PIBM Program Guide

Wednesday, 27 September

A101-104
08:30 -- 10:00
W1A • Plenary Session I
Presiders: Lihong Wang; California Inst. of Technology, USA and Arjun G. Yodh; Univ. of Pennsylvania, USA

W1A.1 • 08:30 (Plenary)
Optical Imaging in Radiation Therapy & Molecular-Guided Surgery for Cancer Treatment, Brian W. Pogue[1]; [1]*Dartmouth College, USA.* Optical imaging is the largest economic sector of the medical imaging market, with endoscopy being the single largest modality utilized in medicine. While optical imaging has its core strengths in endoscopy, laparoscopy, ophthalmology, and pathology, there are still major innovations taking place, which provide the rationale for optical imaging in molecular guidance of procedures.

W1A.2 • 09:10 (Plenary)
Brainsmatics: Deciphering Brain Function with Brain-wide Networks, Qingming Luo[1]; [1]*Huazhong Univ. of Science and Technology, China.* We propose a new approach: BRAINSMATICS, which refers to the integrated, systematic approach of measuring, analyzing, managing and displaying brain spatial data.

A101-104
10:20 -- 12:20
W2A • Plenary Session II
Presiders: Qingming Luo; Huazhong Univ of Science and Technology, China and Brian W. Pogue, Dartmouth College, USA

W2A.1 • 10:20 (Plenary)
Diffuse Optical Monitoring of Brain and Cancer Hemodynamics, Arjun G. Yodh[1]; [1]*Univ. of Pennsylvania, USA.* Recent progress applying diffuse optical techniques to measure blood oxygenation, blood flow, and oxygen metabolism during neoadjuvant breast cancer treatment will be described. Similar techniques, applied to cerebral autoregulation and hemodynamics, will also be discussed.

W2A.2 • 11:00 (Plenary)
Optical Tissue Diagnostics Based on Label-free, Functional Biomarkers Optical Tissue Diagnostics Based on Label-free, Functional Biomarkers, Irene Georgakoudi[1]; [1]*Tufts Univ., USA.* Optical tissue diagnostics based on label-free, functional biomarkers optical tissue diagnostics based on label-free, functional biomarkers

W2A.3 • 11:40 (Plenary)
***In vivo* 3-photon Imaging of the Mouse Brain,** Chris Xu[1]; [1]*Cornell Univ., USA.* Over the last two decades, multiphoton microscopy has created a renaissance in the brain imaging community. It has changed how we visualize neurons by providing high-resolution, non-invasive imaging capability deep within intact brain tissue.

Poster Area
13:30 -- 15:00
W3A • Poster Session
Presiders: Wei Chen; Univ. of Central Oklahoma, USA and Dan Zhu; Wuhan National Lab for Optoelectronics, China

W3A.1
Fabrication of Agarose Based Micro Check Valves on Microfluidic Chips, Yi Qiao[1], Yuxiang Zhang[1], An Ju[1], Junji Li[1], Jing Tu[1], Zuhong Lu[1]; [1]*State Key Laboratory of Bioelectronics, School of Biological Science and Medical Engineering, Southeast Univ., China.* Assumption of check values usually requires complex process. We present a simple

approach to fabricate micro ball check valves by using agarose droplets as spools, which provides high assembly efficiency and robust performance.

W3A.2
Magnetic Property of Macroscopically Assembled Nanoparticles for Potential Biomedical Applications, Jianfei Sun[1]; *[1]Southeast Univ., China.* We utilized the layer-by-layer (LBL) assembly and the magnetic field-directed assembly to fabricate the film-like and the stripe-like assemblies of iron oxide nanoparticles. The Poynting's theorem-based magnetothermal property and magnetism-mediated effect upon cells were studied.

W3A.3
Nonlinear Photoacoustic Imaging Using Long Laser Pulse, Fei Gao[2,1]; *[1]Nanyang Technological Univ., Singapore; [2]ShanghaiTech Univ., China.* In this paper, we report a long laser pulse induced dual photoacoustic (LDPA) nonlinear effect. An analytical model is derived to describe the generation of the dual photoacoustic pulses, which is experimentally proved in vivo.

W3A.4 • 13:30
Optical monitoring of calf muscle blood flow and oxygen extraction in patients with peripheral artery disease, Zhe Li[1], Wesley Baker[2], Steven Schenkel[2], Erin Englund[2], Arjun G. Yodh[2], Jinchao Feng[1], Zhonghua Sun[1], Pengyu Liu[1], Kebin Jia[1]; *[1]Beijing Univ. of Technology,, China; [2]Univ. of Pennsylvania, USA.* This paper reports non-invasive optical measurements of skeletal muscle blood flow and oxygen extraction dynamics before/during/after treadmill exercise in patients with peripheral artery disease patients who are experiencing claudication.

W3A.5
The Photoacoustic Tomography System Based on Medical Ultrasound Array, Li Z. Ran[1]; *[1]Fujian Normal Univ., China.* A system which combines photoacoustic tomography with ultrasonic array is developed, the system has fast data acquisition speed and good solution. The experiment shows that the method has the potential application value in clinic.

W3A.6
The SERS Applications of Star-shaped Gold Nanoparticles, Weiping Qian[1], Qianqian Su[1]; *[1]Southeast Univ., China.* In this study, gold nanostars with controllable branchlengths were synthesized. The potential use of these nanostars in detection applications and analysis of living cells based on SERS were also investigated.

W3A.7
Two-photon Excited Fluorescence Imaging of Blood Flow in Live Mouse Dorsal Skin Window Chamber Model, Shaozhuang Yang[1]; *[1]College of optoelectronic Engineering, Shenzhen Univ., China.* In this study, a fast two-photon laser scanning microscopy system has been developed to obtain a series of real-time images of blood flow within dorsal skin window chamber in live mouse tumor model.

W3A.8
A Neighborhood Vector Principal Component Analysis Method for Small Defect Target Detection, Zhengzhou Wang[2,1], Qinye Yin[2], Jingwei Kou[1], Yanwen Xia[3], Bingliang Hu[1]; *[1]Optics and Precision Mechanics of CAS, Optics and Precision Mechanics of CAS, China; [2]School of Electronic & Information Engineering, Xi'an Jiaotong Univ., China; [3]Research Center of Laser Fusion, China Academy of Engineering Physics, China.* A new NVPCA in combination with a region-growing method, serving as a target enhancement and segmentation algorithm, respectively, which can detect most defect targets when the damaged regions are less than 2 pixels in size.

W3A.9
Effects of Low-level laser therapy (LLLT) on acute recovery after exhausting cycling exercise, Fang H. Li[1]; *[1]Nanjing Normal Univ., China.* LLLT applied to quadriceps muscles after exhausting cycling exercise decreased blood lactate level and heart rate and increased Wingate test performance, indicating that LLLT applied after fatigue may enhance acute recovery.

W3A.10
Age-related changes in effective connectivity as revealed by Dynamic Bayesian theory using near-infrared spectroscopy, Congcong Huo[1], Gongcheng Xu[1], Zengyong Li[2]; *[1]Shandong Univ., China; [2]National Research Center for Rehabilitation Technical Aids, China.* The age-related changes in effective connectivity was analyzed based on dynamic Bayesian inference and graph theory using NIRS in resting-state. Directed interaction, capacity of functional specificity and integration were found to be attenuated with aging.

W3A.11
Effect of temperature on glucose photoacoustic detection based on the pulsed laser induced ultrasonic, Zhong Ren[1,2], Guodong Liu[1], Yu Ding[1]; *[1]Key Laboratory of Optic-Electronic and Communication, Jiangxi Science and Technology Normal Univ., China; [2]School of Mechanical and Electronics, Nanchang Univ., China.* The effect of temperature on glucose photoacoustic detection was investigated. Results show photoacoustic values of glucose increase with temperature. Based on linear fitting, predicted concentration deviation is 4.1mg/dl when temperature shifts 0.1°C.

W3A.12
Silver nanoparticle-treated paper as a surface-enhanced Raman scattering (SERS) substrate for seminal plasma analysis, Zufang Huang[1], Gang Cao[1], Xuchao Miu[1], Yan Sun[2], Jinhua Chen[3], Yongzeng Li[1], Jinping Lei[1], Rong Chen[1]; *[1]Fujian Normal Univ., China; [2]Fujian provincial maternal and child health hospital, China; [3]Fujian provincial hospital, China.* Paper-based SERS substrate fabricated by soaking with silver colloids was characterized, and SERS spectra of seminal plasma over different soaking time were obtained to optimize the performance. Our results showed that optimum SERS spectra of seminal plasma can be achieved to provide a great potential for detection and analysis of seminal plasmas.

W3A.13
Photoacoustic monitoring of traumatic brain injury and recovery by stem cells labeled with Prussian blue *in vivo*, Ronghe Chen[1], Jing Lv[1], Hongke Wang[2], Weitao Li[2], Liming Nie[1];*[1]Xiamen Univ., China; [2]Nanjing Univ. of Aeronautics and Astronautics, China.* Photoacoustic tomography (PAT) with Prussian blue (PB) was applied to non-invasively monitor brain injury and recovery with stem cell therapy. Hemorrhage was clearly imaged and PB-labeled stem cells were successfully visualized by PAT *in vivo*.

W3A.14
Photoacoustic imaging of mouse heart with myocardial infarction: comparison with ultrasound imaging and SPECT, Jing Lv[1], Ya Peng[1], Zhide Guo[1], Zijing Li[1], Qingliang Zhao[1], Liming Nie[1]; *[1]Xiamen Univ., China.* Photoacoustic tomography (PAT) equipped with 128 ultrasonic transducers was applied to image the mouse heart before and after myocardial infarction (MI) modeling. The results demonstrate that PAT is capable of MI diagnosis and injury localization.

W3A.15
Retrieval of Monochromatic Fringe Phase Shifts in Polychromatic Talbot-Lau Grating X-Ray Interferometry, Xizeng Wu[1], Aimin Yan[1], Hong Liu[2]; *[1]Univ. of Alabama at Birmingham, USA; [2]Univ. of Oklahoma, USA.* Exploring the non-linear relationship between polychromatic and monochromatic fringe shifts in grating phase contrast imaging, we developed a general analytic approach that enables ones to directly compute the monochromatic fringe shifts from polychromatic measurement.

W3A.16
Optimizing the Synthesis of Core/Shell Structured Au@Cu2S Nanocrystals as Contrast-Enhanced for Bioimaging Detection, Wei L. Liu[1]; *[1]Shenzhen Univ., China.* We reported Au@Cu2S nanocrystals in the aqueous phase with a core/shell structured, and we demonstrated that Au@Cu2S nanocrystals could be used for the Optical Coherence Tomography (OCT) test.

W3A.17

Optimizing the Synthesis of Core/Shell Structured Au@Cu2S Nanocrystals as Contrast-Enhanced for Bioimaging Detection, Wei L. Liu[1]; *[1]Shenzhen Univ., China.* We reported Au@Cu2S nanocrystals in the aqueous phase with a core/shell structured, and we demonstrated that Au@Cu2S nanocrystals could be used for the Optical Coherence Tomography (OCT) test.

W3A.18

Effects of Ultrasonic Waves on Breast Cancer Cell Line (*MCF-7*) Coupled with *Zinger Officinale* (GINGER) Extract Using Cell Viability and Comet Assay Tests, Giermin Aj E. Sahagun[1], Romeric F. Pobre[1]; *[1]De la Salle Univ., Philippines.* Effects of ultrasound and ginger on breast cancer cell line (MCF-7) were done using cell viability and comet assay tests. Results showed that specific ultrasound frequency has significant cell death.

W3A.19

Single-Step Fabrication of Metallic Micropatterns, Yi Zeng[1], Zhongze Gu[1]; *[1]Southeast Univ., State Key Laboratory of Bioelectronics, China.* We have developed a method to fabricate metallic micropatterns with one step. The metallic micropatterns had a good enhancement to Raman signal. Besides, the abilities of encoding and forming droplet micorpatterns spontaneously were also possessed by the metallic micropatterns.

W3A.20

An fMRI data analysis strategy for Seafarer's brain functional network study, Yuhu Shi[1], Weiming Zeng[1]; *[1]Shanghai Maritime Univ., China.* A new strategy of functional connectivity detection is introduced to obtain more accurate brain functional networks using ICA with intrinsic priori information. The seafarers' fMRI data is used to evaluate the effectiveness through nonparametric Wilcoxon tests.

W3A.21

Optimized visual AuNP beacon for tracing mRNA changes in living cells, Siwen Li[1]; *[1]China pharmaceutical Univ., China.* In this manuscript, we prepared a highly efficent molecular beacon by manipulating the number of sequences on AuNPs and surface modification with PEG and cell-penetrating peptide.

W3A.22

***In vivo* skin optical clearing efficiency of sucrose and fructose,** Wei Feng[1], Rui Shi[1], Chao Zhang[1], Dan Zhu[1]; *[1]Wuhan National Lab for Optoelectronics, China.* In vivo skin optical clearing efficiency of disaccharides attracts extensive attentions. Here, we employed laser speckle contrast imaging and optical coherence tomography for evaluating the *in vivo* skin optical clearing performance of sucrose and fructose.

W3A.23

Portable Surface Plasmon Resonance Biosensor and Its Applications, Pan Qi[1], Ying Li[2,3], Shi P. Li[2,4], Jin G. Zhong[2,4]; *[1]Department of Electronics Engineering, Guangdong Communication Polytechnic, China; [2]Laboratory of Optoelectronic Information and Sensing Technologies of Guangdong Higher Education Inst.s, Jinan Univ., China; [3]Pre-Univ., Jinan Univ., China; [4]Department of Optoelectronic Engineering, Jinan Univ., China.* A self-constructed portable SPR biosensor is introduced. It was used to detect shrimp hemocyanin and microcystin. The experiment results show that the device has the application prospect in the field of food safety detection.

W3A.24

A portable phenotyping for maize plant using cellphone, Lingbo L. Liu[2], Wanneng Yang[1,3], Junli Ye[3], Qian Liu[2]; *[1]National Key Laboratory of Crop Genetic Improvement and National Center of Plant Gene Research, China; [2]Britton Chance Center for Biomedical Photonics, Wuhan National Laboratory for Optoelectronics, China; [3]College of Engineering, Huazhong Agricultural Univ., China.* We develop a cell phone application for maize phenotyping. We raise a new method to reduce the influence of the casual posture when the user is holding the cellphone. And we also develop a new algorithm to automatically segment every individual leaf from one plant.

W3A.25

Nanoliposomes for photodynamic therapy guided by fluorescence and computed tomography imaging, Hao Xu[1], Tymish Y.Ohulchanskyy[1], Junle Qu[1]; *[1]College of Optoelectronic Engineering, Key Laboratory of Optoelectronic*

Devices and Systems of Ministry of Education and Guangdong Province, Shenzhen Univ., China. The efficacy of photodynamic therapy (PDT) can be enhanced by combining photosensitizers (PS) with medical imaging modality. In our research, CT imaging contrast agent and PS were coencapsulated in nanoliposome for fluorescence imaging and CT guided PDT. It offers great promise as a theranostic agents uniting diagnostic and therapeutic features.

W3A.26

Mechanism study on photoacoustic conversion efficiency of plasmon-mediated nanoprobes based on finite element analysis, Yujiao Shi[1], Sihua Yang[1], Da Xing[1]; *[1]South China Normal Univ., China.* Highly efficient nanoprobes are desirable for good-performance photoacoustic molecular imaging. We present simulations of photoacoustic effect for plasmon-mediated nanoprobes based on finite element analysis, to provide deep understanding of the micromechanism of the photoacoustic conversion.

W3A.27

Dual-slit confocal light sheet microscopy for *in vivo* whole-brain imaging of larval zebrafish, Ling Fu[1]; *[1]Huazhong Univ of Science and Technology, China.* We developed a dual-slit confocal light sheet microscopy which enhanced the image SNR and obtained two-fold imaging rate compared with conventional line scanning confocal microscopy.

W3A.28

Nonlinear optical microendoscopy based on double-clad photonic crystal fiber driven by four-plate piezoelectric actuator, Ling Fu[1]; *[1]Huazhong Univ. of Science and Technology, China.* Here we presented an optimized actuator for driving a particular fiber cantilever in the view point of energy, which contributes to driving large diameter specialty fibers due to low energy dissipation.

W3A.29

A Confocal Endomicroscopy for Cellular Imaging, Ling Fu[1]; *[1]Huazhong Univ. of Science and Technology, China.* We present a prototype of confocal endomicroscopy, which can be compatible with biopsy channel of conventional endoscopy, with an immediate diagnosis that is virtually consistent with the histologic diagnosis with 8 fps imaging speed.

W3A.30

Characterization the biochemical specificity of mouse spinal cord by confocal Raman microspectral Imaging, Yuze Gong[1,2], Xu Zhang[1,2], Jie Li[1,2], Yaning Yin[1,2], Kaige Wang[2], Qingli He[1], Jintao Bai[1,2], Shuang Wang[2]; *[1]Dept. of Physics, Northwest Univ., China; [2]Inst. of Photonics and Photon-Technology, Northwest Universit, China.* A longitudinal study was implemented to reveal a precise linkage between the spectral features and the molecular composition in ex vivo mouse spinal cord tissue by microspectral Raman imaging, which form a solid basis for the molecular investigation on pathology states of spinal cord injury.

W3A.31

Direct 3D imaging of an internal space encompassed by turbid layers using a surface quasi-point light source for precorrection, Honglin Liu[1], Mu Qiao[1], Guanghui Pang[1], Shensheng Han[1]; *[1]Key Laboratory for Quantum Optics and Center for Cold Atom Physics, Shanghai Inst. of Optics and Fine Mechanics, Chinese Academy of Sciences, China.* A method to noninvasively see inside an internal space encompassed by turbid layers, e.g., eggs, edema and bladders, using a surface quasi-point light source for precorrection is presented, which has equivalently infinite depth of field.

W3A.32

Dual-mode Micro-Optical Sectioning Tomography for simultaneously acquiring Golgi-stained neuronal morphology with co-located cytoarchitecture in the same brain, Xiao Chen[1,2], Xiaoyu Zhang[1,2], Qiuyuan Zhong[1,2], Qingtao Sun[1,2], Jie Peng[1,2], Hui Gong[1,2], Jing Yuan[1,2]; *[1]Collaborative Innovation Center for Biomedical Engineering, Wuhan National Laboratory for Optoelectronics-Huazhong Univ. of Science and Technology, China; [2]Britton Chance Center and MOE Key Laboratory for Biomedical Photonics, School of Engineering Sciences, Huazhong Univ. of Science and Technology, China.* We developed dual-mode Micro-Optical Sectioning Tomography, to simultaneously

image the reflective neural morphology and fluorescent cytoarchitecture of a Golgi-stained whole mouse brain at a single-neuron resolution in 4 days.

W3A.33
Withdrawn.

W3A.34
Cross-sectional photoacoustic tomography of intracerebral haemorrhage in mice, Jinge Yang[1], Dan Wu[1], Guang Zhang[1], Huabei Jiang[1,2]; *[1]Univ of Electronic Science & Tech China, China; [2]Univ. of South Florida, USA.* In this study, we in vivo examined intracerebral haemorrhage (ICH) induced by collagenase in mice using cross-sectional photoacoustic tomography (csPAT). The PA images showed hematoma area that was cross-verified by histologic images.

W3A.35
Detection of Axillary Lymph Node Metastasis in Breast Cancer using Mulitiphoton Microscopy, Wu Yan[1], Lin Yuxiang[2], Lian Yuane[3], Lin Peihua[4], Shu Wang[4], Zhuo Shangmu[4], Fu Fangmeng[2], Wang Chuan[2], Jianxin Chen[4]; *[1]Fujian Univ. of techonology, China; [2]Department of Breast Surgery, The Affiliated Union Hospital of Fujian Medical Univ., China; [3]Department of Pathology, The Affiliated Union Hospital of Fujian Medical Univ., China; [4]Fujian Normal Univ., China.* Multiphoton microscopy (MPM) was applied to identify lymphocytes, metastatic cells and the tumor stroma in negative and positive axillary lymph node respectively, which facilitated the pathological analysis of lymph nodes in vivo.

W3A.36
Human tissue analysis based on Raman spectroscopy for nasopharyngeal cancer detection, Qiong Wu[1], Xiaosong Ge[1], Liqing Sun[2], Xueliang Lin[1], Zhihong Xu[1], Duo Lin[1]; *[1]Fujian Normal Univ., China; [2] Affiliated Fuzhou First Hospital of Fujian Medical Univ., China.* This article briefly reviews the applications of Raman spectroscopy technology for nasopharyngeal cancer tissue detection, especially presenting the corresponding work of our group in Fujian normal Univ., and discussing the perspective of this field.

W3A.37
Long-term ultra-low-level power STED nanoscopy, Xusan Yang[1]; *[1]Peking Univ., China.* Through the strategic application of upconversion nanoparticles, we have reduced the intensity of STED nanoscopy by 2-3 orders of magnitude. It reveals a new mechanism of stimulated emission caused by the photon avalanche effect. With only 30 mW laser, resolution down to 28nm has been attained, which is 1/36 of the excitation wavelength.

W3A.38
UbasM: a simple, rapid and DiI-compatible optical clearing method for volume imaging, Lingling Chen[1], Guiye Li[1], Yamin Li[1], Yingchao Li[1], Lina Liu[1], Ang Liu[1], Shuangchen Ruan[1];*[1]Shenzhen Univ., China.* We present a new, simple, convenient aqueous optical clearing agent, termed UbasM that rapidly renders fixed tissue samples highly transparent and reliably preserve emission from fluorescent proteins and lipophilic dyes in membrane integrity preserved tissues.

W3A.39
Reduction of acoustic distortions by multi-stencils fast marching method in the linear array transducer based photoacoustic tomography, Xiangwei Lin[1], Mingjian Sun[1], Naizhang Feng[1], Guangsong Wang[1], Yang Liu[1], Ying Fu[1], Ge Qu[1]; *[1]Harbin Inst. of Technology, China.* The acoustic properties in biological tissue are inhomogeneous, resulting in the deterioration in the reconstructed photoacoustic image. By contrast, multi-stencils fast marching method could produce accurate speed map for the reduction of acoustic distortions.

W3A.40
Topological Photobiomodulation, Chengyi T. Liu[1]; *[1]South China Normal Univ., China.* The phenomenology of photobiomodulation has not been resolved because it was based on P-values. The data were re-analyzed with

topology in this paper, and it was found that photobiomodulation promotes the activation of self-limited process.

W3A.41
A general method for delivering cell-impermeable organic fluorescent probes into living cells for super-resolution imaging, Meng Zhang[1]; *[1]Wuhan National Laboratory for Optoelectr, China.* Here we develop a general method that can deliver cell-impermeable fluorescent probes into living cells efficiently and specifically label various intracellular organelles. Based on our delivering method, we obtained live-cell super-resolution images of intracellular organelles.

W3A.42
A Stereological Quantitative Analysis of the Brain-wide Distribution of SOM Neurons in Whole Mouse Brain, Chen Zhang[1], Cheng Yan[1], Miao Ren[1], Anan Li[1], Tingwei Quan[1], Hui Gong[1], Jing Yuan[1]; *[1]HUST, China.* This platform combined whole-brain optical imaging using the Brain-wide Positioning System (BPS) and stereological localization using NeuroGPS to generate an accurate stereological cell count of SOM-expressing neurons in a mouse brain.

W3A.43
Tomographic Diffractive Microscopy for Better 3D Imaging, Dashan Dong[1], Yanhui Cai[1], Ziheng Ji[1], Hong Yang[1], Qihuang Gong[1,2], Kebin Shi[1,2]; *[1]State Key Laboratory for Mesoscopic Physics, Collaborative Innovation Center of Quantum Matter, School of Physics, Peking Univ., China; [2]Collaborative Innovation Center of Extreme Optics, Shanxi Univ., China.* We report on a fast three dimension refractive index imaging of INS-1 cells based on optical holographic tomography. The imaging speed is boosted by simultaneously controlling the rotation of light and raw imaging logging. A fast and robust algorithm is used to mapping the data in frequency domain.

W3A.44
A simple, rapid method to precisely locate mRNAs of intact mouse brain via fluorescence tomography, Wenyan n. Guo[2,1], Xiuli Liu[2,1], Yadong Gang[2,1], Fangfang Yin[2,1], Pei Li[2,1], Fei Huang[2,1], Ning Li[2,1], Qi Zhang[2,1], Xuyin Li[2,1], Yao Jia[2,1], Feng Xiong[2,1], Xiaojun Wang[2,1], Hui Gong[2,1], Qingming Luo[2,1], Shaoqun Zeng[2,1]; *[1]Britton Chance Center and MOE Key Laboratory for Biomedical Photonics, School of Engineering Sciences, Huazhong Univ. of Science and Technology, China; [2]Collaborative Innovation Center for Biomedical Engineering, Wuhan National Laboratory for Optoelectronics, Huazhong Univ. of Science and Technology, China.* To precisely locate mRNAs of mouse brain, a simple, rapid method was developed via combining whole mount in situ hybridization and fluorescence tomography, with cytoarchitectonic landmarks provided by propidium iodide real-time counterstaining during the imaging.

W3A.45
Simple, Cost-effective Blood Counting Without Needing Trained Users, Dengling Xie[1], Yaning Li[1], Kaiqin Chu[1], Zachary Smith[1]; *[1]Univ of Science and Tech of China, China.* We present a single-step sample preparation protocol and automated imaging & analysis system for highly accurate blood counting at the point of care, appropriate for completely untrained users in rural and low-resource settings.

W3A.46
Photo-responsive Nanovehicle for Two Independent Wavelength-Triggered Sequential Release of P-gp shRNA and Doxorubicin to Optimize Synergistic Therapy of Multidrug-resistant Cancer Cells, Ming Wu[1], Xin Y. Lin[1], Xiaolong Liu[1]; *[1]Mengchao Hepatobiliary Hospital of Fujia, China.* Earlier release of RNA molecules than drugs is vital but still difficult for overcoming multidrug resistance of cancer cells. Herein, we reported photo-responsive mesoporous silica nanoparticles utilizing two independent light to control their sequential release.

W3A.47
Path-based preprocess method for accelerating decoupled fluorescence Monte Carlo simulation, Xu Jiang[1], Yong Deng[1], Qingming Luo[1]; *[1]Wuhan National Laboratory for Optoelectr, China.* We developed a path-based preprocess method for accelerating decoupled fluorescence Monte Carlo (dfMC) simulation. By optimizing the storage of

path-related quantities, the computational time of the dfMC method is significantly reduced.

W3A.48

In Situ Imaging Of Mitochondria In Living Zebrafish Embryos, Ying He[1], Zhigang Yang[1], Junle Qu[1]; *[1]Key Laboratory of Optoelectronic Devices and Systems of Ministry of Education and Guangdong Province, College of Optoelectronic Engineering, Shenzhen Univ., China.* Our group design and synthesize a highly selective and cell-permeable fluorescent probe,which is target to the mitochondrion. Furthermore,we use the probe to get the imaging of mitochondria in living embryo cells of zebrafish.

W3A.49

Identification and quantitative evaluation of the scar formation in glaucoma post-operative filtration channel by Mueller matrix microscope, Xi Liu[1], Jialing Zhou[2,3], Yang Dong[2,3], Honghui He[2], Hui Ma[1,2]; *[1]Center for Precision Medicine and Healthcare, Tsinghua-Berkeley Shenzhen Inst., China; [2]Shenzhen Key Laboratory for Minimal Invasive Medical Technologies, Inst. of Optical Imaging and Sensing, Graduate School at Shenzhen, Tsinghua Univ., China; [3]Department of Biomedical Engineering, Tsinghua Univ., China.* The Mueller matrix microscope has been applied for quantitative evaluation of glaucoma post-operative scar formation in rabbit eye. The calculation and analysis of Mueller matrix transformation (MMT) parameter Φ indicate great potential in auxiliary diagnosis.

W3A.50

Digital holographic imaging through turbid media, Shiping Li[1,2], Pan Qi[3], Ying Li[4], Jin G. Zhong[1,2]; *[1]Department of Optoelectronic Engineering, Jinan Univ., China; [2]Key Laboratory of Optoelectronic Information and Sensing Technologies of Guangdong Higher Education Inst.s, Jinan Univ., China; [3]Department of Electronics Engineering, Guangdong Communication Polytechnic, China; [4]Pre-Univ., Jinan Univ., China.* A method of imaging through turbid media using digital holography is presented. Theories of light propagation in turbid media and digital holography are described. Experiments to image the objects hidden in turbid media are given. The experimental results show that images of the objects can be achieved by use of digital holography.

W3A.51

Enhancement of PEGylated Gold Nanoparticles Delivery to Mouse Brain in Vivo by Acupuncture, Dan Wu[2,3], Ruihuan Cui[2,3], Xiuyun Guo[2,3], Qiquan Shang[2,3], Man Wu[2,3], Jinge Yang[2,3], Huabei Jiang[2,1]; *[1]Department of Medical Engineering, Univ. of South Florida, USA; [2]School of Physical Electronics, Univ. of Electronic Science and Technology of China, China; [3]Center for Information in Medicine, Univ. of Electronic Science and Technology of China, China.* We report on an effective drug delivery approach consisting of PEGylated gold nanoparticles (as the drug carrier), traditional Chinese medicine (TCM) acupuncture (as the auxiliary method), and photoacoustic tomography (PAT) as the imaging technique.

W3A.52

Machine learning-based detection and segmentation of bioresorbable vascular scaffolds struts in intravascular OCT images, Yifeng Lu[1], Yihui Cao[1], Jing Jing[2], Qinhua Jin[2], Yundai Chen[2], Rui Zhu[1], Jianan Li[1]; *[1]Xi'an Inst. of Optics and Precision Mechanics of CAS, China; [2]PLA General Hospital, China.* We propose a machine learning-based method for struts detection in IVOCT images. Then, dynamic programing is used for struts segmentation. Based on the above results, struts malapposition analysis is conducted automatically.

W3A.53

Photo-responsive hollow silica nanoparticles for light triggered gene and photodynamic synergistic therapy, Xin Y. Lin[1], Ming Wu[1], Xiaolong Liu[1]; *[1]Mengchao Hepatobiliary Hospital of Fujian Medical Univ., China.* A novel photo-sensitive hollow silica nanoparticle based gene and photosensitizer (PS) co-delivery platform (HNP-Cou-PD) was proposed for synergistic gene and PDT therapy triggering by dual wavelength light irradiation.

W3A.54

Circular scanning photoacoustic tomography based on a coplanar light illumination and ultrasonic detection, Xiangwei Lin[1], Jing Meng[2], Depeng Hu[1], Guanji Leng[1], Shaoheng Yu[1], Yang Liu[1], Riqiang Lin[3], Xiaoyang Liu[3], Chengbo Liu[3], Xiaojing Gong[3], Mingjian Sun[1]; *[1]Harbin Inst. of Technology, China; [2] Qufu Normal Univ.,*

China; [3]Shenzhen Inst.s of Advanced Technology, Chinese Academy of Sciences, China. A circular scanning photoacoustic tomography using coplanar light illumination and ultrasonic detection is proposed by the aid of a translucent quartz bowl. Phantom experiments demonstrate this novel coplanar configuration could greatly expand the imaging scope.

W3A.55

Multifunctional small molecule fluorophore for long-duration tumor-targeted monitoring and dual modal phototherapy, Yi Ma[1], Yueqing Gu[1]; *[1]China pharmaceutical Univ., China.* A specific tumor-targeted small molecular fluorophore for synchronous long-duration cancer imaging, photodynamic and photothermal therapy is synthesized, which presents a potential strategy to develop small-molecule-based cancer theranostic agents for simultaneous cancer targeting, imaging and therapy.

W3A.56

The Photoacoustic Tomography System Based on Medical Ultrasound Array, Li Zuoran[1], Wu Huaqin[1], Lin Yongping[1], Li Zhifang[1], Li Hui[1]; *[1]Fujian Normal Univ., China.* A system which combines photoacoustic tomography with ultrasonic array is developed, the system has fast data acquisition speed and good solution. The experiment shows that the method has the potential application value in clinic.

W3A.57

***In vivo* imaging of melanoma by using noncontact all-optical photoacoustic microscopy,** Zhongjiang Chen[1], Wangting Zhou[1]; *[1]South China Normal Univ., China.* In this paper, we presented a noncontact all-optical photoacoustic microscopy for *in vivo* imaging of melanoma. The *in vivo* experiment results have demonstrated the noncontact all-optical photoacoustic microscopy system can image the melanoma *in vivo*.

W3A.58

Neural-vascular Coupling of Acute Ethanol Adminstration using Laser Speckle Contrast Imaging, Weitao Li[1], Yameng Zhang[1], Yuemei Zhao[1], Yan Zhang[1], Zhiyu Qian[1]; *[1]Nanjing Univ. of Aeronautics and Astronautics, China. We applied* a linear operator *to obtain* relative cerebral blood fl*ow*. *R*esults showed that acute ethanol administration indeed caused a rise of blood flow compared with the saline group, and an opposite trend in *the* firing rate. It *can be utilized* to research the correlation between c neuronal activity and hemodynamic responses.

W3A.59

Structure-guided design of mitochondria-targeting near-infrared fluorophore for dual modal phototherapy, Chunmeng Shi[1]; *[1]Third Military Medical Univ., China.* Mitochondria are recognized as the ideal target for cancer treatment and multifunctional near-infrared small-molecule photosensitizer (PS) is developed for synchronous cancer photodynamic therapy (PDT) and photothermal therapy (PTT) by targeting cancer-cell mitochondria.

W3A.60

Determination of gastric adenocarcinoma optical absorption coefficient based on focusing photoacoustic imaging, Huaqin Wu[1]; *[1]Fujian normal Univ. China, China.* We used PAT to quantify the difference optical absorption coefficient between gastric tumor and normal tissue, and verify the experiment results by inverse Monte Carlo simulation.This method is particularly useful to diagnose the gastric cancer.

W3A.61

Multispectral backscattering Mueller matrix imaging on thick fresh tissues, Yuanhuan Zhu[1], Yang Dong[2], Hui Ma[2,1]; *[1]Tsinghua-Berkeley Shenzhen Inst., China; [2]Tsinghua Univ., China.* We use multispectral LED light sources of six different colors to take Mueller matrix images. Multispectral polarized light backscattering measurements can help to reveal more details on the microstructure of the sample.

W3A.62

Treatment Evaluation Indices for Laser Ablation Therapeutic Method: A Numerical Study, Yuhao Li[1], Jingyi Hu[1], Yi Gong[1], Jie Tang[2], Changcun Pan[2], Xinru Xiao[2], Yigang Qiu[4], Shaolong Kuang[3], Yue Wu[1], Baiquan Su[1]; *[1]Beijing Univ. of*

Post and Telecommu, China; [2]Beijing Tiantan Hospital, Capital Medical Univ., China; [3]Soochow Univ., China; [4]NAVY General Hospital, China. Future autonomous robotic laser therapeutic method depends on quantitative treatment evaluation. Three evaluation indices for treatment performance are defined and their effectiveness are demonstrate by presenting result of a spiral ablation trajectory on numerical study.

W3A.63

High-resolution Refractive Index Tomography Using Discrete Algebraic Reconstruction Technique, Moosung Lee[1], Seungwoo Shin[1], YongKeun Park[1]; *[1]KAIST, Korea.* We develop a reconstruction algorithm in diffraction tomography, which exploits the prior information about homogeneous and uniform refractive index distributions of samples. The presented algorithm shows high-quality reconstructions of various samples in simulations and experiments.

W3A.64

Optical Clearing Agent for Enhanced Imaging Dorsal Blood Vessel in Nude Mice, Xiangyu Niu[1], Huabin He[1], Buhong Li[1]; *[1]Fujian normal Univ., China.* Optical clearing agent (OCA) has been successfully used for improving optical imaging of dorsal blood vessel in mouse. In this study, the application of OCA for imaging dorsal blood vessel in nude mice was achieved.

W3A.65

Label -free Imaging of Gliomas with Multiphoton Microscopy, Na Fang[1], Zanyi Wu[2], Xingfu Wang[3], Yuanxiang Lin[2], Lianhuang Li[2], Zhida Chen[1], Shanshan Shanshan Cai[3], Xueyong Liu[3], Yupei Chen[3], Jianxin Chen[1], Dezhi Kang[2]; *[1]Fujian Normal Univ., China; [2]Department of Neurosurgery, The First Affiliated Hospital of Fujian Medical Univ., China; [3]Department of Pathology, The First Affiliated Hospital of Fujian Medical Univ., China.* Multiphoton microscopy was used to image gliomas without fluorescent dyes. Our results demonstrated that MPM is able to discern between normal tissue, tumor and necrosis. Several features significant for the diagnosis were clearly visualised.

W3A.66

High-quality water-soluble and surface functionalized upconversion nanocrystals as luminescent probes for quantitative detection of microRNA-21 sequences, Yafeng Kang[1], Chengyu Li[1], Chongyang Song[1], Bei Zheng[1], Hongwu Tang[1]; *[1]Wuhan Univ., China.* We show that octylamine-modified poly-(acrylic acid) is adopted to wrap hydrophobic upconversion nanoparticles (UCNPs), and the UCNPs are further biofunctionalized and applied to integrate luminescence imaging with optical tweezers for detecting microRNA-21 sequences.

W3A.67

Improving lateral resolution of selective plane illumination microscopy with an enhanced SOFI, Dong Liang[1]; *[1]SIOM, China.* We present a modified super-resolution optical fluctuation imaging algorithm (SOFI) combined with SPIM which can quickly improve the lateral resolution of SPIM by two times with 50 frames of raw images.

W3A.68

Large Core Fiber Utilized to Optimize Output Beam of All-fiber Probe for Optical Coherence Tomography, Jianrong Qiu[1], Yi Shen[1], Zhihua Ding[1]; *[1]State Key Lab of Modern Optical Instrumentation, China.* Using large core fiber (LCF) to optimize optical performances of all-fiber probe for optical coherence tomography is presented. Numerical simulation results of probes with optimized structure parameters are displaced.

W3A.69

A Quantitative Assessment of Hepatocellular Carcinoma Grading using Multiphoton Microscopy, Hongxin Lin[1], Ning Zuo[1], Shuangmu Zhuo[1]; *[1]Fujian Normal Univ., China.* We use collagen signals of hepatocellular carcinoma to distinguish the tumor grading through multiphoton microscopy. It successfully shows the expression of collagen, and the boxplots of collagen-related changes using the T-test.

W3A.70

Real-Time Data Acquisition System for Radiation-induced Acoustic Imaging, Zhong Ji[1], yongsheng cui[1]; *[1]South China Normal Univ., China.* We established a data acquisition system, which composed of multielement detector, switch, multielement acquisition cards, field programmable gate arrays (FPGAs), and computer, for real-time capturing the raw photoacoustic and thermoacoustic data and reconstructing the image.

W3A.71
Graphene Oxide Nanoprobe for Rapid DNA Detection, Wan Xiaofang[1]; *[1]Shenzhen Univ., China.* Here we have developed a graphene oxide based approach for rapid and sensitive detection of DNA. The biosensor displays a sigmoidal response to DNA ranging from 5nM to 1000nM. And the total analysis time is less than 20min.

W3A.72
A assessment method of early gastric tumor excision based second harmonic generation signal, Ning Zuo[1], Hongxin Lin[1], Xiaoling Zheng[2], Shuangmu Zhuo[1]; *[1]Fijian Normal Univ., China; [2]Fujian Provincial Hospital, China.* Combining qualitation and quantitation to analyze the collagen fibers of ESD excision specimens using multiphoton microscopy, we successfully differentiate early gastric cancer with the submucosal invasion from the normal tissues.

W3A.73
CNN-based Automatic Region Identification for Accelerating Whole Mouse Brain Imaging, Zhiguang Wang[1,2], Shangbin Chen[1,2], Hui Gong[1,2], Qingming Luo[1,2], Anan Li[1,2];*[1]Collaborative Innovation Center for Biomedical Engineering, Wuhan National Laboratory for Optoelectronics-Huazhong Univ. of Science and Technology, China; [2]Britton Chance Center and MOE Key Laboratory for Biomedical Photonics, School of Engineering Sciences, Huazhong Univ. of Science and Technology, China.* To reduce the time required for imaging during whole-brain data acquisition, we proposed a machine learning based method to segment the contour of propidium iodide-stained mouse brain images of tomography and achieved effective results.

W3A.74
Fast Quantifying Discrepancies Between Brain-wide Neuron Reconstructions, Hang Zhou[1], Shiwei Li[1], Tingwei Quan[1], Shaoqun Zeng[1]; *[1]Huazhong Univ of Science & Technology, China.*Digital Reconstruction of brain-wide neuron contribute to the understanding of how brain works. Without heuristic knowledge, we quantifying discrepancies between neuron reconstructions to get golden standards. Here we report a fast method introducing hashing and binary search strategy to accelerate the quantifying work.

W3A.75
Combination Optimization of PLS Regression and SG Smoothing in NIR Analysis of Hemoglobin, Tao Pan[1], Bingren Yan[1], Yi Tang[1], Jiemei Chen[1], Lijun Yao[1]; *[1]Jinan Univ., China.* The combination optimization method of partial least squares regression combined with Savitzky-Golay smoothing was proposed, and successfully applied to near-infrared spectroscopic analysis of hemoglobin in the human peripheral blood samples.

W3A.76
A lysosome-targetable and two-photon fluorescent probe for imaging endogenous *β*-galactosidase in living ovarian cancer cells, Yueqing Gu[1], Jinxin Huang[1]; *[1]China Pharmaceutical Univ., China.* We have rationally designed and synthesized a novel two-photon fluorescence probe FC-βgal for monitoring endogenous β-gal in lysosome.

W3A.77
White Light Quantitative Phase Imaging Unit, YoonSeok Baek[1], KyeoReh Lee[1], Jonghee Yoon[1], YongKeun Park[1]; *[1]KAIST, Korea.* We present white light quantitative phase imaging unit (WQIU) as a practical realization of quantitative phase imaging. WQPIU which consists of a liquid crystal retarder, birefringent crystals and polarizers, enables phase imaging at conventional microscopes.

W3A.78
Optical topography guided diffuse optical tomography for imaging brain function, Bingyuan Wang[1], Jie He[1], Xue Ding[1], Yao Zhang[1], Jiao Li[1], Wenjuan Ma[3], Limin Zhang[1], Zhongxing Zhou[1], Feng Gao[1,2], Huijuan Zhao[1,2]; *[1]College of*

Precision Instrument and Optoelectronics Engineering, Tianjin Univ., China; [2]Tianjin Key Laboratory of Biomedical Detecting Techniques and Instruments, Tianjin, China; [3]Cancer Inst. and Hospital, Tianjin Medical Univ., Tianjin, China. Optical topography guided diffuse optical tomography is developed to regularize the ill-posed inverse problems involved in brain imaging. Simulation experiments demonstrate that stronger robustness and higher quantitativeness are obtained without adding any other modality measurements.

W3A.79

Nonlinear Photoacoustic Imaging by Pump-Probe Excitation, Fei Cao[1], Zhihai Qiu[1], Rui Zhang[1], Puxiang Lai[1], Lei Sun[1]; *[1]The Hong Kong Polytechnic Univ., Hong Kong.*Nonlinear photoacoustic imaging is demonstrated by a pump-probe photoacoustic excitation scheme by using PPIX. The system has potentials to greatly facilitate deep-tissue photoacoustic theranostics as well as high resolution dynamic photoacoustic molecular imaging.

W3A.80

Ultra-thin Lens-less Holographic Microscopy Using a Scattering Layer, YoonSeok Baek[1], YongKeun Park[1]; *[1]KAIST, Korea.* A digital holographic microscopy using a scattering objective is presented. The proposed method measures a complex amplitude of light without a conventional objective lens or an external reference arm. The principle and the performance of the method have been validated through experiments.

W3A.81

Label-free, Optical Measurements of Brain Morphologies in Alzheimer's Disease Using Quantitative Phase Imaging, Moosung Lee[1], Eeksung Lee[1], JaeHwang Jung[1], Hyeonseung Yu[1], Kyoohyun Kim[1], Jonghee Yoon[1], Shinhwa Lee[1], Yong Jeong[1], YongKeun Park[1]; *[1]KAIST, Korea.* We employ quantitative phase microscopy technique to investigate structural alterations in brains due to Alzheimer's disease. Quantifying optical scattering parameters, we show that Alzheimer's disease is associated with the morphological inhomogeneity of brains.

W3A.82

Optical coherence photoacoustic microscopy for retinal disease imaging, Cuixia Dai[1]; *[1]Shanghai Inst. of Technology, China.* We performed the dual-modality Optical coherence photoacoustic microscopy on Age related macular degeneration (AMD) model in rat to investigate the morphology and variability of the AMD diseases and to validate the therapeutic approaches.

W3A.83

Monitoring the Breath Signal of Small Animals for Gated Photoacoustic Microscopy of Mice, Jianshuang Wei[1], Qun Wang[1], Xiaoquan Yang[1], Zhihong Zhang[1], Qingming Luo[1]; *[1]Wuhan National Lab for Optoelectronics, China.* In photoacoustic microscopy(PAM), the imaging quality is limited by the motion artifacts of living animals. We introduce prospective respiratory gating for PAM to address this issue. This method captures the mouse's respiratory signal to trigger system imaging.

W3A.84

A Feature Point Based Registration of Brain Microscopic Images to the Reference Brain Atlas, Hong Ni[1,2], Shangbin Chen[1,2], Hui Gong[1,2], Qingming Luo[1,2], Anan Li[1,2]; *[1]Collaborative Innovation Center for Biomedical Engineering, Wuhan National Laboratory for Optoelectronics-Huazhong Univ. of Science and Technology, China; [2]Britton Chance Center and MOE Key Laboratory for Biomedical Photonics, School of Engineering Sciences, Huazhong Univ. of Science and Technology, China.* Recently, we have developed a Micro-Optical Sectioning Tomography system which enables single neuron resolution. By using a flexible strategy, we have aligned our MOST dataset to a reference brain atlas from Allen from Allen Inst..

W3A.85

3D visualization of the ascending pathway of motor nucleus with viral infection and fluorescent imaging, Ben Long[1], Tao Jiang[1], Jing Yuan[1], Xiangning Li[1], Hui Gong[1]; *[1]Wuhan National Lab for Optoelectronics, China.* To explore the network of the central motor system, we combined the fMOST technology with the recombinant Rabies virus. Rabies virus densely infected limbic system, brain stem and motor-related cortex, which included in motor system.

W3A.86
Automatic Collection of Paraffin-embedded Tissue Sections, Lu Tan[1], Ouyang Zhanmu[1], Ben Long[1], Jing Yuan[1], Xiaoquan Yang[1], Xiangning Li[1], Hui Gong[1], Qingming Luo[1]; *[1]Wuhan National Lab for Optoelectronics, China.* We developed an automatic collection system that use sticky tape to achieve the collection of paraffin-embedded slices. We demonstrated that the collected brain slices can be used for immunohistochemistry studies.

W3A.87
Intravital simultaneous autofluorescence-multiharmonic imaging, Haohua Tu[1]; *[1]Univ of Illinois at Urbana-Champaign, USA.* We empower multiphoton microscopy to visualize vital unlabeled cells and tissues of animals or human, achieve slide-free imaging *in vivo* and in real-time, and enable simple translational research from live cells and animals to human.

W3A.88
Two photon Imaging Unveils Stress-Induced Remodeling of Structural Plasticity in Mouse Frontal Association Cortex, Zhao Li[1]; *[1]Huazhong Univ. of Science and Techn, China.* Chronic social defeat stress induces re-modelling of neural circuit in mouse frontal association cortex no matter whether there is any depression behavior after exposure of stress.

W3A.89
Study Piezo1 Localization and Transportation Dynamics by Light-sheet Microscopy, Rui Zhang[1], Zhihai Qiu[1], Fei Cao[1], Jinghui Guo[1], Lei Sun[1]; *[1]The Hong Kong Polytechnic Univ., Hong Kong.* The mechanosensitive ion channel piezo1 plays an important role in mediating varied cellular signaling. It is hypothesized that diverse functions of piezo1 could depend on its subcellular localizations. Here we demonstrated that activation of piezo1 can change its subcellular localization as a feedback by using light-sheet microscope.

W3A.90
Performance Comparisons of Two Treatment Planning Methods for Laser Ablation Therapeutic Approach, Jingyi Hu[1], Yuhao Li[1], Yi Gong[1], Jie Tang[3], Changcun Pan[3], Xinru Xiao[3], Yigang Qiu[4], Shaolong Kuang[2], Yue Wu[1], Baiquan Su[1]; *[1]Beijing Univ. of Post and Telecommu, China; [2]Soochow Univ., China; [3]Beijing Tiantan Hospital, Capital Medical Univ., China; [4]NAVY General Hospital, China.* Treatment planning of laser spot on tissue dominates ablation performance. We investigate the comparative performance of difference velocities with a same trajectory for a laser spot on lesion tissue surface surrounding by normal tissue.

W3A.91
Titania conjugated phthalocyanine for two-photon photodynamic therapy on cancer cells, Xinyue Liang[1], Xiaobo Pan[1], Xinyi Wang[1], Yueyue Jing[1], Longfang Yao[1], Jiong Ma[1], Lan Mi[1];*[1]Fudan Univ., China.* This paper presents a novel photosensitizer TiO_2-Pc with strong two-photon absorption and enhanced fluorescence compared with Pc. The photokilling efficiency of TiO_2-Pc excited by two-photon was found significant on cancer cells for the first time.

W3A.92
Tunable Acoustic Gradient Index Lens for Fast Axail Scanning Photoacoustic Microscopy, Xiaoquan Yang[1], Bowen Jiang[1], Xianlin Song[1], Qingming Luo[1]; *[1]Wuhan National Lab for Optoelectronics, China.* The diffraction limits of optical focus restrict the field of view along the depth direction of OR-PAM. In this paper, the fabrication of the tunable acoustic gradient index lens (TAG) lens was demonstrated. And the performance of the TAG lens was also shown.

W3A.93
Development of a plastic embedding method for preservation of red fluorescent protein, Miao Ren[1], Jiaojiao Tian[1], Yang Yang[1], Hui Gong[1], Xiangning Li[1]; *[1]Wuhan National Lab for Optoelectronics, China.* To improve the preservation of red fluorescent proteins (RFP) during resin embedding procedure, we developed the plastic embedding methods that can preserve RFP and decrease the auto-fluorescence simultaneously.

W3A.94

Generation of high-peak-power sub-nanosecond 650-nm band optical pulses based on semiconductor laser diodes toward STED application, Jui-Hung Hung[1], Hiroyuki Yokoyama[1]; *[1]New Industry Creation Hatchery Center, Tohoku Univ., Japan.* Toward the application in pulsed-mode STimulated Emission Depletion (STED) super-resolution microscopy, we have developed a novel optical pulse source to generate sub-ns 650-nm band optical pulses having 40-W peak-power and 330-ps duration at 1-MHz rate, based on a semiconductor laser controlling technology.

W3A.95

A preliminary method to align fluorescence images of resin embedded mouse brains, Xiao Hu[1,2], Xiaojun Wang[1,2], Lei Su[1,2], Yurong Liu[1,2], Huimin Zhang[1,2], Xiuli Liu[1,2], Shaoqun Zeng[1,2]; *[1]Collaborative Innovation Center for Biomedical Engineering, Wuhan National Laboratory for Optoelectronics-Huazhong Univ. of Science and Technology, China; [2]Britton Chance Center and MOE Key Laboratory for Biomedical Photonics, School of Engineering Sciences, Huazhong Univ. of Science and Technology, China.* The mouse brain atlas of fluorescence Micro-Optical Sectioning Tomography was linearly globally registered based on the rigid transformation and the affine transformation, then it was nonlinearly locally registered based on the Demons symmetric diffeomorphisms algorithm.

W3A.96

Study on the Influence of Optical Clearing on Polarization Imaging Contrast, Nan Zeng[1], Hui Ma[1], Yu Huang[1], Dongsheng Chen[1], Qiaolin Xie[1], Valery V. Tuchin[2]; *[1]Tsinghua Univ., China; [2]Saratov National Research State Univ., Russian Federation.* We simulated the tissue clearing process focusing on two type tissue anisotropy: the interstitial birefringence and the fibrous scatterers. By comparing experiments and simulations, we examine how the polarization contrast changes with the clearing.

W3A.97

A label-free visualize Characterization Method for Dynamic Feature of a Neuron Based on Optical Phase Imaging, Wenbo Tang[1], Ying Ji[1], Zhiya Chen[1], Mingming Zhang[2], Yawei Wang[1,2]; *[1]Faculty of science, Jiangsu Univ., China; [2]School of mechanical engineering, Jiangsu Univ., China.* A new method to characterize the dynamic firing activity feature of a neuron is presented based on optical phase imaging. The method has the advantages both of label-free operation and simple calculation.

W3A.98

Microstructural imaging of human esophagus using multiphoton microscopy, Yaping Zeng[1], Jian Xu[1], Deyong Kang[2], Shuangmu Zhuo[1], Xiaoqin Zhu[1], Jiangbo Lin[2], Jianxin Chen[1];*[1]Fujian Normal Univ., China; [2]The Affiliated Hospital of Fujian Medical Univ., China.* Esophageal tissues contain abundant endogenous signals. In this work, we attempt to present microstructures of the four-layer structures of the human esophagus wall by multiphoton microscopy.

W3A.99

Selective Photo-activation and Resolution increasing in Structured Illumination Microscope, Dong Wen[1], Pengcheng Li[1]; *[1]Huazhong Univ. of Science & Technology, China.* We use a DMD to generate structured light illumination to increasing resolution in fluorescence microscope, and a SLM is used to generate pattern photo-activation image to select the area we need.

W3A.100

Scalable embedding method with hydrogel for optical imaging of fluorescent samples, Can Zhou[1], Ting Luo[1], Hui Gong[1], Xiangning Li[1]; *[1]Wuhan National Lab for Optoelectronics, China.* To acquire high SNR biological image in vitro, we developed a scalable embedding method of small deformation with modified hydrogel, which is compatible for large samples with kinds of fluorescent proteins and fluorescein.

W3A.101

3D Affine Registration of Large Image Stack for High-Resolution Brain Imaging Techniques, Chaozhen Tan[1,2], Zhao Feng[1,2], Hong Ni[1,2], Yuxin Li[1,2], Hui Gong[1,2], Qingming Luo[1,2], Anan Li[1,2]; *[1]Collaborative Innovation Center for*

Biomedical Engineering, Wuhan National Laboratory for Optoelectronics-Huazhong Univ. of Science and Technology, China; [2]Britton Chance Center and MOE Key Laboratory for Biomedical Photonics, School of Engineering Sciences, Huazhong Univ. of Science and Technology, China. To solve the stereotaxic deviation and sample deformation in Micro-Optical brain images at high resolution, we develop a high performance 3D affine registration method for large image stack to correct the stereotaxic space and morphology.

W3A.102

Study on Multi-parameter Evaluation Method of VDT Visual Fatigue Based on EEG and NIRS, Meng Ji[1], Pengcheng Li[1]; *[1]HUST, China.* The visual fatigue experiment was designed to establish a visual fatigue monitoring system for simultaneous monitoring of ERP, SSVERP, EEG and blood oxygen signals. The purpose is to form multi-parameter objective evaluation of visual fatigue.

W3A.103

New approach to fast analyze spontaneous cortical activity alternation between motifs, Wen M. Li[1]; *[1]HUST, China.* Using large size images for function connection analysis encounter large time consumption and insufficient computer memory. A new approach based on spatial analysis could rapidly extract different cortical activity motifs alternate over the time series.

W3A.104

Circulating tumor cells occur nonuniformly monitored by in vivo flow cytometry, Xi Zhu[1], Yuanzhen Suo[1], Nan Ding[1], Hao He[1], Xunbin Wei[1]; *[1]Med-X Research Inst., Shanghai Jiao Tong Univ., China.* Understanding the distribution of CTCs may improve the detectable rate of it. By using in vivo flow cytometry, we found that intervals between neighboring CTCs at late stages of liver cancer were exponential distribution.

W3A.105

Insight into the photo dynamic reaction of SNP and interaction of SNP with DNA/HSA upon photo irradiation, Lifang Liu[1], LeiLei Xie[1], Wenming Wang[1], Hongfei Wang[1]; *[1]Inst. of Molecular Science, Shanxi Univ., China.* Sodium Nitroprusside (SNP) has been widely applied clinically as a vasodilator. The photo dynamic reaction of SNP, photo induced cleavage of supercoiled pBR322 DNA by SNP and the binding modes of SNP with human serum albumin (HSA) were investigated.

W3A.106

Fast Fluorescence Lifetime Imaging Basis on Compressive Sensing, Bingling B. Chen[1], Wei Yan[1], Dnaying Lin[1], Junle Qu[1]; *[1]College of Optoelectronic Engineering, Shenzhen Univ., China.* We propose a fast fluorescence lifetime imaging method based on compression sensing (CS) sampling. By using this method, the imaging speed of the fluorescence lifetime is greatly improved while ensuring the accuracy of reconstruction.

W3A.107

Combining optical imaging and pharmacological methods to localize N-methyl-D-aspartate glutamate receptors in a stomach wall, Iuliia Golovynska[1,2], Tatiana Beregova[2], Tatiana Falalyeyeva[2], Sergii Golovynskyi[1], Junle Qu[1], Tymish Y.Ohulchanskyy[1]; *[1]Shenzhen Univ., China; [2]Inst. of Biology and Medicine, Taras Shevchenko National Univ. of Kyiv, Ukraine.* The glutamate receptors of N-methyl-D-aspartate type were directly detected by fluorescence imaging in rat stomach tissue and also studied by combination of pharmacology methods, aiming on detailed localization of the receptors in a stomach wall.

W3A.108

Polymeric Nanoparticles Loaded with Organic Dye for Optical Bioimaging in Near-Infrared Range, Artem Yakovliev[1], Lyudmyla O. Vretik[2], Roman Ziniuk[1], Julia L. Briks[3], Yuriy L. Slominskii[3], Junle Qu[1], Tymish Y.Ohulchanskyy[1]; *[1]College of Optoelectronic Engineering, Shenzhen Univ., China; [2]Taras Shevchenko National Univ. of Kyiv, Ukraine; [3]Inst. of Organic Chemistry NASU, Ukraine.* Poly-N-isopropylacrylamide (PNIPAM) based nanoparticles are formulated, postloaded with near-infrared dyes and charachterized. Obtained nanoparticles was tested as the near-infrared imaging contrast agents.

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W3A.109

Parallel Implementation of 2D Structure Tensor for High Resolution Brain Imaging, Shangbin Chen[1,2], Anan LI[1,2], Chaozhen Tan[1], Jie Peng[1], Hui Gong[1,2], Qingming Luo[1,2];*[1]Collaborative Innovation Center for Biomedical Engineering, Wuhan National Laboratory for Optoelectronics-Huazhong Univ. of Science and Technology, China; [2]Britton Chance Center and MOE Key Laboratory for Biomedical Photonics, School of Engineering Sciences, Huazhong Univ. of Science and Technology, China.* We have developed a parallel algorithm of 2D structure tensor for high resolution brain imaging. It allows us to quantify the orientation of neural fibers and blood vessels efficiently.

W3A.110

Label-free and Rapid Quantification of the Lipid Contents in Individual Microalgae Using Optical Diffraction Tomography, Jae-hwang Jung[1], Han-Byeol Kim[2], Seong-Joo Hong[2], Geon Kim[1], Seungwoo Shin[1], SangYun Lee[1], Dong-Jin Kim[3], Choul-Gyun Lee[2], YongKeun Park[1]; *[1]KAIST, Korea; [2]Department of Biological Engineering, Inha Univ., Korea; [3]Nelson Mandela African Institution of Science and Technology, Tanzania, United Republic of.* We demonstrate label-free and non-invasive quantification of the lipid inside individual microalgae, *Nannochloropsis oculata*, from the three-dimensional refractive index distribution measured using optical diffraction tomography.

W3A.111

Interfacing Global Fiber Tracking for Optical Microscopy Imaging, Zhengyu Pan[1,2], Zhengchao Xu[1,2], Hui Gong[1,2], Qingming Luo[1,2], Anan LI[1,2], Shangbin Chen[1,2]; *[1]Collaborative Innovation Center for Biomedical Engineering, Wuhan National Laboratory for Optoelectronics-Huazhong Univ. of Science and Technology, China; [2]Britton Chance Center and MOE Key Laboratory for Biomedical Photonics, School of Engineering Sciences, Huazhong Univ. of Science and Technology, China.* Tracing of neuron morphology is an essential technique in neuroscience. Many conventional methods are local algorithms that may accumulate error step by step. Thus, we apply a global tracking algorithm to reconstruction neuron morphology.

W3A.112

A Czerny-turner Spectrometer for Ultrahigh Resolution SD-OCT, Zhangkai Peng[1], Wenchao Liao[1], Shengnan Ai[1], Chengming Wang[1], Wenxin Zhang[1], Xiao Zhang[1], Ping Xue[1];*[1]Tsinghua Univ., China.* A Czerny-turner spectrometer is specially designed to eliminate coma and other aberrations with high spectral resolution over a bandwidth of >200nm centered at 830nm and enable SD-OCT imaging with high resolution of ~1.6μm.

W3A.113

Measurements of Polarization-dependent Angular Light Scattering from Individual Microscopic Samples Using Polarization Fourier Transform Light Scattering, Jae-hwang Jung[1], Jinhyung Kim[1], Min-Kyo Seo[1], YongKeun Park[1]; *[1]KAIST, Korea.* We demonstrate polarization-sensitive measurements of the angle-resolved light scattering from a liquid crystal droplet and silver nano wire utilizing quantitative phase imaging and Fourier transform light scattering.

W3A.114

A novel probe for endoscopic OCT imaging, Wenchao Liao[1], Tianyuan Chen[1], Chengming Wang[1], Wenxin Zhang[1], Zhangkai Peng[1], Xiao Zhang[1], Shengnan Ai[1], Deyong Fu[1], Tieying Zhou[1], PING XUE[1]; *[1]Tsinghua Univ, China.* A probe is made to overcome depth of focus limitations for endoscopic OCT imaging, achieving an effective depth of focus of >1mm with lateral resolution of ~4μm. C-mode OCT imaging of biological tissue is demonstrated.

W3A.115

Characterizations of Erythrocytes from Individuals with Sickle Cell Diseases and Malaria Infection in Tanzania Using a Portable Quantitative Phase Imaging Unit, Jae-hwang Jung[1], Lucas E. Matemba[2], KyeoReh Lee[1], Paul Kazyoba[2], Jonghee Yoon[1], Julius J. Massaga[2], Kyoohyun Kim[1], Dong-Jin Kim[3], YongKeun Park[1]; *[1]KAIST, Korea; [2]National Inst. for Medical Research, Tanzania, United Republic of; [3]Nelson Mandela African Institution of Science and Technology, Tanzania, United Republic of.* We demonstrate characterization of the red blood cells obtained from individuals with sickle cell disease and with malaria infection using quantitative phase imaging. Morphological, biochemical, and biophysical properties of individual red blood cells are investigated.

W3A.116
Multiscale photoacoustic visualization of the cardio-cerebrovascular development in the embryonic zebrafish, Qian Chen[1], Lei Xi[1]; *[1]UESTC, China.* In this study, we applied multiscale optical resolution photoacoustic microscopy (ORPAM) to image the whole-body vasculature of the embryonic zebrafish with a special focus on the development of the cardio-cerebrovascular system.

W3A.117
Photoacoustic Elasticity Imaging for Soft Tissue-mimicking Phantom, Naizhang Feng[1], Ying Fu[1], Tong Wang[1], Mingjian Sun[1]; *[1]Harbin Inst. of Technology at Weihai, China.*Photoacoustic elasticity imaging for soft tissue-mimicking phantom is proposed, based on laser-generated shear wave. It generates high frequency shear wave for high-resolution imaging and has potential to achieve non-contact testing by integrating with optical detection

W3A.118
A Fast Sparse Sampling Photoacoustic Microscopy System, Mingjian Sun[1], Guanji Leng[1], Ying Fu[1], Yang Liu[1], Keke Yang[1], Xiangwei Lin[1], Naizhang Feng[1]; *[1]Harbin Inst. of technology at Weihai, China.* Traditional full-sampling mode cannot meet the experimental requirements since long time-consuming. Based on the sparseness of photoacoustic images, present study establish a fast sparse sampling photoacoustic microscope system for saving time and rebuilding good images.

W3A.119
New Technique to Compensate Dispersion of OCT Imaging, Wenxin Zhang[1], Xiao Zhang[1], Chengming Wang[1], Wenchao Liao[1], Shengnan Ai[1], Zhangkai Peng[1], Ping Xue[1]; *[1]Tsinghua Univ., China.* A novel transformation for dispersion compensation utilizing the conjugate function of the signal itself is proposed. Its ability to compensate dispersion in biological sample and obtain the sample's group-velocity and third order dispersion is also demonstrated.

W3A.120
Hybrid photoacoustic and ultrasound imaging of tongue cancer, Heng Guo[1], Lei Xi[1]; *[1]U. of Electr. Sci. and Tech. of China, China.* Tongue cancer is an increasingly common disease. We proposed a dual-modality photoacoustic and ultrasound imaging technique to simultaneously map the functional and structural information for early-stage tongue cancer detection.

W3A.121
Measuring Structural, Chemical, and Biomechanical Properties of Live Amphibian Erythrocytes Using Optical Diffraction Tomography, SeongYeon Youn[2], EuiTae Lee[2], Daeheon Kwon[2], Jonghun Shin[2], Yoonsil Lee[2], Geon Kim[1], Moosung Lee[1], YongKeun Park[1]; *[1]KAIST, Korea; [2]Daejeon Science High School for the Gifted, Korea.* We present optical characterizations of live amphibian erythrocytes by utilizing quantitative phase imaging. Without any labeling or preparation procedures, 3-D refractive index tomogram and 2-D phase delay of amphibian erythrocyte were measured using Mach-Zehnder interferometry.

W3A.122
Optical transparence windows for head tissues in near and short-wave infrared regions, Sergii Golovynskyi[1], Iuliia Golovynska[1], Ludmila Stepanova[2], Oleksandr Datsenko[2], Junle Qu[1], Tymish Y.Ohulchanskyy[1]; *[1]Shenzhen Univ., China; [2]Taras Shevchenko National Univ. of Kyiv, Ukraine.* The optical permeability of rat head tissues, such as brain cortex, cranial bone and skin has been determined in the visible, near-infrared and short-wave infrared regions, aiming towards the trough-skull brain imaging.

W3A.123
Visualize the morphology of tissue blocks with hematoxylin and eosin staining, Yawu Li[1]; *[1]Huazhong Univ. of Science and Techn, China.* In this work, we use hematoxylin and eosin method to stain whole mount tissues and then to acquire the morphological information with 3D imaging system; this would be helpful to study tumor growth and metastasis.

W3A.124
Label-free Structural Characterizations of Pinus Pollen Grains Using Optical Diffraction Tomography, Geon Kim[1], YongKeun Park[1]; *[1]KAIST, Korea.* We present a label-free structural characterization of individual pollen grains from trees of genus Pinus using quantitative phase imaging. 3-D refractive index distribution in single pollen grain was measured using optical diffraction tomography.

W3A.125
Fast transversal flow vector resolving with high spatial resolution reachable using speckle decorrelation optical coherence tomography, Lei Fu[1], Wenping Li[1], Ya Su[1], Yimin Wang[1], Lei Chen[3], Hongjie Wang[3], X. Steve Yao[1,2]; *[1]Photonics Information Innovation Center, China; [2]General Photonics Corporation, USA; [3]Affiliated Hospital, Hebei Univ., China.* We present a tri-scan method which can resolve the transversal flow vector by speckle decorrelation OCT. High spatial resolution can be reached by using the data set within a specific portion of the scan range.

W3A.126
Two-photon Small Molecular Enzymatic Probes, Lin Li[1]; *[1]Nanjing TECH Univ., China.* Two-photon Small Molecular Enzymatic Probes (TSMEPs) have helped to uncover new biological roles and functions of a series of enzymes, therefore we hope to encourage more TSMEPs to be developed for diverse enzymes.

W3A.127
High-resolution imaging immunofluorescence-labeled large-volume brain tissues, Yadong Gang[1], Xiaojun Wang[1], Ruixi Chen[1], Fangfang Yin[1], Xiuli Liu[1], Zheng-bo Wang[2], Xin-tian Hu[2], Shaoqun Zeng[1]; *[1]Wuhan National Laboratory for Optoelectronics, China; [2]1Key Laboratory of Animal Models and Human Disease Mechanisms of Chinese Academy of Sciences and Yunnan Province, China.* We combined large sample resin embedding with immunofluorescence staining to acquire biomolecules profiles with high spatial-resolution. After evaluating the compatibility of this method and filtering embedding resin, we achieved to high-resolution image immunolabeled large-volume tissues.

W3A.128
Cell-permeable organic fluorescent probes for live-cell long-term super-resolution imaging reveal lysosome-mitochondrion interactions, Yubing Han[3,2], Meihua Li[1,2], Fengwu Qiu[1,2], Meng Zhang[1,2], Yuhui Zhang[1,2]; *[2]Britton Chance Center for Biomedical Photonics, Huazhong Univ. of Science and Technology-Wuhan National Laboratory for Optoelectronics, China; [3]MoE Key Laboratory for Biomedical Photonics, Department of Biomedical Engineering, Huazhong Univ. of Science and Technology, China.* Two kinds of cell-permeable organic fluorescent probes with high photostability were developed for lysosomes and mitochondria. With these probes, we first observed dynamic physical lysosome-mitochondrion interactions for over 13 min in live-cell dual-color super-resolution imaging.

W3A.129
A reduced graphene oxide-based fluorescence resonance energy transfer sensor for highly sensitive detection of trypsin, Jianshu Xu[1], Yating Lin[1], Ya Hu[1], Shusen Xie[1], Juqiang Lin[1];*[1]Fujian Normal Univ., China.* Reduced graphene oxide is utilized as a FRET probe acceptor to quench the fluorescent donor emission. Compared with control group, the fluorescence intensity increased 6.59 times, indicating the probe is promising for detecting trypsin activity.

W3A.130
Quenching effects of (-)-epigallocatechin-3-gallate for triplet photosensitizer and singlet oxygen during photosensitization, Xianglian Liao[1], Huiyun Lin[1], Buhong Li[1]; *[1]Fujian Normal Univ., China.* Time and spectral resolved singlet oxygen ($^1O_2$) luminescence was detected to elucidate quenching effects of (-)-epigallocatechin-3-gallate (EGCG) for triplet photosensitizer and $^1O_2$ during photosensitization. The data indicate that EGCG could efficiently quench triplet photosensitizer and $^1O_2$.

W3A.131

Delivery of Peptide Antigen with Lipid-based Fluorescent-trackable Nanoparticles in Vivo for Cancer Immunotherapy, Sha Qiao[1], Yuan Qian[1], Zhihong Zhang[1]; *[1]Huazhong Univ. of Science & Technology, China.* Dendritic cells (DCs) play important roles in cancer immunotherapy. Recently, we developed a lipid-based fluorescent-trackable nanoparticle which could target and deliver antigen peptides and adjuvants to DCs simultaneously and achieved promising effects of cancer immunotherapy.

W3A.132
CT/FMT dual-model imaging of breast cancer based on peptide-lipid nanoparticles, Guoqiang Xu[1,2], Qiaoya Lin[1,2], Zhihong Zhang[1,2]; *[1]Collaborative Innovation Center for Biomedical Engineering, Wuhan National Laboratory for Optoelectronics-Huazhong Univ. of Science and Technology, China; [2] Britton Chance Center and MOE Key Laboratory for Biomedical Photonics, School of Engineering Sciences, Huazhong Univ. of Science and Technology, China.* Here, we developed a breast cancer-targeting nanoparticle for dual-modality imaging based on incorporation of CT contrast agents (iodinated oil) and far-infrared fluorescent dyes (DiR-BOA) into core of nanoparticles, and obtained FMT and CT signals simultaneously.

W3A.133
Edge Recognition on Terahertz Pulse Images of Cutaneous Malignant Melanoma, Sun Ping[1]; *[1]Beijing Normal Univ., China.* Terahertz pulse imaging of cutaneous malignant melanoma was carried out across a frequency range of 0.2–1.4 THz. The areas of normal and cancerous tissues were determined using multi-scale, multi-azimuth and multi-structural element mathematical morphology.

W3A.134
Hybrid EEG-fNIRS Based BCI for Rehabilitation, Yuan L. Zhu[1], Pengcheng Li[1]; *[1]HUST, China.* We aim at design a motor-magery based brain-computer interface(BCI) using functional near-infrared spectroscopy(fNIRS) and electroencephalography(EEG) for rehabilitation.We use the common spatial pattern(CSP) to extract features which are then classified with the support vector machine(SVM).

W3A.135
Graphene Based Optical Differential Detection for Photoacoustic Imaging, Chonglei Zhang, Fan Yang, Wei Song, Hui Fang, Changjun Min, Xiaocong Yuan*. *Shenzhen Univ., China.* Photoacoustic signals cause a slight change in the refractive index of the medium, which can be detected based on the absorption difference of the multilayer grapheme film exerting on p and s polarized light beams.

A101-102
15:40 -- 17:30
W4A • Neurophotonics
Presider: Chris Xu; Cornell Univ., USA and Shaoqun Zeng; Huazhong Univ. of Science & Technology, China

W4A.1 • 15:40 (Keynote)
Photonics for the study of neurons: from synaptic plasticity to network dynamics, Guoqiang Bi[1]; *[1]Univ. of Science and Technology of China, China.* Fluorescence imaging and other photonic methods are used to reveal how mitochondrial activity underlies the conversion from short-term to long-term synaptic plasticity and how reverberatory activity emerges in neuronal networks through synaptic plasticity.

W4A.2 • 16:10 (Invited)
DMD-based two-photon random-access imaging and optical stimulation for neuroimaging applications, Shih-Chi Chen[1]; *[1]The Chinese Univ. of Hong Kong, Hong Kong.* I will present our recent work on femtosecond laser manipulation based on digital micromirror devices (DMD) and binary holography; and its applications in developing the next-generation two-photon excitation (TPE) microscopes.

W4A.3 • 16:30 (Invited)

Fast High-resolution Miniature Two-photon Microscopy for Brain Imaging in Freely-behaving Mice at the Single-spine Level, Liangyi Chen[1]; [1]*Inst of Molecular Medicine, Peking Univ., China.* We have designed a fast, high-resolution, miniaturized two-photon microscope. Weighting 2.15 g, it is capable of imaging at high spatiotemporal resolution (0.64 µm laterally and 3.35 µm axially, 40 Hz at 256 × 256 pixels).

W4A.4 • 16:50 (Invited)
Fast Volumetric Imaging Methods for Whole Brain Imaging in Larval Zebrafish, Lin Cong[1], Zeguan Wang[3], Wei Hang[1], Zhenkun Zhang[1], Chunfeng Shang[1], Lu Bai[1], Jiulin Du[1,3], Kai Wang[1,2]; [1]*Inst. of Neuroscience, State Key Laboratory of Neuroscience, CAS Center for Excellence in Brain Science and Intelligence Technology, Chinese Academy of Sciences, China;* [2]*Univ. of Chinese Academy of Sciences, China;* [3]*Univ. of Science and Technology of China, China.* We developed a new type of light field microscope with extended field-of-view. We achieved whole larval zebrafish brain imaging at near single cell resolution and at 90 Hz volume rate. We demonstrated its applications in functional imaging of neural dynamics and fast imaging of circulating blood cells in larval zebrafish brain.

W4A.5 • 17:10 (Invited)
Multi-modal Optical Imaging of Cortial Spreading Depression, Pengcheng Li[1]; [1]*Huazhong Univ of Science and Technology, China.* Cortical spreading depression (CSD) is related to brain diseases such as cerebral ischemia, migraine and brain injury. Multi-modal optical imaging methods were employed to investigate the physiology of CSD to help understanding its underlying mechanism for brain disfunction.

A103-104
15:40 -- 17:40
W4B • Nanotechnology for Biophotonics
Presiders: Yueqing Gu; China Pharmaceutical Univ., China and Katarina Svanberg; Lund Laser Centre, Sweden

W4B.1 • 15:40 (Keynote)
Integrating Intelligent Materials into Organ on a Chip System, Zhongze Gu[1]; [1]*Southeast Univ., China.* We have developed several kinds of organ-on-chips, organ-on-liquid-phase barcodes chips, liver on a chip, three-dimensional vascularized tissue on a chip, tumor on a chip, neuromuscular junction on a chip, kidney on a chip, heart on a chip, etc.

W4B.2 • 16:10 (Keynote)
Optical Trapping of Nanoparticles: New Opportunities in Nanoscale Sensors, Peter Reece[1]; [1]*Univ. of South Wales, Australia.* Combining nanotechnology with optical trapping offers new possibilities for developing photonic force probes and nanoscale sensors with engineered functionality that target specific types of physical, biological and chemical interactions. In addition, nanoparticles provide interaction volumes that are many times smaller than their microscopic counterparts, thereby potentially creating much higher resolutions for sensing in a variety of confined complex environments.

W4B.3 • 16:40 (Invited)
Monitoring Circulating Tumor Cells by In-vivo Photoacoustic
Flow Cytometry, Xunbin Wei[1]; [1]*Med-X Res. Inst, Shanghai Jiao Tong Univ, China.* An in vivo photoacoustic flow cytometer (PAFC) is used to monitor circulating tumor cells. The counting of circulating tumor cells provides insights in cancer metastasis. It is useful to understand the molecular mechanisms of tumor metastasis.

W4B.4 • 17:00 (Invited)
Ag_2S Quantum Dots for Advanced In Vivo Imaging: Seeing is Believing, Qiangbin Wang[1]; [1]*Chinese Academy of Science, China.* We have successfully developed a new kind of Ag2S QDs in the second near-infrared window (900-1700 nm) for in vivo imaging with much deeper tissue penetration and higher spatiotemporal resolution.

W4B.5 • 17:20 (Invited)

Organic Nanodots for Superresolution Optical Imaging, Changfeng Wu[1], Zhihe Liu[1], Xiaofeng Fang[1]; *[1]Southern Univesity of Science and Technology, China.* Organic nandots exhibit superior brightness and tunable optical properties. This presentation describes the development of small organic nanodots for biological imaging. Stimulated emission depletion (STED) imaging and Superresolution optical flunctuation imaging (SOFI) were demonstrated.

Thursday, 28 September

A101-102
08:30 -- 09:50
T1A • Novel Techniques for Bioimaging I
Presider: Oxana Semyachkina-Glushkovskaya; Saratov State Univ., USA and Ruikang K. Wang; Univ. of Washington, USA

T1A.1 • 08:30 (Invited)
Fluorescence lifetime imaging and its applications in cellular microenvironment measurement and auxiliary diagnosis, Junle Qu[1]; *[1]Shenzhen Univ., China.* FLIM can be used to measure intracellular viscosity, analyze cellular differentiation and apoptosis, and monitor macromolecule dynamic changes in the nucleus as well as aid diagnosis of H&E-stained pathological sections.

T1A.2 • 08:50 (Invited)
FRET Based Probe for the Detection of NO in Tumor Environment, Yueqing Gu[1], Han Wang[1]; *[1]China Pharmaceutical Univ., China.* The nanosystem consists of the amphiphilic polymer PAAO， UCNPs and RhBs. The RhBs can absorb the 540nm light of UCNPs emission with the existence of NO could realize real-time monitoring of the treatment process.

T1A.3 • 09:10 (Invited)
Quantitative Image Analysis of Multiphoton Microscopy in the Application to Brain Imaging, Shu Wang[1], Xiuqiang Chen[2], Weilin Wu[1], Zhida Chen[1], Huiping Du[1], Xingfu Wang[3], Yu V. Fu[2], Liwen Hu[3], Jianxin Chen[1]; *[1]Fujian Normal Univ., China; [2]Chinese Academy of Sciences, China; [3]Fujian Medical Univ., China.* Quantitative image analysis methods were developed. A combination of multiphoton microscopy and image analysis methods established a visualized approach for identification of brain structure and boundary between normal and cancerous tissues.

T1A.4 • 09:30 (Invited)
GRIN Lens Based High Speed Confocal System for Deep Brain Calcium Imaging, Ling Fu[1]; *[1]Huazhong Univ. of Science and Technology, China.* We developed a gradient index lens (GRIN lens) based high speed confocal system to detect the calcium signal efficiently with single cell resolution for deep brain.

A103-104
08:30 -- 09:50
T1B • Immunophotonics and Analytical Biophotonics
Presider: Buhong Li; Fujian Normal Univ., China and Sune R. Svanberg; South China Normal Univ., China

T1B.1 • 08:30 (Invited)
Immunophotonics-based therapy for Metastatic Cancers, Wei R. Chen[1]; *[1]Univ Central Oklahoma, USA.* An immunophotonics-based novel therapy was developed for the treatment of metastatic cancers. It uses the combination of local laser irradiation and immunological stimulation through administration of immunoadjuvants.

T1B.2 • 08:50 (Invited)

Actin Cytoskeletal Remodeling in the Regulation of Glucose Homeostasis, Man Shrestha[1], Chun-Yan Lim[1], Weiping Han[1]; *[1]Singapore Bioimaging Consortium, Singapore.* Glucose transporter 4 (GLUT4) is a key regulator of systemic glucose homeostasis. We recently showed that GLUT4 translocation is regulated by actin remodeling triggered by insulin signaling. Here we present that AMPK-mediated phosphorylation of an actin-capping protein is required for GLUT4 exocytosis and glucose uptake in muscle cells.

T1B.3 • 09:10 (Invited)
In vivo optical imaging of anti-tumor immune response, Zhihong Zhang[1], Shuhong Qi[1], Fei Yang[1]; *[1]Huazhong Univ. of Science & Technol, China.* In vivo optical spatio-temporal imaging of the tumor microenvironment is useful to explain how tumor immunotherapies work. Here, we try to use this technology to answer two important questions about tumor immune response *in vivo*.

T1B.4 • 09:30 (Invited)
Smart Nanomaterials for Synergistically Enhancing Photodynamic Therapy Efficiency, Xiaolong Liu[1]; *[1]Mengchao Hepatobiliary Hospital, Fujian Medical Univ., China.* Taken together, here described nanoplatform with tumor cell specific responsive properties and programmable PDT/PTT/chemotherapy functions, might be an interesting synergistic strategy for HCC treatment.

A202
08:30 -- 09:50
T1C • Annual Symposium for KLBMP and SKLB I
Presider: Zuhong Lu, Southeast Univ., China and Dan Zhu; Wuhan National Lab for Optoelectronics, China

T1C.1 • 08:30
Multiplex and ultrasensitive bioassays based nanophotonic materials, Xiangwei Zhao[1]; *[1]Southeast Univ., China.* We proposed to use plasmonic nanotags and photonic crystal materials for multiplex detection of proteins in a wide concentration range from fg mL^{-1} to sub mg mL^{-1}, which has wide applications in precision medicine.

T1C.2 • 08:50
High-power Homogeneous Illumination for Super-resolution Localization Microscopy with Large Field-of-view, Zhen-Li Huang[1]; *[1]Wuhan National Lab for Optoelectronics, China.* Super-resolution localization microscopy with large field-of-view has not been achieved due to the lack of high-power homogeneous illumination. Here we report our efforts to achieve the largest reported field-of-view with homogeneous spatial resolution.

T1C.3 • 09:10 Postdeadline Submission
Imaging subcellular structures for biomedical applications, Fu-Gen Wu[1]; *[1]Southeast Univ., China.* In this talk, I will introduce our very recent advancements of using a variety of molecular- or nanoparticle-based fluorescent probes for visualizing subcellular structures such as plasma membrane, mitochondria, lysosome, and nucleus.

T1C.4 • 09:30
Cell-permeable Organic Fluorescent Probes for Live-cell super-resolution Imaging, Yubing Han[1], Meihua Li[1], Meng Zhang[1], Yuhui Zhang[1]; [1]Britton Chance Center for Biomedical Photonics, Huazhong Univ. of Science and Technology-Wuhan National Laboratory for Optoelectronics*, China.* We anticipate that these fluorescent probes and our delivery strategies will be helpful tools for live-cell super-resolution imaging and substantially benefit characterizations of dynamic physical interactions between intracellular organelles in living cells.

A202
10:05 -- 12:05
T2C • Annual Symposium for KLBMP and SKLB II
Presider: Qingming Luo; Huazhong Univ. of Science and Technology, China and Zhongdang Xiao; Southeast Univ., China

T2C.1 • 10:05 Postdeadline
Nonlinear Vibrational Spectroscopy for Probing Biological Interfaces, Xiaolin Lu[1]; *[1]Southeast Univ., China.* Background of a nonlinear optical technique – sum frequency generation (SFG) spectroscopy was introduced first. Examples were presented to demonstrate study of biological interfaces using SFG.

T2C.2 • 10:25
Quantifying the Brain-wide and Regional Distributions of Type-specific Neurons Using Whole-brain Optical Imaging and Stereoscopic Cell Counting, Jing Yuan[1]; *[1]Wuhan National Lab for Optoelectronics, Huazhong Univ of Science & Technology, China.* We propose a stereological analysis platform for quantifying the brain-wide and regional distributions of type-specific neurons in a whole mouse brain using the Brian-wide Position System and NeuroGPS.

T2C.3 • 10:45 Postdeadline
Evaluation of Barcodes Reveals Ligation Biases between the Terminal Bases, Jing Tu[1], Na Lu[1], Qinyu Ge[1], Zuhong Lu[1]; *[1]Southeast Univ., China.* Barcode-independent biases accompany with the application of barcodes in high throughput sequencing. We evaluate two types of barcodes on a sequencing-by-ligation platform. The results suggest that terminal bases of barcodes tend to influence ligation.

T2C.4 • 11:05
Advanced NeuroGPS-Tree achieves brain-wide reconstruction of neuronal population, Tingwei Quan[1]; *[1]Wuhan National Laboratory for Optoelect, China.* Here, we repored a software tool for brain-wide reconstruction of neuronal population. The reconstructions indicated that without loss of the reconstruction accuracy, our tool has about 10 folds speed gain over the commercial software that provides the manual reconstruction.

T2C.5 • 11:25 Postdeadline
Precise measurement of two-photon absorption coefficient of microscale biophotonics materials by femtosecond laser pump-probe, Qiannan Cui[1], Chunxiang Xu[1], Hui Zhao[2];*[1]Southeast Univ., China; [2]The Univ. of Kansas, USA.* We present a new method to spatiotemporally measure two-photon absorption coefficient of microscale biophotonics materials by femtosecond laser pump-probe. Our method is more accurate than Z-scan technique.

T2C.6 • 11:45
Rapid optical clearing method for mouse brain tissues, Tingting Yu[1], Yisong Qi[1], Jianyi Xu[1], Jingtan Zhu[1], Yusha Li[1], Dan Zhu[1]; *[1]Wuhan National Lab for Optoelectronics, China.* Various tissue optical clearing techniques have emerged for large-volume imaging. Most of them suffer from long processing time. Here, we introduced rapid clearing methods for thin and thick brain blocks, respectively.

A101-102
10:20 -- 12:00
T2A • Novel Techniques for Bioimaging II
Presider: Junle Qu; Shenzhen Univ., China

T2A.1 • 10:20 (Invited)
Non-invasive Optical Imaging of Tissue Morphology and Microcirculations in vivo, Ruikang K. Wang[1]; *[1]Univ. of Washington, USA.* We discuss the use of OMAG to delineate the dynamic blood perfusion, down to capillary level resolution, within living tissues, including cerebral blood flow in rodent models, retinal vessel networks and subcutaneous skin microcirculation in humans.

T2A.2 • 10:40 (Invited)
Structural and Functional Fourier Domain Optical Coherence Tomography, Technology and Applications, Zhihua Ding[1]; *[1]Zhejiang Univ., China.* Optical coherence tomography (OCT) systems with ultralong depth range, ultrawide

lateral field, ultrahigh axial resolution, and enhanced contrasts are introduced. Quasi-needle-like focus in OCT and lens-free all-fiber OCT probe are presented. New applications are feasible with these developed OCT systems.

T2A.3 • 11:00 (Invited)
Biological Microlasers Inside Cells and Tissues, Matjaz Humar[1,2]; *[1]J. Stefan Inst., Slovenia; [2]Faculty of Mathematics and Physics, Univ. of Ljubljana, Slovenia.* Lasers made out of biological and biocompatible materials have been produced and inserted into cells and tissues. Biological lasers enable tagging of thousands of cells, intracellular sensing, diagnostics and novel imaging methods.

T2A.4 • 11:20 (Invited)
Characterizing Microstructural Features of Breast Carcinoma Tissues in Different Progression Stages by Transformed Mueller Matrix Parameters, Honghui He[1], Yang Dong[1], Wei Sheng[1], Hui Ma[1]; *[1]Tsinghua Univ., China.* In this work, we demonstrate that the transformed Mueller matrix parameters and Mueller matrix microscope can be used as tools for quantitative diagnosis of breast ductal carcinoma tissues at different progression stages.

T2A.5 • 11:40 (Invited)
Time-domain Diffuse Optical Tomography of Thyroid Gland, Yoko Hoshi[1]; *[1]Hamamatsu Univ., Japan.* NIRS was originally designed for clinical monitoring, and it has also become a useful tool for neuroimaging studies with the so called functional NIRS (fNIRS). In parallel to these developments, diffuse optical tomography (DOT) using near-infrared (NIR) light has been being developed.

A103-104
10:20 -- 12:00
T2B • Translational Biophotonics I
Presider: Hui Ma; Tsinghua Univ., China and Sihua Yang; MOE Key Laboratory of Laser Life Science, China

T2B.1 • 10:20 (Invited)
Laser Spectroscopy to Meet some Challenges in Medicine, Katarina Svanberg[2,1], Wansha Li[2], Ying Li[2], Huiying Liu[2], Hao Zhang[2], Sune R. Svanberg[2,1]; *[1]Lund Laser Centre, Sweden; [2]Center for Optical and Electromagnetic Research, South China Academy of Advanced Optoelectronics, South China Normal Univ., China.* Laser based spectroscopic techniques can be used in the detection and therapy of many human diseases. Examples will be given from a variety of clinical areas, such as oncology, orthopedics and pediatrics, and also from the field of food safety and antibiotic control.

T2B.2 • 10:40 (Invited)
Laser Spectroscopy applied to Environmental, Ecological, Agricultural and Food Safety Research, Sune R. Svanberg[1,2], Zheng Duan[1], Wei Fu[1], Wansha Li[1], Ying Li[1], Yiyun Li[1], Ming Lian[1], Huiying Liu[1], Xun Wang[1], Hao Zhang[1], Guangyu Zhao[1], Shiming Zhu[1], Katarina Svanberg[1,2]; *[1]South China Normal Univ., Sweden; [2]Lund Univ., Sweden.* Laser spectroscopy has a multitude of applications of importance to human and eco-system well-being, such as in the environmental, ecological, agricultural and food safety areas. Recent work, mostly from SCNU, will be reviewed.

T2B.3 • 11:00 (Invited)
Towards Optical Bioimaging in Near and Short-wave Infrared Regions: Contrast Agents and Tissue Optical Properties, Tymish Y. Ohulchanskyy[1,2]; *[1]College of Optoelectronic Engineering, Shenzhen Univ., China; [2]Instiute for Lasers, Photonics and Biophotonics, State Univ. of New York, Univ. at Buffalo, USA.* Optical bioimaging probes are developed in conjunction with study of spectral properties of biological tissues in near infrared (NIR) and short-wave infrared (SWIR) regions (~800-1700nm). An applicability of some endogenous and exogenous contrast agents for imaging in NIR and SWIR optical transparency windows are assessed.

T2B.4 • 11:20 (Invited)

Spatiotemporal Detection of Singlet Oxygen Luminescence for Photodynamic Therapy, Buhong Li[1]; *[1]Key Laboratory of OptoElectronic Science and Technology for Medicine of Ministry of Education, Fujian Normal Univ., China.* Singlet oxygen is recognized to be the main cytotoxic species generated during photodynamic therapy. In this talk, the emerging strategies for enhanced photosensitized singlet oxygen generation are introduced, and the recent advances in spatiotemporal detection of singlet oxygen luminescence at around 1270 nm are presented.

T2B.5 • 11:40 (Invited)
Laser-induced generation of singlet oxygen: new strategies in the treatment of brain tumor, Oxana Semyachkina-Glushkovskaya[1], Ekaterina Borisova[2], Sergei Sokolovski[3], Alexander Shirokov[4], Nikita Navolokin[5], Natalia Shushunova[1], Alexander Khorovodov[1], Maria Ulanova[1], Madina Sagatova[1], Ilana Agranivich[1], Anastasiya Bodrova[1], Maria Dvoryatkina[1], Edik Rafailov[3], Valery V. Tuchin[6,7]; *[1]Interdisciplinary Center of Critical Technologies in Medicine, Saratov State Univ., Russian Federation; [2]Inst. of Electronics, Bulgarian Academy of Sciences, Bulgaria; [3]Optoelectronics and Biomedical Photonics Group, Aston Univ., UK; [4]Inst. of Bioorganic Chemistry, Russian Academy of Sciences, Russian Federation; [5]Saratov State Medical Univ., Russian Federation; [6]Interdisciplinary Center of Critical Technologies in Medicine, Saratov State Univ., Russian Federation; [7]Interdisciplinary Laboratory of Biophotonics, National Research Tomsk State Univ., Russian Federation.* Here we show the photodynamics (PD)-induced opening of the blood-brain barrier in dependence on different light doses and concentrations of photosensitizer that is important for correction of PD-related fluorescence guided resection of brain tumor

A101-102
13:30 -- 14:30
T3A • Student Competition

A101-102
14:30 -- 16:10
T4A • Analytical Biophotonics
Presider: Ling Fu; Huazhong Univ of Science and Technology, China and Tymish Y. Ohulchanskyy; SUNY Buffalo, USA

T4A.1 • 14:30 (Invited)
Focused and controllable optical delivery in complex media using wavefront shaping, Puxiang Lai[1]; *[1]Hong Kong Polytechnic Univ., Hong Kong.* Achieving noninvasive focused or controlled optical delivery at depths in tissue is challenging due to strong scattering of light. Recent progress on wavefront engineering has opened up new opportunities for this long sought goal.

T4A.2 • 14:50 (Invited)
Towards High Spatial Resolution Imaging Based on Optical Field Engineering, Kebin Shi[1]; *[1]Peking Univ., China.* In this talk, I will present our recent progresses on deep tissue fluorescence super-resolution and non-labeling chiral sum frequency generation imaging by utilizing optical field engineering mechanism.

T4A.3 • 15:10 (Invited)
Deep Tissue Two-photon Microscopy with Local structure illumination, Ke Si[1]; *[1]Zhenjiang Univ., China.* A high-resolution two-photon microscopy deep into the scattering medium is reported, by structure illuminating the sample in the focal volume and demodulating the fluorescent signal thereafter.

T4A.4 • 15:30 (Invited)
SPEED Microscopy: Fast Single-molecular Tracking and 3D Deconvolution Process, Jiong Ma[1]; *[1]Fudan Univ., China.* For studying the Nucleocytoplamic transport mechanism, we developed a new methods named single-point edge-excitation sub-diffraction (SPEED) microscopy. SPEED microscopy allows 3D spatial density maps of molecular pathway of the NPC with a spatiotemporal resolution of 9 nm and 400 μs.

T4A.5 • 15:50 (Invited)
Structured Illumination Microscopy for Super-resolution Live Cell Imaging, Dong Li[1]; *[1]Inst. of Biophysics, CAS, China.* Structured illumination microscopy excels at live cell super-resolution imaging, since many fewer raw images and much lower light levels are required. We will report the latest advances in its spatiotemporal resolution, imaging duration, and hyper-spectrum.

A103-104
14:30 -- 16:10
T4B • Translational Biophotonics II
Presider: Zhihua Ding; Zhejiang Univ., China

T4B.1 • 14:30 (Invited)
Photoacoustic Imaging: Technology Development Towards Clinical Translations, Zhihua Xie[1], Xiaojing Gong[1], Chengbo Liu[1], Riqiang Lin[1], Ji Leng[1], Muyue Xing[1], Liang Song[1]; *[1]CAS Shenzhen Inst of Advanced Technology, China.* Photoacoustic imaging is a novel hybrid medical imaging technology. It uniquely combines the advantages of optical absorption contrast with ultrasonic resolution for in vivo imaging as deep as 5-7 centimeters. Here we will discuss photoacoustic technology development pursued in our lab towards clinical translations.

T4B.2 • 14:50 (Invited)
All-optical photoacoustic microscopy for biomedical applications, Sihua Yang[1]; *[1]MOE Key Laboratory of Laser Life Science, China.* All-optical photoacoustic microscopy for biomedical applications

T4B.3 • 15:10 (Invited)
Photoacoustic Imaging Guide Efficiently Tumor Therapy by Microbubble Explosion Induced by Ultrasonication, Liming Nie[1], Honghui Li[1], Zhiyou Wu[1]; *[1]Xiamen Univ., China.* We encapsulated photosensitizers in the microbubble, allowing synergistic physical burst therapy and photodynamic therapy. The results showed that the bubble explosion could bring mechanical impacts by its transient burst wave and improve the treatment.

T4B.4 • 15:30 (Invited)
Dual-phase Stimulated Raman Scattering Microscopy for Rapid, Label-free Histology, Minbiao Ji[1], Lili Zhang[1]; *[1]Fudan Univ., China.* We developed dual-phase SRS.

T4B.5 • 15:50 (Invited)
Modeling Methods Applied in Micro Lens System, Hua Liu[1]; *[1]AVIC, China.* Micro lens are developing the methodology in advanced multiple configuration systems. The effect of system evaluated criterion that MTF, REA, and RMS can support our issue qualitatively. Results showed that can not only change systems weight, size and structural stability, but also increase freedom in design.

A101-102
16:20 -- 17:20
T5A • Plenary Session III
Presider: Qingming Luo; Huazhong Univ of Science and Technology, China

T5A.1 • 16:20 (Plenary)
Photoacoustic Tomography: Omniscale Imaging from Organelles to Patient, Lihong V. Wang[1]; *[1]California Inst. of Technology, USA.* Photoacoustic tomography provides *in vivo*multiscale functional, metabolic, molecular, and histologic imaging across the scales of organelles through organisms with consistent contrast. Penetration and resolution have reached 7 cm and 90 nm with trade-offs, respectively.