institució Catalana de Recerca i Estudis Avançats (ICREA), Spain; [3]ProCareLight, Spain.* We present a versatile module for speckle contrast optical spectroscopy, which is designed to fit a broad range of applications in which the integration of non-invasive monitoring of pulsatile blood flow is desired.

M1B.6 • 09:45
Exploring a New Spectral Range for Time-Domain Near Infrared Spectroscopy, Laura Di Sieno[1], Alessandro Bossi[1], Tommaso Palo[1], Lisa Kobayashi Frisk[2], Alessandro Torricelli[1,3], Ilias Tachtsidis[4], Turgut Durduran[2,5], Antonio Pifferi[1,3], Alberto Dalla Mora[1]; *[1]Politecnico di Milano, Italy; [2]ICFO-Institut de Ciències Fotòniques, The Barcelona Inst. of Science and Technology, Spain; [3]Istituto di Fotonica e Nanotecnologie, Consiglio Nazionale delle Ricerche, Italy; [4]Department of Medical Physics and Biomedical Engineering, Univ. College London, UK; [5]Institucio Catalana de Recerca i Estudis Avancats (ICREA), Spain.* We propose to use the 1064 nm wavelength for near-infrared diffuse optical spectroscopy both alone (to retrieve concentration of only O_2Hb or as a second wavelength (if also the HHb concentration has to be computed).

Room: ICM Room 22b
08:30 -- 10:00
M1C • OCT Applications
Presider: Brendan Kennedy; Nicolaus Copernicus Univ., Poland

M1C.1 • 08:30
Multi-MHz-OCT Endoscopic Imaging with an Automated Pullback Mechanism, Awanish P. Singh[1], Madita Göb[1], Sazgar Burhan[1], Nikolay Tesmer[1], Wolfgang Draxinger[1], Simon Lotz[1], Berenice Schulte[2], Mark Ellrichmann[2], Robert Huber[1], Maik Rahlves[1]; *[1]Univ. of Lübeck, Germany; [2]Interdisciplinary Endoscopy, Medical Department I, Univ. Hospital Schleswig-Holstein, Germany.* We present an automated pullback mechanism for MHz-OCT rectoscopy to address non-uniform motion artifacts via consistent probe retraction. High-resolution images of a test sample demonstrate uniform frame spacing, reduced distortion, and improved imaging accuracy, validating its potential for *in-vivo* clinical applications.

M1C.2 • 08:45
OCT-Based Three-Dimensional Multi-Parametric Imaging of the Cerebral Microcirculation, Jianbo Tang[1]; *[1]SUSTech, China.* We present an Optical Coherence Tomography (OCT)-based imaging technology for the measurement of the microvascular

network's three-dimensional (3D) structure, blood flow velocity, and blood flow transit time.

M1C.3 • 09:00
Ultra-Fast Two-Dimensional Vibration Vector Measurements Based on Optical Coherence Tomography, Tillmann Spellauge[3,1], Ben Elsmore[1], Darven Murali Tharan[3,1], Marco Bonesi[3,1], Jami Shepherd[3,1], Craig Radford[2], Frederique Vanholsbeeck[3,1]; *[1]Department of Physics, Univ. of Auckland, New Zealand; [2]Inst. of Marine Science, Leigh Marine Laboratory, Univ. of Auckland, New Zealand; [3]The Dodd-Walls Center for Photonic and Quantum Technologies, New Zealand.* We present a dual-beam depth-resolved vibrometry system for measurements of vibration vectors. The system recovers vibration angle and absolute amplitude in two dimensions with unprecedented measurement times of only 0.5 seconds for a full B-scan.

M1C.4 • 09:15
Depth-Extended ex-Vivo Ocular Tissue Imaging Using Spatial Phase-Resolved Optical Coherence Microscopy, Shrivatsan Rajagopalan[1], Ansel Chen[1], Jun Song[1], Shuichi Makita[2], Yoshiaki Yasuno[2], Joanne Matsubara[4], Pierre Lane[3], Myeong Jin Ju[4,1]; *[1]School of Biomedical Engineering, Univ. of British Columbia, Canada; [2]Computational Optics Group, Univ. of Tsukuba, Japan; [3]Integrative Oncology, BC Cancer Research Center, Canada; [4]Department of Ophthalmology & Visual Sciences, Univ. of British Columbia, Canada.* Spatial phase-resolved optical coherence microscopy configuration enables a single-shot cellular resolution ocular tissue imaging with extended depth-of-focus realized by a simple numerical refocusing algorithm without any sophisticated phase correction process.

M1C.5 • 09:30
Development of Multi-View Optical Coherence Tomography (OCT) With a Registration Algorithm Combining Refractive Index Correction for Tooth Imaging, Yin-Shen Cheng[1], Pei-chen Sung[1], Zi-Wen Kao[1], Fang-Ying Hua[2], Ting-Hao Chen[1], Chuan-Bor Chueh[1], Yin-Lin Wang[2], Hsiang-Chieh Lee[3,4]; *[1]Graduate Inst. of Photonics and Optoelectronics, National Taiwan Univ., Taiwan; [2]Department of Dentistry, National Taiwan Univ. Hospital, Taiwan; [4]Department of Electrical Engineering, National Taiwan Univ., Taiwan.* In this study, a novel swept-source OCT system is proposed for dental diagnosis. With in-house developed refractive index correction-based image stitching algorithm, the results show the feasibility of our system and enhancement of image quality.

M1C.6 • 09:45
Optical Coherence Tomography and Elastography of Fresh Human Prostate, Marta K. Skrok[1], Szymon Tamborksi[1], Matt Hepburn[1], Mateusz Maniewski[2,3], Lukasz Szylberg[2,3], Brendan F. Kennedy[1]; *[1]Nicolaus Copernicus Univ., Poland; [2]Department of Tumor Pathology and Pathomorphology, Oncology Centre, Poland; [3]Department of Obstetrics, Gynaecology and Oncology, Collegium Medicum, Poland.* Developing more accurate prostate cancer diagnostic methods and procedures for nerve-sparing surgery is a continuing challenge. Here, we evaluate the potential of optical coherence tomography and elastography to visualize prostate microarchitecture toward improving intraoperative decision-making.

Room: ICM Room 5
08:30 -- 10:00
M1A • Photodynamic Therapy I
Presider: Lothar Lilge; Univ. Health Network, Canada

M1A.1 • 08:30
In-Vitro Investigations on Combining 5-ALA-PDT With Berbamine as a Multimodal Therapy Approach for Urinary Bladder Cancer, Muriel S. Kabus[1], Maximilian Aumiller[1], Adrian Rühm[1], Ronald Sroka[1], Heike Pohla[1]; *[1]LIFE-Center, LMU Munich, Germany.* Berbamine was found to enhance the accumulation of 5-ALA induced protoporphyrin IX as photosensitizer, leading to increased urinary bladder cancer cell destruction after irradiation. Additionally, increased PDT efficiency correlated with increased ROS generation.

M1A.2 • 08:45
PDT Dosimetry Considerations for Endovascular PDT Aimed at Downstage "Borderline Resectable" Pancreatic Cancers, Lothar Lilge[1], Alain Garcia Vazquez[2], Tina Saeidi[3], Juan Verde[2], Fanélie Wanert[2], Axel Schmid[4], Lee Swantrom[2], stephen Bown[5], Arjen Bogaards[6]; *[1]Princess Margaret Hospital, Canada; [2]IHU Strasbourg, Inst. for image-guided surgery, France; [3]Medical Biophysics, Univ. of Toronto, Canada; [4]Radiology, Univ. Hospital Erlangen, Germany; [5]Univ. College London, UK; [6]Vascular Oncology Biotechnologies B.V., Netherlands.* Endovascular light delivery for PDT of pancreatic cancer is investigated as an approach to clear tumours encasing major blood vessels in the pancreas as a means to downstage the patients and render them suitable for further surgical removal of their tumour.

M1A.3 • 09:00
Photodynamic Therapy Potential of *Ruta Chalepensis* Extracts: Anticancer and Photosensitizing Effects, Cennet Özay[1], Emel Bakay[2], Nermin Topaloglu[1]; *[1]Izmir Katip Celebi Univ., Turkey; [2]Deparment of Pharmacy, Åbo Akademi Univ., Finland. Ruta chalepensis* extract (RCOE) exhibited significant ROS generation under photodynamic therapy, with PDT10 and PDT25 inducing 4-fold and 8-fold increases, respectively. This suggests its potential as a plant-based photosensitizer for PDT applications in cancer treatment.

M1A.4 • 09:15
Optical Instrumentations Monitoring Dosimetric Parameters for Photodynamic Therapy, Buhong Li[1]; *[1]Hainan Univ., China.* Emerging optical systems or instrumentations for monitoring dosimetric parameters, including light distribution and dose, tissue optics, photosensitizer, oxygen, and singlet oxygen during photodynamic therapy (PDT) were summarized. The challenge and perspective for establishing PDT dosimetry are provided.

M1A.5 • 09:30
The Effects of Pioglitazone on Indocyanine Green-Mediated Photodynamic Therapy Against Papillary Thyroid Cancer, Derya Sema Yaman Kalender[1,2], Mehmet Eren Kalender[3], Nermin Topaloglu[4]; *[1]Department of Biomedical Technologies, Inst. of Natural and Applied Sciences, Izmir Katip Celebi Univ., Turkey; [2]Department of Endocrinology and Metabolism, Atatürk Training and Research Hospital, Izmir Katip Celebi Univ., Turkey; [3]Department of Medical Oncology, Atatürk Training and Research Hospital, Izmir Katip Celebi Univ., Turkey; [4]Department of Biomedical Engineering, Faculty of Engineering and Architecture, Izmir Katip Celebi Univ., Turkey.* This study evaluated Indocyanine Green-based photodynamic therapy combined with pioglitazone for papillary thyroid cancer. Results show a synergistic

effect, reducing tumor cell viability while minimizing damage to normal thyroid cells.

M1A.6 • 09:45
Improvement of Photodynamic Action in Ovarian Cancer Cells Through PBM Pre-Treatment and Multifunctional Mesoporous Silica Nanoparticles, Busra Sirek[1,2], Özlem Yildiz[3], Didem Sen Karaman[1], Nermin Topaloglu[1]; *[1]Department of Biomedical Engineering, Faculty of Engineering and Architecture, Izmir Katip Celebi Univ., Turkey; [2]Department of Biomedical Technologies,Inst. of Natural and Applied Sciences, Izmir Katip Celebi Univ., Turkey; [3]Department of Biomedical Engineering, Institue of Natural and Applied Sciences, Izmir Katip Celebi Univ., Turkey.* Photodynamic therapy was combined with photobiomodulation to improve the anticancer efficacy in the presence of curcumin-loaded MSNs against ovarian cancer cells. PBM pre-treatment at red and near-infrared wavelengths enhanced photodynamic action and ROS production.

Room: ICM Room 5
10:30 -- 12:00
M2A • ECBO Plenary Session
Presider: Hamid Dehghani; Univ. of Birmingham, UK and Peter So; Massachusetts Inst. of Technology, USA

10:30 (Plenary)
Harnessing Label-Free Two-Photon Microscopy for Dynamic Imaging of Cellular Metabolism and Matrix Remodeling in Living Tissues, Irene Georgakoudi[1]; *[1]Thayer Engineering at Dartmouth, USA.* Label-free two-photon microscopy leveraging endogenous fluorescence and second harmonic generation enables dynamic assessment of cellular metabolism, extracellular matrix remodeling, cell-cell and cell-matrix interactions. This information is critical for advancing diagnostics, therapeutic monitoring, and understanding of disease progression, especially when informed by complementary tools, such as transcriptomics.

11:15 (Plenary)
Optical Frontiers in Reproductive Health: Imaging, Manipulation, and Measurement at the Start of Life, Kishan Dholakia[1]; *[1]Univ. of St Andrews, UK.* There is a burgeoning need to enhance assisted reproductive technologies to ultimately improve IVF outcomes. I will describe the use of a range of advanced photonics-based approaches of light sheet microscopy, photopolymerisation, optical trapping and digital holographic microscopy for this purpose.

Room: ICM Hall B0
12:00 -- 14:00
M3A • Joint Posters Session I

M3A.1
Large Field of View Correction with Refractive Adaptive Optics in 2-Photon Microscopy, Antonio Vanzo[1], Yin-Tzu Hsieh[2], Dong-Han Li[2], Pin-Chun Liao[2], Jye-Chang Lee[2], Shi-Wei Chu[2], Stefano Bonora[1]; *[1]Istituto di Fotonica Nanotecnologie CNR, Italy; [2]Department of Physics, National Taiwan Univ., Taiwan.* We present a first implementation of a multi-conjugated adaptive optics system in a two-photon microscope to enhance contrast in high-speed

volumetric imaging of neuron networks in the living brain.

M3A.2
Chemometrics-Enhanced Infrared Spectroscopy: an Advanced Approach for Biomedical Research on Diabetes Mellitus, Mohamed E. Abdelmonaem[1,3], Chiedozie Ugwoke[2], Armin Alibegović[4], Erika Cvetko[2], Joze Grdadolnik[1], Anja Šerbec[2], Nejc Umek[2], Barbara Zupančič[1]; *[1]Laboratory for Molecular Structural Dynamics, Theory Department, National Inst. of Chemistry, Slovenia; [2]Inst. of Anatomy, Faculty of Medicine, Univ. of Ljubljana, Slovenia; [3]Biotechnical Faculty, Univ. of Ljubljana, Slovenia; [4]Inst. of Forensic Medicine, Faculty of Medicine, Univ. of Ljubljana, Slovenia.* The study uses chemometrics-enhanced FTIR spectroscopy to detect diabetes-induced changes in the composition of skeletal muscles. This method paves its way into medicine as it outperforms traditional assays providing comprehensive data with minimal sample preparation.

M3A.3
Investigation of High-Power Laser-Driven X-Rays for Photodynamic Therapy, Viorel Nastasa[1], Angela Staicu[2], Mihaela Balas[3], Ana Maria Udrea[2], Liviu Neagu[1], Andi Cucoanes[1], Mihaela Bacalum[4], Mihai Boni[2], Ionut Relu Andrei[2], Petru Ghenuche[1], Domenico Doria[1], Ionut Ungureanu[2]; *[1]ELI-NP, Romania; [2]Laser Department, INFLPR, Romania; [3]Faculty of Biology, Univ. of Bucharest, Romania; [4]DFVM, IFIN-HH, Romania.* While PDT offers advantages such as minimal invasiveness and low systemic toxicity, its limited tissue penetration necessitates novel delivery strategies. To overcome this limitation, we used scintillating nanoparticles (NPs) to convert ionizing radiation into visible light, thus activating nearby photosensitizers.

M3A.4
Attention-Based Neural Network for Multi Class Classification of Human Skin Carcinoma Using in-Vivo Autofluorescence and Diffuse Reflectance Spectroscopy, Dongqin Ni[1,2], Marie Camonin[3], Valentin Kupriyanov[3], Marine Amouroux[3], Grégoire Khairallah[4], Walter Blondel[3], Martin Hohmann[1,2]; *[1]Inst. of Photonics Technologies, Germany; [2]Erlangen Graduate School in Advanced Optical Technologies, Germany; [3]Université de Lorraine, CNRS, CRAN UMR 7039, France; [4]Department of Plastic, Aesthetic and Reconstructive Surgery, Metz-Thionville Regional Hospital, France.* This contribution presents an attention-based neural network model developed to classify skin carcinomas, actinic keratosis and normal skin from multimodal spectroscopy on 131 patients. Preliminary results show accuracy and f1-score of 64 % and 0.44 respectively.

M3A.5
Analysis of Vital Signs from Wearable Sensor Data for Early Detection of Cardiovascular Risks, Abayomi D. Babalola[1], Manish Tripathi[2], Faiyaz Ahamad[2]; *[1]Federal Polytechnic Ile-oluji, Nigeria; [2]computer science and Engineering, Integral Univ. lucknow, India.* Machine learning predicts cardiovascular risk using real-time vital signs, with 98.99% accuracy achieved using Random Forest and XGBoost, and wearable sensors enhance remote monitoring and early detection.

M3A.6
Shot-Noise Limited Tunable Stimulated Raman Scattering Microscopy and its Application for Virtual Histology, Naveen Gajendra Kumar[2], Sandro Heuke[1], Barbara Sarri[1], Elliot Cornet[1], Yong Jian Wang[2], Romain Appey[3], Hervé Rigneault[1]; *[1]Institut Fresnel, France; [2]Lightcore Technologies, France; [3]APHM, France.* Stimulated Raman scattering (SRS) microscopy is a

nonlinear imaging technique that visualizes chemical composition by detecting molecular-vibrational bonds. We present a shot-noise limited, tunable SRS Microscopy scheme optimized for fast virtual histology, fingerprint imaging etc.

M3A.7
Emission Integral Effect with Temperature Gradients in Mid-Infrared Passive Spectroscopic Imaging, Daichi Anabuki[1], Hibiki Yano[1], Ruka Kobashi[2], Yuto Mukaihara[2], Akira Nishiyama[3], Kenji Wada[3], Akiko Nishimura[3], Ichiro Ishimaru[2]; *[1]Graduate school of science for creative emergence, Kagawa Univ., Japan; [2]Faculty of engineering and design, Kagawa Univ., Japan; [3]Faculty of medicine, Kagawa Univ., Japan.* By measuring mid-infrared radiation from the human body, we have the potential to measure blood glucose non-invasively. To develop the theory of the proposed method, we investigated the effect of temperature gradients on mid-infrared radiation.

M3A.8
Dimensionality Reduction Approaches for use With Deep Learning Classification Algorithms on Chemical Imaging Data, Rahul Suresh[1], Mohd Rifqi Rafsanjani[1], Karin Jirstrom[2], Arman Rahman[3], William Gallagher[4], Aidan Meade[1]; *[1]School of Physics, Clinical and Optometric Sciences, Technological Univ. Dublin, Ireland; [2]Division of Oncology and Therapeutic Pathology, Department of Clinical Sciences,, Univ. of Lund, Sweden; [3]School of Medicine, Univ. College Dublin, Ireland; [4]UCD School of Biomolecular and Biomedical Science, UCD Conway Inst.,, Univ. College Dublin, Ireland.* Classification of breast cancer subtype is crucial for clinical decision support. This work demonstrates significant impact of dimensionality reduction methodology upon deep-learning classification performance with chemical imaging data.

M3A.9
A Frugal Multispectral Imaging Solution - 2SPID - to Identify Uropathogens via SVM and ANN Classification., Denis F. Leroux[1], Alan Blanchet[2], Corinne Davenas[1], Louis Lac[2], Yann Le Bihan[1], Corine Fulchiron[1]; *[1]BioMérieux S. A., France; [2]Neovision, France.* Targeting clinical laboratories from low-resource settings, bioMérieux created a low-cost multispectral-imaging device for Uropathogens identification from bacterial colonies on agar. Species classification using 2D-CNN and 1D-SVM architectures are compared with/without use of agar ‘context’ information.

M3A.10
Evaluation of E-Cigarette Users Saliva by FTIR Spectroscopy, Camila Lopes Ferreira[1], Sara Maria Santos Dias da Silva[1], Emanuelly C. dos Santos Rocha[1], Yasmin Ferreira Azevedo dos Reis[1], Jean P. Moraes[1], Darcio Kitakawa[2], Luis Felipe Carvalho[1,2]; *[1]UNITAU - Univ. of Taubaté, Brazil; [2]CK Estomatologia, Brazil.* Salivary composition of electronic cigarette users was investigated and compared with that of non-users, employing FTIR spectroscopy. It was revealed significant modifications in spectral bands associated with proteins, lipids and volatile compounds.

M3A.11
Deep Learning-Based AI Model for Brain Tumor Segmentation in Digital Pathology and Terahertz Imaging, Seung Jae Oh[1], Hyeon Sang Bark[2], Inhee Maeng[1], Chul Kang[2], Seok-Gu Kang[1], Han-Cheol Ryu[3], Se Hoon Kim[1], Young Bin JI[2]; *[1]Yonsei Univ., Korea (the Republic of); [2]APRI, Korea (the Republic of); [3]Sahmyook Univ., Korea (the Republic of).* This study

presents a deep learning-based AI model for brain tumor segmentation in digital pathology images. We developed and trained the model with DEEP:PHI, employing U-Net and attention U-Net architectures.

M3A.12
Photobiomodulation: The Effect of Linearly Polarized Light on Wound Healing, You-rim Park[1], Seo Yeon Lee[1], Yu Jeong Kim[1], Joo Beom Eom[1]; *[1]Dankook Univ., Korea (the Republic of).* We fabricated a photobiomodulation (PBM) system using polarized light to evaluate wound healing effect. Results showed that S-wave polarization, despite lower energy, promoted better healing than unpolarized light, suggesting its potential for enhancing skin regeneration.

M3A.13
Hyperspectral Imaging-Based Tissue Oxygen Saturation Mapping for Assessing Vascular Reactivity, Chaeryeong Jang[1], Taeyeon Gil[1], Onseok Lee[1]; *[1]Soonchunhyang Univ., Korea (the Republic of).* We proposed the effectiveness of hyperspectral imaging-based tissue oxygen saturation (StO_2) mapping. The method revealed differences in vascular function, even in the normal blood pressure range, suggesting its applicability for early vascular health assessment.

M3A.14
Study of the Effect of Breathing Exercises on Cerebral and Extra-Cerebral Hemodynamics With TD-FNIRS, Charly Caredda[1], Letizia Contini[2], Bruno Montcel[1], Rebecca Re[2,3]; *[1]Creatis, France; [2]Dipartimento di Fisica, Politecnico di Milano, Italy; [3]Istituto di Fotonica e Nanotecnologie, Consiglio Nazionale delle Ricerche, Italy.* We analyzed physiological and TD-fNIRS signals during breathing exercises. Results showed cardiovascular-respiratory synchronization during modulated breathing and strong coherence between cerebral TD-NIRS signals and peripheral blood volume during breath holds, suggesting autonomic nervous system involvement.

M3A.15
Automated Registration of Intraoperative Optical Images with Preoperative MRI, Charly Caredda[1], Eric Van-Reeth[1,2], Fernand Fort[1], Michaël Sdika[1], Thiébaud Picart[3], Jacques Guyotat[3,1], Fabien C. Schneider[4], Bruno Montcel[1]; *[1]Creatis, France; [2]Département Sciences du Numérique, CPE Lyon, France; [3]Cranial Neurosurgical Department, Hospices Civils de Lyon, France; [4]Université Jean Monnet Saint-Étienne, France.* We developed an image processing pipeline to register preoperative MRI with intraoperative optical images of the patient's brain. The pipeline is included in the clinical practice and the registration error was 1.43±0.72 mm. fMRI and intraoperative optical identifications were compared and showed a good correspondence.

M3A.16
Deep Learning-Based Prediction of Fractional Flow Reserve Using Optical Coherence Tomography, Juyeol Eom[1], Hyeong Soo Nam[1], Dong Oh Kang[2], Jin Won Kim[2], Hongki Yoo[1]; *[1]KAIST, Korea (the Republic of); [2]Korea Univ. Guro Hospital, Korea (the Republic of).* We propose a deep learning algorithm that utilizes OCT-derived morphological and biochemical features to predict continuous FFR changes along the coronary artery, improving stenosis localization and enhancing diagnostic decision-making for coronary artery disease.

M3A.17
Hollow Core Fiber Based System Combined with Surface Enhanced Raman Spectroscopy (SERS) for Ultra-Trace Detection of DNA Molecule, Navdeep Navdeep[1], anjika Kumari[1], Meenakshi meenakshi[1], Satish K. Dubey[1], Dalip Singh Mehta[1]; *[1]Indian Inst. of Technology, Delhi, India.* This study presents an approach utilizing a hollow core fiber system and the SERS method for detection of Adenine, achieving limit of detection of 1nM. This method is beneficial for rapid identification of metabolic diseases.

M3A.18
Machine Learning-Enhanced Two-Photon Microscopy for the Detection of Esophageal Cancer Progression Through Collagen Analysis, Kausalya Neelavara Makkithaya[1], Ming-Che Chan[2], Wei-Shiuan Tseng[2], Nirmal Mazumder[1], Guan-Yu Zhuo[2]; *[1]Manipal Academy of Higher Education, India; [2]National Yang-Ming Chiao-Tung Univ., Taiwan.* We demonstrate a novel approach combining two-photon microscopy with machine learning algorithms to analyze collagen organization in esophageal tissues, enabling differentiation between squamous cell carcinoma and high-grade dysplasia through quantitative extracellular matrix assessment.

M3A.19
A System for Full-Body Dermoscopic Spectral Imaging at Visible and Near-Infrared Wavelengths, Edgars Kviesis-Kipge[1], Uldis Rubins[1], Jekaterina Tihomirova[1], Ilze Irbe[1], Marta Skrastina[1], Janis Spigulis[1]; *[1]Univ. of Latvia, Latvia.* A full-body skin dermatoscopy device was developed with three visible wavelengths (450, 520, 638 nm) and clinically validated. It now includes a near-infrared (850 nm) channel to detect deeper skin inclusions like tumors. This update describes the added elements and presents the first infrared images of skin nevi.

M3A.20
Assisting Epilepsy Neurosurgery of Focal Cortical Dysplasia With Multimodality Fluorescence and SpiderMass Spectroscopy : a Phantom Study, Angèle Denis[1,2], Arthur Gautheron[1,3], Pierre-Aurélien Beuriat[4,5], Isabelle Fournier[2], Bruno Montcel[1]; *[1]Université de Lyon, Université Claude Bernard Lyon 1, UJM-Saint Etienne, CNRS, INSALyon, Inserm U1206, CREATIS UMR 5220, France; [2]Université de Lille, Inserm U1192, Laboratoire Proteomique, Réponse Inflammatoire et Spectrométrie de Masse (PRISM), France; [3]CPE, France; [4]Service de neurochirurgie Pédiatrique, Hospices Civils de Lyon, France; [5]Université Claude Bernard Lyon 1, France.* The efficiency of neurosurgery for focal cortical dysplasia depends on the delineation of the epileptogenic zone. We aim to improve diagnostic accuracy by comparing fluorescence spectroscopy and Spidermass spectrometry of protoporphyrin IX phantoms.

M3A.21
FTIR Exploratory Analysis of Phenol Peel Formulas Developed Over 60 Years: Impact on Efficacy and Safety, Fernando T. Gonçalves[1], Sara J. Michalopoulos[2], Rosangela T. Vitor[4], Nelson Mauricio-Junior[3], Rogerio L. Romeiro[1], Luis Felipe Carvalho[2], Sheila C. Cortelli[1,2]; *[1]São Leopoldo Mandic Faculty, Brazil; [2]UNITAU - Univ. of Taubaté, Brazil; [3]Neofarma Manipulation Pharmacy, Brazil; [4]Rhaizes Phamacy, Brazil.* Main phenol chemical peels were analyzed by FTIR. Peaks in the regions 3000 – 3500 (cm^{-1}) differed between croton-oil and no croton-oils. The key peaks revealed essential biochemical components with potential biological roles.

M3A.22
Impact of Passive Leg Rising Test on the Remote Photoplethysmography Signal Waveform, Zbignevs Marcinkevics[1], Uldis Rubins[1], Una U. Zelca[1], Davids Obuhovskis[1], Andris

Grabovskis[1]; [1]*Univ. of Latvia, Latvia.* This study examines remote photoplethysmography (rPPG) waveform changes during the Passive Leg Raising Test to assess fluid responsiveness non-invasively. Results suggest rPPG-derived reflection index (RI) correlates with hemodynamic changes, offering a potential alternative to invasive monitoring.

M3A.23
Scanning Wide-Field Tomography for High-Speed Mesoscale Volumetric Imaging of Biodynamics in Vivo, Jiazhen Zhai[1], Junle Qu[2], Lingjie Kong[1]; [1]*Tsinghua Univ., China;* [2]*Shenzhen Univ., China.* High-speed, mesoscale volumetric imaging is highly desired but unavailable yet. We propose the scanning wide-field tomography, taking the advantages of random-access scanning and Fourier light-field microscopy, for imaging over ~4.6×4.6×0.32 mm^3 at high spatio-temporal resolutions.

M3A.24
Diagnostic Biomolecule Detection via Combination of Metasurface Platform and Artificial Intelligence, Jin Tae Kim[1], Jinke Li[2], Hongliang Li[2], Hyo-Young Cho[1], Jin-Soo Kim[3], Duk-Yong Choi[4], Chenxi Wang[2], Sang-Shin Lee[2]; [1]*Electronics and Telecom Research Inst, Korea (the Republic of);* [2]*Kwangwoon Univ., Korea (the Republic of);* [3]*Korea Univ., Korea (the Republic of);* [4]*Australian National Univ., Australia.* We propose an innovative diagnostic biomolecule detection method by using a combination of metasurface platform and artificial intelligence. We achieved successful detection of C-reactive protein (CRP) concentrations with over 99 % accuracy.

M3A.25
Autofluorescence Photobleaching Mapping of non-Melanoma Skin Cancer and Rare Disease Skin Lesions, Emilija V. Plorina[1], Alexey Lihachev[1], Ilze Lihacova[1], Norbert Kiss[3], Dmitrijs Bliznuks[2]; [1]*Inst. of Atomic Physics and Spectroscopy, Univ. of Latvia, Latvia;* [2]*Inst. of Applied Computer Systems, Riga Technical Univ., Latvia;* [3]*Department of Dermatology, Venereology and Dermatooncology, Semmelweis Univ., Hungary.* Autofluorescence photobleaching imaging is a temporal measurement method of tissue autofluorescence which has been studied previously as a potential approach to early diagnosis of skin cancer. This study analyzes the intensity and photobleaching rate maps of non-melanoma skin cancer lesions and related rare disease skin lesions.

M3A.26
Employing Augmentation and Batch Normalisation With Chemical Imaging Data for Classification of Cancer Subtype Within a Deep Learning Approach, Rahul Suresh[1], Mohd Rifqi Rafsanjani[1], Karin Jirstrom[2], Arman Rahman[3], William Gallagher[4], Aidan Meade[1]; [1]*School of Physics, Clinical and Optometric Sciences, Technological Univ. Dublin, Ireland;* [2]*Division of Oncology and Therapeutic Pathology, Department of Clinical Sciences, Univ. of Lund, Ireland;* [3]*UCD School of Medicine, UCD Conway Inst., Univ. College Dublin, Ireland;* [4]*UCD School of Biomolecular and Biomedical Science, Univ. College Dublin, Ireland.* Data augmentation and batch normalisation strategies applied to high-dimensional chemical imaging data are explored in terms of their impact upon performance of deep learning algorithms for cancer subtype classification.

M3A.27
Detection of Urea and Creatinine in Urine by Surface-Enhanced Raman Spectroscopy, Anjika Kumari[1], Navdeep Navdeep[1], Meenakshi meenakshi[1], Ekta Srivastava[1],

Satish K. Dubey[1], Dalip Singh Mehta[1]; [1]*Indian Inst. of Technology Delhi, India.* This article proposed a SERS technique with chemical route method of silver (Ag) nano dendrites (NDs) for rapid detection of urea and creatinine levels in urine for clinical diagnoses of chronic kidney disease.

M3A.28
Toward Printing the Brain: a Microstructural Ground Truth Phantom for MRI, Franziska Chalupa-Gantner[1], Michael Woletz[2], Benedikt Hager[3], Alexander Ricke[4], Siawoosh Mohammadi[5], Stefan Binder[1], Stefan Baudis[4], Aleksandr Ovsianikov[1], Christian Windischberger[2], Zoltan Nagy[6]; [1]*Inst. of Materials Science and Technology, TU Wien, Austria;* [2]*Center for Medical Physics and Biomedical Engineering, Medical Univ. of Vienna, Austria;* [3]*Department of Biomedical Imaging and Image-guided Therapy, Medical Univ. of Vienna, Austria;* [4]*Inst. of Applied Synthetic Chemistry, TU Wien, Austria;* [5]*Max Planck Research Group MR Physics, Max Planck Inst. for Human Development, Germany;* [6]*7Laboratory for Social and Neural Systems Research, Univ. of Zurich, Switzerland.* dMRI is a promising imaging technique for examining the human brain. Validation of dMRI is challenging, and specialized test samples, so-called brain phantoms, that mimic the tissue microstructure authentically, are needed. High-resolution 3D printing by means of 2-Photon Polymerization allows for the manufacturing of such novel brain phantoms.

M3A.29 Examination of the Effect of Choice of Performance Metric for Hyperparameter Tuning and Model Performance in Deep Learning Classification Approaches With Chemical Imaging Data, Rahul Suresh[1], Mohd Rifqi Rafsanjani[1], Karin Jirstrom[2], Arman Rahman[3], William Gallagher[4], Aidan Meade[1]; [1]*School of Physics, Clinical and Optometric Sciences, Technological Univ. Dublin, Ireland;* [2]*Division of Oncology and Therapeutic Pathology, Department of Clinical Sciences, Univ. of Lund, Sweden;* [3]*UCD School of Medicine, UCD Conway Inst., Univ. College Dublin, Ireland;* [4]*UCD School of Biomolecular and Biomedical Science, UCD Conway Inst., Univ. College Dublin, Ireland.* Effective hyperparameter tuning of deep learning algorithms for highly imbalanced classification problems with chemical imaging data is demonstrated to crucially require the careful choice of performance metric.

M3A.30
Tuning the Loss Function of Deep Learning Convolutional Networks for Optimisation of Classification Performance With Chemical Imaging Datasets, Rahul Suresh[1], Mohd Rifqi Rafsanjani[1], Karin Jirstrom[2], Arman Rahman[3], William Gallagher[4], Aidan Meade[1]; [1]*School of Physics, Clinical and Optometric Sciences, Technological Univ. Dublin, Ireland;* [2]*Division of Oncology and Therapeutic Pathology, Department of Clinical Sciences, Univ. of Lund, Sweden;* [3]*UCD School of Medicine, UCD Conway Inst., Univ. College Dublin, Ireland;* [4]*UCD School of Biomolecular and Biomedical Science, UCD Conway Inst., Univ. College Dublin, Ireland.* Loss functions are a crucial element of designing deep learning classification models for imbalanced classification tasks. Here we demonstrate the impact of various loss functions on classification of breast cancer subtype with chemical imaging datasets.

M3A.31
Hybrid Photonic Circuits for High-Precision Diagnostics, Evangelos Marakis[1], Savvas Papamakarios[1,2], Maria Farsari[1], Zacharakis Giannis[1]; [1]*FORTH-IESL, Greece;* [2]*Physics, National and Kapodistrian Univ. of Athens, Athens, Greece.* We present a hybrid photonic platform integrating Two-Photon Polymeriza-tion (TPP) and UV lithography for biomechanical diagnostics. Optimized via WaveSim, it enables compact, high-resolution optical circuits,

bridging rapid prototyping and scalable fabrication for biomedical sensing and micro-optical imaging.

M3A.32
Designing a Raman System for Droplets Microfluidics, Sergio Quintero[1], Pedro Braga-Fernandes[1,2], Alar Ainla[1], Lorena Dieguez[1], Sara Abalde[1]; *[1]Dieguez Research group, International Iberian Nanotechnology Laboratory, Portugal; [2]Aveiro Univ., Portugal.* In this work we proposed the design and assembly of a built in-house Raman microscope system using a Raman fiber probe. The engineered device can be useful in different applications in droplets microfluidics field.

M3A.33
Influence of Substrate Selection for Thin ex-Vivo Specimens on Hyperspectral Imaging Measurements of Silicone Phantom, José Alberto Gutiérrez Gutiérrez[1,2], Verónica Mieites Alonso[1,2], Olga M. Conde[1,2]; *[1]Universidad de Cantabria, Spain; [2]Valdecilla Health Research Insitute (IDIVAL), Spain.* Hyperspectral imaging (HSI) in medical diagnostics is affected by substrate selection, especially for thin or low-scattering samples. This study analyzes silicone phantoms with varying aluminum oxide concentrations, emphasizing substrate influence in VisNIR and SWIR measurements.

M3A.34
Melanoma Fixation for OCT Imaging: How Long is Too Long?, Verónica Mieites Alonso[1,2], Shayamita Ghosh[2], José A. Gutiérrez-Gutiérrez[1,2], Mónica L. Fanarraga[2], Olga M. Conde[1,2]; *[1]Universidad de Cantabria (UC), Spain; [2]Valdecilla Health Research Insitute (IDIVAL), Spain.* This study evaluates the impact of fixation duration on the optical properties of melanoma. OCT measurements showed significant changes in attenuation between 2-6 hours of fixation, highlighting the need for standardized fixation protocols for imaging.

M3A.35
Synergistic Antibacterial Effects of α-Mangostin and Photodynamic Therapy Against Multidrug-Resistant Pathogens, Mateusz Guzniczak[2], Dorota Wojnicz[1], Kamila Korzekwa[3], Maciej Wernecki[3], Agnieszka Ulatwoska-Jarza[2], Igor Buzalewicz[2], Dorota Tichaczek-Goska[1]; *[1]Department of Biology and Medical Parasitology, Faculty of Medicine, Wroclaw Medical Univ., Poland; [2]Department of Biomedical Engineering, Faculty of Fundamental Problems of Technology, Wroclaw Univ. of Science and Technology, Poland; [3]Department of Microbiology, Faculty of Biological Sciences, Univ. of Wroclaw, Poland.* This study investigates α-mangostin and photodynamic therapy as potential enhancers of antibacterial activity against uropathogenic bacteria. Using digital holotomography and confocal microscopy, we demonstrate improved bacterial penetration and photosensitizer accumulation, suggesting a promising antimicrobial strategy.

M3A.36
Co-Robot Supported Air-Jet Based Optical Coherence Elastography Towards in-Situ Brain Tumor Tissue Delineation, Nicolas Detrez[1], Dirk Theisen-Kunde[1], Wolfgang Draxinger[2], Thies Hörcher[1], Veit Danicke[1], Sazgar Burhan[2], Jessica Kren[3], Matteo Bonsanto[3], Robert Huber[2,1], Ralf Brinkmann[1,2]; *[1]Medical Laser Center Luebeck, Germany; [2]Inst. of Biomedical Optics, Germany; [3]Department of Neurosurgery, Univ. Medical Center Schleswig-Holstein, Germany.* Accurate tumor delineation in neurosurgery is challenging. We developed an *in-situ* optical coherence elastography system using air-jet excitation and phase based full-range

OCT. The challenges in transitioning from *ex vivo* to *in-situ* application are presented.

M3A.37
Wide-Field Line-Scanning Multispectral Fluorescence Lifetime Imaging With a CMOS-SPAD Array, Matthew Douglas[1], Andrew Green[1], Michael Tanner[1]; [1]*Heriot Watt Univ., UK.* We demonstrate a wide-field fluorescence lifetime imaging system using a single-photon avalanche diode (SPAD) line array for applications in disease detection. Time-multiplexed excitation pulses yield subtle differences in the fluorescence lifetime of a plant sample.

M3A.38
Enhancing Skin Tone Representation in Optical Phantoms, Anni S. Ranta-Lassila[1], Alexey Popov[1]; [1]*VTT Technical Research Centre of Finland, Finland.* Optical biotissue-mimicking phantoms enable standardized testing and validation conditions for optical devices. To better represent the optical variability of human skin, we fabricated phantoms with a range of skin tones for more inclusive assessments.

M3A.39
Diagnosys of Oral Cancer Using FTIR Hyperspectral Images and Linear Discriminant Analysis, Daniella L. Peres[1], Daniela d. Silva[1], Denise M. Zezell[1]; [1]*Universidade de São Paulo, Brazil.* This study used FTIR hyperspectral imaging (HSI) and LDA to classify 48 OSCC and 48 healthy tissue samples, achieving 85\% accuracy. These results show that HSI with LDA can aid early OSCC detection.

M3A.40
SEIRA Enhancement of Amoxicillin Detection Using Laser-Generated Gold Nanoparticles, Vinicius P. Anjos[1,2], Daniela d. Silva[1], Danielle d. Laskowski[3], Arandi G. Bezerra Junior[3], Denise M. Zezell[1,2]; [1]*Center for Lasers and Applications, Nuclear and Energy Inst., Brazil;* [2]*Univ. of São Paulo, Brazil;* [3]*Programa de Pós-Graduação em Física e Astronomia, Federal Univ. of Technology – Paraná, Brazil.* Our research demonstrates SEIRA-based detection of Amoxicillin using AuNP as an enhancing substrate. The approach boosts FTIR sensitivity, enabling precise molecular characterization. This method holds promise for pharmaceutical analysis and trace-level antibiotic.

M3A.41
Surface Enhanced Raman Spectroscopy as a Diagnostic Tool to Differentiate Cancerous and Non-Cancerous Oral Tissues, Nidhi Mehta[1], Pramila Thapa[1], Varun Surya[2], Deepika Mishra[2], Dalip Singh Mehta[1]; [1]*Indian Inst. Of Technology Delhi, India;* [2]*Department of Oral Pathology and Microbiology, Centre for Dental Education & Research (CDER), b, AIIMS, Hauz Khas, New Delhi,110016, India, India.* A facile SERS substrate fabrication method for distinguishing cancerous and non-cancerous oral tissues is reported. The discrimination relies on biochemical changes occuring with developing malignancy. The study presents nanostructure morphology, SERS substrate fabrication and preliminary results for oral cancer detection using this SERS substrate.

M3A.42
Optical Metabolic and Morphological Undamaged Evaluation and NIR Suppression of 3D Scaffold-Based Cancer Models, Arooj Khalid[1], Valentina Pasquale[2], Sacco Elena[2], Marco Vanoni[2], Sergei Sokolovsky[1], Edik Rafailov[1]; [1]*Aston Univ., UK;* [2]*Univ. of Milano-Bicocca, Italy.* Development of 3D Melanoma- full-thickness skin equivalent (Melanoma-FSE) and non-

muscle invasive bladder cancer (NMIBC) models for studying the cancer progression metabolic and morphological characteristics as well as therapeutic effects of NIR 1267 nm.

M3A.43
Terahertz Spectroscopic Imaging for Brain Alterations Induced by Lymphatic Dysfunction in the Head and Neck Region, Seung Jae Oh[1], Hwayeong Cheon[2], Dong-Cheol Woo[2], Seungwoo Cha[2], Yeon Ji Chae[2], Inhee Maeng[1], Jae Yong Jeon[2]; *[1]Yonsei Univ., Korea (the Republic of); [2]Asan Medical Center, Korea (the Republic of).* Terahertz imaging reveals brain alterations caused by lymphatic dysfunction in the head and neck by detecting increased water content, cerebrospinal fluid imbalance, and neuro-inflammation, providing insights into neurological risks and potential diagnostic applications.

M3A.44
Selective Detection of Ca^{2+} Ions in Fetal Bovine Serum Using an InSb Grating Coupled Terahertz SPR Sensor, Zhi-mei Qi[1,2]; *[1]Aerospace Information Research Inst., Chinese Academy of Sciences, China; [2]School of Electronic, Electrical, and Communication Engineering, Univ. of Chinese Academy of Sciences, China.* An InSb grating with a period of 130 μm was prepared and used as a terahertz surface plasmon resonance (THz-SPR) sensor, and the selective detection of Ca^{2+} ions in fetal bovine serum was achieved by precipitating $CaCO_3$ formed in the serum sample onto the InSb grating.

M3A.45
A Monte Carlo Study to Assess the Effect of Skin Tone on non-Contact Measurements of Blood Oxygenation, Aleksi Leinonen[1], Markku Alamäki[1], Aki Mäyrä[1], Alexey Popov[1]; *[1]VTT Technical Research Centre of Finland, Finland.* Monte Carlo simulations of light propagation in a 7-layer skin model were used to assess the effect of skin tone on the oxygenation calibration curves, with darker skin (with higher melanin content) exhibiting steeper slopes.

M3A.46
Optical Evaluation of the Impact of Filtration on Diagnostic Salivary Components, Somali Dhal[1], An H. Luu[2], Sanathana Konugolu Venkata Sekar[1], Siddra Maryam[1], Edward Fahy[3], Richael N. Riordain[3], Katarzyna I. Komolibus[1], Stefan Andersson-Engels[1], Nilushni Sivapragasam[2], Rekha Gautam[1]; *[1]Tyndall National Inst., Ireland; [2]School of Food and Nutritional Sciences, Univ. College Cork, Ireland; [3]Cork Univ. Dental School and Hospital, Ireland.* This study investigates how filtration affects the biochemical composition of human saliva, aiming to standardize protocols and enhance the accuracy of Raman spectral analysis for diagnostic applications.

M3A.47
Automated Fluorescence Microscopy Imaging System With Deep Learning-Driven Analysis of Mitochondria Morphology for Rapid Drug Discovery Screening, Yuetong Jia[1], Edward N. Ward[1], Francesca W. van Tartwijk[1], Clemens F. Kaminski[1]; *[1]Univ. of Cambridge, UK.* A fluorescence microscopy imaging system with advanced autofocus, automated screening, and AI-driven image processing is developed for individual cell screening to identify drug effects based on mitochondrial morphological changes.

M3A.49
Operator-Free Optical Coherence Tomography with Automated Alignment and Artifact Detection, Reuben J. Foo[1,2], Bingyao Tan[1,2], Damon Wong[1,2], Jacqueline Chua[1,2], Leopold Schmetterer[1,2]; *[1]Singapore Eye Research Inst., Singapore National Eye Centre, Singapore; [2]SERI-NTU Advanced Ocular Engineering (STANCE), Singapore.* We present a clinically validated automated OCT system integrating robotics and AI-driven artifact detection to enhance usability and ensure consistent image quality, which seeks to reduce reliance on skilled operators and improve efficiency in healthcare institutions.

M3A.50
FlowCyPy: A High-Fidelity Flow Cytometry Simulation Framework for Extracellular Vesicle Analysis, Martin Poinsinet de Sivry[1], Ton van Leeuwen[1], Edwin van der Pol[1]; *[1]Biomedical Engineering & Physics, Amsterdam UMC, Univ. of Amsterdam, Netherlands.* FlowCyPy is an open-source simulation framework integrating physics-based fluidic, optical, and electronic models to predict extracellular vesicle detection in flow cytometry, enabling instrument optimization, calibration standardization, and improved sensitivity for < 200nm particles.

Room: ICM Room 11
14:00 -- 15:30
M4B • Clinical and Preclinical Applications of Diffuse Optics III
Presider: Nienke Bosschaart; Univ. of Twente, Netherlands

M4B.1 • 14:00
Liver Steatosis Evaluation in Transplantation: Near-Infrared Diffuse Reflectance Spectroscopy, Antoine Uzel[1], Michaël Sdika[1], Sophie Chopinet[2,3], Pauline Brige[3,4], Olivier Lopez[3,4], Bruno Montcel[1]; *[1]CREATIS, France; [2]Department of Digestive Surgery and Liver Transplantation, Hôpital la Timone, France; [3]Aix Marseille Univ, LIIE, France; [4]Aix Marseille Univ, CERIMED, France.* We present a novel approach for quantitative assessment of hepatic steatosis using near-infrared diffuse reflectance spectroscopy (NIR-DRS). Based on an analytical diffusion model, our method enables real-time evaluation of tissue composition. Validation on a murine model shows excellent correlation with histopathology.

M4B.2 • 14:15
Hyperspectral Imaging in the Visible and Short-Wave InfraRed on Freshly Resected Breast Cancer Specimens, Lorenzo Vinco[2,1], Andrea Rabolini[1], Dario Polli[1,2]; *[1]Politecnico di Milano, Italy; [2]NIREOS, Italy.* Abstract: The current workflow for intraoperative margin assessment is limited, with Hematoxylin&Eosine being the gold standard for tissue analysis. We show hyperspectral imaging is a promising tool for improving the identification of tumoral margins during surgery.

M4B.3 • 14:30
Thermal Denaturation of Deoxyhemoglobin: Evidence for a Previously Unreported Intermediate State, Alessandro Bossi[1], Paola Saccomandi[1], Antonio Pifferi[1]; *[1]Politecnico di Milano, Italy.* We attempt to prove the existence of an unreported form of Methemoglobin, which arises from the treatment of deoxyhemoglobin, through the thermal treatment treatment of calf blood.

M4B.4 • 14:45
Monitoring Fluid Responsiveness Using Hybrid Diffuse Optics During Passive Leg Raising Maneuver, Marta Zanoletti[1], M. Atif Yaqub[1], Lorenzo Cortese[1], Caterina Amendola[2], Mauro Buttafava[3], Davide Contini[2], Edgar Cortés[4], Michele Lacerenza[3], Sara Nogales[4], Alessandro Torricelli[2,5], Jaume Mesquida[4], Turgut Durduran[1,6]; *[1]ICFO -Institut de Ciencies Fotoniques, Spain; [2]Politecnico di Milano, Italy; [3]Pionirs, Italy; [4]Critical Care, Parc Taulí, Spain; [5]Istituto di Fotonica e Nanotecnologie, Consiglio Nazionale delle Ricerche, Italy; [6]Institució Catalana de Recerca i Estudis Avançats (ICREA), Spain.* Fluid therapy is essential in hemodynamic resuscitation, but not all patients benefit. Passive leg raising predicts fluid responsiveness, necessitating reliable cardiac output (CO) monitoring. Here, we present a complementary approach using hybrid diffuse optics as a surrogate for CO monitoring.

M4B.5 • 15:00
Differences of Time-Domain NIRS-Derived Hemodynamic Parameters of the Vastus Lateralis Muscle With Age and Physical Activity, Marco Nabacino[1], Caterina Amendola[1], Letizia Contini[1], Davide Contini[1], Lorenzo Spinelli[2], Alessandro Torricelli[1,2], Andrea Pilotto[3], Fulvio Lauretani[4], Julian Alcazar[5,6], Martino Franchi[7], Alberto Botter[8], Simone Porcelli[3], Rebecca Re[1,2]; *[1]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]GENUD Toledo Research Group, Faculty of Sport Sciences, Univ. of Castilla-La Mancha, Spain; [6]CIBER of Frailty and Healthy Aging (CIBERFES), Instituto de Salud Carlos III, Spain; [7]Department of Biomedical Sciences, Univ. of Padua, Italy; [8]Department of Electronics and Telecommunications, Politecnico di Torino, Italy.* Skeletal muscle hemodynamic parameters of 59 volunteers from two age groups (middle-aged and old) and two training levels were measured using Time-Domain Near-Infrared Spectroscopy. Significant differences were observed with training status, but not with age.

M4B.6 • 15:15
Understanding Skeletal Muscle's Vascular Function and Health with Time-Domain Near Infrared Spectroscopy, Rebecca Re[1,2], Letizia Contini[1], Caterina Amendola[1], Davide Contini[1], Lorenzo Spinelli[2], Alessandro Torricelli[1,2]; *[1]Dipartimento di Fisica, Politecnico di Milano, Italy; [2]Istituto di Fotonica e Nanotecnologie, Consiglio Nazionale delle Ricerche, Italy.* We propose a method based on fast time domain near infrared spectroscopy to study skeletal muscle's vasculature function and health. We present the method and in-vivo acquisitions during rest, contraction and recovery on 8 subjects.

Room: ICM Room 22b
14:00 -- 15:30
M4C • Light Sheet and In-Vivo Tissue Microscopy
Presider: Zacharakis Giannis; FORTH-IESL, Greece

M4C.1 • 14:00 (Invited)
Tomographic Flow Cytometry of Organoids Using Ultra-Fast 3D Two-Photon SLIDE Microscopy, Matthea Thielking[1], Gregory Berg[1], Christan Stock[1], Florian Sommer[2], Sebastian Karpf[1]; *[1]Universität zu Lübeck - BMO, Germany; [2]Leibniz-Inst. for Virology, Germany.* We present tomographic imaging flow cytometry (TomoFlow) for high-resolution, three-dimensional imaging of cellular tissue in flow. It leverages SLIDE, an ultra-fast two-photon microscopy

technique, for high penetration fluorescence imaging of organoids at high volume throughput.

M4C.2 • 14:30
Imaging Calcium Oscillations in Arabidopsis Root Hairs with Light-Sheet Fluorescence Microscopy, Giorgia Tortora[1], Emma Martinelli[1], Stefano Buratti[2], Alex Costa[2], Andrea Bassi[1], Alessia Candeo[1]; *[1]Politecnico di Milano, Italy; [2]Università degli Studi di Milano, Italy.* The employment of light-sheet fluorescence microscopy together with the development of customized software for image registration enables high-resolution imaging and fast, reliable analysis of calcium oscillations in root hairs of Arabidopsis thaliana plants.

M4C.3 • 14:45
SNR-Enhanced Single-Objective Two-Photon Oblique Light Sheet Microscopy with Low Repetition Rate Light Source, Jeonggeun Song[1], Wooijn Lee[1], Hyeong Soo Nam[1], Hamin Park[2], Young-Gyun Park[2], Hongki Yoo[1]; *[1]Mechanical engineering, Korea Advanced Inst of Science & Tech, Korea (the Republic of); [2]Bio & Brain engineering, Korea Advanced Inst of Science & Tech, Korea (the Republic of).* We developed a single-objective two-photon oblique light sheet microscope incorporating a pulse picker. By adjusting the laser repetition rate, we achieved high-SNR 3D fluorescence imaging across large areas of thick brain tissue.

M4C.4 • 15:00
Miniature Achromatic Microendoscopic Objective for 2-Photon Diagnostic Imaging, Jinyun Liu[1], Tomasz Tkaczyk[1]; *[1]Rice Univ., USA.* A microendoscopic objective integrating a commercial glass lens with two-photon polymerization (2PP)-fabricated polymer optics is presented. This ultra-compact, high-NA (0.6) design enables achromatic correction at 775 nm and 860 nm for multi-wavelength nonlinear biomedical imaging.

M4C.5 • 15:15
Noninvasive Microscopy of Blood Cells in Premature Infants, Reut Friedman[1], Calri Felszer-Fisch[2], Ariel Koren[3], Carina Levin[3,4], Dvir Yelin[1]; *[1]Technion -Israel Inst. of Technology, Israel; [2]Neonatal Intensive Care Unit, Emek Medical Center, Israel; [3]Pediatric Hematology Unit, Emek Medical Center, Israel; [4]The Ruth and Bruce Rappaport Faculty of Medicine, Technion-Israel, Israel.* Spectrally encoded flow cytometry is applied for noninvasive imaging of blood cells in premature infants. The confocal images captured by the system show comparable image quality to images obtained from an adult lip.

Room: ICM Room 5
14:00 -- 15:30
M4A • Raman Spectroscopy I
Presider: Zhiwei Huang; National Univ. of Singapore, Singapore

M4A.1 • 14:00
Autofluorescence-Raman Spectroscopy for Intra-Operative Detection of Residual Basal Cell Carcinoma: Diagnostic Accuracy and Incorrect Detections, Radu Boitor[1], Sandeep Varma[2], Somaia Elsheikh[3], Hywel Williams[4], Ioan Notingher[1]; *[1]School of Physics and Astronomy, Univ. of Nottingham, UK; [2]Nottingham NHS Treatment Centre, UK; [3]Department of Pathology, Nottingham Univ. Hospitals, UK; [4]Centre of Evidence-Based Dermatology, Univ. of Nottingham, UK.* Autofluorescence (AF)–Raman spectroscopy was shown to detect residual basal cell carcinoma (BCC) on the resection margin of fresh, surgically excised tissue

specimens. The performance of AF-Raman was compared to the reference standard of histology.

M4A.2 • 14:15
Raman Spectroscopy Studies on Imatinib- Sensitive and Resistance Chronic Myeloid Leukemia Cells, Rahul Mojidra[1,2], Arti Hole[1], Rukmini Govekar[1,2], Murali Krishna K. Chilakapati[1,2]; *[1]TMC-ACTREC, India; [2]HBNI, India.* Monitoring development of resistance to tyrosine-kinase-inhibitor-imatinib during treatment is crucial to avoid disease progression in chronic myeloid leukemia. Raman spectroscopy studies explored stratification of progressive imatinib resistance in K562 cell, to develop early detection tool.

M4A.3 • 14:30
Towards Real-Time Molecular Profiling of Glioblastoma via Stimulated Raman Scattering Imaging, Maximilian Brinkmann[1], Felix Neumann[1], Ramon Droop[1], Steffen Ullmann[1], Thomas Würthwein[1], Tim Hellwig[1], Silke Morris[1], Felix Stark[2], Isabel Schneider[2], Christoph Sippl[2]; *[1]Refined Laser Systems, Germany; [2]Department of Neurosurgery, Univ. Hospital Bayreuth, 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.

M4A.4 • 14:45
Raman Spectroscopy of Canine Cancer to Differentiate Oral Malignancy, Arti Hole[1], Kiran Bendale[1], Poonam Gera[1], Pradip Chaudhary[1], Murali Krishna K. Chilakapati[1]; *[1]TMC-ACTREC, India.* Canine models are ideal for comparative oncology research due to human similarities, hence analogs. Raman Spectroscopy (RS) explored for classifying canine oral cancers - Epulis, Spindle Cell Sarcoma, Squamous Cell Carcinoma, and Round Cell tumors.

M4A.5 • 15:00
Label-Free Classification of Breast Cancer Using Raman Spectroscopy and Machine Learning, Zhiyu Zhu[1], Ahmed Ezzat[1], Alfie Roddan[1], Yingwei Hou[1], Nilanjan Mandal[1], Jiacheng Xu[1], Ziqi Zhang[1], Mengyi Zhou[1], Ara Darzi[1], Simon Dryden[1], Daniel Leff[1], Alexander J. Thompson[1]; *[1]Department of Surgery and Cancer, Hamlyn Centre, UK.* We applied Raman spectroscopy to an ex vivo study of breast cancer, and demonstrated accurate classification of healthy and cancerous samples using Machine Learning.

M4A.6 • 15:15
Real-Time Detection of Microplastics in Biological Fluids Using Porous SERS Substrates, Meenakshi Meenakshi[1], Vrishty Kundu[1,2], Sathi Das[1], Anjika Kumari[1], Navdeep Navdeep[1], Dalip Singh Mehta[1], Kanchan Saxena[2]; *[1]Indian Inst. of technology Delhi, India; [2]Amity Inst. of Renewable and Alternative Energy, Amity Inst. of Renewable and Alternative Energy, Amity Univ., India.* This study presents a rapid method for detecting two different types of microplastics: polypropylene and polyvinylchloride in urine using a gold coated porous silicon substrate, allowing direct analysis without sample pre-treatment with a portable Raman spectrometer.

Room: ICM Room 11
16:00 -- 17:30
M5B • Innovative Applications of Diffuse Optics
Presider: Jana Kainerstorfer; Carnegie Mellon Univ., USA

M5B.1 • 16:00
Physics-Based Rendering of Biological Media, Florian Foschum[1], David Hevisov[1], Markus Wagner[1], Alwin Kienle[1]; [1]*Quantitative imaging & sensor technologies, Institut für Lasertechnologien in der Medizin und Meßtechnik an der Universität Ulm, Germany.* Predicting the appearance of translucent biological specimens is challenging. We use the radiative transfer equation and accurately determined optical coefficients to render esthetic images, achieving near-identical results with real photographs (ΔE2000 < 1).

M5B.2 • 16:15
Real-Time Bioreactor Monitoring Using Differential Fluorescence Diffuse Optical Tomography, Jiaming Cao[1], Jon Gorecki[2], Chileab Redwood-Sawyerr[2], Cleo Kontoravdi[2], Karen Polizzi[2], Christopher Rowlands[2], Hamid Dehghani[1]; [1]*Univ. of Birmingham, UK;* [2]*Imperial College London, UK.* Condition of engineered cells in bioreactors can be estimated in real-time using fDOT. A system and an efficient algorithm reconstructing the fluorescence changes are proposed and validated using a controlled cell culture experiment.

M5B.3 • 16:30
Influence of the Layer Structure of Leaves on the Determination of Their Scattering and Absorption Properties, Corinna Konrad[1], Markus Wagner[1], Florian Foschum[1], Alwin Kienle[1]; [1]*Institut für Lasertechnologien, Germany.* An integrating sphere setup is used to determine the optical properties of plant leaves. A crosstalk between the absorption and reduced scattering coefficient is obtained and explained with the layer structure of the leaves.

M5B.4 • 16:45
Exploring the Optics of Chicken Eggs Using Time-Domain Diffuse Optics, Vamshi Damagatla[1], Lennard van den Tweel[2], Ilaria Bargigia[1], Freek Ariese[3], Antonio Pifferi[1]; [1]*Politecnico di Milano, Italy;* [2]*Wageningen Univ., Netherlands;* [3]*Vrije Universiteit, Netherlands.* We explore light propagation in chicken eggs using time-domain diffuse optical spectroscopy and Monte Carlo simulations which reveal the eggshell's role as an integrating sphere, and demonstrate the ability to distinguish incubated from unincubated eggs.

M5B.5 • 17:00
Broadband Time-Domain Diffuse Optical Spectroscopy to Measure and Monitor Snow, Vamshi Damagatla[1], Matteo Tommasini[1], Paolo M Ossi[1], Antonio Pifferi[1]; [1]*Politecnico di Milano, Italy.* We investigate light propagation in snow using broadband time-domain diffuse optical spectroscopy from 550–1100 nm on snow phantoms. We analyze absorption spectra, presence of contaminants, and scattering changes due to snow density variations.

M5B.6 • 17:15
Non -Invasive Monitoring of Lipid Dynamics in Seals: Preliminary in-Vivo Spectroscopic Experiments, Aparajita Naik[1], J. C. McKnight[2], Joanna Kershaw[2], Deepshikha Acharya[1], Gemma Bale[1]; *[1]Univ. of Cambridge, UK; [2]Sea Mammal Research Unit (SMRU), Univ. of St. Andrews, UK.* This research explores short wave infrared red (SWIR) spectroscopy for non-invasive monitoring of lipid dynamics in seals. Preliminary in-vivo studies analyzed dietary lipid changes in blood.

Room: ICM Room 22b
16:00 -- 17:30
M5C • Multiphoton Microscopy II
Presider: Marie-Claire Schanne-Klein; LOB - Ecole Polytechnique, CNRS, Inserm, France

M5C.1 • 16:00
Broadband Background-Free Stimulated Raman Scattering Microspectroscopy Utilizing a Novel Frequency Modulation Scheme, Luca Genchi[1], Sergey P. Laptenok[1], Carlo Liberale[1]; *[1]King Abdullah Univ of Sci & Technology, Saudi Arabia.* We present a novel broadband frequency-modulation stimulated Raman scattering architecture using femtosecond and picosecond lasers, and two narrowband filters, including a fast acousto-optic tunable filter, enabling simplified and flexible wavenumber selection for background-free Raman micro-spectroscopy.

M5C.2 • 16:15
Tunable Wide-Field Broadband Video-Rate CARS Microscope in the Fingerprint Region, Chiara Ceconello[1], Andrea Rabolini[1], Federico Vernuccio[1], Salvatore Sorrentino[1], Arianna Bresci[1], Francesco Manetti[1], Renzo Vanna[2], Giulio Cerullo[1,2], Dario Polli[1,2]; *[1]Politecnico di Milano, Italy; [2]Istituto di Fotonica e Nanotecnologie, Consiglio Nazionale delle Ricerche, Italy.* We present a wide-field CARS microscope enabling label-free vibrational imaging over large fields of view at video rate, capturing fast biological dynamics in real time with broadband signal generation for chemically specific contrast.

M5C.3 • 16:30
Label Free 775nm SLIDE Autofluorescence Images of NADH and FAD, Tonio F. Kutscher[1], Christan Stock[1], Stefan Meyer[1,2], Jonas Jurkevicius[1], Moritz Wiggert[3], Florian Sommer[1,4], Stefanie Köhler[1], Philipp Lamminger[1], Sebastian Karpf[1]; *[1]Univ. of Lübeck, Germany; [2]Medizinisches Laserzentrum Lübeck, Germany; [3]Université de Geneva, Switzerland; [4]Leibniz Inst. of Virology, Germany.* We present label-free autofluorescence images of NADH and FAD using a spectro-temporal laser imaging by diffractive excitation (SLIDE) microscope. The kHz image acquisition speeds of SLIDE combined with autofluorescence enable rapid and label-free imaging flow cytometry.

M5C.4 • 16:45
Non-Linear Microscopy as a Novel Tool for Cellular Senescence Diagnosis, Meropi Mari[1], Eleni Kanakousaki[2,1], Anthi Ranella[1], George Filippidis[1], Costas Fotakis[3,1]; *[1]IESL / FORTH, Greece; [2]Biology, Univ. of Crete, Greece; [3]Physics, Univ. of Crete, Greece.* The non-linear modality of Third Harmonic Generation (THG) can discriminate between senescent and nonsenescent fibroblasts by detecting a distinct lipid content increase of senescent cells,

offering a noninvasive approach towards the characterization of cellular senescence.

M5C.5 • 17:00
Virtual Histology of Brain Aspirate Using Kilohertz Two-Photon SLIDE Microscopy, Gregory Berg[1], Matthea Thielking[1], Sebastian Karpf[1]; *[1]Inst. of Biomedical Optics (BMO), Universität zu Lübeck, Germany.* This study presents a virtual H&E staining method for brain tumour aspirate using SYTO82 and Nile Red dyes. The acquisition with SLIDE microscopy offers potential for fast intraoperative histological evaluation via imaging flow histology.

M5C.6 • 17:15
Non-Destructive, Label Free Chemical Characterization of *Mycobacterium Tuberculosis (MTB)* Biofilms via QCL-Based Mid-IR Reflection Microspectroscopy, Bei Shi Lee[2], Matthias Godejohann[3], Mengyang Liu[1], Rainer A. Leitgeb[1], Wolfgang Drexler[1], Michael Berney[2,4], Richard Haindl[1]; *[1]Center for Medical Physics and Biomedical Engineering, Medical Univ. of Vienna, Austria; [2]Epidemiology, Biostatistics and Prevention Inst., Univ. of Zurich, Switzerland; [3]MG Optical Solutions GmbH, Germany; [4]Albert Einstein College of Medicine, USA.* We applied label-free QCL-based mid-IR reflection microspectroscopy to analyze heterogeneous *MTB* biofilms. Hyperspectral imaging with RGB thresholding identified extracellular matrix microdomains with distinct protein, carbohydrate, lipid, and phosphate distributions.

Room: ICM Room 5
16:00 -- 17:30
M5A • Detection of Endogenous and Exogenous Chromophores
Presider: Alexander Bykov; Univ. of Oulu, Finland

M5A.1 • 16:00
Exploiting Spectral Signatures for Retinal Health Assessment: A Phasor Analysis Approach, Armin Eskandarinasab[1], Laura Rey-Barroso[1], Francisco J. Burgos-Fernández[1], Meritxell Vilaseca[1]; *[1]Center for Sensors, Instruments and Systems Development, Universitat Politècnica de Catalunya, Spain.* This study applies phasor analysis to multispectral retinal images for automated classification of healthy and diseased cases, achieving high accuracy with a v-SVM classifier and first harmonic for the entire retina and macular region.

M5A.2 • 16:15
Spectral Online Monitoring (SOM) in Inhomogeneous Tissue-Mimicking Optical Phantoms, Julian Schmidt[1], Maximilian Aumiller[1], Krishna Subedi[1], Ronald Sroka[1], Adrian Rühm[1]; *[1]Klinikum der Universität München, Germany.* Spectral online monitoring (SOM) performed during interstitial photodynamic therapy (iPDT) has so far been analyzed for homogeneous optical properties. A method is presented to extend SOM analysis to inhomogeneous tissue.

M5A.3 • 16:30
Mechanisms for Optoacoustic Stimulation of the Tympanic Membran, Christin Grill[1], Florian Denk[3], Hendrik Husstedt[3], Ralf Brinkmann[1,2]; *[1]Medical Laser Center Lübeck, Germany; [2]Univ. of Lübeck, Inst. of Biomedical Optics, Germany; [3]German Inst. of Hearing Aids, Germany.* Towards an alternative hearing aid, pulsed laser induced stimulation of eardrum models was investigated by synchronous measurements of membrane displacement and sound

pressure. Thermoelastic membrane bending was found to be most effective.

M5A.4 • 16:45
Validation of Intraoperative Functional Brain Mapping Based on Color Imaging with Direct Electrical Brain Stimulation, Charly Caredda[1], Thiébaud Picart[2], Jacques Guyotat[2,1], Bruno Montcel[1]; *[1]Creatis, France; [2]Cranial Neurosurgical Department, Hospices Civils de Lyon, France.* In this study, we evaluated the sensitivity and specificity of intraoperative color imaging to identify brain functions during neurosurgery on 12 patients. The identifications were compared to electrical brain stimulation and showed a good correspondence.

M5A.5 • 17:00
Complex Refractive Index Evaluation in the NIR Spectral Range, David Abookasis[1]; *[1]Ariel Univ., Israel.* An integrated approach based on Kramers-Kronig relations, diffusion approximation, Fresnel equations and dispersion models have been used to evaluate complex refractive index. Approach was tested on different turbid media including human and mouse models.

M5A.6 • 17:15
Influence of Sensitivity Metrics Definition on Fluorescence Molecular Endoscopy (FME) Systems Performance Assessment and Quality Control, Anna Tenditnaya[1,2], Elena Kriukova[1,2], Ruben Gabriëls[3], Wouter Nagengast[3], Vasilis Ntziachristos[1,2], Dimitris Gorpas[1,2]; *[1]Inst. of Biological and Medical Imaging, Helmholtz Zentrum München, Germany; [2]Chair of Biological Imaging, Central Inst. for Translational Cancer Research (TranslaTUM), School of Medicine and Health & School of Computation, Information and Technology, Technical Univ. of Munich, Germany; [3]Department of Gastroenterology and Hepatology, Univ. Medical Center Groningen, Univ. of Groningen, Netherlands.* To boost translation of fluorescence molecular endoscopy (FME), we developed a standardization methodology employing composite phantoms to assess FME systems performance. Additionally, we showed a need for the precise definition of contract and signal-to-noise ratio.

Tuesday, 24 June

Room: ICM Room 11
10:30 -- 12:00
Tu1B • Advances in Instrumentation and Technology II
Presider: Adam Liebert; Inst Biocybernet i Inżynierii Biomed PAN, Poland

Tu1B.1 • 10:30
Time-Resolved Diffuse Optical System with Spectral Parallelization Over a 16-Channel SiPM Array, Giulia Maffeis[1], Elisabetta Avanzi[1], Nicola Serra[1], Alessandro Bossi[1], Valerio Gandolfi[1], Xinqiu Ye[1], Andrea Farina[2], Cosimo D'Andrea[1], Laura Di Sieno[1], Paola Taroni[1], Antonio Pifferi[1], Alberto Dalla Mora[1]; *[1]Politecnico di Milano, Italy; [2]Istituto di Fotonica e Nanotecnologie, Consiglio Nazionale delle Ricerche, Italy.* The compact (32×45 mm^2) SiPM-based multi-channel system enables parallelized spectral acquisition (700–950 nm, Δλ = 16 nm), demonstrating reliable performance on phantoms and effective tissue characterization *in vivo* during scans on back and calf.

Tu1B.2 • 10:45
A Hybrid Time-of-Flight-Resolved Parallel Interferometric Near-Infrared Spectroscopy (Parallel INIRS) With a Fast Two-Dimensional and a Single-Channel INIRS, Marcin J. Marzejon[1], Klaudia Nowacka-Pieszak[1,2], Michal Dabrowski[1,2], Dawid Borycki[1,2]; *[1]Inst. of Physical Chemistry PAS, Poland; [2]International Centre for Translational Eye Research, Poland.* Continuous-wave parallel interferometric near-infrared spectroscopy (CW-πNIRS) monitors cerebral blood flow noninvasively but lacks time-of-flight resolution. Time-of-flight-resolved parallel iNIRS enhances CW-πNIRS by improving spatial resolution and enabling shorter source-collector separations.

Tu1B.3 • 11:00
Custom SNSPD for Hybrid Time-Domain Diffuse Optics, Martin Caldarola[1], Amin Fakhree[1], Tommaso Palo[3], Vamshi Vamshi Damagatla[3], Laura Di Sieno[3], Antonio Pifferi[3], Alberto Dalla Mora[3], Lisa Kobayashi Frisk[2], Turgut Durduran[2,4]; *[1]Single Quantum B.V., Netherlands; [2]ICFO, Spain; [3]Politecnico Milano, Italy; [4]ICREA, Sri Lanka.* We present a superconducting nanowire single-photon detector (SNSPD) system designed for diffuse optics applications. We describe the specifications of the detectors and we show results from time-domain diffuse correlation spectroscopy and near infrared spectroscopy

Tu1B.4 • 11:15
Time-Domain Diffuse Optical Tomography with Pattern Illumination and Detection: Experimental System, Giovanna T. Carneiro[1,2], Jarjish Rahaman[3], Meghdoot Mozumder[3], Tanja Tarvainen[3], Andrea Farina[2,1]; *[1]Politecnico di Milano, Italy; [2]Istituto di Fotonica e Nanotecnologie, Consiglio Nazionale delle Ricerche, Italy; [3]Univ. of Eastern Finland, Finland.* We present a experimental setup for time-resolved Diffuse Optical Tomography (DOT) combining structured light illumination and single-pixel camera detection using Hadamard patterns and multiple-view approach. Measurements are performed on a solid phantom with absorbing inclusions.

Tu1B.5 • 11:30
Broadband non-Contact Spectroscopy Using Time-Domain Diffuse Optics, Vamshi Damagatla[1], Laura Di Sieno[1], Andrea Farina[1], Alberto Dalla Mora[1], Antonio Pifferi[1]; *[1]Politecnico di Milano, Italy.* We perform non-contact broadband spectroscopy at a height of 7cm using time-

domain diffuse optical techniques by utilizing a superconducting nanowire detector. We measure phantoms of water and lipids and also performed a preliminary in-vivo study.

Tu1B.6 • 11:45
Robustness of Time-Domain Near-Infrared Spectroscopy Against Skin Pigmentation Differences, Fabio Negretti[1], Caterina Amendola[1], Ilaria Bargigia[1,2], Alessandro Bossi[1], Mauro Buttafava[3], Valeria Calcaterra[4,5], Davide Contini[1], Vamshi Damagatla[1], Michele Lacerenza[3], Virginia Rossi[4], Lorenzo Spinelli[6], Sara Zanelli[4], Gianvincenzo Zuccotti[4,7], Alessandro Torricelli[1,6]; *[1]Dipartimento di Fisica, Politecnico di Milano, Italy; [2]Center for Nano Science and Technology@PoliMi, Istituto Italiano di Tecnologia, Italy; [3]PIONIRS S.r.l., Italy; [4]Pediatric Department, Buzzi Children's Hospital, Italy; [5]Pediatric and Adolescent Unit, Univ. of Pavia, Italy; [6]Consiglio Nazionale delle Ricerche, Istituto di Fotonica e Nanotecnologie, Italy; [7]Department of Biomedical and Clinical Science, Univ. of Milan, Italy.* We systematically demonstrate skin pigmentation negligibly affects TD-NIRS results (optical properties, hemodynamic parameters) through in-vivo (static, dynamic, campaign on pediatric cohort) and phantom measurements, proving its robustness in retrieving tissue saturation in clinical settings.

Room: ICM Room 22b
10:30 -- 12:00
Tu1C • Multiphoton Microscopy III
Presider: Carlo Liberale; King Abdullah Univ of Sci & Technology, Saudi Arabia

Tu1C.1 • 10:30 (Invited)
Polarization-Resolved SHG Imaging of the Lamellar Structure of the Human Cornea Over its Full Thickness., Poncia Nyembo Kasongo[1], Clothilde Raoux[1], Pierre Mahou[1], Anatole Chessel[1], Gaël Latour[1,2], Marie-Claire Schanne-Klein[1]; *[1]LOB - Ecole Polytechnique, CNRS, Inserm, France; [2]Université Paris-Saclay, France.* We have used epi-detected polarization-resolved SHG microscopy to map the orientation of collagen lamellae in whole human corneas. We have also measured the refractive index of these corneas to implement a refractive index matched configuration.

Tu1C.2 • 11:00
Polarization-SHG Analysis of Regenerative Tissue in Porcine Knee Cartilage Defects Treated With Stem Cells, Van-Tung Nguyen[1], Anupama Nair[2], Shu-Chun Chuang[3,4], Yi-Shan Lin[3,4], Chung-Hwan Chen[3,4], Chi-Hsiang Lien[5], Shean-Jen Chen[1]; *[1]College of Photonics, National Yang Ming Chiao Tung Univ., Taiwan; [2]Department of Biomedical Engineering, Univ. of Wisconsin-Madison, USA; [3]Orthopaedic Research Center, Kaohsiung Medical Univ., Taiwan; [4]Regeneration Medicine and Cell Therapy Research Center, Kaohsiung Medical Univ., Taiwan; [5]Department of Mechanical Engineering, National United Univ., Taiwan.* This study presents a dual-liquid crystal-based polarization-resolved second harmonic generation microscopy technique for analyzing cartilage repair. By assessing peptide pitch angle, anisotropy, and circular dichroism, it distinguishes collagen types (I/II) and monitors regeneration in a porcine knee defect model.

Tu1C.3 • 11:15
Modelling and Predicting Second Harmonic Generation from Protein Molecular Structure, Bahar Asadipour[1], Emmanuel Beaurepaire[1], Xingjian Zhang[1], Anatole Chessel[1], Pierre Mahou[1], Willy Supatto[1], Marie-Claire Schanne-Klein[1], Chiara Stringari[1]; *[1]laboratory for Optics and Biosciences, CNRS, Ecole Polytechnique, France.* Here we present a general multi-scale numerical framework relating the micrometer-scale SHG measurements at the optical wavelength to the atomic-scale and molecular structure of the proteins under study and their supramolecular arrangement.

Tu1C.4 • 11:30
Label Free Third Harmonic Generation Microscopy for the Understanding of Peripheral Demyelination in Neurodegeneration, Milvia I. Alata Tejedo[1], Robert Ciarán Prior[2,3], Candice Fung[1], Ludo Van Den Bosch[2,3], Zhiqing Zhang[4], Pieter Vanden Berghe[1]; *[1]Translational Research Center for Gastrointestinal Disorders, Katholieke Universiteit Leuven, Belgium; [2]Department of Neurosciences, Experimental Neurology, Leuven Brain Inst., Katholieke Universiteit Leuven, Belgium; [3]Center for Brain & Disease Research, Laboratory of Neurobiology, VIB, Belgium; [4]Inst. of Modern Optics, Nankai Univ., China.* THG imaging of the sciatic nerve in ALS and CMT models of neurodegeneration enabled us to distinguish demyelination patterns associated specifically to each disease. Myelin associated anomalies were observed intravitally and in fresh dissected tissue.

Tu1C.5 • 11:45
Quantitation of Collagen Remodeling in Murine Cervix During Gestation Using Polarization-Resolved SHG Microscopy, Jessica C. Ramella-Roman[3], Vaky Abdelsayed[1], JunZhu Pei[3], Mala Mahendroo[4], Clothilde Raoux[1], Gaël Latour[1,2], Marie-Claire Schanne-Klein[1]; *[1]LOB - Ecole Polytechnique, CNRS, Inserm, France; [2]Université Paris-Saclay, France; [3]Department of Biomedical Engineering, Florida International Univ., USA; [4]Department of Obstetrics and Gynecology, Univ. of Texas Southwestern Medical Center, USA.* Polarization-resolved SHG imaging of the mouse cervix provides orientation maps of collagen remodeling during pregnancy at the submicrometer scale. Order metrics computed in small bins show a significant difference between early and late pregnancy.

Room: ICM Room 5
10:30 -- 12:00
Tu1A • Multispectra Techniques Across Biophotonics
Presider: Zhiwei Huang; National Univ. of Singapore, Singapore and Lothar Lilge; Univ. Health Network, Canada

Tu1A.1 • 10:30
Transforming Hematoxylin and Eosin Histopathology with Two-Color Two-Photon Absorption and Fluorescence Imaging, Zongshuai Hai[1], Soumit Saha[1], Xiang Fang[1], Fake F. Lu[1]; *[1]Binghamton Univ., USA.* We present a two-color two-photon absorption and fluorescence imaging method for volumetric hematoxylin and eosin (H&E) histopathology, achieving high-resolution, artifact-free imaging of thick tissue sections, which improves histopathological assessment for clinical diagnosis.

Tu1A.2 • 10:45
Enhancing Phosphene Spatial Resolution with TACS Pulse Width Modulation: A Novel Non-Invasive Electrical Stimulation Protocol, Veronica Kurkjian[1], Faraz Sadrzadeh-Afsharazar[1], Alexandre Douplik[1,2]; *[1]Toronto Metropolitan Univ., Canada; [2]iBest, Keenan Research Centre of the Li Ka Shing Knowledge Inst., St. Michael's Hospital, Canada.* Visual impairment affects 285 million worldwide. This study aims to develop a novel non-invasive electrical stimulation protocol using tACS pulse width modulation to control phosphene stimulation, making non-invasive visual prostheses more comparable to invasive devices.

Tu1A.3 • 11:00
Optical Hyperthermia Mediated by Gold Nanoprisms to Boost Hydra Regeneration: Insights into Calcium Dynamics, Natalia Dell'Aversano[1], Giorgia Tortora[2], Emma Martinelli[2], Alessia Candeo[2], Maria Moros[3], Andrea Bassi[2], Angela Tino[1], Claudia Tortiglione[1], Valentina Marchesano[1]; *[1]CNR-ISASI, Italy; [2]Dipartimento di Fisica, Politecnico di Milano, Italy; [3]Instituto de Nanociencia y Materiales de Aragón (INMA), Spain.* This study explores the usage of gold nanoprisms (AuNPs) as intracellular nanoheaters to enhance *Hydra* regeneration via NIR irradiation. It investigates local and global effects of heat on cellular processes, employing advanced imaging techniques to track calcium fluxes.

Tu1A.4 • 11:15
Increasing the Use of FT-IR Spectroscopy as Diagnostic Screening in Clinical Practice, Luis Felipe Carvalho[1]; *[1]UNITAU - Univ. of Taubaté, Brazil.* FT-IR spectroscopy provides rapid, non-invasive biochemical analysis for diagnostics. This study examines its potential for early disease detection and improved patient management, demonstrating feasibility as a screening tool.

Tu1A.5 • 11:30
A Linear Discriminant Analysis for Interleukin-1beta Effects on the Vibrational Spectroscopy of Heart Tissue, Raffaele Stasi[1], Oscar Moreno-Loiza[2], Daniela d. Silva[1], Vinicius P. Anjos[1], Evelin Monteiro[2], Emiliano H. Medei[2], Denise M. Zezell[1]; *[1]Center for Lasers and Applications, Nuclear and Energy Research Inst., Brazil; [2]Inst. of Biophysics Carlos Chagas Filho, Federal Univ. of Rio de Janeiro, Brazil.* Fourier-transform infrared (FTIR) spectroscopy imaging was used to analyze cardiac atria from IL-1β-treated mice. Linear discriminant analysis identified spectral differences, notably in the 1500--1800 cm^{-1} region, suggesting IL-1β alters protein and lipid composition in heart tissue.

Tu1A.6 • 11:45
Optical Properties Corrected Fluorescence Spectroscopy for Liver Graft Viability Monitoring, Antoine Uzel[1], Michaël Sdika[1], Guillaume Rossignol[2,3], Xavier Muller[2], Natacha Boulanger[2], Olivier Lopez[5,6], Arthur Gautheron[1,4], Bruno Montcel[1]; *[1]CREATIS, France; [2]Department of General Surgery and Liver Transplantation, Croix-Rousse Univ. Hospital, Hospices Civils de Lyon, France; [3]Department of Pediatric Surgery and Liver Transplantation, Femme Mere Enfant Univ. Hospital, Hospices Civils de Lyon, France; [4]CPE Lyon, France; [5]Aix Marseille Univ, LIIE, France; [6]Aix Marseille Univ, CERIMED, France.* We present a novel method combining fluorescence spectroscopy and diffuse reflectance measurements for liver graft viability assessment. Our approach corrects for tissue optical properties, enabling accurate fluorophore quantification. The method was validated on tissue-mimicking phantoms and porcine ischemia-reperfusion models.

Room: ICM Hall B0
12:00 -- 14:00
Tu2A • Joint Posters Session II

Tu2A.1
Background Noise and PSF Characterization for High Reflecting Sample in PS-SS-OCT Using the Movement of Mirror on Reference Arm, Nuerbahati Ayiben[1], Rene Siegmund[1], Alexander Egner[1]; *[1]Institut für Nanophotonik Göttingen e.V., Germany.* We present an approach for separating system-induced noise from sample reflections in PS-SS-OCT, improving signal clarity and enabling robust background characterization in systems without balanced detection.

Tu2A.2
Monitoring MC38 Murine Tumor Progression and Treatment Outcomes Using Hyperspectral Imaging, Tadej Tomanic[1], Crt Keber[1], Tim Bozic[2,3], Bostjan Markelc[2,4], Simona Kranjc Brezar[2,5], Gregor Sersa[2,6], Matija Milanic[1,7]; *[1]UL, Faculty of Mathematics and Physics, Slovenia; [2]Inst. of Oncology Ljubljana, Slovenia; [3]Univ. of Ljubljana (UL), Slovenia; [4]UL, Biotechnical Faculty, Slovenia; [5]UL, Faculty of Medicine, Slovenia; [6]UL, Faculty of Health Sciences, Slovenia; [7]Jozef Stefan Inst., Slovenia.* This study highlights hyperspectral imaging for monitoring MC38 murine tumor progression and response to radiotherapy and electrochemotherapy. Results demonstrate the potential for non-invasive tumor assessment, providing valuable insights into tumor dynamics and therapeutic efficacy.

Tu2A.3
Multispectral Processing ot the Images of Cutaneous Neoplasms in Experimental Animals, Boris S. Gurevich[1], Kirill V. Zaichenko[1], Vladimirov L. Fyodor[1], Darya A. Gribova[1], Anastasia A. Aliferko[1]; *[1]Inst. for Analytical Instrumentation, Russian Federation.* The experimental setup and the results of a series of experiments on multispectral processing of skin neoplasms in experimental animals (rats) are described. These experiments aim to provide diagnosis of skin cancer at early stages of its development.

Tu2A.4
Enhancing Characterization of Chemical and Morphological Changes in Tissue With a Hybrid Raman and Partial Wave Spectroscopy System, Sabir Ul Alam[1,2], Elena Kriukova[1,2], Mikhail Mazurenka[1,2], Sabrina Marcazzan[1,2], Sarah Glasl[1,2], Michael Quante[3], Markus Tschurtschenthaler[4], Gerwin J. Puppels[5], Vasilis Ntziachristos[1,2], Dimitris Gorpas[1,2]; *[1]Helmholtz Zentrum München (GmbH), Germany; [2]Technical Univ. of Munich, Germany; [3]Klinik für Innere Medizin II, Germany; [4]German Cancer Research Center (DKFZ) and German Cancer Consortium (DKTK), Germany; [5]RiverD International B.V, Netherlands.* We demonstrate a hybrid system combining Raman spectroscopy and partial wave spectroscopy, improving tissue classification accuracy and detecting variation in tissues from an intestinal tumorigenesis mouse model, showcasing the system's potential for field cancerization studies.

Tu2A.5
Optimized Reconstruction Framework in Fluorescence Diffuse Optical Tomography Using Radiative Transfer Equation, Pascal Nguyen[1,2], Martin Rodriguez-Vega[1], Julien Wojak[1], Paul Dorval[2], Rémi André[1], Maxime Henry[3], Véronique Josserand[3], Xavier Le Guével[3], Anabela Da Silva[1]; *[1]Aix Marseille Univ, CNRS, Centrale Med, Institut Fresnel, Marseille, France, France; [2]Kaer Labs, Nantes, France, France; [3]Inst. for Advanced Biosciences, Univ. Grenoble Alpes, INSERM U1209,CNRS UMR 5309, 38000 Grenoble, France, France.* We present a

fluorescence diffuse optical tomography reconstruction framework based on the radiative transfer equation. Validated against the diffusion approximation framework, it proves to be a viable alternative for second near-infrared window tomography reconstruction.

Tu2A.6
Simulation Study on Spatial Distribution of Diffuse Reflectance Detected Near the Slit Illuminated Area in Skin, Tomonori Yuasa[1], Rei Nishimura[1], Iori Kojima[1], Kumiko Kikuchi[2], Naomichi Yokoi[3], Yoshihisa Aizu[1]; *[1]Muroran Inst. of Tech., Japan; [2]Shiseido Co. Ltd., Japan; [3]Chitose Inst. of Sci. and Tech., Japan.* Spatial distribution of diffuse reflectance detected near the slit illuminated area was investigated by Monte Carlo simulation in the nine-layered skin model. Results may provide possibility of detecting changes in scattering in dermis.

Tu2A.7
Investigation on Differentiation of Skin Spectral Reflectance for Simple Estimation of Change in Oxygen Saturation, Naomichi Yokoi[2], Iori Kojima[1], Tomonori Yuasa[1], Yoshihisa Aizu[1]; *[1]Muroran Inst. of Technology, Japan; [2]Chitose Inst. of Science and Technology, Japan.* We investigate a relation of oxygen saturation versus a differential skin spectral reflectance by Monte Carlo simulation and multiple regression analysis, and show a possibility for simply estimating the oxygen saturation in skin tissue.

Tu2A.8
Cloud-Based Automated System for NIRS Data Processing, Darshana Gopal[1], Musa Talati[1], Uzair Hakim[1], Luca Giannoni[1], Ilias Tachtsidis[1], Subhabrata Mitra[2], Olayinka Kowobari[2], Olivia Newth[3], Hakim-Moulay Dehbi[4], Neha Varun[5], Dimitrios Siassakos[6], Sara Hillman[6], Niccole Ranaei-Zamani[2]; *[1]Department of Medical Physics and Biomedical Engineering, Univ. College London, UK; [2]Neonatology, EGA Inst. for Women's Health, Univ. College London, UK; [3]Obstetrics Unit, Univ. College London Hospital, UK; [4]Comprehensive Clinical Trials Unit, Univ. College London, UK; [5]All India Inst. of Medical Sciences, India; [6]Maternal and Fetal Medicine, Elizabeth Garrett Anderson Inst. for Women's Health, Univ. College London, UK.* This paper presents a cloud-based system for automated NIRS data processing, featuring an interactive dashboard for visualization, quality assessment, and cleaning, alongside an AWS Lambda-powered pipeline for automated processing and storage.

Tu2A.9
Optimal Wavelength Selection for Laparoscopic Multispectral Imaging to Visualize Tissue Oxygenation, Annekatrin Pfahl[1], Hannes Köhler[1], Andreas Melzer[1,2]; *[1]Universitat Leipzig, Germany; [2]Univ. of Dundee, UK.* Selecting spectral bands for medical multispectral imaging is challenging. Simulations, regression models, and a-priori knowledge defined various combinations of light-emitting diodes for laparoscopic illumination to measure tissue oxygenation. The best one led to an RMSE of 0.04. Current results must be confirmed in patient studies.

Tu2A.10
Fluorescence Imaging of Fast Moving Samples, Ondrej Mandula[1]; *[1]CEA-LETI, France.* A method for SNR improvement of fluorescence signal in fast moving samples such as swimming sperm cells. Fluorescence is progressively accumulated along the tracks established from a transmission channel recorded simultaneously.

Tu2A.11

NIR and SWIR Continuous Wave Diffuse Optical Tomography from a Wearable Device Setup, Julien Wojak[1], Sydur Rahman[1], Laurent Alacoque[2], Jean-Michel Tualle[3], Dominique Ettori[3], Xavier Alacoque[4], Anabela Da Silva[1]; *[1]Aix Marseille Univ, CNRS, Centrale Med, Institut Fresnel, France; [2]DOPT Department, Univ. Grenoble Alpes, CEA Leti, France; [3]LPL, UMR 7538, Université Sorbonne Paris-Nord, France; [4]Anesthesia, intensive care Oncopole Claudius Regaud, France.* This paper presents absorption reconstruction by diffuse optical tomography from two infrared wavelength measurements using a reflection configuration proposed on a wearable device dedicated to diffuse imaging of biological tissues.

Tu2A.12
Tracking Microbial Activity Using Laser Speckle Analysis, Ilze Lihacova[1], Valts Liepins[3], Eduards T. Mincis[2], Emilija V. Plorina[1], Edgars Kviesis-Kipge[1], Alexey Lihachev[1], Janis Liepins[2]; *[1]Inst. of Atomic Physics and Spectroscopy, Univ. of Latvia, Latvia; [2]Inst. of Microbiology and Biotechnology, Univ. of Latvia, Latvia; [3]Inst. of Numerical Modelling, Univ. of Latvia, Latvia.* The laser speckle imaging system developed in this study monitored *Pleurotus ostreatus* growth in real-time. This non-invasive method reliably mapped microbial activity with low data volume and fast processing, accelerating microbiological experiments and enhancing high-throughput screening applications.

Tu2A.13
Combining Scalp Coupling Index with Coefficient of Variation to Determine FNIRS Signal Quality in 3D Printed Optode Holders, Pichaya Tappayuthpijarn[1], Urban Marhl[2], Piotr Saowsz[3], Paul Anders[1], Vojko Jazbinšek[2], Adam Liebert[3], Tilmann Sander[1], Stanislaw Wojtkiewicz[3]; *[1]Physikalisch-Technische Bundesanstalt (PTB), Germany; [2]Inst. of Mathematics, Physics and Mechanics, Slovenia; [3]Nalecz Inst. of Biocybernetics and Biomedical Engineering, Poland.* 3D-printed fNIRS optode holders ensure precise array geometry relative to brain anatomy. We evaluate signal quality using the scalp coupling index and coefficient of variation.

Tu2A.14
A Liquid Phantom for Validating Hyperspectral Imaging in Brain Tumour Resection, Angelos Artemiou[1], Fréderic Lange[1], Charly Caredda[2], Luca Giannoni[1], Bruno Montcel[2], Ilias Tachtsidis[1]; *[1]Univ. College London, UK; [2]CREATIS, France.* This paper presents a liquid phantom for simulating gliomas in brain tissue. Constructed from PMMA using laser-cut channels guided by segmented surgical images, it simulates vasculature and tumours with blood, Intralipid.

Tu2A.15
Asymmetric Self-Calibrating Method for Accurate Cerebral Oximetry, Leila Motamed Jahromi[1], Lin Yang[2,1], Alexander von Lühmann[2], Dirk Grosenick[1]; *[1]Physikalisch-Technische Bundesanstalt, Germany; [2]NIRx Medizintechnik GmbH, Germany.* We developed a novel asymmetric model to apply the self-calibrating method to non-symmetric source-detector configurations being in use for high-density brain imaging. The approach was successfully validated on tissue-mimicking phantoms using a fNIRS brain imager.

Tu2A.16
Full Vibrational Spectroscopy for Simultaneous Mechanical, Structural and Chemical Analysis, Morteza Behrouzitabar[1,2], Karlis Berzins[3], Cristian Manzoni[4], Dario Polli[5,4], Giulio Cerullo[5,4], Renzo Vanna[4], Giuseppe Antonacci[2]; *[1]Univ. of Milano-Bicocca, Italy; [2]Specto Photonics, Italy; [3]Univ. of Copenhagen, Denmark; [4]CNR-Istituto di Fotonica e Nanotecnologie (CNR-IFN), Italy; [5]Politecnico di Milano, Italy.* The spectrum of the light scattered by acoustic and molecular vibrations offers unique mechanical, structural, and chemical information of matter. We introduce a method to measure the entire vibrational spectrum to analyze pharmaceuticals.

Tu2A.17
Quantifying Raman Photon Generation Depth via Diffusion Modeling, Alessandro Bossi[1], Valerio Gandolfi[1], Andrea Farina[1], Ilaria Bargigia[1], Antonio Pifferi[1], Fabrizio Martelli[2]; *[1]Politecnico di Milano, Italy; [2]Dipartimento di Fisica e Astronomia, Università Degli Studi Di Firenze, Italy.* In this work, we propose a model derived from diffusion theory of the generation depth of Raman photon with respect to the time of arrival.

Tu2A.18
Glucose Measurement in a Turbid Medium Using DRS Technique at 940nm, Luc Andre[1], Martin Lejosne[1], Jean Hue[1], Michael Pelissier[1], Florence Rigal[1], Guillaume Blanquer[1], Giacomo Badano[1]; *[1]CEA-LETI, France.* We propose a spectroscopic system using a 940nm LED to measure glucose concentration in a turbid medium. We reach a resolution of 0.5g/L, a penetration depth of 600µm for an input power as low as 15µW.

Tu2A.19
Determining the Optical Properties of Scattering Media Using a Cluster of Advanced Devices, Alwin Kienle[1], Levin Stolz[1], Markus Wagner[1], Johannes Mäder[1], Joachim Jelken[1], David Hevisov[1], Peter Naglic[1], Florian Foschum[1]; *[1]Institut for Laser Technologies in Medicine and Metrology at the Univ. of Ulm, Germany.* A cluster of advanced devices for determining the optical properties of scattering media has been developed and validated through phantom measurements, laying the foundation for a research center to be established at ILM in 2025.

Tu2A.20
Monte Carlo Simulation of Spectral Reflectance Images of Human Skin with Embedded Lesions, Uldis Rubins[1], Ilze Irbe[1], Janis Spigulis[1]; *[1]Univ. of Latvia, Latvia.* This study applies Monte Carlo simulation to model the spectral images of skin lesions in the visible and near-infrared ranges. By simulating the spatial distribution of backscattered light, we analyze the correlation between its optical properties and spectral features.

Tu2A.21
Development of a Parallel, Multi-Wavelength, Multi-Channel, Multi-Distance, Time-Resolved Near Infrared Spectrometer, Scott Pesenti[1], Alessandro Torricelli[2,1], Lorenzo Spinelli[1]; *[1]Istituto di Fotonica e Nanotecnologie, CNR, Italy; [2]Dipartimento di Fisica, Politecnico di Milano, Italy.* In this work we present a time-domain near-infrared spectroscopy system using a supercontinuum laser for parallel acquisition of seven wavelengths at two inter-fiber distances.

Tu2A.22
Assessment of Muscle Optical Properties by Double Distance TD NIRS Measurements: a Simulation and in-Vivo Study, Rebecca Re[1,2], Alessandro Scano[3], Oriana Amata[4], Antonello Valerio Caserta[4], Marco Nabacino[1], Davide Contini[1], Rinaldo Cubeddu[1], Antonio Frizziero[4], Alessandro Torricelli[1,2], Lorenzo Spinelli[2]; *[1]Dipartimento di Fisica, Politecnico di Milano, Italy; [2]Istituto di Fotonica e Nanotecnologie, Consiglio Nazionale delle Ricerche, Italy; [3]Inst. of Intelligent Industrial Systems and Technologies for Advanced Manufacturing, Consiglio Nazionale delle Ricerche, Italy; [4]Department of Rehabilitation, Azienda Socio Sanitaria Territoriale Gaetano Pini-Centro Specialistico Ortopedico Traumatologico, Italy.* In this work we propose a method based on two source-detector distances and a two-layer geometry for TD NIRS analysis specific for application on muscle. The method was verified with numerical simulations and in-vivo examples.

Tu2A.23
Optimising Placenta Oxygenation Estimation: A Monte Carlo Simulation Study, Uzair Hakim[1], Charly Caredda[2], Frederic Lange[1], Darshana Gopal[1], Musa Talati[1], Luca Giannoni[1], Subhabrata Mitra[1], Ilias Tachtsidis[1]; *[1]UCL, UK; [2]INSA Lyon, France.* We compare the Dual-Slope and Spatially Resolved Spectroscopy methods to resolve StO_2 from the placenta layer of a simulated volume. Findings suggest SRS can more accurately resolve placental oxygen saturation, in contrast with previous findings.

Tu2A.24
Analytical Sensitivity Factor Equations for Attenuation and Moments in Near-Infrared Spectroscopy, Aleh Sudakou[1], Stanislaw Wojtkiewicz[1], Roman Maniewski[1], Adam Liebert[1]; *[1]IBIB PAN, Poland.* We derived analytical sensitivity factor equations for attenuation and moments in NIRS that allow recovering any magnitude changes in absorption or scattering, provided the diffusion approximation remains valid.

Tu2A.25
Advancing Neuroscience Diagnostics: A Hyperspectral Imaging System for Real-Time Biochemical Insights Into Brain Tissue, Anam Toaha[3], Pietro Ricci[3], Louis Chessel[1], Dorotea Nardini[3], Luca Giannoni[2], Ilias Tachtsidis[2], Francesco S. Pavone[3]; *[1]Biomedical Engineering, Polytech Lyon, France; [2]UCL, UK; [3]Univ. of Florence, Italy.* Here we present a hyperspectral imaging system designed for advancing the detection and diagnosis of brain tumors. We provide a comprehensive characterization of the system, which guarantees rapid spectral scanning, tunable wavelength selection, large field of view, high signal-to-noise ratio and spatio-temporal resolution.

Tu2A.26
Sparse-View Cherenkov Imaging Reconstruction Algorithm via Markov Projection Dynamic Prior, Hu Zhang[1,2], Ting Hu[2], Zhonghua Sun[2], Zhe Li[2], Kebin Jia[2], Jinchao Feng[2]; *[1]Univ. of Birmingham, UK; [2]Beijing Univ. of Technology, China.* *A sparse-view Cherenkov imaging reconstruction method is presented using Markov projection dynamic prior. Experimental results show that this proposed method yields the highest Peak Signal-to-Noise Ratio (PSNR) values of Cherenkov images (23.91 dB and 22.40 dB).*

Tu2A.27
A Data Management Plan for Open Data, Readable and Reusable by Humans and AI, Vamshi Damagatla[1], Alessandro Bossi[1], Ilaria Bargigia[1], Antonio Pifferi[1]; *[1]Politecnico di Milano, Italy.* We present a general and comprehensive data management plan to create open data which is both human and machine readable. We test and demonstrate its versatility using open AI engines to read and reuse it.

Tu2A.28
FetalSenseM: a Multi-Wavelength Near-Infrared Spectroscopy Device for in-Vivo Oxygenation and Metabolism Measurements, Musa Talati[1], Temisan Illukwe[1], Dimitrios Airantzis[1,2], Darshana Gopal[1], Danial Chitnis[3], Uzair Hakim[1], Jack Highton[1], Luca Giannoni[1], Niccole Ranaei-Zamani[4], Subhabrata Mitra[4], Ilias Tachtsidis[1]; *[1]Department of Medical Physics and Biomedical Engineering, Univ. College London, UK; [2]School of Computing and Mathematical Sciences, Birkbeck, Univ. of London, UK; [3]School of Engineering, Univ. of Edinburgh, UK; [4]EGA Inst. for Women's Health, Univ. College London, UK.* This work proposes a new design and novel wavelength selection for a multi-wavelength, multi-distance near-infrared spectroscopy device, which assesses in vivo changes in oxygenated and deoxygenated haemoglobin and oxidised cytochrome-c-oxidase concentrations, along with tissue saturation.

Tu2A.29
Effect of Tissue Thickness on Background Interference in Confocal Raman Spectroscopy of Fixed Human Histological Skin Slides., Marie Camonin[1], Marine Amouroux[1], Julien Pierson[1], Grégoire Khairallah[2], Nirmal Mazumder Mazumder[4], Hervé Rinnert[3], Walter Blondel[1]; *[1]CRAN UMR 7039 CNRS, France; [2]Metz-Thionville Regional Hospital, France; [3]Institut Jean Lamour UMR 7198, France; [4]Manipal School of Life Sciences, India.* This study investigates the impact of sample thickness in confocal Raman micro-spectroscopy at 532 nm on reducing background interference in deparaffinized human skin histological slides, improving spectral quality and tissue characterization.

Tu2A.30
Can we Accurately Retrieve Oxyhaemoglobin Concentration at 1064nm with TD-NIRS? – a Monte Carlo Simulation Study, Xingmin Li[1], Frederic Lange[1], Aleh Sudakou[2], Ilias Tachtsidis[1]; *[1]Univ. College London, UK; [2]Nalecz Inst. of Biocybernetics and Biomedical Engineering Polish Academy of Sciences, Poland.* This study investigates the accuracy of retrieving oxyhemoglobin concentration at 1064 nm using Monte Carlo simulations with different oxygen saturation levels. The results show the feasibility of using 1064nm only and evaluate the inaccuracy sources.

Tu2A.31
End-to-end Diffuse Optical Tomography for Functional Brain Activation, Hu Zhang[1,2], Jiaming Cao[1], Ting Hu[2], Zhonghua Sun[2], Zhe Li[2], Kebin Jia[2], Hamid Dehghani[1], Jinchao Feng[2]; *[1]Univ. of Birmingham, UK; [2]Beijing Univ. of Technology, China.* We propose an end-to-end reconstruction using a diffusion model to generate high-quality brain activation maps, integrating fNIRS data. Experimental results on simulated fNIRS data demonstrate that the proposed approach improves reconstruction accuracy.

Tu2A.32
LEDs-Based Handheld Device for Multispectral Imaging, Ranjeet Kumar[1]; [1]*Queen's Univ. Belfast, U.K., UK.* We developed handheld multi-spectral imaging device comprising discrete LEDs (PWM for sequential illumination via Arduino Mega) mounted on inclined 3D-printed unit which was attached to one end of tube-lens and CMOS camera on other end.

Tu2A.33
Three-Beam Interference Photoacoustic Microscopy with Enhanced Detection View, Xiangru Liu[1], Qi Cui[1], Shutian Liu[2], Zhengjun Liu[2], Wei Liu[1]; [1]*Harbin Inst. of Technology, Shenzhen, China;* [2]*School of Physics, Harbin Inst. of Technology, China.* Photoacoustic microscopy (PAM) also suffers from the limited-view issue. To address this, we propose a novel three-beam interference excitation configuration for PAM, which disrupts the coherence of Aline signals, thereby restoring the detection visibility of vertical structures.

Tu2A.34
Photoacoustic Fiberscope for Oxygenation Imaging of Freely Moving Mouse and Sepsis-Induced Brain Dysfunction, Xiaoxuan Zhong[1], Cong Mai[2], Yizhi Liang[1], Long Jin[3], Xin Li[2], Bai-Ou Guan[1]; [1]*Jinan Univ., China;* [2]*Guangdong Provincial People's Hospital, China;* [3]*South China Normal Univ., China.* We present head-attached photoacoustic microscopy for brain vascular structure and functional imaging in small animals under free-moving state with 4.5 grams weight, 1.2 mm wide area, 10 μm resolution and 0.2 Hz frame rate.

Tu2A.35
Enhancing Quantitative Fluorescence Imaging with Hyperspectral Structured Light-Sheet Microscopy (HsLSFM), Cedric Ray[1,2], Sébastien Crombez[1], Florence Ruggiero[4,5], Chloé Exbrayat-Héritier[1], Nicolas Ducros[3,2]; [1]*Universite Claude Bernard Lyon 1, France;* [2]*CREATIS, France;* [3]*INSA Lyon, France;* [4]*ENS Lyon, France;* [5]*IGFL, France.* We present hsLSFM, a hyperspectral structured light-sheet fluorescence microscopy system enhancing fluorophore separation and autofluorescence removal. It improves quantitative imaging for biomedical applications, including developmental biology and live-cell analysis, by integrating structured illumination and spectral unmixing.

Tu2A.36
Parallelized Data Acquisition Using a Fabry-Perot Sensor with Uniform Optical Thickness and a Camera-Based Tomograph for Photoacoustic Imaging, Jan Sievers[1], Claus Villringer[2], Werner Lebek[1], Taravat Gilani[1], Jan Laufer[1]; [1]*Martin-Luther-Univ. Halle, Germany;* [2]*Technical Univ. of Applied Sciences, Germany.* To enhance acquisition speed for photoacoustic imaging, parallelized data acquisition scheme based on image-intensified sCMOS camera together with Fabry-Perot sensor with uniform optical thickness imaging is presented. The capability of backward-mode 3D photoacoustic imaging is demonstrated.

Tu2A.37
3D Printed Human Skull Phantoms for Transcranial Photoacoustic Imaging, Hannah Linde[1], Saskia Menzer[1], Jan Laufer[1], Thomas Kirchner[1]; [1]*Institut für Physik, Univ. of Halle-Wittenberg, Germany.* Photoacoustic (PA) waves are strongly distorted and attenuated in skull bone. To study these effects on PA imaging, we designed and 3D-printed tissue-mimicking phantoms of human skull. We present a comparison of results in phantom and ex vivo skull.

Tu2A.38
Unsupervised Learning-Based Registration Method for Photoacoustic Microscopy Image Sequences, Furong Tang[1], Xiaobin Hong[1], Lidai Wang[2], Jiangbo Chen[1]; *[1]South China Univ. of Technology, China; [2]City Univ. of Hong Kong, China.* An unsupervised deep learning network for real-time correction and registration of fast-scanning photoacoustic microscopy images has been developed, improving speed by 50 times and outperforming traditional methods in extracting dynamic vascular information.

Tu2A.39
PATFOM: A Universal Photoacoustic Tomography Foundation Model for Multi-Task Image Processing, Yutian Zhong[1], Jinchuan He[1], Chaobin Hu[1], Jingqi Yao[1], Long Chen[1], Li Qi[1]; *[1]Southern Medical Univ., China.* We propose PATFOM, a universal foundation model for photoacoustic tomography (PAT). PATFOM is self-supervised pre-trained on the largest PAT image database to date, which contains nearly one million images. Multi-task experiments confirm PATFOM's performance on image restoration, segmentation, light fluence correction, and vessel enhancement.

Tu2A.40
Estimation of Dielectric Parameters in Quantitative Thermoacoustic Tomography, Teemu Sahlström[1], Timo Lähivaara[1], Tanja Tarvainen[1]; *[1]Univ. of Eastern Finland, Finland.* In this work we propose an approach for simultaneous estimation of electrical conductivity and permittivity in quantitative thermoacoustic tomography. The approach is evaluated with simulations using multiple electromagnetic excitations and frequencies.

Tu2A.41
Optical Waveguide Resonance Sensor for Broadband Sensitive Ultrasound Detection, Chenduo Wang[1]; *[1]Shenzhen Univ., China.* A high-sensitivity broad-bandwidth optical waveguide resonance sensor of ultrasound overcomes the limitations of piezoelectric transducers that are widely used in photoacoustic imaging, which shows great potentials for label-free biomedical photoacoustic investigations.

Tu2A.42
A Deep Learning-Based Speed-of-Sound Correction Model for Vascular Photoacoustic Imaging, Yisu Tian[1], Pengwei Han[1], Yipin Lv[1], Bingxue Zhang[1], Feng Gao[1,2], Jiao Li[1,2]; *[1]College of Precision Instrument and Optoelectronics Engineering, TianJin Univ., China; [2]State Key Laboratory of Precision Measurement Technology and Instruments, Tianjin Univ., China.* A deep learning-based speed-of-sound correction model is proposed, which performs nine image reconstructions and fusions based on different speed-of-sound distributions, ultimately outputting a single-channel clear reconstruction, thereby significantly improving reconstruction quality and reducing artifacts.

Tu2A.43
Hybrid Fluorescence and Magnetic Resonance Imaging (HyFMRI) Platform for Functional Neuroimaging, Zhenyue Chen[1], Yi Chen[2,3], Irmak Gezginer[2,3], Qingxiang Ding[1], Yoshihara Hikari[2,3], Xosé Luís Deán-Ben[2,3], Ruiqing Ni[2,3], Daniel Razansky[2,3]; *[1]Tongji Univ., China; [2]Inst. for Biomedical Engineering and Inst. of Pharmacology and Toxicology, Univ. of Zurich, Switzerland; [3]Inst. for Biomedical Engineering, ETH Zurich, Switzerland.* We present a hybrid multichannel fluorescence and MRI platform to achieve concurrent measurement of neuronal and astrocytic activity along with hemodynamic responses in anesthetized mice, revealing

distinct kinetics and correlations in stimulated responses.

Tu2A.44
LED-Based Photoacoustic Detection of Nitrous Oxide, Daniel d. Santos[2,1], Mila Vieira da Rocha[3,1], Guilherme Rodrigues Lima[4], Leonardo Mota[2], Marcelo Gomes da Silva[2], Marcus Wolff[1]; *[1]Hamburg Univ. of Applied Sciences, Germany; [2]Universidade Estadual do Norte Fluminense Darcy Ribeiro, Brazil; [3]Instituto Federal Fluminense, Brazil; [4]Universidade Federal do Espírito Santo, Brazil.* The present study aims to detect nitrous oxide (N_2O) by combining a low-cost LED with a differential photoacoustic cell. Preliminary results indicate the possibility of detecting N_2O in trace levels.

Tu2A.45
Potential Clinical Applications of Ultrasound Optical Tomography: Breast Tissue Characterization and Brain Imaging, Akvile Zabiliute-Karaliune[1], Adam Kinos[1], Alexander Bengtsson[2], David Gustavsson[2], David Hill[1], Egle Bukarte[1], Emilie Krite Svanberg[3], Johannes Swartling[2], Kevin Shortiss[1], Lars Rippe[1], Magnus Dustler[4], Maria Ruchkina[2], Nadia Chaudhry[4], Paulina Tatidis[1], Predrag Bakic[4], Sophia Zackrisson[4], Stefan Kröll[1]; *[1]Physics, Lund Univ., Sweden; [2]Deep Light Vision AB, Sweden; [3]Clinical Sciences, Lund Univ., Sweden; [4]Translational Medicine, Lund Univ., Sweden.* Ultrasound optical tomography combines light and ultrasound measuring optical properties deep inside the body. We experimentally characterize cancer mimicking inclusions in breast tissue phantoms and theoretically simulate imaging performance at significant depths inside the brain.

Tu2A.46
Evaluating Image Quality Metrics for Photoacoustic Imaging, Melle van der Brugge[2], Navchetan Awasthi[2], Francis Kalloor Joseph[1]; *[1]Erasmus MC, Netherlands; [2]Univ. of Amsterdam, Netherlands.* Assessing the quality of photoacoustic images is essential for algorithm development and clinical translation. This study evaluates the efficacy of full-reference image quality metrics tailored to photoacoustic imaging.

Tu2A.47
Optimizing Photoacoustic Systems for Carotid Artery Imaging, Anjali Thomas[1], Sowmiya Chandramoorthi[2], Gijs van Soest[1], Francis Kalloor Joseph[1]; *[1]Erasmus MC, Netherlands; [2]Verasonics Inc, USA.* The carotid artery imaging is clinically relevant for plaque quantification but challenging for photoacoustics. We present probe optimization and quantification aspects for in vivo carotid artery imaging on volunteers using two different systems.

Tu2A.48
Assessment of Thermal Diffusivity in a Multi-Composite Tissue-Mimicking Gel by Photothermal Tomography, Katja Arh[1], Boris Majaron[1,2]; *[1]Jozef Stefan Inst., Slovenia; [2]Faculty of Mathematics and Physics, Univ. of Ljubljana, Slovenia.* We demonstrate how thermal diffusivity of tissue-mimicking agarose gels with highly conductive alumina scatterers can be assessed by application of three-dimensional pulsed-photothermal imaging (a.k.a photothermal tomography) of an embedded optically absorbing object.

Tu2A.49
Particle Size Distribution and Scattering Properties of Intralipid 20%, Mona Shahsavari[1], Mendel Engelaer[1], Martine Kuiper[2], Martin Poinsinet de Sivry de Sivry-Houle[1], Rienk Nieuwland[1], Ton van Leeuwen[1], Edwin van der Pol[1]; *[1]Amsterdam UMC Locatie AMC, Netherlands; [2]Dutch Metrology Inst., Netherlands.* To model the optical properties of Intralipid 20%, the particle size distribution and concentration were measured over a diameter range of 40 to 2,000 nm. These data, combined with traceable refractive index measurements of soybean oil, were used to calculate the scattering coefficient within the independent, single scattering regime.

Tu2A.50
Ultrasound Light Waveguiding to Increase Fluorescent Signals Through Biomimicking Tissue Phantoms, Maxim N. Cherkashin[1], Volodymyr Rohovets[2], Carsten Brenner[1], Georg Schmitz[2], Martin R. Hofmann[1]; *[1]Photonics and Terahertz Technology, RUB, Germany; [2]Medical Engineering, RUB, Germany.* Ultrasound light waveguiding is a developing technique aiding light delivery inside scattering media. We investigate the potential of this approach to increase fluorescent signals of deep targets using biomimicking tissue phantoms.

Tu2A.51
On the Multi-Focus Femtosecond Laser Surgery System for Keratorefractive Lenticule Extraction, Shaoqun Zeng[1], Huaming Li[1], Jing Yuan[1], Yong Deng[1]; *[1]Huazhong Univ of Science and Technology, China.* In order to reduce the incidence of suction loss in Keratorefractive Lenticule Extraction (KLEx), we propose a multi-focus scanning method and achieve KLEx with laser scanning time less than 8s on ex vivo pig eyes.

Room: ICM Room 11
14:00 -- 15:30
Tu3B • Multimodal Imaging
Presider: Teemu Sahlström; Univ. of Eastern Finland, Finland

Tu3B.1 • 14:00 (Invited)
Multi-Modal Opto-Ultrasound Imaging via Transparent Ultrasound Transducer, Chulhong Kim[1]; *[1]Pohang Univ of Science & Technology, Korea (the Republic of).* Here, we demonstrate multi-modal opto-ultrasound imaging systems via transparent ultrasound transducers (TUTs) that enable seamless integration of ultrasound imaging with various optical imaging such as photoacoustic imaging, optical coherence tomography, and/or fluorescence imaging.

Tu3B.2 • 14:30
Miniaturized Ultrasonic Transducer-Based Photoacoustic Microscopy: Enabling High Spatiotemporal Imaging and Concurrent Multi-Modality Imaging, Chengbo Liu[1]; *[1]Shenzhen Inst of Adv Technology, CAS, China.* We have developed high-spatiotemporal-resolution photoacoustic microscopy (PAM) with miniaturized ultrasonic transducers, which overcome the limitation of spatial and temporal resolution in conventional PAM. Our system enables an expandable field of view and facilitates seamless integration with fluorescence microscopy.

Tu3B.3 • 14:45
Non-Regular Handheld Transducer Array for Improved Video-Rate Ultrasound and Photoacoustic Imaging, Shen Song[1,2], Yaoyao Cui[1,2], Yachao Zhang[1,2]; *[1]Univ. of Science and Technology of China, China; [2]Chinese Academy of Sciences, China.* We present a dual-modality ultrasound and photoacoustic imaging system with a non-regular handheld transducer array and a spatially corrected beamforming algorithm, enabling high-speed, multi-spectral imaging and improved vascular feature detection in clinical settings.

Tu3B.4 • 15:00
Dual-Modal Photoacoustic and Ultrasound Imaging System for Functional Analysis of Vasculature *in Vivo*, Jeesu Kim[1]; *[1]Pusan National Univ., Korea (the Republic of).* We demonstrate a biomedical imaging platform that integrates photoacoustic and ultrasound imaging with conventional B-mode ultrasound to provide complementary functional insights onto structural information. The results successfully visualize vascular structure and blood flow *in vivo*.

Tu3B.5 • 15:15
Explainable Deep Learning-Based Mid-Infrared Photoacoustic Microscopy, Eunwoo Park[1], Sampa Misra[1], Dong Gyu Hwang[1], Chiho Yoon[1], Joongho Ahn[1], Donggyu Kim[1], Jinah Jang[1], Chulhong Kim[1]; *[1]Pohang Univ of Science & Technology, Korea (the Republic of).* We present an explainable deep learning-based mid-infrared photoacoustic microscopy (XDL-MIR-PAM), which consistently generates virtually fluorescence-stained high-resolution images similar to confocal microscopy. The XDL-MIR-PAM successfully identifies cell nuclei and filamentous actin in label-free human cardiac fibroblasts.

Room: ICM Room 22b
14:00 -- 15:30
Tu3C • Full Field OCT
Presider: Rainer Leitgeb; Medizinische Universität Wien, Austria

Tu3C.1 • 14:00 (Invited)
Multi-Depth High-Resolution Quantitative Analysis of the Retinal Nerve Fiber Layer with Full-Field OCT, Clémentine Callet[1,2], Maxime Bertrand[3], Kimberly Guzman[4,1], Pedro Mecê[5], Kate Grieve[2], Ethan A. Rossi[4]; *[1]Department of Ophthalmology, Univ. of Pittsburgh, USA; [2]INSERM U968, CNRS, Institut de la Vision, Université de la Sorbonne, France; [3]SharpEye, France; [4]Department of Bioengineering, Univ. of Pittsburgh, USA; [5]Institut Langevin, ESPCI Paris, CNRS, PSL Univ., France.* Full-Field OCT provides high-resolution en-face multi-depth retinal imaging with precise axial sectioning, enabling detailed assessment of retinal nerve fiber layer structures. We present imaging results and an image processing pipeline for quantitative biomarker extraction.

Tu3C.2 • 14:30
Rolling-Phase Dynamic Full-Field Optical Coherence Tomography Applications: Enhancing Cellular Imaging in Dense Biological Structures, Tual Monfort[1], Kate Grieve[1], Olivier Thouvenin[2]; *[1]Sorbonne Universite, INSERM, CNRS, Institut de la Vision, France; [2]Institut Langevin, ESPCI Paris, Universite PSL, CNRS, France.* We present Rolling-Phase D-FFOCT, a novel detection scheme for Dynamic Full-Field Optical Coherence Tomography. This technique uses homogeneous phase measurements. It improves signal-to-noise ratio, reduces speckle,

and uncovers new subcellular structures compared to conventional methods.

Tu3C.3 • 14:45
Quantitative Dynamic OCT for High Throughput Drug Screening, Jianbo Tang[1]; [1]*SUSTech, China.* This study proposes an OCT-based cell viability quantitative detection method for drug screening.

Tu3C.4 • 15:00
***in Vivo* Megahertz Dynamic Optical Coherence Tomography of Human Skin,** Madita Göb[1], Sazgar Burhan[1], Gereon Hüttmann[1,2]; Robert Huber[1,2]; [1]*Univ. of Lübeck, Germany;* [2]*Medical Laser Center Lübeck GmbH, Germany.* We demonstrate Megahertz optical coherence tomography (MHz-OCT) for *in vivo* skin imaging with dynamic contrast at different resolutions. This study presents recent advances and discusses challenges for clinical translation and real-time *in vivo* applications.

Tu3C.5 • 15:15
Intra-Volume Axial Positioning of Individual en-Face Images in Off-Axis Full-Field Time-Domain Optical Coherence Tomography, Michel Wunderlich[2,1], Helge Sudkamp[1], Gereon Hüttmann[2]; [1]*visotec gmbh, Germany;* [2]*Inst. of Biomedical Optics, Univ. of Lübeck, Germany.* Full-field OCT is an option for home and point-of-care devices. A disadvantage is axial distortion in the virtual B-scans. An algorithm has been developed that tracks the axial position of en-face images without additional hardware.

Room: ICM Room 5
14:00 -- 15:30
Tu3A • Wearable, Optical, and Photonic Technologies for Health Monitoring and Diagnostics
Presider: Petra Paiè; Politecnico di Milano, Italy

Tu3A.1 • 14:00
Novel Multi-Channel Wearable Devices Reveal New Possibilities for Monitoring Socially Significant Diseases, Viktor V. Dremin[1], Minh Ngoc Nguyen[1], Ilya Rafailov[2], Sergei Sokolovsky[1], Edik Rafailov[1]; [1]*Aston Univ., UK;* [2]*Aston Medical Technology Ltd., UK.* Wearable devices with ultra-compact semiconductor lasers enable portable blood flow monitoring, featuring channels for perfusion, temperature, fluorescence, and movement. They detect five blood flow rhythms and study tissue metabolism with high sensitivity and robust data analysis.

Tu3A.2 • 14:15
On Site Brain Tumour Detection Using Flow Histology via High Speed Multiphoton SLIDE Microscopy During Ultrasonic Tissue Dissection, Dirk Theisen-Kunde[1], Matthea Thielking[2], Gregory Berg[2], Jessica Kren[3], Julia Neumann[4,5], Matteo Bonsanto[3], Sebastian Karpf[2]; [1]*Medical Laser Center Lübeck, Germany;* [2]*Inst. of Biomedical Optics, Univ. of Lübeck, Germany;* [3]*Neuro Surgery, Univ. Medical Center Schleswig Holstein, Luebeck, Germany;* [4]*Inst. of Neuropathology, Univ. Medical Center Hamburg-Eppendorf, Germany;* [5]*Center for Molecular Neurobiology (ZMNH), Univ. Medical Center Hamburg-Eppendorf (UKE), Germany.* During neuro surgery, using ultrasonic aspirator the dissected tissue is thrown away as waste. Here, the cells in the "waste" are analysed with high-speed SLIDE microscopy to discriminate between tumorous and

healthy tissue.

Tu3A.3 • 14:30
Towards Wireless, Wearable Sensor for Real-Time Gut Function Monitoring, Nilanjan Mandal[1], Yue Wang[1], Alexander J. Thompson[1]; *[1]Imperil College London, UK.* A compact, wearable low-cost fluorescence sensor for gut function assessment demonstrates accurate fluorescein detection, validated through in vitro and in vivo studies, offering enhanced portability and affordability for non-invasive gut health diagnostics.

Tu3A.4 • 14:45
Development of a Fiber Optical Fluorescence Reader for Point-of-Care Monitoring of Piperacillin in Human Serum, Vladislav Reimer[1], Georgios Ctistis[3], Katarina Fedorov[2], Pascal Schröder[3], Hainer Wackerbarth[3], Dimitrios Theodoridis[2], Philip Guehlke[1], Christian Waltermann[1], Alexander Mehren[1], Jan Koch[1], Wolfgang Schippers[1]; *[1]FiSens GmbH, Germany; [2]nal von minden GmbH, Germany; [3]Institut für Nanophotonik Göttingen e.V., Germany.* We demonstrate the first application of a point-of-care fluorescence reader based on fiber-optical spectroscopy for the readout of fluorescence-based assays. As a proof of principle, we determined different piperacillin concentrations in human serum.

Tu3A.5 • 15:00
Towards Background-Free Fiber-Optic SERS Using 2PP-Fabricated Micro-Optics, Yingwei Hou[1], Nilanjan Mandal[1], Belal Ahmad[1], Jang Ah Kim[1], Alexander J. Thompson[1]; *[1]Imperial College London, UK.* To leverage the high sensitivity and specificity of Raman spectroscopy in medical diagnostics, we present two fiber-tip micro-optical components - fabricated via 2-photon polymerization - to allow background-free fiber-optic surface-enhanced Raman spectroscopy.

Tu3A.6 • 15:15
Monitoring of Cerebral Oxygenation with a Pocket-Sized NIRS Device for Aerospace Applications, Michal Kacprzak[1], Piotr Saowsz[1], Mariusz Krej[2], Anna Gerega[1], Aleh Sudakou[1], Kamil Lipinski[1], Krzysztof Kowalczuk[2], Stanislaw Wojtkiewicz[1], Lukasz Dziuda[2], Adam Liebert[1]; *[1]IBBE PAN, Poland; [2]Military Inst. of Aviation Medicine, Poland.* A pocket-size, 8-channel (4per hemisphere) portable NIRS device was developed to monitor cerebral oxygenation in real time. It is designed to withstand high g-forces and utilizes Lock-In detection to minimize ambient light and motion artifacts.

Room: ICM Room 11
16:00 -- 17:30
Tu4B • Novel Illumination
Presider: Ningbo Chen; Chinese Academy of Sciences, China

Tu4B.1 • 16:00 (Invited)
Parallelized Light Guiding With Ultrasound for Improved Imaging in Scattering Media, Blanca Mestre-Torà[1], Xosé Luís Deán-Ben[2,3], Daniel Razansky[2,3], Martí Duocastella[1,4]; *[1]Department of Applied Physics, Univ. of Barcelona, Spain; [2]Inst. for Biomedical Engineering and Inst. of Pharmacology and Toxicology, Faculty of Medicine, Univ. of Zurich, Switzerland; [3]Inst. for Biomedical Engineering, Department of Information Technology and Electrical Engineering, ETH Zurich, Switzerland; [4]Institut de Nanociència i Nanotecnologia, Univ. of Barcelona, Spain.* Ultrasound enables a 200-fold enhancement in light delivery within

scattering samples at an optical thickness of 10. As our results demonstrate, ultrasound-induced refractive index gradients act as embedded waveguides within the sample, improving contrast and penetration depth in optoacoustic tomography imaging.

Tu4B.2 • 16:30
High-Speed 1720 nm SRS Fiber Amplifier for Photoacoustic Microscopy of Lipids, Sang Min Park[1], Seongjin Bak[1], Chang-Seok Kim[1], Hwidon Lee[1]; *[1]Pusan National Univ., Korea (the Republic of).* We present a stimulated Raman scattering fiber amplifier that delivers optical excitations at 1720 nm, with a pulse duration of approximately 5 ns, pulse energy exceeding 1 µJ, and a repetition rate of 200 kHz.

Tu4B.3 • 16:45
Optoacoustic Mesoscopy Based on Laser Diodes, Alexander G. Ross[1,2], Davide D. Giuseppe[1,2], Ravikumar Vaghela[1,2], Dominik Selzner[1,2], Shijia Chen[1,2], Philipp Köhler[1,2], Vasilis Ntziachristos[1,2]; *[1]Chair of Biological Imaging, Technical Univ. of Munich, Germany; [2]Inst. of Biological and Medical Imaging, Helmholtz Munich, Germany.* Herein, we report a new method for high-resolution optoacoustic mesoscopy based on laser diodes. We demonstrate that our method can achieve depth resolutions comparable to traditional laser sources, offering significant size and cost advantages.

Tu4B.4 • 17:00
Photoacoustic Generation with a Constant Intensity Beam, Olivier Jacquin[1], Eric Lacot[1], Olivier Hugon[1], Emmanuel Bossy[1]; *[1]LIPhy, Univ. Grenoble Alpes - CNRS, France.* Photoacoustic generation is generally based on the absorption of light beam with a time-modulated intensity. Here, we introduce a photoacoustic microscopy technique based on time-varying absorption, with a beam of constant intensity.

Tu4B.5 • 17:15
Optically Generated Droplet Beams Improve Optoacoustic Imaging of Choroid Thickness as an Alzheimer's Disease Biomarker, Konstantinos G. Mavrakis[1,2], Gerasimos Divaris[1,3], Maria Tampakaki[1,4], Saba N. Khan[5], Kishan Dholakia[5,6], Zacharakis Giannis[1]; *[1]IESL, FORTH, Greece; [2]Materials Science and Technology, Univ. of Crete, Greece; [3]Physics, Univ. of Crete, Greece; [4]Faculty of Medicine, Univ. of Crete, Greece; [5]School of Physics and Astronomy, Univ. of St Andrews, UK; [6]School of Biological Sciences, Univ. of Adelaide, Australia.* A unique approach to suppress side-lobs of Bessel beams is presented. A Mach-Zehnder-type interferometer is employed to create droplet beams. Droplet illumination is used on murine ocular samples for the investigation of Alzheimer's biomarkers.

Room: ICM Room 22b
16:00 -- 17:30
Tu4C • AI and Image Analysis
Presider: Peter Munro; Univ. College London, UK

Tu4C.1 • 16:00
Theoretical Framework for Maximum Correctable Defocus in Optical Coherence Tomography, Yue Zhu[1,2], Shuichi Makita[2], Yoshiaki Yasuno[2], Naoki Fukutake[3]; *[1]Nanjing Univ. of Science and Technology, China; [2]Univ. of Tsukuba, Japan; [3]Nikon Corporation, Japan.* High-numerical-aperture optical coherence tomography (OCT) enables sub-cellular imaging but faces

resolution-DOF trade-offs. Modeling shows computational refocusing in point-scanning OCT is confocality-limited, while spatially-coherent FFOCT overcomes this, achieving near-infinite MCD, ideal for OCT microscopy.

Tu4C.2 • 16:15
Acceleration of Amplitude-Spectral Dynamic Optical Coherence Tomography Acquisition by Using Deep Learning, Yusong Liu[1], Ibrahim Abd El-Sadek[1,2], Cunyou Bao[1], Atsuko Furukawa[3], Satoshi Matsusaka[3], Yoshiaki Yasuno[1]; *[1]Computational Optics Group, Univ. of Tsukuba, Japan; [2]Department of Physics, Faculty of ScienceDamietta Univ., Egypt; [3]Clinical Research and Regional Innovation, Faculty of Medicine, Univ. of Tsukuba, Japan.* A neural network generating amplitude-spectra-based dynamic OCT (AS-DOCT) from only 16 OCT frames is demonstrated. It reduces the measurement time for 96.9% and enables a volumetric acquisition time of 26s.

Tu4C.3 • 16:30
An Accelerated T-Matrix Method for Simulating the Focusing of Light in Tissue Using Arbitrary Wavefronts, Sean C. Mitchell[1], Jake A. Bewick[2], Dylan M. Marques[3], Simon Arridge[4], Peter Munro[2], Jonathan S. Watkins[1], James Guggenheim[3,2]; *[1]School of Physics and Astronomy, Univ. of Birmingham, UK; [2]Department of Medical Physics and Biomedical Engineering, UCL, UK; [3]School of Medical Sciences, Univ. of Birmingham, UK; [4]Department of Computer Science, UCL, UK.* We present a new efficient numerical toolkit for scattering light within biological tissue using the T-matrix method. We demonstrate its usefulness in areas such as wavefront shaping.

Tu4C.4 • 16:45
Progress on Digital Wavefront Correction and Spatio-Temporal Optical Coherence Tomography for Retinal Imaging, Jem Love[1], Guozheng Xu[1], Myeong Jin Ju[2], Destiny Hsu[3], Lukasz Kornaszewski[4], Maciej Wojtkowski[5], Marinko Sarunic[1]; *[1]Medical Physics and Biomedical Engineering, Univ. College London, UK; [2]The Univ. of British Columbia, Department of Ophthalmology and Visual Sciences, Faculty of Medicine,, Canada; [3]Engineering Science, Simon Fraser Univ., Canada; [4]InCellVu, Poland; [5]International Centre for Translational Eye Research, Poland.* We report our progress on retinal imaging with STOC-T and post-processing resolution enhancement using digital wavefront correction. Results are compared with other instruments looking at structural and functional imaging of the retina.

Tu4C.5 • 17:00
Progress on Deep Reinforcement Learning for Real-Time Defocus and Axial Motion Correction for OCT, Guozheng Xu[1], Arman Athwal[1], Thomas Smart[1], Marinko Sarunic[1]; *[1]Univ. College London, UK.* We present our progress on a defocus and axial motion correction method for OCT B-scans using deep reinforcement learning. The method corrects both errors concurrently to stabilize human retinal imaging in real-time.

Tu4C.6 • 17:15
Synthetic Gradient Noise: a Framework for Generic Denoising of OCT Images Using Only Artificial Data, Viacheslav Mazlin[1,2], Samer Alhaddad[1,2], Samuel Boccara[3]; *[1]Langevin Inst., France; [2]SharpEye, France; [3]Hunter College High School, USA.* We show that neural network trained on purely synthetic gradient noise can well generalize to denoise real OCT images that were never seen by the network.

Room: ICM Room 5
16:00 -- 17:30
Tu4A • Imaging in Medicine and Beyond
Presider: Fake Lu; State Univ. of New York, USA

Tu4A.1 • 16:00
Label-Free High-Contrast Imaging of Pollen for Feature Detection, anand kumar[1], Anuj Saxena[1], Sachin Dhawan[1], Siddharth Runkh[1], Lovey Lovey[1], Mukesh Khare[1], Satish K. Dubey[1], Dalip Singh Mehta[1]; *[1]Indian Inst. Of Technology Delhi, India.* This article proposes label-free high-contrast imaging of different pollen with a low-cost LED-based near-field illumination system for small feature detection. In addition, a comparative study with a bright field (BF) microscope has been performed.

Tu4A.2 • 16:15
Detecting Coronary Artery Disease Through Retinal Vessel Analysis Using Polarization Sensitive Optical Coherence Tomography, Hadi Afsharan[1], Girish Dwivedi[1], Barry Cense[1]; *[1]The Univ. of Western Australia, Australia.* PS-OCT imaging of retinal blood vessels reveals early indicators of coronary artery disease, offering a non-invasive and cost-effective screening method. This technique detects subtle vascular changes before clinical manifestation of cardiovascular disease.

Tu4A.3 • 16:30
GAN-Based 3D Reconstruction of Skin Lesions from Structured Light Projection Images, Laura Rey-Barroso[1], Francisco J. Burgos-Fernández[1], Meritxell Vilaseca[1]; *[1]Universitat Politecnica de Catalunya, Spain.* We propose a GAN-based framework for 3D skin lesion reconstruction from structured light projections, eliminating traditional phase unwrapping and preprocessing. Our approach mitigates motion-induced artifacts, enhancing reconstruction accuracy, efficiency, and clinical applicability in dermatological imaging.

Tu4A.4 • 16:45
Motion Artifact Suppression Using Speed Detection in Handheld Laser Speckle Contrast Imaging: First Results in DIEP Flap Surgery, Anne Rook[1], Ata Chizari[1], Tom Knop[1], Johan Wijbenga[2], Danny Evers[3], Hinne Rakhorst[2], Wiendelt Steenbergen[1]; *[1]Biomedical Photonic Imaging group, Univ. of Twente, Netherlands; [2]Department of Plastic-, Reconstructive-, Hand- and Wrist Surgery, Ziekenhuisgroep Twente (ZGT), Netherlands; [3]Department of Surgical Oncology, Ziekenhuisgroep Twente (ZGT), Netherlands.* This study presents the first automated inter- and intraframe motion correction in handheld LSCI for DIEP flap perfusion monitoring. These results pave the way for more accurate, quantitative, and clinically reliable handheld LSCI measurements.

Tu4A.5 • 17:00
Fast Algorithm for Physical Realizability Check of Experimental Mueller Matrices, Tatiana Novikova[1,2], Alexey Ovchinnikov[3], Gleb Pogudin[1], Jessica C. Ramella-Roman[2]; *[1]Ecole Polytechnique, France; [2]Biomedical Engineering, Florida International Univ., USA; [3]Department of Mathematics, CUNY Queens College, USA.* Mueller matrix is physically realizable when the associated coherency matrix is positive semi-definite (PSF). We found that calculating coefficients of characteristic polynomial is the fasted algorithm for checking matrix PSF, compatible with video-rate data streaming.

Tu4A.6 • 17:15
Comparative Study of Resting-State Seed Correlation Analysis in Functional RGB and Magnetic Resonance Imaging, Adithep Kawinkij[1], Charly Caredda[1], Fabien C. Schneider[2], Jacques Guyotat[3], Eric Van-Reeth[1], Thiébaud Picart[4], Bruno Montcel[1]; *[1]Université de Lyon, INSA-Lyon, Université Claude Bernard Lyon 1, UJM-Saint Etienne, CNRS, Inserm, CREATIS UMR 5220, U1206, F69100 Lyon, France, France; [2]Université Jean Monnet Saint-Étienne, CHU de Saint-Étienne, TAPE Research Unit EA 7423, F-42023, Saint-Étienne, France c Service de Neurochirurgie D, Hospices Civils de Lyon, F69500 Bron, France, France; [3]Service de Neurochirurgie D, Hospices Civils de Lyon, F69500 Bron, France, France; [4]Cranial Neurosurgical Department, Hospices Civils de Lyon, 69677 Bron, France - Lyon 1 Univ., France.* This single-patient study evaluates resting-state seed correlation analysis comparing functional RGB (fRGB) and magnetic resonance imaging (fMRI) through a novel registration framework. Results show fRGB effectively identifies motor and sensory regions with high precision and specificity complementing to fMRI for real-time intraoperative guidance.

Wednesday, 25 June

Room: ICM Room 11
08:30 -- 10:00
W1B • Theory, Algorithms, and Modeling I
Presider: Shinpei Okawa; Hamamatsu Univ. School of Medicine, Japan

W1B.1 • 08:30
Finding the Perfect NIRS Pipeline, Robert J. Ward[1], Felipe Orihuela-Espina[1]; [1]*Univ. of Birmingham, UK.* Many real-world phenomena are discrete-dense. One is the the processing (and analysis) pipeline in fNIRS. We propose a metric tensor to navigate the space that permits gradient-based optimization. We illustrate an fNIRS application.

W1B.2 • 08:45
Standardized Assessment of FNIRS Data Quality with NeuroDOT and OXI, Emma Speh[1], Ari Segel[1], Yash Thacker[1], Dan Marcus[1], Muriah Wheelock[1], Adam T. Eggebrecht[1]; [1]*Washington Univ. School of Medicine, USA.* Assessment of raw data quality metrics for optical brain mapping data allows for reproducibility and interpretability of results. Docker containers facilitate reproductible, standardized workflows with tunable parameters for broad system compatibility.

W1B.3 • 09:00
Resting-State RGB Parcellation: a Data-Driven Approach for Intra-Operative Functional Brain Mapping, Adithep Kawinkij[1], Charly Caredda[1], Fabien C. Schneider[2], Jacques Guyotat[4], Thiébaud Picart[3], Bruno Montcel[1]; [1]*Université de Lyon, INSA-Lyon, Université Claude Bernard Lyon 1, UJM-Saint Etienne, CNRS, Inserm, CREATIS UMR 5220, U1206, F69100 Lyon, France, France;* [2]*Université Jean Monnet Saint-Étienne, CHU de Saint-Étienne, TAPE Research Unit EA 7423, F-42023, Saint-Étienne, France, France;* [3]*Cranial Neurosurgical Department, Hospices Civils de Lyon, 69677 BRON, France - Lyon 1 Univ., France;* [4]*Service de Neurochirurgie D, Hospices Civils de Lyon, F69500 Bron, France, France.* Accurate brain mapping during neurosurgery is crucial. We propose a novel seed cross-correlation parcellation method to analyse resting-state functional RGB images, identifying functional regions in single-patient intraoperative data. Validation against electrical brain stimulation highlights its potential as a vital intraoperative tool.

W1B.4 • 09:15
Investigating the Potential to Estimate Volumetric CSF Morphology with High-Density Diffuse Optical Tomography, Yutian Qin[1], Adam T. Eggebrecht[1]; [1]*Mallinckrodt Inst. of Radiology, Washington Univ. of Medicine, USA.* We simulated and analyzed the effects of cerebrospinal fluid depth and thickness on light intensity fall-off curves using high-density diffuse optical tomography. From results, we investigate the possibility to estimate CSF thickness in local regions.

W1B.5 • 09:30
Optimizing Deep Tissue Monitoring with Diffuse Optics: Virtual Tools for TD-NIRS and TD-SCOS Development, Frederic Lange[1], Xingmin Li[1], Lisa Kobayashi Frisk[2], Turgut Durduran[2,3], Ilias Tachtsidis[1]; [1]*Univ. College London, UK;* [2]*ICFO, Spain;* [3]*ICREA, Spain.* We present an instrument simulator framework for optimizing a simultaneous TD-NIRS and TD-SCOS system featuring a multi-pixel SNSPD. Monte Carlo simulations generate realistic data to

improve detector performance and enhance depth sensitivity in both modalities.

W1B.6 • 09:45
Optimization of Continuous-Wave NIRS Devices for Placental Monitoring. a Simulation Study, Charly Caredda[1], Fréderic Lange[2], Uzair Hakim[2], Subhabrata Mitra[3], Ilias Tachtsidis[2]; *[1]Creatis, France; [2]Department of Medical Physics and Biomedical Engineering, Univ. College London, UK; [3]EGA Inst. for Women's Health, Univ. College London, UK.* NIRS devices take advantage of the near infrared light to monitor deep tissues like brain, muscle or placenta. In this study, we developed a Monte Carlo framework to evaluate the sensitivity of CW-NIRS devices for monitoring the placental function. With this framework, acquisition parameters can be optimized before going into clinical applications.

Room: ICM Room 22a
08:30 -- 10:00
W1C • Functional Microscopy and In-Vivo Tissue Microscopy
Presider: Marcel Schubert; Universität zu Köln, Germany

W1C.1 • 08:30 (Invited)
High-Throughput Widefield Fluorescence Localization Microscopy with Labeled red Blood Cells, Zhenyue Chen[1], Quanyu Zhou[2,3], Chaim Glück[2], Lin Tang[2,3], Daniel Razansky[2,3]; *[1]Tongji Univ., China; [2]Inst. for Biomedical Engineering and Inst. of Pharmacology and Toxicology, Univ. of Zurich, Switzerland; [3]Inst. for Biomedical Engineering, ETH Zurich, Switzerland.* Current neuroimaging lacks spatiotemporal resolution for capillary-level brain activity. We introduce fluorescence localization microscopy with sparsely-labeled red blood cells (4.9 µm, 1s) enabling cortex-wide angiography and simultaneous neurovascular activity mapping, advancing microcirculation and coupling studies in health/disease.

W1C.2 • 09:00
STIMscope: An Open-Source Real-Time Imaging and Patterned Illumination Framework, Hamid T. Chorsi[1], Saray Soldado-Magraner[1], Lihui Lu[2], Yang Dan[2], Dean Buonomano[1], Daniel Aharoni[1]; *[1]Univ. of California Los Angeles, USA; [2]Univ. of California, Berkeley, USA.* We present a reconfigurable spatiotemporal illumination microscopy platform for large field-of-view, single-cell imaging, and patterned illumination, coupled with a real-time closed-loop analysis pipeline. We showcase the system's capabilities through its applications in neural imaging and neuromodulation.

W1C.3 • 09:15
High Resolution Miniaturized Fluorescence Microscopy via Zernike-Based Spatially-Varying Deconvolution, Liangtao Gu[1], Xinyi Zhu[1], Rui Li[2], Ning Zhou[2], Wuwei Ren[1]; *[1]School of Information Science and Technology, ShanghaiTech Univ., China; [2]iHuman Inst., ShanghaiTech Univ., China.* We propose a workflow combining Zernike-based point spread function (PSF) modeling and spatially-varying deconvolution, offering a robust solution for PSF calibration and optical distortion correction. Our method significantly enhances Miniscope image quality and advances its applications in neurobiology.

W1C.4 • 09:30 (Invited)
Self-Supervised Denoising With Temporal Gradient for Dynamic Fluorescence Images, Wooijn Lee[1], Minseok A. Jang[1], Hyeong Soo Nam[1], Jeonggeun Song[1], Jieun Choi[2,3], Joon Woo Song[4], Jae Yeon Seok[5], Pilhan Kim[2,3], Jin Won Kim[4], Hongki Yoo[1]; *[1]Department of Mechanical Engineering, Korea Advanced Inst. of Science and Technology, Korea (the Republic of); [2]Graduate School of Medical Science and Engineering, Korea Advanced Inst. of Science and Technology, Korea (the Republic of); [3]Graduate School of Medical Science and Engineering, KAIST Inst. for Health Science and Technology, Korea (the Republic of); [4]Multimodal Imaging and Theranostic Laboratory, Korea Univ. Guro Hospital, Korea (the Republic of); [5]Department of Pathology, Yongin Severance Hospital, Korea (the Republic of).* We propose a temporal gradient-based self-supervised denoising technique for dynamic fluorescence imaging, improving spatiotemporal redundancy utilization. It enhances fluorescence kinetics interpretation in neuronal and vascular imaging, offering broad potential for biological studies employing fluorescence microscopy.

Room: ICM Room 22b
08:30 -- 10:00
W1D • OCT Methods
Presider: Danielle Harper; Univ. of Cambridge, UK

W1D.1 • 08:30 (Invited)
Choroidal Vascular Disease on-Chip Modeling and Assessment with Optical Coherence Tomography, Carlos Cuartas-Vélez[1], Devin Veerman[1], Tarek Gensheimer[1], Andries van der Meer[1], Nienke Bosschaart[1]; *[1]Universiteit Twente, Netherlands.* We present a platform for quantitative analysis of choroidal vascular networks with optical coherence tomography by using an in vitro, organ-on-chip model of the choroid. We demonstrate quantitative assessment of choroidal health and disease conditions.

W1D.2 • 09:00
Advancing the STOC-T System for High-Resolution Imaging of the Human Retina in Vivo, Marta Mikula-Zdankowska[1], Piotr Wegrzyn[2,1], Maciej Wojtkowski[2,1]; *[1]Inst. of Physical Chemistry, Polish Academy of Sciences, Poland; [2]International Centre for Translational Eye Research, Poland.* This work explores the impact of illumination conditions and numerical averaging on SNR in STOC-T. Using a layered scattering object, we show how optimal parameter selection and averaging strategies improve signal quality. Experimental results demonstrate significant performance enhancement, showcased through human retina volumetric imaging.

W1D.3 • 09:15
Minimally-Invasive Common-Path OCT System for Neurosurgery Applications, Gary Evans[1], Jerome Gandar[2,3], Simon Thiele[4], David Segar[3], Yoseline Rosales Cabara[2], Matthew Lapinski[1], Ivana Gantar[2], Thierry Campiche[2], Corinne Brana[2], Michalina Gora[2], Jules Scholler[1]; *[1]Clee Medical, Switzerland; [2]Wyss Center, Switzerland; [3]Albert Einstein College of Medicine, USA; [4]Printoptix, Germany.* This study presents a minimally invasive, forward-viewing common-path endoscopic OCT system for neurosurgery, offering real-time, high-resolution imaging. Tested in-vivo in a rabbit model, the system differentiates brain tissues and detects blood vessels, enhancing surgical precision and reducing haemorrhage risks.

W1D.4 • 09:30
Speckle Reduction Through Angular Compounding in Robotically Assisted MHz-OCT, Tjalfe Laedtke[1], Sazgar Burhan[1], Simon Lotz[1], Madita Göb[1], Robert Huber[1,2]; *[1]Inst. of Biomedical Optics, Germany; [2]Medical Laser Center Lübeck GmbH, Germany.* We demonstrate speckle reduction in robotically assisted MHz-OCT by angular compounding. The robot is used to acquire images from different angles, which, after registration, are used for efficient speckle averaging without loss of spatial resolution.

W1D.5 • 09:45
Progress on Multi-Contrast Imaging of the Mouse Retina, Thomas Smart[1], Bruno Charbit[1], Ziqi Zhou[1], Destiny Hsu[4], Myeong Jin Ju[3], Colin Chu[1,2], Marinko Sarunic[1]; *[1]Univ. College London (UCL), UK; [2]Moorfields Eye Hospital, UK; [3]Univ. of British Columbia, Canada; [4]Simon Fraser Univ., Canada.* We present our progress on correlating in-vivo structural images (OCT, OCTA, PS-OCT, SLO) with ex-vivo molecular contrast images. Our approach will elucidate the cellular composition of the structural features typical encountered in in-vivo retinal images.

Room: ICM Room 5
08:30 -- 10:00
W1A • NIR Spectroscopy and Imaging
Presider: Michael Tanner; Heriot-Watt Univ., UK

W1A.1 • 08:30
Multispectral Intraoperative Optical Imaging of Functional Activation of the Human Cerebral Cortex – Performance Analysis of Different Light Wavelength Bands, Martin Oelschlägel[1], Christian Schnabel[1], Gerald Steiner[1], Edmund Koch[1], Ilker Eyüpoglu[2], Tareq Juratli[2], Stephan B. Sobottka[2]; *[1]Clinical Sensing and Monitoring, Department of Anesthesiology and Intensive Care Medicine, Carl Gustav Carus Faculty of Medicine, Technische Universität Dresden, Germany; [2]Department of Neurosurgery, Carl Gustav Carus Univ. Hospital Dresden, Germany.* This work compares the performance of functional activity maps of the human cerebral cortex derived from 8 patients during neurosurgical tumor resection using a multispectral imaging system with three different light wavelength bands.

W1A.2 • 08:45
Using Broadband Near-Infrared Spectroscopy to Track Multiple Chromophores: Applications in Dementia Diagnosis, Deepshikha Acharya[1], Emilia Butters[1], Alexander Caicedo[2], Li Su[1,3], John O'Brien[1], Gemma Bale[1]; *[1]Univ. of Cambridge, UK; [2]Pontificia Universidad Javeriana, Colombia; [3]Univ. of Sheffield, UK.* Accurate dementia diagnosis requires tracking multiple biomarkers, increasing scan times and cost in an already limited MRI/PET environment. Here, we demonstrate broadband near-infrared spectroscopy as a potential alternative for simultaneous haemody namic, metabolic and cerebrospinal-fluid tracking.

W1A.3 • 09:00
Importance of Distance Correction in Near-Infrared and Intravascular Ultrasound Imaging for Reliable Assessment of the Cardiovascular Tissue Pathobiological State, Lorenzo Ricciardi[1,2], Philipp Rauschendorfer[1,2], Dimitris Gorpas[1,2], Vasilis Ntziachristos[1,2]; *[1]Technical Univ. Munich, Germany; [2]Helmholtz Zentrum München, Germany.* We present developments in Near-Infrared Fluorescence and Intravascular Ultrasound (NIRF-IVUS) imaging. By correcting blood attenuation on the fluorescence signal, we enhance the detection of the NIRF, improving

the pathobiological state assessment of atherosclerotic tissue.

W1A.4 • 09:15
Development of Intravascular Crosstalk-Free Dual NIRF Imaging System Integrated with Catheter-Based OCT, Yeon Hoon Kim[1], Dong Oh Kang[2], Yong Geun Lim[3], Hyeong Soo Nam[1], Hyun Jung Kim[2], Ryeong Hyun Kim[2], Kyeongsoon Park[3], Jin Won Kim[2], Hongki Yoo[1]; *[1]KAIST, Korea (the Republic of); [2]Korea Univ. Guro Hospital, Korea (the Republic of); [3]Chung-Ang Univ., Korea (the Republic of).* An intravascular dual-spectrum NIRF/OCT system was developed for crosstalk-free multimodal imaging for atherosclerosis assessment. Through phantom and in vivo experiments, it precisely detects osteogenesis and macrophages, enhancing structural and molecular characterization for improved cardiovascular diagnostics.

W1A.5 • 09:30
Assessment of Joint Integrity via Near-Infrared Spectroscopic Estimation of Biomarkers in Synovial Fluid: a Potential Tool for Early Detection of Osteoarthritis, Fatemeh Shahini[1,3], Sanna Oikari[2], Nithin Sadeesh[1], Ervin Nippolainen[1], Harold Brommer[4], Juha Töyräs[3], Petteri Nieminen[2], Isaac O.Afara[1]; *[1]Department of Technical Physics, Univ. of Eastern Finland, Finland; [2]Faculty of Health Sciences, School of Medicine, Inst. of Biomedicine, Univ. of Eastern Finland, Finland; [3]Diagnostic Imaging Center, Kuopio Univ. Hospital, Finland; [4]Department of Clinical Sciences, Faculty of Veterinary Medicine, Utrecht Univ., Netherlands.* This study investigates the capacity of near-infrared spectroscopy (NIRS) for classifying hyaluronan (HA) levels in equine synovial fluid. NIRS, combined with machine learning, discriminated between low and high HA levels with an accuracy of 81%, highlighting its potential as a promising rapid osteoarthritis diagnostic tool.

Room: ICM Room 11
10:30 -- 12:00
W2B • Advances in Instrumentation and Technology III
Presider: Adam Eggebrecht; Washington Univ. in St Louis, USA

W2B.1 • 10:30
Standardised Testing Procedure Based on Optical Phantoms for Validation of Photonics Instrumentation Aimed at Clinical Monitoring of the Placenta, Luca Giannoni[1], Musa Talati[1], Darshana Gopal[1], Uzair Hakim[1], Angelos Artemiou[1], Fréderic Lange[1], Subhabrata Mitra[1], Ilias Tachtsidis[1]; *[1]Univ. College London, UK.* We present here a standardised procedure based on multiple optical phantoms (solid and liquid), for testing, and validation of photonics technological solutions and instrumentation that aims at in vivo, clinical monitoring of the human placenta.

W2B.2 • 10:45
Liquid-Crystal Display-Based Dynamic Phantom for Pulse Oximetry Characterisation, Hui Ma[1,2], Dario Angelone[1,2], Claudia Guadagno[3], Stefan Andersson-Engels[1,4], Sanathana Konugolu Venkata Sekar[1,4]; *[1]Biophotonics, Tyndall National Inst., Ireland; [2]Engineering Science, Univ. College Cork, Ireland; [3]BioPixS Ltd, Ireland; [4]Physics, Univ. College Cork, Ireland.* A light-guided dynamic phantom was developed to simulate microvascular dynamics for biomedical applications, particularly pulse oximetry calibration. The phantom enables real-time optical property modulation, generating heamodynamics signals across multiple wavelengths for device validation and standardisation.

W2B.3 • 11:00
Optical Hand Phantom with Defined Optical Properties, Markus Wagner[1], Florian Foschum[1], Alwin Kienle[1]; [1]*ILM Ulm, Germany.* A homogeneous optical silicone phantom in the shape of a hand, with defined absorption and scattering properties, was developed to match real hand reflectance, optimized using scattering particles and five absorbing pigments.

W2B.4 • 11:15
Diffuse Reflectance Spectroscopy System Radiometrically Calibrated for Quantitative Optical Measurements in Scattering Media, Augustin Vernay[1], Guillaume Blanquer[1], Milena Sofra[1], Rémi Gerbelot[1], Pierre Blandin[1], Mathieu Perriollat[1]; [1]*CEA - LETI, France.* To perform quantitative PPG and DRS measurements, an original bench and a radiometric calibration procedure have been developed. On homogeneous and calibrated phantoms, the measurements were compared with simulations.

W2B.5 • 11:30
Linking Fluorescence Spectroscopy and 31P MRS in NADH Phantoms, Giorgi Asatiani[1], Arthur Gautheron[1], Laurent Mahieu-Williame[1], Helene Ratiney[1], Bruno Montcel[1]; [1]*CREATIS - INSA LYON, France.* Glioblastoma exhibits significant metabolic alterations, making tracking energy metabolism important for its characterization. This could be crucial for glioblastoma resection in neurosurgery. We link two NADH monitoring methods, showing linear dependence on phantom concentrations.

W2B.6 • 11:45
Simulation, Optimisation, and Validation of CoMind R1: a Multichannel Interferometric System for Monitoring Cerebral Blood Flow at Late Times-of-Flight, Anurag Behera[1], Veronika Parfentyeva[1], Dominic Hill[1], Stella Avtzi[1], Octave Etard[1], Alexandra Tran-Van-Minh[1], Youssef Ibrahim[1], Ali Mehmed[1], Artur Istufaj[1], Jan Goodrich[1], Nav Singh[1], Saeed Darabi[1], Pablo Villar Sanjurjo[1], Taimoor Ali[1], Yoojin Kim[1], Tanvi Tambe[1], Clarissa Lin[1], Simone Sturniolo[1], Alexandar Ruesch[1], Yuqian Zhang[1], Amir Salehi Lashkajani[1], Sujit Malde[1], Jan Andersen[1], Gordon McCabe[1], Chloe Maine[1], Matt Thackrah[1], Dawid Borycki[1], Tanja Dragojevic[1], Claus Lindner[1], Robert J Cooper[1]; [1]*CoMind, UK.* In this work, we validate CoMind R1 and demonstrate its ability to retrieve cerebral pulsatile blood flow at time-of-flight exceeding 1 ns, with findings further confirmed by Monte Carlo simulations in a multilayer geometry.

Room: ICM Room 22a
10:30 -- 12:00
W2C • Applications to Cell Biology and Neuroimaging
Presider: Francesca Bragheri; Istituto di Fotonica e Nanotecnologie, Italy

W2C.1 • 10:30 (Invited)
Sensing Cell-Level Contractility Deep Inside Cardiac Organoids Using Microlasers, Nachiket V. Pathak[1], David Ripp[1], Wiebke Luther[1], Matthias König[1], Stefan Jahnel[2], Sasha Mendjan[2], Malte C. Gather[1], Marcel Schubert[1]; [1]*Humboldt Center for Nano- and Biophotonics, Univ. of Cologne, Germany;* [2]*Inst. of Molecular Biotechnology of the Austrian Academy of Sciences, Austria.* Microlasers are promising devices for deep tissue sensing applications. We present the integration of microlasers into large cardiac organoids, the sensing of single cell contractility, and discuss the depth limit under single and multiphoton excitation.

W2C.2 • 11:00
Unraveling Epithelial Cell Networks: Graph-Based Microscope Image Analysis, Ronny J. Tonato Zambrano[1], Frédérique Mittler[3], Lionel Hervé[1], Sophie Achard[2], Maxim Balakirev[3], Guillaume Godefroy[1]; *[1]Univ. Grenoble Alpes, CEA-Leti, France; [2]Univ. Grenoble Alpes, CNRS, Inria, Grenoble INP, LJK, France; [3]Univ. Grenoble Alpes, CEA, INSERM, IRTSV, Large-Scale Biology, France.* A graph-based approach is implemented to analyze and study epithelial cellular network formations over time. Network connectivity is computed through graph theory-based metrics, which exhibit an interesting behaviour to distinguish between experimental conditions.

W2C.3 • 11:15
Towards a General-Purpose Foundation Model for Signal Extraction in Calcium Imaging of Neuronal Network Activities, Weisheng Zhang[1], Junhao Liang[1], Lingjie Kong[1]; *[1]Tsinghua Univ., China.* In dissecting neuronal circuits through calcium imaging, yet it relies on manual segmentations to extract neuronal signals. We present a generalizable foundation model that achieves robust signal extraction across diverse imaging conditions and species.

W2C.4 • 11:30
Multimodal PAM, OCT, and Fluorescence Imaging Guided Stem Cell Treatment of Macular Degeneration, Phuc Nguyen[2], Wei Qian[3], Abigail Fahim[1], Xueding Wang[1], Yannis Paulus[2]; *[1]Univ. of Michigan, USA; [2]Department of Ophthalmology, Wilmer Eye Inst., Johns Hopkins Universtiy, USA; [3]IMRA America Inc, USA.* A non-invasive imaging system was developed to track transplanted hiPSC-RPE cells in rabbits. Labeled cells were monitored using photoacoustic microscopy (PAM), optical coherence tomography, and fluorescence imaging, revealing migration and integration into injured sites, demonstrating feasibility for tracking stem cells in regenerative therapies.

W2C.5 • 11:45
Label-Free Microscopy for Optogenetic Investigations of Arrhythmia in Human Cardiomyocyte Networks Expressing Chrimson, Robert Wendland[1], Felix Schmieder[1], Muhammad A. Sikandar[2], Wolfram-Hubertus Zimmermann[2], Olaf Bergmann[2], Lars Büttner[1], Jürgen Czarske[1]; *[1]Laboratory of Measurement and Sensor System Techniques, TUD Dresden Univ. of Technology, Germany; [2]Department of Pharmacology and Toxicology, Univ. Medical Center Goettingen, Germany.* Advances in label-free microscopy of holographically stimulated cardiomyocytes are presented. We use optogenetically controlled contraction wavefront shaping to model spiral waves causing arrhythmia as a potential pathway for improved treatment strategies.

Room: ICM Room 22b
10:30 -- 12:00
W2D • Contrast: Elastography and PS
Presider: Myeong Jin Ju; Univ. of British Columbia, Canada

W2D.1 • 10:30 (Invited)
Three-Dimensional Imaging of Mechanical Contrast in Human Breast Using Dynamic Optical Coherence Tomography, Matt Hepburn[1,2], Seweryn Morawiec[2], Joel Bellesini[1], Ken Foo[1], Marta Skrok[2], Szymon Tamborski[2], Renate Zilkens[1,3], Laura Gale[4], Mireille Hardie[4], Saud Hamza[5], Anmol Rijhumal[4], Christobel Saunders[3,6], Brendan F. Kennedy[1,2]; *[1]School of*

Engineering, Univ. of Western Australia, Australia; [2]Inst. of Physics, Nicolaus Copernicus Univ. in Torun, Poland; [3]School of Medicine, The Univ. of Western Australia, Australia; [4]PathWest, Fiona Stanley Hospital, Australia; [5]Breast Centre, Fiona Stanley Hospital, Australia; [6]School of Medicine, The Univ. of Melbourne, Australia. We demonstrate a novel approach to generate contrast between healthy and cancerous human breast tissue based on changes in mechanical properties using dynamic optical coherence tomography, validated using co-registered histology.

W2D.2 • 11:00
New Understanding of Phase-Sensitive Optical Coherence Tomography Displacement Measurement, Andrea Mazzolani[1], Jiayue Li[2], Balazs Dura-Kovacs[1], Brendan F. Kennedy[3], Peter Munro[1]; *[1]Univ. College London, UK; [2]Univ. of Western Australia, Australia; [3]Nicolaus Copernicus Univ. in Torun, Poland.* Phase-sensitive OCT determines displacement from the phase difference between consecutive acquisitions. This study introduces a novel physics-based model that describes how speckle characteristics influence the measured phase difference and propose a new displacement estimation technique.

W2D.3 • 11:15
Estimation and Comparison of Brainstem Fiber Orientation via Diffusion MRI Tractography and Polarization Sensitive OCT, Isabella Aguilera[1], Travis Sawyer[1], Elizabeth Hutchinson[1]; *[1]Univ. of Arizona, USA.* dMRI-based tractography methods reconstruct neural pathways but often lack detailed microstructural information. This study compares fiber orientation distributions in the human brainstem obtained through Constrained Spherical Deconvolution Tractography and polarization-sensitive OCT.

W2D.4 • 11:30
Polarization Sensitive Optical Coherence Tomography With Single Input for Imaging the Polarization State Within Various Samples, Johannes Reinhold[1], Christian Schmidt[1], Miriam Sasse[1], Johannes Rohr[1,3], Ronja Koehler[1,3], Jonas Golde[2], Lars Kirsten[1], Christian Hannig[3], Edmund Koch[4], Julia Walther[1]; *[1]Department of Medical Physics and Biomedical Engineering, Faculty of Medicine Carl Gustav Carus, Technical Univ. Dresden, Germany; [2]Fraunhofer-Institut für Werkstoff- und Strahltechnik IWS, Germany; [3]Polyclinic of Operative Dentistry, Periodontology and Pediatric Dentistry, Faculty of Medicine Carl Gustav Carus, Technical Univ. Dresden, Germany; [4]Clinical Sensoring and Monitoring, Department of Anesthesiology and Intensive Care Medicine, Faculty of Medicine Carl Gustav Carus, Technical Univ. Dresden, Germany.* Polarization-sensitive optical coherence tomography (PS-OCT) was performed to characterize reflectivity, Stokes parameters, retardation and degree of polarization in stretched polycarbonate, human dental hard material ex vivo and oral mucosa in vivo.

W2D.5 • 11:45
Setup of a Polarization Sensitive Ultra-High Resolution Visible-Light OCT, Johannes Reinhold[1], Christian Schnabel[2], Peter Cimalla[2], Lars Kirsten[1], Edmund Koch[2], Julia Walther[1]; *[1]Department of Medical Physics and Biomedical Engineering, Faculty of Medicine Carl Gustav Carus, Technical Univ. Dresden, Germany; [2]Department of Clinical Sensoring and Monitoring, Anesthesiology and Intensive Care Medicine, Faculty of Medicine Carl Gustav Carus, Technical Univ. Dresden, Germany.* Broadband visible light is used to implement one of the highest resolving polarization sensitive OCT systems with an aimed axial resolution of 1.4µm and an intended application in ophthalmology and for examining human oral mucosa.

Room: ICM Room 5
10:30 -- 12:00
W2A • Machine Learning for Biophotonics Diagnosis
Presider: Igor Meglinski; Aston Univ., UK

W2A.1 • 10:30
***AI-Driven Single Shoot Spectral Imaging for Non-Invasive Dermatological Analysis*,** Marcello Melis[1], shayesteh naghinajad[1], Damiano Scalabrin[1], Xi chen[1], Marca Macellari[1]; *[1]Profilocolore SRL, Italy.* Proposed Dermatological Spectral Imaging System (DeSIS) combines patented optics and AI, providing 98% accurate CIELAB and 13-band spectral imaging (300-1000 nm) in a single shoot. It enables real-time, non-invasive, high-accuracy skin diseases mapping and monitoring.

W2A.2 • 10:45
Recognition of Human Liver Cancers by Label-Free Nonlinear Microscopy and Machine Learning, Roberta Galli[1], Sandra Korn[1], Daniela Aust[1], Gustavo B. Baretton[1], Jürgen Weitz[1], Edmund Koch[1], Carina Riediger[1]; *[1]Dresden Univ. of Technology, Germany.* Tumor recognition was demonstrated on samples of 150 patients. Neural network classification of ninety-thousand images of colorectal liver metastases, hepatocellular carcinoma and matched liver tissue achieved a sensitivity and a specificity of 91% and 96%.

W2A.3 • 11:00
Multiple Excitation Wavelengths PpIX Fluorescence Spectroscopy for Gliomas Delineation Assisted by Machine Learning, Hermine A. Quardon[1], Arthur Gautheron[1,2], Antoine Uzel[1], David Meyronet[3,4], Bruno Montcel[1], Thiébaud Picart[5,4], Cedric Ray[1]; *[1]CREATIS, France; [2]CPE, France; [3]Department of Neuropathology, Hospices Civils de Lyon,, France; [4]Cancer Initiation and Tumoral Cell Identity Department, Cancer Research Centre of Lyon, France; [5]Department of Neurosurgery, Hôpital Neurologique Pierre Wertheimer, Hospices Civils de Lyon, France.* A method for preprocessing and classifying fluorescence measurements to distinguish tumorous from healthy tissue is proposed, as 5-ALA fluorescence-guided surgery, effective for high-grade gliomas, is less use-ful for low-grade gliomas without visible fluorescence.

W2A.4 • 11:15
A Novel Deep Learning-Based OCT Approach for Multiparametric Bacterial Colony Classification and Accurate Diagnosis, Mateusz Guzniczak[1], Agnieszka Ulatwoska-Jarza[1], Anna Wieliczko[2], Anna Matczuk[3], Igor Buzalewicz[1]; *[1]Department of Biomedical Engineering, Faculty of Fundamental Problems of Technology, Wroclaw Univ. of Science and Technology, Poland; [2]Department of Pathology, Division of Microbiology, Faculty of Veterinary Medicine, Wroclaw Univ. of Environmental and Life Sciences, Poland.* The study presents the concepts of rapid, label-free OCT-based multiparametric phenotyping of bacterial colonies using attenuation coefficient (μT). Retrieved 2D-μT maps exhibit significant predictive potential, with 86.3% to 100% of colonies accurately classified by species.

W2A.5 • 11:30
Pioneering Robotically Assisted Laser Arthroplasty: First Cadaveric Demonstration, Samuel Withers[1,2], Kaylene Schutz[1], Brett Robertson[1,2], Riaz Khan[1,2]; *[1]ArthroLase, Australia; [2]Univ. of Western Australia, Australia.* This study investigated robotically-assisted laser arthroplasty for unicompartmental knee replacement in a cadaveric model. The system demonstrated capacity for large scale bone removal with submillimetre accuracy (0.57-0.61mm deviation), highlighting promise for arthroplasty applications.

W2A.6 • 11:45
Multimodal Imaging and AI-Based Analysis of Fungi Hyphae in Tissue Sections, Saskia M. Wolter[1], Lorenzo Vinco[2,3], Andrea Rabolini[3], Eleonora Erriquez[4], Eric Fantuzzi[4], Francesco Crisafi[4], Matteo Negro[4], Daniela Pelzel[1], Anna Mühlig[1], Ferdinand von Eggeling[1], David Pertzborn[1]; *[1]Department of Otorhinolaryngology, Jena Univ. Hospital, Germany; [2]NIREOS s.r.l., Italy; [3]Department of Physics, Politecnico di Milano, Italy; [4]Cambridge Raman Imaging S.r.l., Italy.* This research compares conventional staining techniques and advanced imaging approaches, including MALDI-MSI, HSI, and Stimulated Raman spectroscopic imaging, for enhancing fungal detection in tissue sections.

Room: ICM Hall B0
12:00 -- 14:00
W3A • Joint Posters Session III

W3A.1
A Tailor-Made Multiview Fluorescent Macro-Imaging Platform for the Investigation of Long-Distance Ca^{2+} Signaling in Adult Plants, Giorgia Tortora[1], Bianca M. Orlando Marchesano[2], Stefano Buratti[2], Matteo Grenzi[2], Andrea Bassi[1], Alex Costa[2], Alessia Candeo[1]; *[1]Politecnico di Milano, Italy; [2]Università degli Studi di Milano, Italy.* We present the development of a tailor-made double-view large field of view macro-imaging fluorescent system for studying the propagation of Ca^{2+} waves in adult plants in response to external stimuli.

W3A.2
Progress on the Development of Zebrafish Optoretinography System to Observe Light-Evoked Response of Retina, Hang Chan Jo[1], Robert J. Zawadzki[2,3], Dae Yu Kim[1]; *[1]Department of Electrical and Computer Engineering, Inha Univ., Korea (the Republic of); [2]UC Davis Eye-Pod Small Animal Ocular Imaging Laboratory, Department of Cell Biology and Human Anatomy, UC Davis, USA; [3]UC Davis Eye Center, Dept. of Ophthalmology & Vision Science, UC Davis, USA.* Optoretinography, an analysis of light-evoked morphological change of retinal structures based on optical coherence tomography image sequences, can provide insight into the underlying processes of the phototransduction activation cascade.

W3A.3
Towards Multi-View 3D Dental Imaging Based on Optical Coherence Tomography, Stephan Becker[1], Julia Grundmann[2], Antonia Starcke[1], Vincenz Porstmann[3], Christian Hannig[2], Jonas Golde[1]; *[1]Fraunhofer IWS, Germany; [2]Policlinic of Operative Dentistry, Periodontology and Pediatric Dentistry, TU Dresden, Faculty of Medicine, Germany; [3]Anesthesiology and Intensive Care Medicine, Clinical Sensoring and Monitoring, TU Dresden, Faculty of Medicine, Germany.* Dental imaging is a promising OCT application but limited in visualizing deeper structures and shadowed regions. We show the fusion of multi-view

volumetric teeth measurements based on refraction and optical delay correction, validated by µCT.

W3A.4
Novel Technique of Phase Stabilisation in Swept-Source OCT, Alejandro Martinez Jimenez[1], Adrian G. Podoleanu[1], Adrian Bradu[1]; *[1]Univ. of Kent at Canterbury, UK.* This work presents a technique to correct laser-induced phase variations in Swept-Source optical coherence tomography instruments. Preliminary results show significant improvement from an initial 3.6 radians to less than 0.1 radians when using our approach.

W3A.5
Femtosecond Bioprinting of Cellular Spheroids, Bastian Kreidl[1], Stefanie Sudhop[1], Heinz P. Huber[1], Hauke Clausen-Schaumann[1]; *[1]Hochschule München, Germany.* Facing the increasing popularity of 3D-cellular systems as alternative to classical 2D-culture models, Femtosecond Bioprinting (FSB) has been advanced, overcoming former geometrical constraints, now enabling the high precision transfer of individual mammalian cellular spheroids.

W3A.6
Development of Endoscopic Optical Coherence Tomography and *in-Vivo* Monitoring of the Inflammatory Bowel Disease in Mice, Muktesh Mohan[1,2], Kanwarpal Singh[1,2]; *[1]Max-Planck-Institut für die Physik des Lichts, Germany; [2]Max-Planck-Zentrum für Physik und Medizin, Germany.* We aim to create a non-invasive method for detecting IBD using a 1310 nm endoscopic optical coherence tomography (OCT) system. Mice with acute colitis underwent longitudinal colon imaging for real-time monitoring of disease progression.

W3A.7
Ex-Vivo Measurements of Eardrum Vibrations Using Optical Coherence Tomography, Pieter Lievens[2], Sam van der Jeught[2], Max Eldrett[1], Adrian Bradu[1]; *[1]Univ. of Kent, UK; [2]Univ. of Antwerp, Belgium.* We present a swept-source optical coherence tomography instrument purposely developed to measure the vibrational response of the rabbit eardrum. Our preliminary results suggest that the reduced thickness compared to the human eardrum allows for lower inertia, thus shifting the tympanic membrane's frequency response towards higher frequencies.

W3A.8
Accurate Measurements of the Axial Positions of High Reflective Layers in Spectral Domain Interferometry, Lucy Abbott[1], Adrian G. Podoleanu[1], Adrian Bradu[1]; *[1]Univ. of Kent, UK.* This work presents a method that accurately senses the absolute positions of highly reflective layers without requiring resampling of the interferometric chirped signals or compensating for unbalanced dispersion.

W3A.9
Image Quality Enhancement on OCTA Retina Images Using a Deep Neural Network, Berfin Dinç[1], Mahmut Kaya[4,3], Serhat Tozburun[2,1]; *[1]Izmir Biomedicine and Genome Inst., Dokuz Eylul Univ., Turkey; [2]Izmir Biomedicine and Genome Center, Dokuz Eylul Univ., Turkey; [3]Associate Professor Mahmut Kaya Clinic, Turkey; [4]Faculty of Medicine, Dokuz Eylul Univ., Turkey.* The study introduces an artificial intelligence algorithm that uses narrow-field data to enhance wide-field OCTA images. This enhancement improves image quality in en-face and depth, achieving

an 80% Structural Similarity Index with high-resolution B-scan images.

W3A.10
Adapting the Opto-Mechanical Characteristics of Intervertebral Discs for Photoacoustic Probing, Roman Allais[2], Valentin Espinas[1,4], Pauline Brige[3,4], Antoine Capart[1], Anabela Da Silva[1], Olivier Boiron[2]; *[1]Aix Marseille Univ, CNRS, Centrale Méditerranée, Institut Fresnel, France; [2]Aix Marseille Univ, CNRS, Centrale Méditerranée, IRPHE, France; [3]Aix-Marseille Univ, Centre Européen de Recherche en Imagerie Médicale (CERIMED), Marseille, France, France; [4]Aix-Marseille Univ, Laboratoire d'Imagerie Interventionnelle Expérimentale (LIIE), France.* We developed intervertebral disc phantoms using agarose and TiO2, enabling independent tuning of optical absorption and reduced scattering to match physiological values, while density and specifi c heat capacity remain within 10% of target values.

W3A.11
High Fluorescence of Phytochromes Does Not Require Chromophore Protonation, Franz-Josef Schmitt[1], Sagie Katz[2], Hoang Trong Phan[3], Fabian Rieder[1], Jan Laufer[1], Peter Hildebrandt[2]; *[1]Inst. of Physics, Martin-Luther-Universität Halle-Wittenberg, Germany; [2]Inst. of chemistry, Technische Universität Berlin, Germany; [3]Leibniz Inst. for New Materials, Germany.* Two single-domain phytochromes, miRFP670nano3 and miRFP718nano, contain BVs deprotonated at one of the inner pyrrole rings, which is unusual for tetrapyrroles in proteins. The rates of proton exchange most probable determine the fluorescence quantum yields.

W3A.12
The Fluorescence Yield of Red pH Sensitive Proteins is Mainly Determined by Stability and Internal Water Contact of the Chromophore, Franz-Josef Schmitt[1], Amna Shah[1], Hoang Trong Phan[2], Christian Tüting[3], Fabian Rieder[1], Alina-Sophie Henneberger[1], Farzin Ghane Gholmohamadi[1], Panagiotis L. Kastritis[3], Jan Laufer[1]; *[1]Inst. of Physics, Martin-Luther-Universität Halle-Wittenberg, Germany; [2]Leibniz Inst. for New Materials, Germany; [3]Inst. of Biochemistry and Biotechnology, Martin-Luther-Universität Halle-Wittenberg, Germany.* The different pH dependence of the time resolved fluorescence spectra in two red-shifted fluorescent proteins, mCardinal and mNeptune are explained by differences in internal water contact and H-bonds between chromophore and the surrounding residues.

W3A.13
An *in Vivo* Corneal Static Biomechanical Property Measurement Device Based on Optical Coherence Tomography and Negative Pressure Adhesion, Shaoqun Zeng[1], Honghao Wang[1], Jing Yuan[1], Yong Deng[1]; *[1]Wuhan National Laboratory for Optoelectronics, Huazhong Univ. of Science and Technology, China.* An *in vivo* corneal static biomechanical measurement device based on optical coherence tomography and negative pressure adhesion system was developed in this study, providing a new tool for clinical corneal biomechanical evaluation.

W3A.14
Stripe-Like Raster Scanning for Large-Area OCT Imaging, Rene Riha[1], Adrian G. Podoleanu[1], Manuel Marques[1], Adrian Bradu[1], Radu Boitor[2], Ioan Notingher[2]; *[1]Univ. of Kent, UK; [2]Univ. of Nottingham, UK.* By combining a galvo scanner with a motorised XY-stage, we propose stripe-like raster scanning for large-area OCT. We provide calculations for lateral dimensions, and test the technique on an 8 cm × 5 cm sample.

W3A.15
Wavelength Segmentation-Based Phase Analysis for Enhanced Axial Measurement Range in Full-Field Optical Coherence Microscopy, Minju Jeong[1], Jaeheung Kim[1], Hwidon Lee[1,2], Chang-Seok Kim[1,2]; *[1]Pusan National Univ., Korea (the Republic of); [2]Engineering Research Center for Color-Modulated Extra-Sensory Perception Technology, Korea (the Republic of).* SS-OCM enables submicron-resolution phase imaging but its measurement range is limited by 2π ambiguity. This study extends the axial range without system modifications by integrating wavelength-segmented phase imaging with FF-SS-OCM for bioimaging.

W3A.16
Stability-Enhanced Phase Measurement Through Optical Coherence Microscopy with a Stretched-Pulse Mode-Locked Laser, Jaeheung Kim[1], Seongjin Bak[1], Gyeong Hun Kim[2], Hwidon Lee[1], Chang-Seok Kim[1]; *[1]Pusan National Univ., Korea (the Republic of); [2]Wellman Center for Photomedicine, Harvard Medical School, USA.* We present a phase-stable swept-source optical coherence microscopy system utilizing a custom-built stretched-pulse mode-locked laser. Achieving milliradian phase stability and a 5-MHz A-line rate, our system enables high-precision phase imaging for advanced biomedical applications.

W3A.17
Adaptive DBSCAN for OCT Retinal Layer Segmentation Applications, Agata Gut[1], D Robert Iskander[1]; *[1]Wroclaw Tech, Poland.* A concept of an adaptive DBSCAN algorithm, incorporating local rotations of the designated core points, is proposed to improve the image processing tool that utilizes statistical information of OCT speckle for the retinal layer segmentation.

W3A.18
Application of Raman Spectroscopy for Ovarian Cancer Detection, Farhat Zeinab[1], Nicolas Errien[1], Romuald Wernert[2], Veronique Verriele[2], Frederic Amiard[1], Philippe DANIEL[1]; *[1]IMMM - UMR CNRS 6283, France; [2]Maine et Loire, ICO Paul Papin, France.* This study was to evaluate if Raman spectroscopy combined to chemometric method such as Principal Component Analysis could differentiate, in the case of Ovarian cancer between cancerous and normal tissues from different types of samples.

W3A.19
Efforts in Adapting a Raspberry Pi to Full-Field Optical Coherence Tomography, Taylor Sanderson[1], Adrian Bradu[1], Ranjan Rajendram[2], Adrian G. Podoleanu[1]; *[1]Univ. of Kent, UK; [2]Moorfields Eye Hospital, UK.* The adaptation of a Raspberry Pi and low-cost camera into a full-field OCT system is demonstrated. Challenges in utilising the low-cost components are discussed. Promise is shown for a compact and cost-effective OCT solution.

W3A.20
Enhancement of Retinal OCT Scans Using EDSR Model With an SSIM-Based Loss Function, Berfin Dinç[3], Mahmut Kaya[4,1], Serhat Tozburun[2,3]; *[1]Associate Professor Mahmut Kaya Clinic, Turkey; [2]Department of Biophysics, Faculty of Medicine, Izmir Biomedicine and Genome Center, Dokuz Eylul Univ., Turkey; [3]Izmir Biomedicine and Genome Inst., Dokuz Eylul Univ., Turkey; [4]Faculty of Medicine, Dokuz Eylul Univ., Turkey.* We present an EDSR model with an SSIM-based loss function, achieving an 88% SSIM score and an 11% improvement in similarity. This approach outperforms MSE-based EDSR and enhances the perceptual quality of retinal OCT images.

W3A.21
Understanding Dynamic Structures in Breast Cancer Spheroid by Full-Field and Point-Scanning Dynamic Optical Coherence Tomography, Ann M. Detje[1], Nobuhisa Tateno[2], Atsuko Furukawa[3], Rion Morishita[2], Yoko Miura[1], Satoshi Matsusaka[3], Yoshiaki Yasuno[2]; *[1]Inst. of Biomedical Optics, Univ. of Lübeck, Germany; [2]Computational Optics Group, Univ. of Tsukuba, Japan; [3]Faculty of Medicine, Univ. of Tsukuba, Japan.* We investigate fine dynamic structures of cancer spheroids by dynamic optical coherence tomography (DOCT) and fluorescence imaging. Small clusters of cells were found in DOCT images, and they were identified as apoptotic cells.

W3A.22
Impact of Defocus on OCT Signal Strength - Surface Model Versus Particle Model, Simon Hoffmann[1], Werner Nahm[1]; *[1]Inst. of Biomedical Engineering, Karlsruher Institut für Technologie, Germany.* OCT Signal strength shows a severe dependency on defocus. This dependency was found to be even more pronounced when comparing backscattering from particles to a planar surface. This result highlights the importance of focusing OCT.

W3A.23
Eye-Screen: A Compact Line-Field Spectral-Domain Optical Coherence Microscopy Design for Diabetic Peripheral Neuropathy Screening, Samuel J. Lawman[1], Uazman Alam[1], Yalin Zheng[1], Yao-Chun Shen[1]; *[1]Univ. of Liverpool, UK.* The device under development aims to measure sub-basal nerve loss. Here we present its updated measured performance metrics. Up to 1.1 M AScans/s, 70 (84) dB single frame SNR (absolute sensitivity) and ~2x2x2 µm resolution.

W3A.24
Fluorescence Lifetime Tomography, Fabian Rieder[1], Karl O. Schnelle[1], Jan Laufer[1], Franz-Josef Schmitt[1]; *[1]Department of Physics, Martin Luther Univeristy, Germany.* Time-resolved fluorescence tomography enables precise spatial differentiation of fluorophores with overlapping spectra. Using a scanning system, we acquired decay kinetics from a sample phantom filled with acridine orange and fluorescein, revealing distinct lifetime contrasts.

W3A.25
Detecting the Optical Sweeping Direction of a Fast Swept Source Without an Optical Spectrum Analyser, Adrian Fernandez Uceda[1], Adrian G. Podoleanu[1]; *[1]Univ. of kent, UK.* In this paper, a technique is presented for determining the sweeping direction of any swept source without recurring to optical spectrum measurements but using elements of the OCT system only.

W3A.26
Keeping Cells Alive in Microscopy, Herbert Schneckenburger[1], Christoph Cremer[2]; *[1]Hochschule Aalen, Germany; [2]Kirchhoff-Inst. for Physics, Univ. Heidelberg, Germany.* Non-phototoxic light doses in 3D and super-resolution microscopy range from a few mJ/cm2 up to more than 100 J/cm2 and strongly depend on wavelength, the mode of illumination as well as the illuminated light spot.

W3A.27
Visualization and Cellular Uptake of Carbon Dots in Ovarian Cancer Cells Using Label-Free Optical Microscopy, Vivek Rastogi[1], Pooria Lesani[1,2], Ashutosh Kumar[1], Neelkanth M. Bardhan[1,3], Paula T. Hammond[1], Angela M. Belcher[1]; *[1]Massachusetts Inst. of Technology, USA; [2]School of Science, RMIT Univ., Australia; [3]Break Through Cancer, USA.* Carbon dots (CDs) have emerged as a cutting-edge nanomaterial for bioimaging, offering exceptional photostability, tunable fluorescence, biocompatibility, and low toxicity. This study presents a label-free microscopy approach to analyze CDs interactions with ovarian cancer cells and their cellular dynamics.

W3A.28
Development of Stokes-Mueller Polarimetry Integrated With Machine Learning for Tissue Characterization, Sindhoora K. Melanthota[1], Spandana K U[1], Raghavendra U[1], Sharada Rai[1], KK Mahato[1], Nirmal Mazumder[1]; *[1]Manipal Academy of Higher Education, India.* We developed a machine learning (ML) enabled Stokes-Mueller microscope for the quantitative analysis of tissue specimen which provides key structural insights through various polarization parameters such as DOP, DOLP, DOCP, and anisotropy (r).

W3A.29
Fast and Ultrasensitive Multispectral SRS Imaging With new Light Source, Ingo Rimke[1], Lenny Reinkensmeier[2], Rene Siegmund[2], Gero Stibenz[1], Peter Trabs[1], Stefan Popien[1], Carli Canela[3], Xin Gao[3], Wei Min[3], Alexander Egner[2]; *[1]APE GmbH, Germany; [2]Department of Optical Nanoscopy, Inst. for Nanophotonics, Germany; [3]Department of Chemistry, Columbia Univ., USA.* A new picosecond light source for ultra-sensitive SRS microscopy allow imaging in the CH- and fingerprint region as well as of Raman labels. Its fast tuning of about one second enables easy multispectral SRS imaging.

W3A.30
How Visual Cortex Neurons Encode the External World: Miniaturized 2 Photon Calcium Imaging in Freely Moving Mice., Mathias Imezgaren[1], Guy Bouvier[2], Yannick Goulam Houssen[1]; *[1]Hearing Inst., France; [2]CNRS, France.* We recorded neuronal calcium signals using miniature two-photon microscopy during visual stimulation to understand how sensory representations in the visual cortex V1 are modulated by self-generated versus external motion.

W3A.31
Cell Identification Using Machine Learning of red Blood Cells and Blood Coagulation Structures in Flow Cytometry Using Digital Holographic Microscopy, Hideki Funamizu[1], Taiki Sasaki[1]; *[1]Muroran Inst. of Technology, Japan.* In this study, we report the cell identification using machine learning of morphological parameters based on phase information of red blood cells and blood coagulation structures in flow cytometry using digital holographic microscopy.

W3A.32
Hybrid Fractional Fourier Transform Framework for Off-Axis Digital Holographic Microscopy, Müge Topcu[1,2], Serhat Tozburun[1,2]; *[1]Izmir Biomedicine and Genome Center, Turkey; [2]Izmir International Biomedicine and Genome Inst., Dokuz Eylul Univ., Turkey.* A hybrid fractional Fourier transform (FrFT) framework was proposed to enhance the resolution of amplitude reconstructions in digital off-axis holographic microscopy by combining digital and optical FrFT approaches through a simulation study.

W3A.33
Active Optical Dispersion Manipulation for Line-Scanning Temporal Focusing Multiphoton Microscopy, Chia-Yuan Chang[1], Jui-Chi Chang[1], Cheng-Yu Lee[1], Ping-Hua Shih[1]; [1]*National Cheng Kung Univ., Taiwan.* Multiphoton-based temporal focusing microscopy provides fast and axial-resolved fluorescence imaging. With line-scanning mechanism, the axial resolution is improved. Furthermore, a two-stage optical dispersion manipulation is proposed for optimization of laser pulse width and multiphoton excitation.

W3A.34
High-Speed Time-Resolved Fluorescence Measurements with Minimal Distortion: Over 1.2 Photon per Period in TCSPC With a Hybrid Photodetector, Piergiorgio Daniele[1], Gennaro Fratta[1], Ivan Labanca[1], Giulia Acconcia[1], Ivan Rech[1]; [1]*Dipartimento di Elettronica, Informazione e Bioingegneria, Politecnico di Milano, Italy.* Time-Correlated Single-Photon Counting (TCSPC) enables the measurement of ultra-fast optical signals with picosecond resolution. However, measurement speed is limited by pile-up distortions. This work demonstrates an advanced correction method, enabling high-speed TCSPC with minimal distortion.

W3A.35
Implementation of Real Time Image Reconstruction and Visualization in Single Molecule Localization Microscopy, Pranjal Choudhury[1], Amalesh Kumar[1], Bosanta R. Boruah[1]; [1]*Indian Inst. of Technology Guwahati, India.* We present a method for near real-time single-molecule localization microscopy, enabling immediate super-resolved image visualization during acquisition. This approach reduces processing time and disk space usage, benefiting live-cell imaging and high-resolution clinical studies.

W3A.36
High-Speed Label-Free Imaging of Epithelial-Mesenchymal Transition in Cancer Cells by Stimulated Raman Microscopy, Maximilian Brinkmann[1], Felix Neumann[1], Ramon Droop[1], Steffen Ullmann[1], Thomas Würthwein[1], Tim Hellwig[1], Silke Morris[1], Eva Döpker[2], Björn Kemper[2], Jürgen Schnekenburger[2]; [1]*Refined Laser Systems, Germany;* [2]*Biomedizinisches Technologiezentrum, Universität Münster, Germany.* We present a high-speed, label-free Stimulated Raman Scattering (SRS) microscopy system for real-time epithelial-mesenchymal transition imaging in cancer cells.

W3A.37
3D Tracking Algorithm for *Neocaridina Davidi* in a Dual Camera System, Roberto Fernández[1], Diego Álvarez[2], Miguel Moscoso[2], Jorge Ripoll[3]; [1]*Departamento de Física, Ingeniería de Sistemas y Teoría de la Señal, Universidad de Alicante, Spain;* [2]*Departamento de Matemáticas, Universidad Carlos III de Madrid, Spain;* [3]*Departamento de Bioingeniería, Universidad Carlos III de Madrid, Spain.* A 3D tracking system for the invertebrate *Neocaridina davidi* was developed using a dual-camera setup and a 3D Object Tracking Algorithm. The algorithm's ability to extract locomotion dynamics, interindividual interactions, and environmental responses was evaluated using synthetic data, simulating shrimp movement under experimental conditions.

W3A.38
High-Resolution Fluorescence Imaging Reveals Heterogeneous Extracellular Matrix (ECM) in *Mycobacterium Tuberculosis (MTB)* Biofilms., Bei Shi Lee[1], Abigail Joyce Deloria[2], Mengyang Liu[2], Rainer A. Leitgeb[2], Wolfgang Drexler[2], Michael Berney[2,3], Richard Haindl[2]; *[1]Epidemiology, Biostatistics and Prevention Inst., Univ. of Zurich, Switzerland; [2]Center for Medical Physics and Biomedical Engineering, Medical Univ. of Vienna, Austria; [3]Albert Einstein College of Medicine, USA.* Fluorescence confocal imaging of *Mycobacterium tuberculosis* biofilms stained with NucGreen, Calcofluor White, and Concanavalin A Alexa Fluor 647 reveals bacilli in an ECM with β- and α-linked polysaccharide scaffolds, implicating drug tolerance and immune evasion.

W3A.39
***Liver Tumour Diagnostics Using an Optical Fibre Probe for Time-Resolved Autofluorescence Imaging*,** Dafne Suraci[1], Luca Tirloni[3], Chiara Gatto[3], Serena Pillozzi[4], Lorenzo Antonuzzo[4,5], Antonio Taddei[3,4], Riccardo Cicchi[1,2]; *[1]National Inst. of Optics, National Research Council (INO-CNR), Italy; [2]European Laboratory for Non-linear Spectroscopy (LENS), Italy; [3]Hepatobiliopancreatic Surgery, Careggi Univ. Hospital, Italy; [4]Univ. of Florence, Italy; [5]Oncology, Careggi Univ. Hospital, Italy.* In this study, we propose a novel fibre-based autofluorescence lifetime imaging probe for the diagnosis of hepatic cancer. Our approach facilitates real-time tumour margin delineation, thereby providing metabolic insights that enhance diagnostics and surgical precision.

W3A.40
Quad-SPIM: a Novel Light-Sheet Microscope for High-Speed Imaging of Human Brain Tissue, Laura Perego[1], Franco Cheli[1], Samuel Bradley[1,2], Danila Di Meo[1,3], Luca Giannoni[4], Josephine Ramazzotti[1], Michele Sorelli[1,5], Giacomo Mazzamuto[1,2], Irene Costantini[1,3], Francesco S. Pavone[1,2]; *[1]Univ. of Florence, European Laboratory for Non-Linear Spectroscopy, Italy; [2]Physics and Astronomy, Univ. of Florence, Italy; [3]Department of Biology, Univ. of Florence, Italy; [4]Department of Medical Physics and Biomedical Engineering, Univ. College London, UK; [5]Department of Information Engineering, Univ. of Florence, Italy.* Light-sheet fluorescence microscopy is a powerful imaging technique for neuroscience, enabling high-resolution, fast volumetric imaging of large brain tissues. We present a novel microscope using four wavelengths to simultaneously reveal structural details with micrometre precision.

W3A.41
3D Light-Sheet Tilted Image Reconstruction Pipeline Based on Image Formation Analysis, Lionel Hervé[1], Anne-Flore Mailland[1], Xavier Mermet[1], Benjamin Guillaud[1], Emily Tubbs[2], Chiara Paviolo[1], Camille Laporte[1], Pierre Blandin[1]; *[1]Univ. Grenoble Alpes, CEA, LETI, France; [2]Univ. Grenoble Alpes, CEA, INSERM, IRIG Biomics, France.* A fluorescence light-sheet microscope dedicated for monitoring organ-on-chips is reported. The constraints impose tilted imaging. We have modelled the phenomena in order to reconstruct the volumes faithfully and to optimise the geometric configuration.

W3A.42
Compact Fluorescence Microscope with Extended Depth-of-Field for Mitigating Jitters During Microgravity Simulation, Andy Shi[2], Hao Tang[1], Lingjie Kong[1]; *[1]Tsinghua Univ., China; [2]Tsinghua Univ. High School, China.* For real-time observation of biodynamics during microgravity simulation with random positioning machine, optical microscopes resisting jitters are required. We develop a compact fluorescence microscope of extended depth-of-field by >20-fold, significantly enhancing imaging stability and efficacy.

W3A.43
Tilted Lenses Take the Advantage of Lorentz Transformation to Rotate an Image Around the Axis of View, Matus Sobona[1], Radovan Sokol[2], Maik Locher[3], Jakub Belin[1,2]; *[1]Central European Inst. of Technology, Czechia; [2]Brno Univ. of Technology, Czechia; [3]Univ. of Glasgow, UK.* We present an imaging system, consisting of nine tilted lenses that perform an image rotation around the axis of view. For the design, Lorentz transformation and Wigner rotation are applied.

W3A.44
Advantages and Drawbacks of Back-Scattering Scanning Polarimetric Setups for Medical Applications, Bhanu P. Singh[1], Nadine A. Coorens[1,2], Vladislav Stefanov[1], André Stefanov[1]; *[1]IAP, Univ. of Bern, Switzerland; [2]Faculty of Science and Technology, Univ. of Twente, Netherlands.* We present two back-scattering scanning polarimetric setups that separate incoming and outgoing light using a beamsplitter and a mirror. We discuss their advantages, drawbacks, and compare effectiveness in determining a Mueller matrix for polystyrene suspension.

W3A.45
Moringa Leaf Powder and Seed Oil: Infrared, Raman and DFT Insights, Kashika Khatri[1], Urbi Kundu[2], Aparajita Bandyopdhyay[3], Amartya Sengupta[1]; *[1]Indian Inst. of Technology Delhi, India; [2]THz Spectroscopy and Imaging Laboratory, IIT Delhi, India; [3]JW Goethe Univ., Germany.* This study analyzes Moringa leaf powder and seed oil using Raman and Fourier Transform Infrared (FTIR) spectroscopy. Experimental results are supported by simulated theoretical spectra of key Moringa constituents.

W3A.46
Fiber-Coupled, sub-ps Ti-Sapphire Laser for Multi-Excitation Wavelength, Head-Mounted Two-Photon Excitation Fluorescence Microscopy of the Brain, Gergely Szipocs[1], Adam Krolopp[1,2], Shau Poh Chong[3], Peter Török[3], Robert Szipocs[1,2]; *[1]R&D Ultrafast Lasers Kft., Hungary; [2]HUN-REN Wigner RCP, Hungary; [3]Nanyang Technological Univ., Singapore.* A fiber-coupled, sub-ps Ti-sapphire laser operating in three wavelength regimes at around 810 nm, 920 nm and 1000 nm is introduced for *in vivo* nonlinear microscopy of the brain.

W3A.47
Light-Sheet Light-Field Macrophotography for Imaging Neuronal Structure, Kai-Lun Ting[1], Feng-Chun Hsu[1], Chun-Yu Lin[1], Bo-Heng Liu[2], Ann-Shyn Chiang[2], Shean-Jen Chen[1]; *[1]College of Photonics, National Yang Ming Chiao Tung Univ., Taiwan; [2]Brain Research Center, National Tsing Hua Univ., Taiwan.* We present a high-speed, high-resolution volumetric imaging system using light sheet illumination and light-field macrophotography, enabling rapid 3D reconstruction with enhanced resolution via microlens arrays and Richardson-Lucy deconvolution.

W3A.48
Intravital Mid-Infrared Pump and Probe Detection of Metabolites, Björn Puttfarcken[1,2], Constantin Berger[1,2], Jiawang Qiu[1,2], Miguel Pleitez[1,2]; *[1]Inst. of Biological and Medical Imaging, Helmholtz Zentrum München (GmbH), Germany; [2]Chair for Biological Imaging, Technical Univ. of Munich, Germany.* A mid-infrared pump–probe system was developed for non-invasive metabolite sensing, showing accurate spectral detection in samples, concentration-dependent responses, and in-vivo feasibility. The new sensor aims to enhance specificity through spectral unmixing.

W3A.49
Experimental Variabilities When Studying Plant Epidermal Monolayer Using Continuous Wave Terahertz Spectroscopy, Urbi Kundu[1], Mayuri Kashyap[2], Aparajita Bandyopdhyay[1], Amartya Sengupta[1]; *[1]Indian Inst. of Technology Delhi, India; [2]CSIR–Central Glass & Ceramic Research Inst. (CSIR–CGCRI), India.* Continuous-wave THz spectroscopy for real-time analysis of plant epidermal monolayer in exposed environmental conditions require study of experimental variabilities, crucial for generating relevant results.

W3A.50
Real-Valued Intensity Transmission Matrix Based Multimode Fibre Beamshaping for Biophotonics Applications, Hui Ma[1,2], Rekha Gautam[1], Stefan Andersson-Engels[1,3], Sanathana Konugolu Venkata Sekar[1,3]; *[1]Biophotonics, Tyndall National Inst., Ireland; [2]Engineering Science, Univ. College Cork, Ireland; [3]Physics, Univ. College Cork, Ireland.* A beam-shaping system based on the real-valued intensity transmission matrix of a multimode fiber manipulates illumination patterns at its distal tip enabling structured illumination diffuse reflectance for quantitative endoscopic applications.

W3A.51
Image-Reconstruction Algorithm for an Object Covered by a Strongly Scattering Layer, Also Applicable for 3D Imaging, Eliška Anna Michalicová[2], Jakub Belin[1,2]; *[1]Central European Inst. of Technology, Czechia; [2]Brno Univ. of Technology, Czechia.* We present an iterative algorithm for image reconstruction when the target object is covered by a strongly scattering layer.

Room: ICM Room 11
14:00 -- 15:30
W4B • Theory, Algorithms, and Modeling II
Presider: Turgut Durduran; ICFO -Institut de Ciencies Fotoniques, Spain

W4B.1 • 14:00
An Adaptive Stochastic Gauss-Newton Method for Optical Tomography Using the Monte Carlo Method, Jonna Kangasniemi[1], Meghdoot Mozumder[1], Aki Pulkkinen[1], Tanja Tarvainen[1]; *[1]Univ. of Eastern Finland, Finland.* An adaptive stochastic Gauss-Newton method for reconstructing absorption and scattering coefficients in optical tomography using the Monte Carlo method for light transport was developed. Based on numerical simulations, the method provides reconstructions with good accuracy.

W4B.2 • 14:15
Deep Tissue Characterization by Ultrasound Optical Tomography Hybrid Monte Carlo Model, Stefan Susnjar[2,1], Adam Kinos[2], Predrag Bakic[3,5], Sophia Zackrisson[5,4], Johannes Swartling[1], Stefan Kröll[2], Nina Reistad[2]; *[1]SpectraCure AB, Sweden; [2]Department of Physics, Lund Univ., Sweden; [3]Medical Radiation Physics, Department of Translational Medicine, Lund Univ., Sweden; [4]Department of Imaging and Physiology, Skåne Univ. Hospital, Sweden; [5]Diagnostic Radiology, Department of Translational Medicine, Lund Univ., Sweden.* We propose analytical expressions for ultrasound optical tomography and verify them in Monte Carlo simulations. The proposed hybrid analytical-statistical Monte Carlo model enables quantitative reconstruction of up to 5-centimetre deep tissue absorption inhomogeneities.

W4B.3 • 14:30
Digital Twin for Deriving Optical Properties of Turbid Media Using Cubic Spline-Parameterized Phase Functions, Levin Stolz[1], Alwin Kienle[1], Florian Foschum[1]; *[1]ILM Ulm, Germany.* We present a goniometric method combining Monte Carlo simulations and inverse fitting to extract optical properties of turbid media. Our approach improves phase function modeling via cubic splines, enhancing accuracy beyond the Henyey-Greenstein approximation.

W4B.4 • 14:45
Enhanced Imaging Through Scattering Tissue Using NIR Multispectral Fusion Techniques, Ariel Schwarz[1], Amir Shemer[1], Nisan Atiya[1], Yevgeny Beiderman[2], Yossef Danan[1]; *[1]JCE, Israel; [2]HIT, Israel.* This study introduces a non-invasive optical diagnostic method using near-infrared (NIR) imaging and image fusion techniques to detect internal tissue objects, like cancerous tumors, providing accurate reconstructions of hidden tissue layers in experimental setups.

W4B.5 • 15:00
Enhancing Deep Inclusion Localisation in Diffuse Optical Tomography by Time-Gated Datatypes, Ifechi Ejidike[1], Michael Tanner[1]; *[1]Heriot-Watt Univ., UK.* In diffuse optical tomography, measurements are much more sensitive to the surface. We explore how time-gated data-types could give insight into the correct normalisation to improve deep inclusion sensitivity.

W4B.6 • 15:15
NIRFASTerFF: An Open-Source Python Package for Efficient Photon Modeling, Jiaming Cao[1], Samuel Montero-Hernandez[1], Rickson Mesquita[1], Hamid Dehghani[1]; *[1]Univ. of Birmingham, UK.* This work presents a new Python package, NIRFASTerFF, an open-source, cross-platform, efficient, FEM-based tool for solving multi-modal photon modeling problems in diffuse optics, powered by highly parallelized algorithms on both CPU and CUDA-enabled GPU.

Room: ICM Room 22a
14:00 -- 15:30
W4C • Detection Technologies
Presider: Amir Rosenthal; Technion Israel Inst. of Technology, Israel

W4C.1 • 14:00 (Invited)
Light-Sheet Photoacoustic Imaging with Camera Based Ultrasound Detection, Kevin Schitter[1], Guenther Paltauf[1], Robert Nuster[1]; [1]*Univ. of Graz, Austria.* We propose two camera-based photoacoustic imaging methods to generate images with optical resolution, which utilize optical phase-contrast detection and structured-line excitation to reconstruct both 2D and 3D images, potentially improving spatial resolution and imaging speed.

W4C.2 • 14:30
Ultraviolet Optical-Resolution Photoacoustic Microscopy of Fresh Tissue Slices Using a Static Ultrasound Detector and Fast Galvo Scanning, Daniel Toader[1], Robert Nuster[1], Guenther Paltauf[1]; [1]*Karl-Franzens-Universitaet Graz, Austria.* Photoacoustic microscopy with optical resolution in the ultraviolet is demonstrated on fresh biological tissue. Model-based reconstruction generates depth-dependent images from signals generated by combining a static, focused ultrasound receiver and a rapidly scanned excitation beam.

W4C.3 • 14:45
2D Spiral Array with Single Element Microlenses for 3D Optoacoustic Imaging, Marc Fournelle[1], Wolfgang Bost[1], Christian Degel[1], Steffen Tretbar[1]; [1]*Fraunhofer IBMT, Germany.* We investigated the possibility to apply defocusing micro-lenses on a 2D spiral array based on a 4 MHz piezocomposite material. We showed an improvement of the opening angle from 16 to 37° and could reconstructed point targets with a FWHM of 420 µm.

W4C.4 • 15:00
Wide-Field Optical-Resolution Optoacoustic Microscopy Utilizing a Stationary Silicon-Photonics Acoustic Detector for Reflection and Transmission Imaging Configurations, Tamar Harary[1], Michael Nagli[1], Nathan Suleymanov[1], Ilya Goykhman[1], Amir Rosenthal[1]; [1]*Technion, Israel.* We present a novel OR-OAM system with a stationary silicon photonics acoustic detector (SPADE) with semi-isotropic sensitivity, enabling high-resolution, large-field imaging without acoustic path scanning. This advances clinical translation through a compact, miniature probe design.

W4C.5 • 15:15
Ultrasound Transmission Matrix Measurement Using an All-Optical System, Ron Moisseev[1], Amir Rosenthal[1]; [1]*Technion, Israel.* We designed an all-optical ultrasound system for transmission matrix measurement using optoacoustic generation and silicon-photonics-based detection, overcoming piezoelectric transducer limitations. The system enables wideband, omnidirectional response, high signal fidelity, and imaging capabilities were demonstrated.

Room: ICM Room 22b
14:00 -- 15:30
W4D • New Technology I
Presider: Adrian Podoleanu; Univ. of Kent, UK

W4D.1 • 14:00 (Invited)
Modelling Confocal and Offset Detection Paths of an Adaptive Optics Scanning Laser Ophthalmoscope to Guide Contrast Optimization, Julia Granier[1,2], Elena Gofas Salas[1,2], Kate Grieve[1,2], Peter Munro[3]; *[1]Institut De La Vision Paris, France; [2]CHNO des Quinze-Vingts, France; [3]Univ. College London, UK.* We present a model for confocal and offset detections in an adaptive optics scanning laser ophthalmoscope to enable optimized contrast and enhanced visualization of transparent retinal features.

W4D.2 • 14:30
Holoscopic Microendoscopy, Svea Höhl[1], Tim Eixmann[1], Martin Ahrens[2,3], Noah Heldt[2,3], Peter König[3,4], Ori Katz[5], Gereon Hüttmann[2,3]; *[1]Medical Lasercenter Lübeck, Germany; [2]Inst. of Biomedical Optics, Universität zu Lübeck, Germany; [3]Airway Research Center North (ARCN), German Center of Lung Research (DZL), Germany; [4]Inst. of Anatomy, Universität zu Lübeck, Germany; [5]Inst. of Applied Physics, Hebrew Univ. of Jerusalem, Israel.* We present a compact endoscopic holoscopy setup using multicore fibers (MCFs) for three-dimensional imaging of scattering tissues. This method, which integrates holographic recording, enables bend-insensitive imaging, improving the potential for optical biopsies.

W4D.3 • 14:45
3D Printed Encapsulated Microlens for Endoscopic Optical Coherence Tomography, Claudia Imiolczyk[1,2], Marco Wende[3], Alok K. Kushwaha[1,2], Lei Xiang[1,2], Nikoo Soltan[1], Harald Giessen[4], Robert A. McLaughlin[5,2], Claire F. Jones[1,2], Jiawen Li[1,2]; *[1]School of Electrical and Mechanical Engineering, The Univ. of Adelaide, Australia; [2]Inst. for Photonics and Advanced Sensing, The Univ. of Adelaide, Australia; [3]Inst. of Applied Optics and Research Center SCoPE, Univ. of Stuttgart, Germany; [4]4th Physics Inst. and Research Center SCOPE, Univ. of Stuttgart, Germany; [5]Faculty of Health and Medical Sciences, The Univ. of Adelaide, Australia.* We present a novel, robust, miniaturized 3D printed encapsulated probe for endoscopic optical coherence tomography, featuring improved mechanical stability, high-resolution, large-depth-of-focus in vivo imaging, demonstrated in a pig's intrathecal space, offering potential to advance diagnostics.

W4D.4 • 15:00
Hand-Held Fibre Optic 2D Scanner with Single 1D Actuation for Structural Imaging and Fluorescence Quantification, Muhammad Safwan Burhanudin[1], Alexander Yong[1], Nazihah Husna Abdul Aziz[1], Yixin Hong[1], Kaicheng Liang[1]; *[1]Nanyang Technological Univ., Singapore.* Cancer margins are difficult to differentiate by naked eye. Dual-modality OCT-guided and fluorescence detection using a piezoelectric bender scanner enabled simultaneous structural 3D information and fluorescence measurement. Validation experiments were performed on murine tissue.

W4D.5 • 15:15
Assessing Coronary Blood Flow in Vivo: a Quantitative Approach Using Intracoronary Doppler OCT, Fan Yang[1], Chenguang Li[4], Qingyue Tan[1], Wei Yu[1], Giovanni Luigi De Maria[2,5], Fu Wang[1], Jigang Wu[3], Shengxian Tu[1,2]; *[1]School of Biomedical Engineering, Shanghai Jiao Tong Univ., China; [2]Department of Cardiovascular Medicine, Univ. of Oxford, UK; [3]Univ. of Michigan-Shanghai Jiao Tong Univ. Joint Inst., Shanghai Jiao Tong Univ., China; [4]Department of Cardiology, Zhongshan Hospital, Fudan Univ., China; [5]Oxford Univ. Hospitals NHS Foundation Trust, Univ. of Oxford, UK.* We present a method for in vivo quantification of coronary blood flow using Doppler OCT, integrating phase noise reduction and Doppler angle compensation. Ex vivo and in vivo experiments demonstrate promising results for accurate assessments.

Room: ICM Room 5
14:00 -- 15:30
W4A • Raman Spectroscopy II
Presider: Rainer Leitgeb; Medizinische Universität Wien, Austria

W4A.1 • 14:00
Intraoperative Assessment of Oral Cancer Margins with Rapid Fiberoptic Raman Spectroscopy, Zhiwei Huang[1]; *[1]National Univ. of Singapore, Singapore.* We report the development of an intraoperative, real-time oral cancer demarcation platform using fiberoptic Raman spectroscopy with the accuracy of 91%, providing a robust and objective surgical margin diagnosis for OSCC patients.

W4A.2 • 14:15
Portable Handheld Probe-Based Confocal Raman System: a Versatile Tool for Non-Invasive Objective Assessment of Dermatological Conditions, Dinish U.S[1], Keertana Vinod Ram[1], Randall Ang[1], Renzhe Bi[1], Yik Weng Yew[2], Steven Tien Guan Thng[2], Malini Olivo[1]; *[1]A*STAR Skin Research Labs, Singapore; [2]National Skin Center, Singapore.* We report on the development and application of confocal Raman spectroscopy (CRS) system with a flexible handheld probe for non-invasive skin assessment, enabling detailed biochemical analysis in the epidermis to objectively evaluate various skin conditions.

W4A.3 • 14:30
Fiberoptic Raman Spectroscopy for in Vivo Detection of non-Muscle Invasive Bladder Cancer at Cystoscopy, Zhiwei Huang[1]; *[1]National Univ. of Singapore, Singapore.* A customized fiberoptic Raman spectroscopy system is developed to acquire in vivo bladder tissue Raman spectra for improving in vivo bladder early cancer detection during cystoscopic examination.

W4A.4 • 14:45
Raman Spectroscopy of Biofluids for the Detection of Lymph Node Metastasis in Oral Cancer Subjects: A Pilot Study, Panchali Saha[1,2], Poonam Joshi[1], Pankaj Chaturvedi[1], Murali Krishna C[1,2]; *[1]ACTREC, Tata Memorial Centre, India; [2]Homi Bhabha National Inst., India.* Lymph node metastasis is a critical prognostic indicator for oral cancers. Fusion model of serum and salivary Raman spectral data achieved correct identification of 100% node negative and 86% of node positive cases.

W4A.5 • 15:00
Cold Atmospheric Plasma Jet's Effect on Hamster Buccal Pouch Carcinogenesis: A Serum Raman Spectroscopy Study, Poonam Gawli[1], Kshama Pansare[1], Aksay Vaid[2], Arti Hole[1], Murali Krishna K. Chilakapati[1], Alphonsa Joseph[2], Mukesh Ranjan[2]; *[1]TMC-ACTREC, India; [2]IPR, India.* Cold atmospheric plasma jet treatment on hamster-buccal pouch cancers resulted in complete remission. Thus, suggesting as potential therapeutic approach for oral cancers. Further, findings also suggest efficacy of serum Raman spectroscopy in minimally invasive treatment monitoring.

W4A.6 • 15:15
Development of a Raman Spectroscopy Biofluid Interrogation Platform Applied to Lung Cancer Detection from Blood Plasma, Frédéric Leblond[1,2], Katherine Ember[1,2], Esmat Zamani Ahmad[1,2], Frédérick Dallaire[1,2], Éloise D'Amours[1,2], Marwa Boonas[1,2], Juliette Selb[1,2], Romane Le Roy Pépin[1,2], Guillaume Sheehy[1,2], Nassim Ksantini[1,3]; *[1]Polytechnique Montréal, Canada; [2]Research Center, Centre hospitalier de l'Université de Montréal, Canada; [3]CENTECH, Exclaro, Canada.* We present a low-cost lung cancer detection technique using a Raman spectroscopy biofluid platform. Our study is tested in 263 patients and may bring lung cancer screening to a wider population.

Room: ICM Room 11
16:00 -- 18:00
W5B • Machine Learning in Diffuse Optics
Presider: Davide Contini; Politecnico di Milano, Italy

W5B.1 • 16:00 (Invited)
High-Accuracy Diffuse Optical Tomography Using Neural Network Postprocessing, Jiaming Cao[1], Joe O. Evans[1], Emma Speh[2], Adam T. Eggebrecht[2], Hamid Dehghani[1]; *[1]Univ. of Birmingham, UK; [2]Washington Univ. in St Louis, USA.* A neural network can be used to postprocess and improve the spatial accuracy of DOT reconstruction. In both simulated and experimental data, the method significantly and consistently outperforms the classic smoothing-based postprocessing.

W5B.2 • 16:30
Diffuse Optical Tomography Using Deep Learning to Marginalize Errors due to Inaccurate Baseline Optical Parameters in Brain Imaging, Meghdoot Mozumder[1], Pauliina Hirvi[2], Ilkka Nissilä[2], Andreas Hauptmann[3], Jorge Ripoll[4], David E. Singh[4]; *[1]Itä-Suomen Yliopisto, Finland; [2]Aalto Univ., Finland; [3]Univ. of Oulu, Finland; [4]Universidad Carlos III de Madrid, Spain.* Diffuse optical tomography uses near-infrared light for 3D brain imaging. We simulated errors due to inaccurate baseline parameters and developed a deep learning technique that mitigated these errors, enhancing contrast and localization of activation changes.

W5B.3 • 16:45
BPU-Net: An Efficient End-to-End Deep-Learning Diffuse Optical Tomography Model for Structured Scan Data, Ben A. Fry[1], Rickson Mesquita[1], Hamid Dehghani[1], Robin B. Dale[1]; [1]*Univ. of Birmingham, UK.* Current DL-DOT architectures do not exploit dataset structures causing learning inefficiencies. This work evaluates network design based on dataset spatial structures; causing a 44% training time reduction, increased performance and reduced data requirements.

W5B.4 • 17:00
Transformer-Encoder for Real-Time DOT Scanning, Robin B. Dale[1], Nicholas Ross[2], Scott Howard[2], Thomas D. O'Sullivan[2], Hamid Dehghani[1]; [1]*Univ. of Birmingham, UK;* [2]*Univ. of Notre Dame, USA.* Deep-Learning based Diffuse Optical Tomography enables real-time clinical breast imaging, but current models are scanning-pathway-specific. Here, a transformer architecture is proposed to encode arbitrary scanning pathways, enabling flexible real-time imaging with a single trained model.

W5B.5 • 17:15
Non-Invasive Intracranial Pressure Estimation From Cerebral Blood Flow Dynamics Using Wavelet-Based Deep Learning, Viacheslav Danilov[1], Monica Torrecilla[2], Carolina Fajardo[2], Murad Al-Nusaif[2,3], Susanna Tagliabue[2], Jonas Fischer[2], Diego Lopez[3,4], Marta Peris[3], Maria Poca[3,4], Juan Sahuquillo[3,4], Turgut Durduran[2,5], Gemma Piella[1]; [1]*Department of Engineering, Universitat Pompeu Fabra, Spain;* [2]*Institut de Ciències Fotòniques, Spain;* [3]*Neurotraumatology and Neurosurgery Research Unit, Vall d'Hebron Research Inst., Spain;* [4]*Department of Neurosurgery, Vall d'Hebron Univ. Hospital, Spain;* [5]*Institució Catalana de Recerca i Estudis Avançats, Spain.* A wavelet decomposition network estimated intracranial pressure from pulsatile cerebral blood flow in 44 idiopathic normal pressure hydrocephalus patients, with 70% of windows showing less than 6 mmHg error for the 0–15 mmHg range.

W5B.6 • 17:30
Point-of-Care, Continuous Assessment of Multiple Biomarkers Using Long Wavelength Near Infrared Spectroscopy for Dialysis., Shree Krishnamoorthy[1], Walter Messina[1], Cian Kiely[2], Nicola Rossberg[2], Andrea Visentin[2], Ray Burke[1], Stefan Andersson-Engels[1]; [1]*Tyndall National Inst., Ireland;* [2]*School of Computer Science & IT, Univ. College Cork, Ireland.* Dialysis is a crucial treatment for chronic kidney disease. Long wavelength near-infrared (LWNIR) spectroscopy has potential for continuous, point-of-care monitoring during dialysis. LWNIR spectroscopy with novel calibration using liquid biophantoms is developed here to measure key biomarkers in a microfluidic system simulating dialysis channel.

W5B.7 • 17:45
Machine Learning-Enhanced Random Laser Sensing: Unveiling Scattering Anisotropy for Optical Property Characterization, Dongqin Ni[1,2], Florian Klaempfl[1,2], Michael Schmidt[1,2], Martin Hohmann[1,2]; [1]*Inst. of Photonic Technologies (LPT) - FAU, Germany;* [2]*Erlangen Graduate School in Advanced Optical Technologies (SAOT) - FAU, Germany.* We apply machine learning to enhance diffuse reflectance spectroscopy-random laser sensing, revealing that anisotropy factor g dominates random laser emission in the subdiffusive regime.

Room: ICM Room 22a
16:00 -- 18:00
W5C • Quantitative Imaging
Presider: Min Wu; Technische Universiteit Eindhoven, Netherlands

W5C.1 • 16:00
A Solid Phantom Recipe to Mimic Optical and Acoustic Properties of Biological Tissue, Katarzyna I. Komolibus[1], Andrea Doyle[3], Dermot Daly[3], Aoife M. Ivory[4], Baptiste Jayet[1], Stefan Andersson-Engels[1], Sanathana Konugolu Venkata Sekar[1,2]; *[1]Tyndall National Inst., Ireland; [2]BioPixs Ltd, Ireland; [3]RCSI, Ireland; [4]St Vincent Private Hospital, Ireland.* A photoacoustic phantom recipe mimicking wide range of optical and acoustic properties observed in human tissue is presented. Phantoms are characterized over broadband range of optical wavelengths and acoustic frequencies.

W5C.2 • 16:15
Does Medium Stiffness Affect Photoacoustic Image Intensity? a Phantom Study, Elahe Rastegar Pashaki[1], Ashkan Ghanbarzadeh Dagheyan[1]; *[1]Univ. of Twente, Netherlands.* This study examines the effect of medium stiffness on photoacoustic (PA) image intensity using agar phantoms. Results show increased PA image intensity when going from 1% to 2% agar, but reduced intensity at a higher concentration.

W5C.3 • 16:30
Realistic PA/US Simulations of Articular Cartilage, Roby Weeteling[1], Yuexin Qi[1], Corrinus C. van Donkelaar[1], Rob P. Janssen[1,2], Keita Ito[1], Richard G. Lopata[1], Min Wu[1]; *[1]Biomedical Engineering, Eindhoven Univ. of Technology, Netherlands; [2]Orthopaedic Surgery & Trauma, Maxima Medical Center, Netherlands.* A simulation method was developed to model PA/US image acquisition of cartilage, simulating both optical fluence and acoustic wave propagation. Osteoarthritis-related microstructure was incorporated, making it a promising tool for osteoarthritis research and diagnosis.

W5C.4 • 16:45
Digital Superphantoms for in Silico Thyroid Nodule Photoacoustics Imaging, Max Rietberg[1], Bram de Wilde[1], Jelmer Wolterink[1], Srirang Manohar[1]; *[1]Univ. of Twente, Netherlands.* Thyroid nodules occur in almost two-thirds of the population. Diagnostic imaging with ultrasound could benefit from the addition of photoacoustics. In silico testing and optimisation of this combination is possible with superphantoms.

W5C.5 • 17:00
Opto-Mechanical Characterization of the Intervertebral Disc Using Photoacoustic Imaging, Antoine Capart[1], Roman Allais[2], Julien Wojak[1], Olivier Boiron[2], Anabela Da Silva[1]; *[1]Aix Marseille Univ, CNRS, Centrale Méditerranée, Institut Fresnel, France; [2]Aix Marseille Univ, CNRS, Centrale Méditerranée, IRPHE, France.* This study introduces quantitative photoacoustic imaging to assess intervertebral disc degeneration, characterized by dehydration and associated degenerative diseases, offering a novel approach to evaluate disc health and advance diagnostic techniques.

W5C.6 • 17:15
Quantitative Photoacoustic Imaging of Simulated Carotid Plaque, Mervenur Akkus[1], Anjali Thomas[1], Sowmiya Chandramoorthi[2], Gijs van Soest[1], Francis Kalloor Joseph[1]; *[1]Erasmus MC, Netherlands; [2]Verasonics Inc, USA.* We propose a method using arterial blood as a fluence marker for quantitative photoacoustic imaging of carotid plaques. We demonstrate this approach with simulated carotid plaques and validate the method through experiments.

W5C.7 • 17:30
Acoustic Background Noise in Photoacoustic Tomography, Dylan M. Marques[1], David Martin-Sanchez[2,3], Olumide Ogunlade[1,3], Edward Zhang[3], Paul Beard[3], James Guggenheim[1,3]; *[1]Univ. of Birmingham, UK; [2]CSIC, Spain; [3]Univ. College London, UK.* To characterize the limits of detection sensitivity in photoacoustic imaging, we applied ultra-sensitive sensors to measure the “acoustic background” – random pressures arising from thermal vibrations. The results could help guide the design of photoacoustic systems.

W5C.8 • 17:45
Towards Quantitative Photoacoustic Imaging Assisted by Ultrasound Power Doppler, Ivana Falco[1], Charlotte Constans[1], Emmanuel Bossy[1], Bastien Arnal[1]; *[1]Univ. Grenoble Alpes, CNRS, LiPhy, France.* Quantitative photoacoustic imaging involves an optical inverse problem asking for priors. We propose to add Ultrasound Power Doppler information to: 1) measure the fluence in blood vessels, 2) solve the inverse problem for (μa, μ′s).

Room: ICM Room 22b
16:00 -- 18:00
W5D • New Technology II

W5D.1 • 16:00 (Invited)
Phase-Code Mode-Locked Laser at 1060 nm for Circular-Ranging Optical Coherence Tomography, Danielle J. Harper[1,2], Hyun-Sang Park[2,3], Tae Shik Kim[2,3], Yong-Chul Yoon[2,3], Jongyoon Joo[2,3], Norman Lippok[2,3], Benjamin J. Vakoc[2,3]; *[1]Univ. of Cambridge, UK; [2]Wellman Center for Photomedicine, Massachusetts General Hospital, USA; [3]Harvard Medical School, USA.* Phase-code mode-locking can be used to create stepped frequency comb sources for optical coherence tomography, but has only been demonstrated at telecommunication wavelengths. We have constructed a phase-code mode-locked laser with a retinal-imaging-compatible 1060 nm central wavelength.

W5D.2 • 16:30
Stretched-Pulse Active Mode-Locking Comb Swept Laser Without Fabry-Pérot Etalon for Subsampled Optical Coherence Tomography, Seongjin Bak[1], Gyeong Hun Kim[2], Hwidon Lee[1], Chang-Seok Kim[1]; *[1]Pusan National Univ., Korea (the Republic of); [2]Wellman Center for Photomedicine, Harvard Medical School and Massachusetts General Hospital, USA.* We present a stretched-pulse active mode-locking comb-swept laser without Fabry-Pérot etalon for subsampled OCT. This etalon-free design improves spectral stability, reduces acquisition burden, and enhances high-speed imaging, advancing OCT applications in biomedical and industrial fields.

W5D.3 • 16:45
High-Speed, Long-Range SS-OCT Imaging Based on HCG-VCSEL and Real-Time Calibration Framework, Chien-Hua Peng[1], Kuang-Lei Haung[1], Jian-Zhi Wang[1], Jyh-Tsung Hsieh[2], Hsiang-Chieh Lee[1]; *[1]National Taiwan Univ., Taiwan; [2]Bandwith10 Ltd., USA.* In this study, we have developed a SS-OCT system using an HCG-VCSEL wavelength-swept laser with a calibration interferometer for real-time k-calibration, achieving real-time, long-range imaging of a full eye model and a stepped 3D-printed model at an A-scan rate of 30 kHz.

W5D.4 • 17:00 (Invited)
Megahertz FDML Laser With on-the-fly Adjustable Sweep Rate Between 835 kHz and 13.4 MHz, Simon Lotz[1], Wolfgang Draxinger[1], Anneli Dick[1], Robert Huber[1,2]; *[1]Universität zu Lübeck, Germany; [2]Medizinisches Laserzentrum Lübeck GmbH, Germany.* We present a Megahertz FDML laser which can be automatically, and on-the-fly switched to speed values between 830 kHz and 13.4 MHz using optical switches in the buffer stage.

W5D.5 • 17:30
Lifting Constraints on Multi-kHz Raster-Line Scanning Frequency Matching in Multi-MHz Swept-Source OCT Imaging Systems, Wolfgang Draxinger[1,2], Simon Lotz[1], Allegra Behr[1], Madita Göb[1], Robert Huber[1]; *[1]Univ. of Lübeck, Germany; [2]Medical Laser Center Lübeck, Germany.* The established synchronization scheme of *swept source optical coherence tomography (SS-OCT)* calls for the raster-line frequency to be a remainder-less divider of the sweep frequency. Two methods are presented that increase flexibility in scanner operation.

W5D.6 • 17:45
Dual Laser Full-Field Fourier-Domain Optical Coherence Tomography for Improving Axial Resolution, Sarvesh A. Thakur[1], Nelson P. Klooster[1], Dierck Hillmann[1]; *[1]Vrije Universiteit Amsterdam, Netherlands.* We demonstrate a high (axial) resolution Full-Field Fourier-Domain optical coherence tomography (FF-FD-OCT) system by computationally stitching the OCT spectra from two independently sweeping lasers. The results are validated using different samples.

Room: ICM Room 5
16:00 -- 18:00
W5A • Pre-Clinical and Clinical Studies Oncology and More
Presider: Paola Taroni; Politecnico di Milano, Italy

W5A.1 • 16:00
Statistical Analysis of Infrared Spectroscopy for Diagnosing Inflammatory Bowel Disease-Associated Cancer, Eric Kumi-Barimah[1], Raneen Toman[1], Sharib Ali[1], Animesh Jha[1], Venkataraman Subaraman[1]; *[1]Univ. of Leeds,, UK.* We report mid-IR spectroscopic analysis of colorectal tissues collected from IBD patients. PCA and HCA models were adopted to differentiate between the IBD patients of low/high-risk and those with CRC by providing a visual graphical distinction.

W5A.2 • 16:15
Real-Time Evaluation of Polyps During Colonoscopy Using Fibre-Optic Microscopy with Ultraviolet Surface Excitation, Alexander Yong[1], Nazihah Husna Abdul Aziz[1], Ko Hui Tan[1], Gaurav Manek[2], Rachel Rui Yi Sim[2], Rachel Loi[3], Gwyneth Shook Ting Soon[3], Dedrick Kok Hong Chan[3], Kaicheng Liang[1]; *[1]Nanyang Technological Univ., USA; [2]Agency for Science, Technology and Research, Singapore; [3]National Univ. Hospital, Singapore.* The evaluation of excised samples during endoscopy could inform intra-operative decisions and reduce pathology workload. Fibre-optic microscopy with ultraviolet surface excitation was deployed in a colorectal surgery department for polyp imaging, with correlation to histopathology.

W5A.3 • 16:30
Autofluorescence Lifetime Imaging Probe for Optical Diagnostics of Liver Tumors, Dafne Suraci[1], Luca Tirloni[2], Chiara Gatto[2], Serena Pillozzi[3], Lorenzo Antonuzzo[4,2], Antonio Taddei[2,4], Riccardo Cicchi[1,5]; *[1]CNR INO, Italy; [2]Hepatobiliopancreatic Surgery, Careggi Hospital, Italy; [3]Experimental and Clinical Biomedical Sciences, Univ. of Florence, Italy; [4]Experimental Clinical Medicine, Univ. of Florence, Italy; [5]European Laboratory for Non-linear Spectroscopy (LENS), Italy.* We present a fiber-based autofluorescence lifetime imaging probe for hepatic cancer diagnostics. Our approach enables real-time tumor margin delineation and differentiation between different tumors, providing metabolic insights that enhance oncological diagnostics and surgical precision.

W5A.4 • 16:45
Polarization-Sensitive Imaging of Uterine Cervical Structures, Jessica C. Ramella-Roman[1], JunZhu Pei[1], Tananant Boonya-Ananta[1], Ajmal Ajmal[1], Amanda Sanchez[1], Andres Rodriguez[1]; *[1]Florida International Univ., USA.* In this study, we utilize multimodal and polarization-sensitive imaging approaches to obtain a comprehensive perspective on uterine cervix remodeling. This contributes to improved assessments of Spontaneous Preterm Birth risk and its underlying mechanisms.

W5A.5 • 17:00
Noninvasive in-Vivo Bone Characterisation, Hui Ma[1,3], Sanathana Konugolu Venkata Sekar[1,2], Pranav Lanka[1], Suraj Kumar Kothuri[1,3], Stefan Andersson-Engels[1,4], Rekha Gautam[1]; *[1]Tyndall National Inst., Ireland; [2]BioPixS Ltd, Ireland; [3]Engineering Science, Univ. College Cork, Ireland; [4]Physics, Univ. College Cork, Ireland.* We optimised spatial offset in a dual-wavelength Raman setup to assess bone quality, extracting deep-tissue chemical information beyond conventional methods. Validation with phantoms and in vivo measurements confirmed its effectiveness.

W5A.6 • 17:15
Transcutaneous Fluorescence Spectroscopy for Non-Invasive Assessment of Small Bowel Permeability in Patients with Irritable Bowel Syndrome Undergoing Low FODMAP Diet, Qian Chen[1], Nilanjan Mandal[1], Pratik Ramkumar[2], Yabiz Sardar[2], Karl K. Yong[3], James Alexander[3], Sophie Stevens[3], Nisha Patel[3], Hutan Ashrafian[2], Ara Darzi[2], Alexander J. Thompson[1]; *[1]The Hamlyn Centre, imperial College Lond, UK; [2]Imperial College London, UK; [3]Imperial College Healthcare NHS Trust, UK.* Transcutaneous fluorescence spectroscopy was used to assess intestinal barrier function non-invasively in irritable bowel syndrome (IBS), demonstrating effective discrimination between IBS patients and healthy volunteers and showing changes in IBS on low FODMAP diet.

W5A.7 • 17:30
Multispectral Optical Sensor for Psychological Stress Detection in Skin, Victoria Barygina[1], Enrico Baria[1], Elena Cravero[2,3], Francesco Goretti[3], Francesco S. Pavone[1,3]; *[1]Univ. of Florence, Italy; [2]Campus Bio Medico Univ. of Rome, Italy; [3]LENS - European Laboratory for Non-Linear Spectroscopy, Italy.* We aim to individuate psychological stress-related skin response with a high-throughput multimodal combination of optical techniques. A multimodal approach achieved 100% accuracy in classifying “no-stress” and “stress” conditions.

W5A.8 • 17:45
Dynamic Properties of Retinal Vessels’ Morphology Observed With High-Resolution Scanning Laser Ophthalmoscope, Julia A. Kochanska[1], Maciej Nowakowski[2], Patrycjusz Stremplewski[1], Edyta Dabrowska[3,4], Carlos López-Mariscal[1], Marcin Sylwestrzak[1], Krzysztof Dalasinski[2], Jacek Wolf[3,4], Marcin Hellmann[3,4], Krzysztof Narkiewicz[3,4], Anna Szkulmowska[2], Maciej Szkulmowski[1]; *[1]Faculty of Physics, Astronomy and Informatics, Nicolaus Copernicus Univ. in Torun, Poland; [2]Inoko Vision Ltd. L.P., Poland; [3]Faculty of Medicine, Medical Univ. of Gdansk, Poland; [4]Center for Translational Medicine, Medical Univ. of Gdansk, Poland.* We present an advanced scanning laser ophthalmoscope for imaging retinal microcirculation. By tracking vascular parameters over time, we extract changing pulse frequencies, providing insight into vascular dynamics relevant for cardiovascular and neurovascular research.

Thursday, 26 June
Room: ICM Room 11
08:30 -- 10:00
Th1B • Advances in Instrumentation and Technology IV
Presider: Dirk Grosenick; Physikalisch Technische Bundesanstalt, Germany

Th1B.1 • 08:30
A Miniature Sensor Board for Smarter Near-Infrared Diffuse Optical Spectroscopy Probes, M. Atif Yaqub[1], Marta Zanoletti[1], Lorenzo Cortese[1], Daniel Senciales[1], Ameer Ghouse[1], Jonas Fischer[1], Turgut Durduran[1,2]; *[1]ICFO -Institut de Ciencies Fotoniques, Spain; [2]Institució Catalana de Recerca i Estudis Avançats (ICREA), Spain.* A miniaturized sensor board, designed to enhance data quality monitoring, probe placement standardization and laser safety for near-infrared diffuse optical spectroscopy probes. It combines touch, force, light, and motion sensors, providing practical real-time monitoring of data-quality, rapid response for laser safety and probe placement guidance.

Th1B.2 • 08:45
Optical and Ultrasound Measurements for Artery Diameter Extraction for Blood Pressure Monitoring, Milena Sofra[1], Augustin Vernay[1], Elodie Cao[1], Laurent Gerfault[1], Rémi Gerbelot[1], Mathieu Perriollat[1], Guillaume Blanquer[1], Pierre Blandin[1]; *[1]CEA-LETI, France.* We examine the correlation between optical and ultrasound synchronized signals. Measurements are conducted on a custom-made experimental bench, on a representative medium. We demonstrate that the optical signals contain the information on the artery diameter.

Th1B.3 • 09:00
Simulation of an Optical Microneedle Interface for Arterial Dynamics Measurement via Photoplethysmography, Guillaume Blanquer[1], Sacha Juillard[1], Mathieu Perriollat[1], Marianne Consonni[1], Isabelle Texier[1], Anne Planat-Chretien[1]; *[1]CEA - LETI, France.* Optical Microneedle Interface enhances both the injection of light into biological tissues and the sensitivity of detecting targeted physiological parameters. We present simulation that highlight the impact of a microneedle interface on improving the monitoring of arterial dynamics.

Th1B.4 • 09:15
Determination of Depth-Dependent Dynamic Properties of Turbid Media Using Frequency-Modulated Scattering Holography, Binbin Zhang[1], Sophinese Iskander-Rizk[1], Nandini Bhattacharya[1]; *[1]TU Delft, Netherlands.* We propose to use a frequency-modulated light source and a high-speed camera to simultaneously measure the optical and depth-dependent dynamic properties of turbid media. This approach mitigates bandwidth limitations encountered by previously demonstrated interferometric near-infrared spectroscopy techniques.

Th1B.5 • 09:30
Exploration of Polarization Speckle Metrics to Characterize Scattering Properties of Turbid Media, Carla Kulcsar[2], Daniel Louie[1], Alex Vitkin[1,2]; *[1]UHN, Canada; [2]Medical Biophysics, Univ. of Toronto, Canada.* This study leverages the statistical properties of polarization speckles to characterize turbid optical phantoms that emulate cancer-related optical changes. A new framework of custom metrics is explored.

Th1B.6 • 09:45
Room-Light Operation of a Three-Wavelength Spatial Frequency Domain Imaging System Using Pulsed Illumination and an 8-Tap CMOS Image Sensor, Yu Feng[1], Chen Cao[1], Keita Yasutomi[1], Shoji Kawahito[1], Gordon T. Kennedy[2], Anthony Durkin[2], Keiichiro Kagawa[1]; [1]*Shizuoka Univ., Japan;* [2]*Univ. of California, Irvine, USA.* We demonstrate room-light operation of a three-wavelength spatial frequency domain imaging system using an 8-tap CMOS image sensor synchronized with high-peak-power, low-duty-cycle pulsed LEDs, achieving ambient light suppression at 282 lux and motion artifact suppression.

Room: ICM Room 5
08:30 -- 10:00
Th1A • Novel Light Sources and Beams
Presider: Mads Bergholt; King's College London, UK

Th1A.1 • 08:30
Polarization-Resolved OCT: Enhancing Retinal Band Interpretation and Functional Optoretinography, Xincheng Yao[1], Shaiban Ahmed[1], Taeyoon Son[1]; [1]*Univ. of Illinois at Chicago, USA.* Polarization-resolved optical coherence tomography differentiates ballistically reflected and multiply scattered photons, improving retinal layer interpretation and functional optoretinography. Parallel-polarization OCT reveals light-induced photoreceptor outer segment shrinkage; cross-polarization OCT highlights dynamic scattering properties.

Th1A.2 • 08:45
Towards Detection of Analytes in Biotissues Using Twisted Light with Orbital Angular Momentum, Alexander Bykov[1], Anton Sdobnov[1], Ivan Lopushenko[1], Igor Meglinski[2]; [1]*Univ. of Oulu, Finland;* [2]*Aston Univ., UK.* This study explores OAM beams for analyte sensing in biological tissues. Demonstrating robust phase memory, our approach enables non-invasive glucose detection in scattering media, offering a highly sensitive optical technique for biomedical diagnostics.

Th1A.3 • 09:00
Angular Light Scattering for Quantification of the Fat Concentration in Human Milk, Wietske Verveld[1], Johanna R. de Wolf[1], Wilma Petersen[1], Nienke Bosschaart[1]; [1]*Biomedical Photonic Imaging, Univ. of Twente, Netherlands.* Human milk fat measurements are crucial for lactation care and research. We present the potential of angular light scattering for fat content quantification, based on goniometric measurements and fat globule sizes of fifty milk samples.

Th1A.4 • 09:15
Orbital Angular Momentum Light in Complex Media: Propagation, Preservation, and Applications, Fatima Khanom[1], Nawal Mohamed[1], Ivan Lopushenko[2], Anton Sdobnov[2], Alexander Doronin[3], Alexander Bykov[2], Edik Rafailov[1], Igor Meglinski[1]; [1]*Aston Univ., UK;* [2]*Univ. of Oulu, Finland;* [3]*Victoria Univ. of Wellington, New Zealand.* We investigate twisted light propagation in turbid media, demonstrating phase memory retention despite microscopic scattering. Simulations and experiments reveal high refractive index sensitivity and a novel phase preservation framework, benefiting biomedical imaging, secure optics, and precision applications.

Th1A.5 • 09:30
Quartz Tuning Fork as Photodetector for Benzene Monitoring Beyond 12 µm, Lavinia A. Mongelli[1], Andrea Zifarelli[1], Kumar Kinjalk[1], Alexei Baranov[1], Oijie Wang[1], Pietro Patimisco[1], Vincenzo Spagnolo[1], Angelo Sampaolo[1]; *[1]PolySense, Italy.* A novel sensor for detecting BTEX compounds was developed using light-induced thermoelastic absorption spectroscopy (LITES). The system employed an InAs/AlSb quantum cascade laser (14.85 µm) and a custom quartz tuning fork photodetector, with benzene selected as case study.

Th1A.6 • 09:45
Orbital Angular Momentum Beams in Turbid Media for High-Precision Diagnostics, Nawal Mohamed[1], Fatima Khanom[1], Diana Galiakhmetova[1], Anton Sdobnov[2], Ivan Lopushenko[2], Alexander Bykov[2], Edik Rafailov[2], Igor Meglinski[1]; *[1]Aston Univ., UK; [2]Univ. of Oulu, Finland.* We investigate propagation and phase stability of Orbital Angular Momentum beams in turbid tissue-like scattering medium, demonstrating its robustness for high-precision diagnosis of tissue samples, with potential for refractive index sensing in complex biological environments.

Room: ICM Room 11
10:30 -- 12:00
Th2B • Theory, Algorithms, and Modeling III
Presider: Giulia Maffeis; Politecnico di Milano, Italy

Th2B.1 • 10:30
A new Method to Optimize Measurement Conditions for Fluorescence Spectroscopy Systems for Intraoperative Glioma Delineation, Arthur Gautheron[1,2], Raphaël Clerc[3], Charly Caredda[1], Mathieu Hébert[3], Bruno Montcel[1]; *[1]CREATIS, France; [2]CPE, France; [3]Univ Lyon, UJM-Saint-Etienne, CNRS, Institut d Optique Graduate School, Lab. Hubert Curien UMR 5516, France.* 5-ALA-induced PpIX fluorescence has been proposed to improve the identification of benign from malignant brain tumors during surgery. Based on simulation, this work helps at determining the best operating measurement conditions for estimating PpIX concentration.

Th2B.2 • 10:45
Simulated Near Infrared Database for Fluorescence Diffuse Optical Tomography, Martin Rodriguez-Vega[1], Pascal Nguyen[1,2], Julien Wojak[1], Maxime Henry[3], Véronique Josserand[3], Anabela Da Silva[1]; *[1]Aix Marseille Univ, CNRS, Centrale Med, Institut Fresnel, France; [2]Kaer Labs, France; [3]Inst. for Advanced Biosciences, Univ. Grenoble Alpes, INSERM U1209, CNRS UMR 5309, France.* This paper presents a methodology for constructing a simulated fluorescence tomography database. It details dataset generation, geometry, optical properties, solvers and data processing. The database ensures reproducibility and supports AI applications in biomedical imaging.

Th2B.3 • 11:00
Symbolic Monte Carlo for Quantifying Fluorescent Biomarkers in Neurosurgical Intraoperative Imaging, Luis A. Martinez Cesena[1,2], Arthur Gautheron[1,3], Maxime Roger[2], Mathieu Galtier[2], Laurent Mahieu-Williame[1], Agnes Delmas[2], Bruno Montcel[1]; *[1]CREATIS, France; [2]INSA Lyon, France; [3]Universite Jean Monnet Saint-Etienne, France.* Symbolic Monte Carlo methods are employed to quantify the fluorescent biomarker Protoporphyrin IX, utilized in neuro-oncology. The outcome matches the experimental measurements setting SMC simulations as a promising tool for intraoperative imaging neurosurgery.

Th2B.4 • 11:15
Sparse-View Cherenkov Imaging Reconstruction Algorithm via Markov Projection Dynamic Prior, Hu Zhang[1,2], Ting Hu[2], Zhonghua Sun[2], Zhe Li[2], Kebin Jia[2], Jinchao Feng[2]; *[1]Univ. of Birmingham, UK; [2]Beijing Univ. of Technology, China. A sparse-view Cherenkov imaging reconstruction method is presented using Markov projection dynamic prior. Experimental results show that this proposed method yields the highest Peak Signal-to-Noise Ratio (PSNR) values of Cherenkov images (23.91 dB and 22.40 dB).*

Th2B.5 • 11:30
Time Domain Raman Forward Solver in a two-Layer Diffusive Medium, Andrea Farina[2], Naseer Kammalamuriyil[1], Alessandro Bossi[3], Valerio Gandolfi[3], Ilaria Bargigia[3], Antonio Pifferi[3], Stefan Susnjar[4], Federico Tommasi[1], Fabrizio Martelli[1]; *[1]Dipartimento di Fisica e Astronomia, Universita degli Studi di Firenze, Italy; [2]Istituto di Fotonica e Nanotecnologie, Consiglio Nazionale delle Ricerche, Italy; [3]Dipartimento di Fisica, Politecnico di Milano, Italy; [4]SpectraCure AB, Sweden.* An analytical model to describe the time domain reflectance Raman signal in a two-layer diffusive medium was developed. The accuracy of the model is verified by comparison with the results of Monte Carlo simulations.

Th2B.6 • 11:45
Time-Domain Diffuse Optical Tomography with Pattern Illumination and Detection: Modeling and Simulation, Jarjish Rahaman[1], Meghdoot Mozumder[1], Giovanna T. Carneiro[2], Andrea Farina[2], Tanja Tarvainen[1]; *[1]Univ. of Eastern Finland, Finland; [2]Istituto di Fotonica e Nanotecnologie, Consiglio Nazionale delle Ricerche, Italy.* Use of structured illumination and detection in time-domain diffuse optical tomography was studied using simulations. Absorption and scattering distributions were reconstructed in frequency domain utilising truncated Fourier series approximation and different orders of spatial patterns.

Room: ICM Room 22a
10:30 -- 11:15
Th2C • Joint Postdeadline Paper Session

Th2C.1 • 10:30 Postdeadline Submission
High-Resolution Dynamic Full-Field Optical Coherence Microscopy for Deep Tissue Cellular Imaging, Erikas Tarvydas[1], Austeja Treciokaite[1], Urte Neniskyte[2], Egidijus Auksorius[1]; *[1]Ctr. for Physical Sciences & Technology, Lithuania; [2]Life Sciences Center, Vilnius Univ., Lithuania.* We demonstrate high-resolution (250 nm) and deep (>100 µm) imaging of various ex vivo mouse tissues using dynamic full-field optical coherence microscopy (FF-OCM), enabled by 100x objectives and a high-brightness white light source.

Th2C.2 • 10:45 Postdeadline Submission
Broadband Micro-Rheology of a Single Chromosome – Exploring the Role of the Chromosome Periphery, Tania Mendonca[1], Roman Urban[2], Kellie Lucken[1], George Coney[1], Neil Kad[2], Manlio Tassieri[3], Amanda J. Wright[1], Daniel Booth[1]; *[1]Univ. of Nottingham, UK; [2]Univ. of Kent, UK; [3]Univ. of Glasgow, UK.* Using two optical traps we explore the biophysical properties of individual chromosomes, studying the role of the chromosome periphery, and present a novel analysis method to explore mechanical properties over 7 decades of frequency.

Th2C.3 • 11:00 Postdeadline Submission
Setting the Stage for Intraoperative Histological Quality Guidance in Autologous fat Treatments via Computed Optoacoustic Microscopy, Constantin G. Berger[1,2], Myeongseop Kim[1,2], Lukas Scheel-Platz[1,2], Andreas Eigenberger[3], Lukas Prantl[3], Panhang Liu[1,2], Vipul Gujrati[1,2], Vasilis Ntziachristos[1,2], Dominik Jüstel[1,2], Miguel A. Pleitez[1,2]; *[1]Chair of Biological Imaging, Central Inst. for Translational Cancer Research (TranslaTUM), School of Medicine and Health & School of Computation, Information and Technology, Technical Univ. of Munich, Germany; [2]Inst. of Biological and Medical Imaging, Bioengineering Center, Helmholtz Munich, Germany; [3]Department of Plastic, Hand and Reconstructive Surgery, Univ. Medical Center Regensburg, Germany.* Autologous fat transfer has enabled substantial advances in plastic and reconstructive surgery, while clinical practice is currently lacking standardization tools. We developed computational optoacoustic microscopy to facilitate intraoperative quality guidance for mechanically enhanced fat grafts.

Room: ICM Room 5
10:30 -- 12:00
Th2A • Hyperspectral Imaging
Presider: Yijing Xie; King's College London, UK

Th2A.1 • 10:30
A Hyperspectral Imaging System for Meningioma Grade Discrimination, Pietro Ricci[1,2], Camilla Bonaudo[1], Ivan Ezhov[3], Anam Toaha[1,2], Dorotea Nardini[1,2], Louis Chessel[4], Luca Giannoni[5], Ilias Tachtsidis[5], Francesco S. Pavone[1,2]; *[1]Univ. of Florence, Italy; [2]European Laboratory for Non-Linear Spectroscopy, Italy; [3]Technischen Universitst Munchen, Germany; [4]Polytech Lyon, France; [5]Univ. College London, UK.* Histopathology is the gold standard for meningioma grading but is limited by processing time and subjectivity. We present a hyperspectral imaging system for real-time, label-free analysis, demonstrating the potential to enhance efficiency in meningioma grading.

Th2A.2 • 10:45
Investigation of Melanin Content Using Hyperspectral Imaging, Maximilian Aumiller[1,2], Prishita Mirchandani[1], Ester Pachyn[1], Ronald Sroka[1,2], Adrian Rühm[1,2]; *[1]Laser-Forschungslabor, LIFE Center, LMU Hospital, Germany; [2]Department of Urology, LMU Hospital, Germany.* Hyperspectral imaging (HSI) data from optical tissue phantoms and human volunteers were analyzed by means of an analytical approach, to enable the evaluation of melanin content in human skin.

Th2A.3 • 11:00
Properties of Iso-Points for Hyperspectral Depth Reconstruction, Dongqin Ni[1,2], Franziska Wandslebe[1], Farshad Mohamadi[1], Martin Hohmann[1,2]; *[1]Inst. of Photonics Technologies, Germany; [2]Erlangen Graduate School in Advanced Optical Technologies, Germany.* An iso-point in hyperspectral imaging is a wavelength where absorption and scattering effects cancel, yielding depth-invariant reflectance. Recent findings reveal it is a narrow spectral range where spectra intersect, influenced by absorption and scattering coefficients.

Th2A.4 • 11:15
Classification of Atopic Dermatitis's Erythema Severity Based on Hyperspectral Imaging and Three-Dimensional Convolutional Neural Network, Seula Kye[1], Yoo Sang Baek[2], Onseok Lee[1]; *[1]Soonchunhyang Univ., Korea (the Republic of); [2]Dermatology, Guro Hospital, Korea Univ., Korea (the Republic of).* We classified the erythema severity of atopic dermatitis hyperspectral imaging (HSI) based on a three-dimensional convolutional neural network (3D-CNN) model, achieving 95% classification performance. The combination of HSI and 3D-CNN will help diagnose erythema.

Th2A.5 • 11:30
Novel Integrated Hyperspectral Device for Widefield Quantitative Fluorescence Imaging of Human Glioma, Silvère Ségaud[1], Matthew Elliot[1,2], Charles Budd[1], Tom Vercauteren[1], Jonathan Shapey[1,2], Yijing Xie[1]; *[1]Kings College London, UK; [2]Kings College Hospital, UK.* We present the characterization of a snapshot hyperspectral camera and its integration into a commercial neurosurgical microscope for quantitative fluorescence imaging of protoporphyrin IX. The device is then showcased for human glioma surgery.

Th2A.6 • 11:45
Potential of Hyperspectral Imaging in Forensic Application, Ina Stadler[1], Maximilian Aumiller[1], Daniel Happach[1], Ronald Sroka[1], Adrian Rühm[1]; *[1]Ludwig-Maximillians-Universität Munchen, Germany.* A medical certified hyperspectral imaging system (HSI) was used to distinguish blood strains from other reddish agents. Furthermore, time dependent changes could be derived from spectral changes showing the potential of this technique for contactless trace recording in criminal cases.

Room: ICM Room 11
14:00 -- 15:30
Th3B • Theory, Algorithms, and Modeling IV
Presider: Andrea Farina; Consiglio Nazionale delle Ricerche, Italy

Th3B.1 • 14:00
Heuristic Model for Photon Propagation in Two-Layer Turbid Media, Fabio Negretti[1], Caterina Amendola[1], Giulia Maffeis[1], Andrea Farina[2], Fabrizio Martelli[3], Lorenzo Spinelli[2]; *[1]Dipartimento di Fisica, Politecnico di Milano, Italy; [2]Istituto di Fotonica e Nanotecnologie, Consiglio Nazionale delle Ricerche, Italy; [3]Dipartimento di Fisica e Astronomia, Università degli Studi di Firenze, Italy.* We propose a heuristic model for light propagation in two-layer turbid media, that accurately reproduces photon Distributions of Time-Of-Flight, while being faster than a full Monte Carlo approach, and is easily scalable to multi-layer domains.

Th3B.2 • 14:15
Real-Time Multispectral Diffuse Optical Tomography for Hemodynamic Imaging Using the SENSOR Algorithm, Lara Pinar[1], Stephen Kim[1], Moegammad A. Bardien[1], Andreas H. Hielscher[1]; [1]*New York Univ., USA.* We present a real-time image reconstruction method for multispectral Diffuse Optical Tomography using the SENSOR algorithm, enabling 3D hemoglobin visualization and quantitative inflammation assessment in Systemic Lupus Erythematosus patients with a flexible finger patching system.

Th3B.3 • 14:30
Algorithm for Deriving Absolute Blood Flow from Reduced Speckle Contrast Data, Lisa C. Kobayashi Frisk[1], Veronika Parfentyeva[1], Manish Verma[1], Turgut Durduran[1,2]; [1]*ICFO -Institut de Ciencies Fotoniques, Spain;* [2]*Institució Catalana de Recerca i Estudis Avançats (ICREA), Spain.* Deriving absolute blood flow from speckle contrast data requires measurements at several exposure times. To simplify this derivation, an algorithm requiring only one exposure time has been developed and evaluated.

Th3B.4 • 14:45
Optical Properties of Two-Layered Turbid Media Obtained via a Homogenous Model Using an Analytical Solution to the Radiative Transfer Equation, Zachary Jones[1], Dominik Reitzle[1], Florian Foschum[1], Alwin Kienle[1]; [1]*ILM Ulm, Germany.* We quantify μ_a-μ_s' cross-talk in a series of *ex-vivo* porcine case studies to demonstrate the risks in fitting two-layer spatially-resolved reflectance (SRR) measurements with a single-layer model using solutions to the radiative transfer equation (RTE).

Th3B.5 • 15:00
Model Development for (Imaging) Single Fiber Reflectance Spectroscopy, Robin van Zutphen[1], Xavier Attendu[1], Ton van Leeuwen[1]; [1]*Amsterdam UMC, Netherlands.* We present and validate an efficient Monte Carlo pipeline for reflectance computations in overlapping source-detector geometries, using it to develop models for (imaging) spectroscopy through a single fiber and assess sensitivity limits for clinical implementation.

Th3B.6 • 15:15
Numerical Study on Time-Domain Functional Near-Infrared Optical Tomography with Regularization Minimizing Entropy, Shinpei Okawa[1], Qaisar Shahzad[1], Yoko Hoshi[1]; [1]*Hamamatsu Univ. School of Medicine, Japan.* The regularization method minimizing the entropy of the reconstructed image was tested in a numerical simulation of near-infrared optical tomography for functional brain imaging to improve the localization and quantification of the image.

Room: ICM Room 5
14:00 -- 15:30
Th3A • Diagnosis Spectroscopy and More
Presider: Igor Meglinski; Aston Univ., UK

Th3A.1 • 14:00
Enhancing Widefield Mid-Infrared Photothermal Microscopy with Fluorescence Detection for Improved Contrast and Cellular Imaging, Subham Adak[2,1], Anooj Thayyil Raveendran[2], Samir El-Mashtoly[2], Jürgen Popp[2,1], Christoph Krafft[2]; *[1]Friedrich-Schiller-Universität Jena, Germany; [2]Leibniz-Institut für Photonische Technologien e.V., Germany.* Fluorescence-enhanced widefield mid-infrared photothermal microscopy improves contrast and sensitivity using temperature-dependent fluorescence emission. It enables targeted infrared spectroscopy, reduces photobleaching, and allows rapid, high-throughput cellular imaging, advancing mid-IR photothermal microscopy for biomedical applications.

Th3A.2 • 14:15
Ultrahigh-Speed Digital Holography for Quantitative Doppler Imaging of the Human Retina, Zacharie Auray[1], Yann Fischer[1], Olivier Martinache[1], Michael Atlan[1]; *[1]ESPCI, France.* High-speed digital holography reveals local blood flow contrasts in the eye fundus through deterministic signal analysis, leveraging a forward scattering model of dynamically diffused light. This approach enables the estimation of absolute blood flow in primary in-plane retinal arteries.

Th3A.3 • 14:30
Rapid Detection of Bacterial Infections via Infrared Spectroscopy, Kiran S. Maiti[1], Susmita Roy[4], Christian Zenner[2], Lindsay J Hall[5], Ronald Sroka[3]; *[1]TUM School of Natural Science, Germany; [2]TUM School of Life Science, Germany; [3]Laser-Forschungslabor, LIFE-Center, LMU Univ. Hospital, Germany; [4]Technical Univ. of Munich, School of Medicine and Health, Department of Clinical Medicine, Klinikum rechts der Isar, Germany; [5]Univ. of Birmingham, Inst. of Microbiology and Infection, UK.* Bacterial infections pose a significant global health risk. Timely and accurate identification of bacterial pathogens is essential for effective infection control. Infrared spectroscopy-based metabolic analysis offers rapid, precise, and non-invasive approach to detecting bacterial infections.

Th3A.4 • 14:45
Sub-Picosecond Laser Ablation and Plume Mass-Spectrometry for the Precision Resection and Diagnosis of Soft Biological Tissue., Timothy Frazer[1], Rainer J. Beck[1], Ioannis Bitharas[1], Daniel Simon[2], Tatiana Malikova[1], Duncan Roberts[2], Andrew Moore[1], Lauren Ford[2], Zoltan Takats[2], Jonathan D. Shephard[1]; *[1]Heriot-Watt Univ., UK; [2]Imperial College London, UK.* Mass-spectrometry of biological tissue using sub-picosecond laser ablation is investigated experimentally. High relative abundances, including peaks at characteristic m/z, are ob-served across a range of laser parameters. Neuromorphic imaging is explored as a secondary diagnostic.

Th3A.5 • 15:00
Digital Holographic Tomography for Rapid, Label-Free Detection of Virus-Induced Cytopathic Effects, Dominika Skrzela[1], Agata Kublicka[2], Anna Matczuk[2], Igor Buzalewicz[1]; [1]*Department of Biomedical Engineering, Faculty of Fundamental Problems of Technology, Wroclaw Univ. of Science and Technology, Poland;* [2]*Department of Pathology, Division of Microbiology, Faculty of Veterinary Medicine, Wroclaw Univ. of Environmental and Life Sciences, Poland.* This study investigates the use of digital holotomography (DHT) for early detection of virus-induced cytopathic effects (CPE). DHT enables rapid, non-destructive, quantitative phenotyping, offering time reduction of detection of viral infection compared to other methods.

Room: ICM Room 11
16:30 -- 18:00
Th4B • Super-Resolved Optical Imaging
Presider: Sebastian Karpf; BMO, Univ. of Luebeck, Germany

Th4B.1 • 16:30
Stochastic SIM: A Scan-Less Super Resolution Retinal Imaging, Marco Leonetti[2,1], Denzel Fusco[1], Ylenia Gigante[1], Lorenza Mautone[1], Silvia Di Angelantonio[1], Giorgia Ponsi[1], Zita Salajkova[2]; [1]*Istituto Italiano di Tecnologia, Italy;* [2]*Nanotec, CNR, Italy.* Stochastically Structured Illumination Microscopy (S2IM), offers improved resolution on naturally randomly moving objects. We implement it on the human retina affected by saccadic movements eliminates the need for an expensive, technically complex optical scanning system.

Th4B.2 • 16:45
The SIMple Microscope: Development of a Fibre-Based Platform for SIM Imaging in Unconventional Environments, Rebecca M. McClelland[1], Edward N. Ward[1], Francesca W. van Tartwijk[1], Stephen J. Devlin[1], Junqing Wang[1], Clemens F. Kaminski[1]; [1]*Univ. of Cambridge, UK.* Optical-sectioning structured illumination microscopy (OS-SIM) patterns are generated by compact, off-the-shelf, in-line fibre components costing <£2k. They are easily assembled in a robust design, addressing practical limitations that currently limit SIM imaging in various environments.

Th4B.3 • 17:00
Astigmatic Vortex Beam Based Autofocus System for Super Resolution Microscopy, Pranjal Choudhury[1], Bosanta R. Boruah[1]; [1]*Indian Inst. of Technology Guwahati, India.* Focus stabilization is crucial for long-term fluorescence imaging, particularly in single-molecule localization microscopy. We present an astigmatic vortex beam-based autofocus method that offers enhanced focus stability enabling robust and automated focus correction, improving imaging precision.

Th4B.4 • 17:15
On-Chip Structured Illumination Microscopy Enabled by Femtosecond Laser Engineered Microscope Slide, Anna Pecorari[2], Francesco Ceccarelli[1], Alessia Candeo[2], Andrea Bassi[2], Roberto Osellame[1], Petra Paiè[2], Francesca Bragheri[1]; *[1]Istituto di Fotonica e Nanotecnologie, Italy; [2]Dipartimento di Fisica, Politecnico di Milano, Italy.* We present a compact glass slide engineered via femtosecond laser micromachining with the integration of optical waveguides, micro-optics and thermal shifters. The device generates dynamic patterns enabling structured illumination microscopy on conventional fluorescence microscopes.

Th4B.5 • 17:30
Wavelet-Informed Pix2pix Model With an FID-Based Loss Function for Confocal Microscopy, Giray N. Mavis[1,2], Berkay A. Durmus[3], Semih Burhan[3], Serhat Tozburun[1,2]; *[1]Izmir Biomedicine and Genome Center, Turkey; [2]Izmir International Biomedicine and Genome Inst., Dokuz Eylul Univ., Turkey; [3]Healysense A.S., Turkey.* We present a novel model based on conditional generative adversarial networks that generates high-quality images from low-quality confocal microscopy images. Our model outperforms four existing models in terms of FID, CMMD, and LPIPS metrics.

Th4B.6 • 17:45
Development of a Crosstalk-Reduced Holographic Modal Wavefront Sensor, Anitta Jomy[1], Amritha Jayan[1], Dinesh N. Naik[1], Biswajit Pathak[1]; *[1]Indian Inst. of Space Sci & Tech, India.* In this paper, we propose an improved version of holographic modal wavefront sensing (HMWS) method based on five-point analysis with condition on intensity for better wavefront estimation with reduced crosstalk, compared to the conventional HMWS.

Room: ICM Room 5
16:30 -- 18:00
Th4A • Photodynamic Therapy II
Presider: Lothar Lilge; Univ. Health Network, Canada

Th4A.1 • 16:30
Is Blood Flow and Blood Volume Informative for Photosensitizer Uptake? in Silico Simulation and in Vivo MRI and SFDI Imaging Study, Tina Saeidi[1], Michael Daly[1], Vaughn Betz[2], Lothar Lilge[1]; *[1]Princess Margaret Hospital, Canada; [2]Univ. of Toronto, Canada.* Knowledge of the spatial photosensitizer accumulation is paramount for personalized PDT treatment planning. Simulation studies showed that the spatial resolution of Blood flow and Blood volume must be larger than the attenuation coefficient of PDT treatment wavelength. Blood flow may predict chlorin e6 accumulation for PDT treatment planning.

Th4A.2 • 16:45
The Role of IR783 in Anticancer Photodynamic Therapy for the Treatment of Papillary Thyroid Cancer, Ilknur Gurtas[1], Nermin Topaloglu[1]; *[1]Department of Biomedical Engineering, Faculty of Engineering and Architecture, Izmir Katip Çelebi Univ., Turkey.* IR783-mediated photodynamic therapy was assessed for papillary thyroid cancer treatment. BCPAP cells treated with IR783 and 808-nm laser irradiation showed significant cell death, indicating IR783-PDT as a promising anticancer therapeutic strategy.

Th4A.3 • 17:00
Real-Time Electrochemical Detection of Singlet Oxygen at the Single-Cell Level Using Platinum Microdisc Electrodes in Photodynamic Therapy, Tugba Akkas[1], Busra Sirek[3,2], Eda G. Safak[3], Nermin Topaloglu[3], Mustafa Sen[3]; *[1]Department of Nanoscience and Nanotechnology, Inst. of Natural and Applied Sciences, Izmir Katip Celebi Univ., Turkey; [2]Department of Biomedical Tecnologies, Inst. of Natural and Applied Sciences, Izmir Katip Celebi Univ., Turkey; [3]Department of Biomedical Engineering,Faculty of Engineering and Architecture, Izmir Katip Celebi Univ., Turkey. Singlet oxygen production at the single cell level was induced by photodynamic therapy and detected by electrochemical method. Platinum disc microelectrodes effectively identified ROS via electrochemical signals from single cells.*

Th4A.4 • 17:15
Photodynamic Potential of *Prospero Autumnale* Leaf Extract Against Prostate Cancer, Ekin C. Yurtseven[1], Eylül S. Ceylan[2], Cennet Özay[3], Nermin Topaloglu[2]; *[1]Department of Biomedical Engineering, Inst. of Natural and Applied Sciences, Izmir Katip Celebi Univ., Turkey; [2]Department of Biomedical Engineering, Faculty of Engineering and Architecture, Izmir Katip Celebi Univ., Turkey; [3]Department of Basic Pharmaceutical Sciences, Faculty of Pharmacy, Izmir Katip Celebi Univ., Turkey. Prospero autumnale* extract was evaluated as a photosensitizer for anticancer photodynamic therapy. Cell viability analysis confirmed its concentration-dependent efficacy, inducing prostate cancer cell death under 50 and 100 J/cm^2 irradiation at 655 nm of wavelength.

Th4A.5 • 17:30
Intraoperative Glioma Delineation With Robust Estimation of 5-ALA-Induced PpIX Contributions in Multiple-Wavelength Excitation Fluorescence Spectroscopy : Application on Clinical Data, Arthur Gautheron[1,2], Michaël Sdika[1], Jacques Guyotat[6], Antoine Uzel[1], David Meyronet[3,4], Mathieu Hébert[5], Thiébaud Picart[6,7], Bruno Montcel[1]; *[1]CREATIS, France; [2]CPE, France; [3]Department of Neuropathology, Groupe Hospitalier Est, Hospices Civils de Lyon, France; [4]Claude Bernard Lyon 1 Univ., Faculty of Medicine Lyon Est, France; [5]Univ Lyon, UJM-Saint-Etienne, CNRS, Institut d Optique Graduate School, Lab. Hubert Curien UMR 5516, France; [6]Department of Tumoral and Vascular Neurosurgery, Pierre Wertheimer Hospital, Hospices Civils de Lyon, France; [7]ancer Initiation and Tumoral Cell Identity Department, Cancer Research Centre of Lyon (CRCL) INSERM 1052, CNRS 5286, France.* Diffuse gliomas are challenging to remove due to indistinguishable tumor margins. This work focuses on tissue classification using fluorescence spectroscopy. A novel approach enhances classification accuracy, aiding in better differentiation of tumor and healthy tissues.

Th4A.6 • 17:45
Assessing Mueller Matrix Polarimetry for Distinguishing Luminal a and B Breast Cancer Subtypes, Kseniia Tumanova[1]; *[1]Univ. of Toronto, Canada.* Mueller matrix polarimetry, particularly the median M44 parameter, shows potential for luminal breast cancer subtype differentiation. Box-Cox transformation significantly improved results, highlighting the importance of preprocessing in polarimetric analysis.