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Contents

PHOTONIC THERAPEUTICS AND DIAGNOSTICS
Program Track Chairs: Brian Jet-Fei Wong, Beckman Laser Institute and Medical Clinic (USA), Eva M. Sevick, The Univ. of Texas Health Science Ctr. at Houston (USA)

BO100 Photonics in Dermatology and Plastic Surgery 2020 (Choi, Zeng) ................. 5
BO101 Therapeutics and Diagnostics in Urology 2020 (Kang) .................. 6
BO102 Imaging, Therapeutics, and Advanced Technology in Head and Neck Surgery and Otolaryngology 2020 (Wong, Ilgner) .7
BO103 Endoscopic Microscopy XV (Tearney, Wang, Suter) ..................... 8
BO104 Diagnostic and Therapeutic Applications of Light in Cardiology 2020 (Gregory, Marcu) .................. 9
BO105 Multiscale Imaging and Spectroscopy (Campagnola, Maitland, Roblyer) ........... 10
BO106 Lasers in Dentistry XXVI (Rechmann, Fried) ..................... 11
BO107 Ophthalmic Technologies XXX (Manns, Ho, Söderberg) ...................... 12
BO108 Visualizing and Quantifying Drug Distribution in Tissue IV (Chan, Evans) ...13
BO109 Optical Methods for Tumor Treatment and Detection: Mechanisms and Techniques in Photodynamic Therapy XXIX (Kessel, Hasan) ............. 14
BO110 Mechanisms of Photobiomodulation Therapy XV (Hamblin, Carroll, Arany) ... 14
BO111 Molecular-Guided Surgery: Molecules, Devices, and Applications VI (Pogue, Gioux) ...................... 15
BO112 Photonic Diagnosis, Monitoring, Prevention, and Treatment of Infections and Inflammatory Diseases 2020 (Dai, Popp, Wu) ............... 16
BO113 Optics and Ionizing Radiation (Pogue) ................................ 17

NEUROPHOTONICS, NEUROSURGERY, AND OPTOGENETICS
Program Track Chairs: David A. Boas, Boston Univ. (USA), Elizabeth Hillman, Columbia Univ. (USA)

BO200 Clinical and Translational Neurophotonics 2020 (Madsen, Yang, Thakor) ........... 18
BO201 Neural Imaging and Sensing 2020 (Luo, Ding, Fu) ....................... 19
BO202 Optogenetics and Optical Manipulation 2020 (Mohanty, Jansen) .................. 20

CLINICAL TECHNOLOGIES AND SYSTEMS
Program Track Chairs: Tuan Vo-Dinh, Duke Univ. (USA), Anita Mahadevan-Jansen, Vanderbilt Univ. (USA)

BO300 Optical Coherence Tomography and Coherence Domain Optical Methods in Biomedicine XXIV (Fujimoto, Izatt) ................. 21
BO301 Advanced Biomedical and Clinical Diagnostic and Surgical Guidance Systems XVIII (Mahadevan-Jansen) .................. 22
BO302 Optics and Biophotonics in Low-Resource Settings VI (Levitz, Ozcan) ........ 23
BO303 Design and Quality for Biomedical Technologies XIII (Hwang, Vargas, Pfefer, Vargas) ...................... 24
BO304 Multimodal Biomedical Imaging XV (Azar, Intes, Fang) ................... 25
BO305 Optical Fibers and Sensors for Medical Diagnostics and Treatment Applications XX (Gannott) ............. 26
BO306 Optical Biopsy XVIII: Toward Real-Time Spectroscopic Imaging and Diagnosis (Alfano, Demos, Seddon) ..................... 27
BO307 Microfluidics, BioMEMS, and Medical Microsystems XVIII (Gray, Becker) .......... 28
BO308 Biomedical Vibrational Spectroscopy 2020: Advances in Research and Industry (Petrich, Huang) ...................... 29
BO309 Biophotonics in Sport: Exercise, Motion and Activity Monitoring, and Wearables (Shadgan, Gandjebakhche) ..................... 30

TISSUE OPTICS, LASER-TISSUE INTERACTION, AND TISSUE ENGINEERING
Program Track Chairs: E. Duco Jansen, Vanderbilt Univ. (USA), Jessica C. Ramella-Roman, Florida International Univ. (USA)

BO400 Optical Interactions with Tissue and Cells XXXI (Ibey, Linz) ................... 31
BO401 Dynamics and Fluctuations in Biomedical Photonics XVII (Oraevsky, Wang) .......... 32
BO402 Photons Plus Ultrasound: Imaging and Sensing 2020 (Oraevsky, Wang) ....... 33
BO403 Biophotonics and Immune Responses XV (Chen) ....................... 34
BO405 Optical Elastography and Tissue Biomechanics VII (Larin, Scarcelli) .......... 35
LA304 Frontiers in Ultrafast Optics: Biomedical, Scientific, and Industrial Applications XX (Herman, Meunier, Osellame) ...................... 37
BIOMEDICAL SPECTROSCOPY, MICROSCOPY, AND IMAGING
Program Track Chairs: Ammasi Periasamy, Univ. of Virginia (USA), Daniel L. Farkas, Univ. of Southern California (USA) and SMI (USA)

BOS00 Imaging, Manipulation, and Analysis of Biomolecules, Cells, and Tissues XVIII (Farkas, Tarnok, Leary) ................. 38
BOS01 Multiphoton Microscopy in the Biomedical Sciences XX (Periasamy, So, König) ....................... 40
BOS02 Three-Dimensional and Multidimensional Microscopy: Image Acquisition and Processing XXVII (Brown, Wilson, Waller) ............................................. 42
BOS03 Single Molecule Spectroscopy and Superresolution Imaging XII (Gregor, Koberling, Erdmann) .............. 42
BOS04 Optical Diagnostics and Sensing XX: Toward Point-of-Care Diagnostics (Côté) ................................. 44
BOS05 Adaptive Optics and Wavefront Control for Biological Systems VI (Bifano, Gigan, Ji) ......................... 45
BOS06 Quantitative Phase Imaging VI (Liu, Popescu, Park) ..................................................... 46
BOS08 High-Speed Biomedical Imaging and Spectroscopy V (Tsia, Goda) ........................................ 48
BOS09 Label-free Biomedical Imaging and Sensing (LBIS) 2020 (Shaked, Hayden) . 50
BOS10 Advanced Chemical Microscopy for Life NEW Science and Translational Medicine (Cheng, Min, Simpson) .................. 51
BOS11 Biomedical Applications of Light Scattering X (Wax, Backman) ...................... 52

NANO/BIOPHOTONICS
Program Track Chairs: Paras Prasad, Univ. at Buffalo (USA), Ewa M. Goldys, The Univ. of New South Wales (Australia)

BO600 Nanoscale Imaging, Sensing, and Actuation for Biomedical Applications XVII (Fixler, Goldys, Wachsmann-Hogiu) ....... 53
BO601 Colloidal Nanoparticles for Biomedical Applications XV (Osiński, Kanaras) ... 54
BO602 Reporters, Markers, Dyes, Nanoparticles, and Molecular Probes for Biomedical Applications XII (Achilefu, Raghavachari) 55
BO603 Plasmonics in Biology and Medicine XVII (Vo-Dinh, Ho, Ray) .................... 56
BO604 Frontiers in Biological Detection: From Nanosensors to Systems XII (Danielli, Miller, Weiss) ......................... 57

General Information ............................................. 5
Submission of Abstracts ..................................... 58
Application Tracks ................................. 59

Submit your abstract today: spie.org/bios20call
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Therapeutics and Diagnostics in Urology 2020 (BO101)

Conference Chairs: Hyun Wook Kang, Pukyong National Univ. (Korea, Republic of)

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SPECIAL ABSTRACT REQUIREMENTS
Submissions to this conference must include:
• 100-word text abstract (for online program)
• 250-word text abstract (for abstract digest)
• 2-page extended abstract (for committee review only). The extended abstract must be submitted as a separate PDF document limited to two pages, including tables and figures. Include author names and affiliations; text; any figures, tables, or images; and sufficient data to permit committee review.

This era of high technology in urology includes many new and routine uses of lasers for treatment and diagnosis. In addition, the use of light for both phototherapeutic and photodiagnostics continues to move from research lab to clinical use. Laser applications assisted with robotic devices enable high precision tissue cutting and ablation during surgery. Other energy-based treatments are also being applied for selective tissue destruction in urology.

This conference covers the use of lasers and thermal technology for treatment and diagnosis in urology and provides an opportunity to share ideas and technical information among scientists, engineers, and clinicians.

Papers are solicited in urological applications of therapeutic and diagnostic modalities including, but not limited to, the following:

LASERS FOR PHOTOTHERAPEUTICS
• Fundamental laser-cell/tissue interactions in urological applications
• Laser coagulation/ablation/resection of tumors in bladder, kidney, ureter, and renal pelvis
• Photodynamic therapy of upper and lower urinary tracts
• Lithotripsy with lasers, shockwave, high-intensity focused ultrasound (HIFU), and pneumatic systems

OTHER ENERGY FORMS FOR TISSUE TREATMENT
• Minimally invasive surgical techniques including radio frequency, microwave, HIFU, cryo, plasma, and irreversible electroproporation (IRE)
• Tissue treatment effects and healing responses after energy-based treatments

TISSUE IMAGING FOR DIAGNOSTICS
• Cellular/molecular imaging, probing, and optical biopsy in urology
• Pre-clinical/clinical applications of optical imaging including optical coherence tomography (OCT), photoacoustic tomography (PAT), fluorescence, polarization, confocal, spectroscopy, microscopy, and photodynamic diagnosis (PDD)
• MRI, CT, PET, ultrasound, and terahertz imaging for detection of urological diseases
• Diagnostic endomicroscopy: OCT, CARS, SRS, FLIM, confocal fluorescence, multiphoton

ADVANCED TECHNOLOGY IN UROLOGY
• Novel designs and applications of optical fibers and endoscopic delivery devices
• Robotic-assisted surgery including radical prostatectomy and nephrectomy
• 3-D modeling and simulation on surgical procedures
• Optical nerve stimulation for dysfunctional urinary systems
• Nanoparticle-assisted and image-guided therapy

BSC BEST PAPER AWARDS
Boston Scientific, Corp. will sponsor the “BSC Best Paper Award” at this conference.

Judging and Requirements
Presentations and manuscripts will be judged based on scientific merit and potential clinical impact. Candidates for the award need to be the presenting author, a full-time student or resident in urology, must submit an extended technical summary (1-3 pages) of their best results at the time of Abstract submission, and must present their papers at the conference. Cash awards will be delivered after the publication of the conference proceedings volume.
Imaging, Therapeutics, and Advanced Technology in Head and Neck Surgery and Otolaryngology 2020 (BO102)

Conference Chairs: Brian J. F. Wong, Beckman Laser Institute and Medical Clinic (USA); Justus F. Ilgner, Uniklinik RWTH Aachen (Germany)

Program Committee: Milind Rajadhyaksha, Memorial Sloan-Kettering Cancer Ctr. (USA); Henricus J. C. M. Sterenborg, Netherlands Cancer Institute, Univ. Medical Center Amsterdam AMC (Netherlands); Javier A. Jo, Texas A&M Univ. (USA); Amy L. Oldenburg, The Univ. of North Carolina at Chapel Hill (USA); Maie A. St. John, The Henry Samueli School of Engineering (USA)

Otolaryngology and head and neck surgery is a fertile field for applications of emerging technologies. Precise focused beams and advanced energy delivery systems provide the foundation for the development of innovative microsurgical techniques. Optical spectroscopic diagnostics, including elastic scattering, differential path-length, fluorescence and infrared spectroscopy, enhance tissue differentiation and identification. Interferometric and stroboscopic optical techniques such as OCT (optical coherence tomography) can be used to monitor motion of the vocal folds and/or of the tympanic membrane. Diagnostic systems increasingly interact with robotic and/or master-slave devices to allow for high precision cutting and ablation. Progress in OCT technology and other areas is facilitated successfully by interactions among clinicians, scientists, engineers, and researchers.

This conference covers the use of lasers and optical technology in otolaryngology and head and neck surgery, and provides an informative and crucial face-to-face interaction between the basic scientist and the clinician: a win-win scenario.

Papers from clinicians, scientists, engineers, and manufacturers are solicited in the following medical subspecialty areas:

- imaging of the vocal cords and airway
- cochlear imaging
- femtosecond laser surgery applications
- CO₂ laser ablation
- middle ear surgery/Stapes surgery
- endoscopic cancer resection
- RF surgical applications
- plasma-mediated ablation
- robotic and master / slave systems
- optical diagnostic techniques
- laryngology and speech science
- translational research.

SAVE THE DATE

Abstracts Due:
24 July 2019

Author Notification:
30 September 2019
The contact author will be notified of acceptance by email.

Manuscripts Due:
8 January 2020

PLEASE NOTE: Submission implies the intent of at least one author to register, attend the conference, present the paper as scheduled, and submit a full-length manuscript for publication in the conference proceedings.

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Endoscopic Microscopy XV (BO103)

Conference Chairs: Guillermo J. Tearney, Wellman Ctr. for Photomedicine (USA); Thomas D. Wang, Univ. of Michigan (USA); Melissa J. Suter, Massachusetts General Hospital (USA)

Program Committee: Kathy Beaudette, Castor Optics, Inc. (Canada); Audrey K. Bowden, Vanderbilt Univ. (USA); Matthew Brenner, Univ. of California, Irvine (USA); Johannes F. de Boer, Vrije Univ. Amsterdam (Netherlands); Arthur F. Gmitro, The Univ. of Arizona (USA); Michalina J. Gora, Lab. des sciences de l’Ingénieur, de l’Informatique et de l’Imagerie (France); Lida P. Hariri, Massachusetts General Hospital (USA); Stephen Lam, The BC Cancer Agency Research Ctr. (Canada); Amy L. Oldenburg, The Univ. of North Carolina at Chapel Hill (USA); Wibool Piyawattanametha, King Mongkut’s Institute of Technology Ladkrabang (Thailand); DongKyun Kang, College of Optical Sciences, The Univ. of Arizona (USA); David D. Sampson, Univ. of Surrey (United Kingdom); Eric J. Seibel, Univ. of Washington (USA).

Papers for this session focus on the development of high resolution imaging systems that are endoscope compatible and include novel techniques for early detection, screening, diagnosis, intervention, and treatment of disease in either pre-clinical models or human subjects. In general, remote detection is based on the use of an optical fiber to transmit light between the instrument and the tissue, and involves the collection of information about molecular and cellular processes without physical excision of tissue. These methods of in vivo optical imaging extends across a wide range of resolution, from molecular, sub-cellular and cellular to tissue and organ levels. The creation of an image may require a variety of different scanning mechanisms.

Endoscopic techniques provide unique advantages over other (e.g. whole body) imaging modalities for evaluating disease present over the epithelial surface of hollow organs. The direct proximity of collection optics to regions of disease can result in unparalleled achievement of resolution, unraveling of molecular mechanisms, and use of fluorescence contrast agents. Examples of applications of endoscopic microscopy to medicine include the detection of pre-malignant lesions, identification of disease below the tissue surface, assessment of depth of tumor invasion, localization of cancer margins, evaluation of effectiveness of pharmacological therapy, and reduction in number of physical biopsies and frequency of surveillance.

This conference provides an inter-disciplinary forum for physicians, molecular biologists, chemists, biochemists, optical engineers, and instrument designers to report and discuss recent results, improvements, and new approaches in the emerging field of endoscopic microscopy.

Contributed papers are solicited concerning, but not limited to, the following areas:

- confocal microendoscopy
- multi-photon microendoscopy
- endoscopic OCT
- endoscopic OCM
- fluorescence endoscopic imaging
- video capsule endoscopy
- endocytoscopy
- high magnification endoscopy
- light scattering spectroscopy
- Raman spectroscopy
- infrared spectroscopy
- MEMS scanning mechanisms
- micro-actuators
- luminal optical contrast agents
- endoscopic image processing and analysis.

JOINT SESSION:

This special joint session is in conjunction with the OPTO conference on MOEMS and Miniaturized Systems (OE119). Papers are solicited that address the unique challenges to deliver high-fidelity microscopic imaging of tissue with a miniaturized instrument platform. Example topics include mechanisms for distal beam scanning, focus control and aberration correction using MOEMS devices, MEMS actuators or electrowetting optics; proximal scanning based on DMD or other SLM technologies; novel optical assembly and alignment techniques; highly corrected miniature optical systems.
CALL FOR PAPERS

Diagnostic and Therapeutic Applications of Light in Cardiology 2020 (BO104)

Conference Chairs: Kenton W. Gregory, Oregon Medical Laser Ctr. (USA); Laura Marcu, Univ. of California, Davis (USA)

Program Committee: Christine P. Hendon, Columbia Univ. (USA); Gijs van Soest, Erasmus MC (Netherlands); Stanislav Y. Emelianov, The Univ. of Texas at Austin (USA); Guillermo J. Tearney, Massachusetts General Hospital (USA)

During the last decade there have been significant scientific developments in the diagnosis and treatment of cardiovascular diseases using lasers and optical technology. Recent progress in vulnerable plaque detection has motivated the development of a variety of new optical techniques for intracoronary diagnosis. The scientific and medical communities have additionally continued to search for new technologies and to improve on existing technologies that can be applied to areas such as cardiovascular recanalization or angioplasty, welding of vascular anastomoses, ablation of arrhythmogenic foci, transmyocardial revascularization, etc. The interdisciplinary research and collaboration among physicians, scientists, engineers, and manufacturers is paramount to maintaining and strengthening the field of biomedical cardiovascular laser applications.

This conference intends to bring together researchers and industry partners to present and discuss the important advances in laser and diagnostic applications in cardiovascular medicine. The intent is to stimulate interactions, which will contribute to future progress in developing effective clinical cardiovascular diagnostic and therapeutic systems.

Topics will include, but are not limited to, the following:

- new laser sources for transmyocardial laser revascularization
- mechanisms of laser revascularization
- ablation of arrhythmogenic foci and bypass pathways
- excimer laser applications
- ablative and nonablative applications
- catheter design for laser therapy of arrhythmias
- evaluation of available laser angioplasty devices
- new fibers and catheter designs for laser angioplasty
- new lead extraction laser catheters
- optical methods of assessing cardiovascular structure, biomechanics and function
- vascular welding
- vascular reactivity to laser energy
- approaches to control and assess the extent of laser injury
- new applications for laser thrombolysis
- spectroscopy
- fluorescence spectroscopy and imaging
- new catheter design for intravascular optical diagnostics
- photodynamic therapy
- photodynamic therapy for intimal hyperplasia
- MEMS for cardiovascular diagnostics
- optical coherence tomography
- Raman, fluorescence, and absorption spectroscopy
- angiography
- thermography
- optical studies of the cardiovascular system in animal models
- contrast agents for cardiovascular diagnosis and therapy
- cardiovascular optogenetics
- translational research.

Submit your abstract today: spie.org/bios20call
Multiscale imaging and spectroscopy are increasing in popularity as groups discover they need to better link structure and function, slow and fast dynamics, physiological and molecular scales, and translational and mechanistic viewpoints. While biologist have pushed for higher resolution and faster imaging, a broader spatial or temporal context is often needed to fully characterize most complex biological systems. Additionally, as cutting-edge imaging and spectroscopy techniques acquire increasingly large data sets, there has been a drive to develop tools to visualize and identify relevant features on a variety of spatial and temporal scales.

This conference will bring together optical tool developers, basic scientists, and clinicians to present advances in multiscale imaging. Topics include the development and applications of single and multi-modality techniques that characterize biological systems over multiple temporal, spatial, or contrast scales.

Technologies include but are not limited to the following:
- diffuse optical spectroscopy, imaging, and tomography
- lightsheet microscopy
- structured illumination microscopy
- multiphoton imaging
- optical coherence tomography
- photoacoustic imaging
- Raman, fluorescence, and absorption spectroscopy
- functional and anatomical imaging
- optical contrast agent development
- photodynamic therapy

Applications include, but are not limited to the following:
- longitudinal monitoring of disease progression or therapy response
- optical methods to assess tissue biomechanical structure and function
- wide-field, high-resolution imaging
- visualization and analysis of large multiscale data sets
- multiscale views of neural activity, tumor biology, and immune response
- integration of preclinical and clinical data sets
- methods to integrate functional and structural optical data sets
- fractal analysis of multiscale imaging data sets.

BEST STUDENT PAPER AWARDS
Judging and Requirements Presentations and manuscripts will be judged based on scientific merit, impact, and clarity. Candidates for the award need to be the presenting author, a full-time student, must have conducted the majority of the research presented in the paper, and must submit their manuscript by the deadline (January 2019).

Nominations To be considered, submit your abstract online, select “Yes” when asked if you are a full-time student, and select yourself as the speaker.

The 2018 winners were Raisa Rasul, Univ. of Arkansas (USA), Best Student Paper and Syeda Tabassum, Boston Univ. (USA), Best Student Paper Runner-Up.
CALL FOR PAPERS

Lasers in Dentistry XXVI (BO106)

Conference Chairs: Peter Rechmann, Univ. of California, San Francisco (USA); Daniel Fried, Univ. of California, San Francisco (USA)

Program Committee: Gregory B. Altshuler, IPG Medical Corp. (USA); Tatjána Dostálová, Charles Univ. in Prague (Czech Republic); Thomas Ertl, Univ. Stuttgart (Germany); David M. Harris, Bio-Medical Consultants, Inc. (USA); Jörg Meister, Universitätsklinikum Bonn (Germany); Eric J. Seibel, Univ. of Washington (USA)

Laser applications for dental hard tissue are a clinical reality. Exciting future applications are being developed and will be featured at this conference. An entire session will be devoted to lesion detection by optical methods. This is one of the areas of rapidly expanding interest in dental research and applications to clinical practice, especially in relation to dental caries. Soft tissue clinical applications continue to be expanded. This conference will provide a forum for presentation of both basic and applied research in laser dentistry. Presentations of clinical studies are especially welcome. Manuscripts will be reviewed prior to publication.

Papers are solicited in all dental laser and biomedical optics dental application areas including, but not limited to, the following:
- optical methods for lesion detection, especially dental caries
- early caries detection
- optical coherence tomography in dentistry
- dental 3D imaging
- caries removal with lasers
- caries prevention with lasers
- laser endodontics
- laser applications in periodontology
- lasers and dental implants
- laser photopolymerization
- laser hard-tissue and soft tissue surgery
- CO2 laser use in dentistry
- Nd:YAG laser use in dentistry
- Diode laser use in dentistry
- Er:YAG/ErCr:YSGG use in dentistry
- other wavelengths for hard or soft tissue use
- clinical trials of lasers for dental applications
- hard-tissue ablation and plasma production
- laser-tissue interactions relevant to dentistry
- wavelength and energy dependence of dental laser applications
- translational research.

SAVE THE DATE

Abstracts Due: 24 July 2019
Author Notification: 30 September 2019
The contact author will be notified of acceptance by email.
Manuscripts Due: 8 January 2020

PLEASE NOTE: Submission implies the intent of at least one author to register, attend the conference, present the paper as scheduled, and submit a full-length manuscript for publication in the conference proceedings.

Submit your abstract today: spie.org/bios20call
Ophthalmic Technologies XXX (BO107)

Conference Chairs: Fabrice Manns, Univ. of Miami (USA); Arthur Ho, Brien Holden Vision Institute (Australia); Per G. Söderberg, Uppsala Univ. (Sweden)

Program Committee: Rafat R. Ansari, NASA Glenn Research Ctr. (USA); Michael Belkin, Tel Aviv Univ. (Israel); Kostadinka Bizheva, Univ. of Waterloo (Canada); David Borja, Alcon Labs., Inc. (USA); Ralf Brinkmann, Univ. zu Lübeck (Germany); Wolfgang Drexler, Medizinische Univ. Wien (Austria); Sina Farsi, Duke Univ. (USA); Daniel X. Hammer, U.S. Food and Drug Administration (USA); Karen M. Joos, Vanderbilt Univ. (USA); Kirill V. Larin, Univ. of Houston (USA); Ezra Maguen, American Eye Institute (USA); Donald T. Miller, Indiana Univ. (USA); Derek Nankivil, Johnson & Johnson Vision Care, Inc. (USA); Daniel V. Palanker, Stanford Univ. (USA); Jean-Marie Parel, Bascom Palmer Eye Institute (USA); Roberto Pini, Istituto di Fisica Applicata Nello Carrara (Italy); Ygal Rotenstreich, The Chaim Sheba Medical Ctr., Tel Hashomer (Israel); Luigi Rovati, Univ. degli Studi di Modena e Reggio Emilia (Italy); Marco Ruggeri, Bascom Palmer Eye Institute (USA); Georg Schuele, OptiMedica Corp. (USA); Jerry Sebag, VMR Institute (USA); Peter Soliz, VisionQuest Biomedical, LLC (USA); Yuankai K. Tao, Vanderbilt Univ. (USA); Valery V. Tuchin, Saratov State Univ. (Russian Federation), Tomsk State Univ. (Russian Federation), Institute of Precision Mechanics and Control of the RAS (Russian Federation); Robert J. Zawadzki, Univ. of California, Davis (USA)

SPECIAL ABSTRACT REQUIREMENTS:

PEER REVIEW

Submissions to this conference must include the following three documents submitted as separate files:
• 100-word text abstract (for online program)
• 250-word text abstract (for abstract digest)
• 2-page extended abstract (for committee review only). The extended abstract must be submitted as a separate document limited to two pages, including tables and figures. Include author names and affiliations; text; any figures, tables, or images; and sufficient data to permit peer review.

All submissions will be peer-reviewed by the Program Committee to determine acceptance. The best extended abstracts will be nominated for the Pascal Rol Award. Extended abstracts will be used only for the purpose of peer review, and will not be published.

NOTE ON DUPLICATE ABSTRACTS

Authors who submit an abstract on a similar topic for presentation at another BIOS conference may be invited to present a short communication that should focus on ophthalmic issues.

You are invited to submit papers to Ophthalmic Technologies XXX - the premier international meeting on therapeutic and diagnostic technology in the field of ophthalmology, which brings together engineers and scientists developing the next innovations, and clinicians and practitioners extending the technology.

Some recent topics covered include:
• ophthalmic diagnostics
• ophthalmic applications of OCT
• adaptive optics
• retinal prosthesis and bionic vision
• wavefront sensing and wavefront-guided surgery
• laser surgical systems
• femto second laser applications
• artificial cornea and keratoprotheses
• optoacoustic monitoring
• functional and molecular imaging of the eye
• imaging of retinal and choroidal vasculature
• selective retinal photocoagulation
• optics of the eye and vision correction
• ocular biometrics
• ocular diagnostics of neural diseases
• virtual reality in ophthalmology
• optics and laser applications in ophthalmic drug delivery.

PASCAL ROL AWARD 2020

Outstanding extended abstracts submitted to the Ophthalmic Technologies conference will be nominated for the Pascal Rol Award for Best Paper in Ophthalmic Technologies. The award and prize will be presented after the last scientific session of the conference to recognize the best paper and presentation. The 2019 recipient of the Pascal Rol Award was Furu Zhang and his colleagues from Indiana Univ. (USA) (see www.pascalrolfoundation.org).

SPECIAL PRESENTATION: Unmet Ophthalmic Technology Needs

This presentation series was established to promote the exchange of ideas between clinicians with a technological need and engineers interested in solving problems in ophthalmology. The invited lecture is sponsored by the Pascal Rol Foundation (www.pascalrolfoundation.org). The 2020 speaker will be Prof. Cynthia Toth, from Duke University.
Visualizing and Quantifying Drug Distribution in Tissue IV (BO108)

Conference Chairs: Kin Foong Chan, BioPharmX, Inc. (USA); Conor L. Evans, Wellman Ctr. for Photomedicine (USA)

Program Committee: Zane A. Arp, U.S. Food and Drug Administration (USA); Huang-Chiao Huang, Univ. of Maryland (USA); Anand T. Kumar, Massachusetts General Hospital (USA); Melissa L. Mather, Keele Univ. (United Kingdom); Wei Min, Columbia Univ. (USA); Alex J. Walsh, Morgridge Institute for Research (USA); Cristina L. Zavaleta, The Univ. of Southern California (USA); Kurt R. Zinn, The Univ. of Alabama at Birmingham (USA)

Current imaging technologies for visualization and quantification of local drug distribution in tissue, whether in vitro/ex vivo or in vivo, are extremely limited. Common among available techniques traditionally used for such imaging application in the pharmaceutical industry to elucidate the pharmacokinetics and pharmacodynamics of drugs is radio-labeling of the target molecule or active pharmaceutical ingredient (API) and mass spec imaging techniques. However, such an approach is expensive and often lead to prolonged developmental cycle. The objective of this conference is to stimulate discussions and broaden the availability of numerous advanced imaging modalities for use in the visualization and quantification of drug distribution in tissue, starting from in vitro/ex vivo assessment for preclinical development toward in vivo nonclinical and clinical development.

Technical and scientific papers related to advanced optical or combination imaging modalities that push beyond the scope of the state-of-the-art in industry are solicited. These include:

OPTICAL AND HIGH-ENERGY PHOTON IMAGING MODALITIES
• Fluorescence microscopy techniques
• Raman and coherent Raman based imaging tools
• Infrared microscopy
• Photoacoustic imaging
• X-ray excited optical luminescence.

MASS SPECTROSCOPY AND NUCLEAR MAGNETIC RESONANCE IN IMAGING
• Matrix Assisted Laser Desorption/Ionization (MALDI)
• Laser ablation electrospray ionization (LAESI)
• Desorption electrospray ionization mass spectrometry (DESI-MSI)
• Time-of-flight secondary-ion mass spectroscopy (ToF-SIMS)
• Nuclear Magnetic Resonance (NMR).

IN VITRO/EX VIVO AND IN VIVO DRUG DISTRIBUTION
• Imaging in research and development for drug screening {* Preclinical development in animal models
• Minimum therapeutic dose/minimum inhibitory concentration for preclinical dose ranging
• Imaging in clinical development: safety and efficacy.

DETECTION, SEGMENTATION, AND EXTRACTION IN DRUG QUANTIFICATION
• Software algorithms for image segmentation
• Machine learning
• 3D reconstruction and mapping
• Time-resolved quantification: local pharmacokinetics and pharmacodynamics
• Correlation to pharmacologic response: clinical safety and efficacy.
Optical Methods for Tumor Treatment and Detection: Mechanisms and Techniques in Photodynamic Therapy XXIX (BO109)

Conference Chairs: David H. Kessel, Wayne State Univ. (USA); Tayyaba Hasan, Wellman Ctr. for Photomedicine (USA)

Program Committee: Bryan Q. Spring, Northeastern Univ. (USA); Srivalleesha Mallidi, Wellman Ctr. for Photomedicine (USA); Theresa M. Busch, Univ. of Pennsylvania (USA)

Photodynamic therapy (PDT) has been approved by health agencies in several countries for treatment of neoplasia in a variety of sites and has been used for treatment of other pathologic conditions including actinic keratosis, atherosclerosis, and age related macular degeneration (AMD). PDT can be used to target different subcellular sites for photodamage, e.g., the endoplasmic reticulum, lysosomes, mitochondria, and the plasma membrane. Photodamage can elicit cell death by activation of apoptosis, circumventing many common modes of drug resistance.

This conference will emphasize drug development, mechanisms, clinical applications, instrumentation for light delivery and dosimetry determinations along with new information on photodynamic mechanisms. Abstracts are encouraged dealing with these topics:

- drug development and characterization
- clinical protocols and outcomes
- mechanisms of phototoxicity
- techniques for light delivery and dosimetry
- tissue optics.

Mechanisms of Photobiomodulation Therapy XV (BO110)

Conference Chairs: Michael R. Hamblin, Wellman Ctr. for Photomedicine (USA); James D. Carroll, THOR Photomedicine Ltd. (United Kingdom); Praveen Arany, Univ. at Buffalo (USA)

Program Committee: Heidi Abrahamse, Univ. of Johannesburg (South Africa); Michael Denton, Air Force Research Lab. (USA); Tomas Hode, Immunophotonics, Inc. (USA); Clark E. Tedford, LumiThera (USA); Mei X. Wu, Harvard Medical School (USA), Wellman Ctr. for Photomedicine (USA)

Low levels of visible light (frequently red or near-infrared) can have significant therapeutic effects on multiple classes of diseases, injuries and medical disorders. In particular it is effective for wound healing and pain control as well as reduction of inflammation and swelling. The recent acceptance of the MeSH term Photobiomodulation (PBM) Therapy by National Library of Medicine will facilitate more concerted efforts in the field at standardizing and optimizing many aspects of this exciting field.

It is believed that the primary intracellular chromophore that absorbs low levels of red and near-infrared light is cytochrome c oxidase, which is located in mitochondria. This absorption of energy may lead to an increase in ATP synthesis and release of reactive oxygen species from the electron transport chain that can subsequently activate transcription factors and lead to cell proliferation and migration. A recently described extracellular mechanism involving activation of latent growth factor complex offers exciting new avenues to explore other PBM mechanisms.

Despite many reports of positive findings from experiments conducted in vitro, in animal models and in randomized controlled clinical trials, PBMT remains controversial. This likely is due to two main reasons; firstly the molecular mechanisms underlying the positive effects are incompletely understood. Secondly the complexity of rationally choosing among a large number of illumination parameters such as wavelength, fluence, power density, pulse structure and treatment timing has led to the publication of a number of negative studies as well as many positive ones.

This conference covers a field that is rapidly achieving a general level of acceptance in the medical and biomedical communities and will cover all of the important areas of PBMT research.

Contributed papers are solicited in the following areas (among others):

- mechanistic studies and cellular chromophores
- development of light sources for LLLT/PBMT (LED photomodulation; pulsed IR light therapy)
- study of LLLT/PBMT dosimetry
- in vitro research in mammalian cells
- in vitro research in micro-organisms in culture
- stimulation of wound healing and scar reduction in animal models
- nerve regeneration and neural stimulation
- prevention of ischemia-induced tissue death and regeneration.
Well-controlled clinical trials in the following areas are strongly encouraged:

- stimulation of wound healing such as non-healing ulcers
- treatments for stroke and degenerative brain disease
- pain reduction in post-surgical and neuralgia patients
- dental applications
- dermatology applications
- reduction of pain and inflammation in arthritis and other orthopedic conditions
- macular degeneration prevention
- reduction of edema.

**Molecular-Guided Surgery: Molecules, Devices, and Applications VI (BO111)**

**Conference Chairs:** Sylvain Gioux, Univ. de Strasbourg (France); Summer L. Gibbs, Oregon Health & Science Univ. (USA)

**Program Committee:** Michael Bouvet, Univ. of California, San Diego (USA); David J. Cuccia, Modulated Imaging, Inc. (USA); Michele Diana, The Institute of Image-Guided Surgery of Strasbourg (France); Fernando Dip, Consultant (USA); Summer L. Gibbs, Oregon Health & Science Univ. (USA); Hisataka Kobayashi, National Cancer Institute (USA); Frédéric Leblond, Ecole Polytechnique de Montréal (Canada); Jonathan T.C. Liu, Univ. of Washington (USA); Vasilis Ntiachristos, Helmholtz Zentrum München GmbH (Germany), Technical Univ. of Munich (Germany); Keith D. Paulsen, Thayer School of Engineering at Dartmouth (USA); Brian W. Pogue, Thayer School of Engineering at Dartmouth (USA); Eben L. Rosenthal, Stanford Health Care (USA); Jonathan M. Sorger, Intuitive Surgical, Inc. (USA); Kenneth M. Tichauer, Illinois Institute of Technology (USA); Alex Vahrmeijer, Leiden Univ. Medical Ctr. (Netherlands); Thomas D. Wang, Univ. of Michigan (USA); Brian C. Wilson, Ontario Cancer Institute (Canada)

### SPECIAL ABSTRACT REQUIREMENTS

Submissions to this conference must include:

- 100-word text abstract (for online program)
- 250-word text abstract (for abstract digest)
- 2-page extended abstract (for committee review only). The extended abstract must be submitted as a separate PDF document limited to two pages, including tables and figures. Include author names and affiliations; text; any figures, tables, or images; and sufficient data to permit committee review.

Advanced optical-molecular imaging applied to surgical guidance has emerged over the last decade as a major sector of Biomedical Optics with a growing impact and increasing numbers of clinical devices and procedures. Molecular-guided surgery relies on imaging specific markers in vivo, whether exogenous (e.g. fluorescence) or endogenous (e.g. hemoglobin), and allows healthcare practitioners to visualize features and function of tissue, in addition to the standard anatomical structures. This field requires a broad range of expertise including instrumentation, chemistry, biology, physics, tracer kinetics and clinical translation.

The number of investigators working in this specific field has grown from just a few individuals to hundreds of research groups today. This new conference aims to consolidate related work into one forum with the goals of pooling expertise and allowing the community to follow and contribute to the field’s progress while offering strong potential for discussions and collaborations.

Submissions are solicited in the following and related areas:

- contrast agents and molecular probes
- devices and methods – fluorescence imaging
- devices and methods – endogenous imaging
- preclinical applications
- clinical translation
- clinical applications.

Submit your abstract today: [spie.org/bios20call](http://spie.org/bios20call)
This conference emphasizes the photonic diagnostic and therapeutic techniques for infections and inflammatory diseases. Technical and scientific papers related to advanced photonic diagnostic, monitoring, prevention, and therapeutic technologies that push beyond the scope of the state-of-the-art in basic science and clinical practice are solicited. These include, but are not limited to:

PHOTONIC DIAGNOSIS AND MONITORING OF INFECTIONS AND INFLAMMATORY DISEASES

- Novel optical biosensors for rapid point of care identification of infections and inflammatory diseases
- Pathogen-targeted photonic imaging
- Optical microscopy bacterial morphology and spectral fingerprint analysis for detecting infectious diseases
- Automated image analysis of bacterial morphology and spectral fingerprint analysis for characterizing antibiotic susceptibility
- Rapid detection of drug resistance via enzyme-activated fluorescence detection
- Multiphoton microscopy for detecting dynamics of immune cell responses to infection
- Confocal microscopy for detecting pathogen-host interaction
- Molecular imaging of infections and inflammatory diseases
- Photoacoustic imaging of infections and inflammatory diseases
- Magnetic resonance imaging of infections and inflammatory diseases
- Positron emission tomography scanning for infections and inflammatory diseases
- Multimodal approaches
- Preclinical bioluminescence imaging of infectious diseases in animal models
- Photonic detection of systemic response to infections
- Photonic monitoring of response to antimicrobial therapy
- Photonic methods and technologies for diagnosis of infections and inflammatory diseases in low-resource settings

Infectious diseases continue to rank high among global mortality factors. Over 95% of the mortality caused by infections is due to the lack of proper diagnosis and treatment. A definite diagnosis of infections can only be obtained by culture and/or molecular detection, which often requires tissue biopsy. This invasive diagnostic procedure takes many hours or even several days to yield an answer, and, sometimes, it is not even possible to obtain a representative biopsy. The inability of physicians to characterize infections at the point of care has led to the wide overuse of broad-spectrum antibiotics and, subsequently, the development of antibiotic resistance by pathogens. The rise of antibiotic resistance has furthermore exponentially complicated the choice of the treatment. Many physicians are concerned that several infections soon may be untreatable. In 2014, the White House announced the National Strategy for Combating Antibiotic-Resistant Bacteria, in which it is noted that new therapeutics and diagnostics are urgently needed to combat emerging and reemerging antibiotic-resistant pathogens. On the global level, the G20 heads of state and government decided in 2017 to create a joint collaboration platform - the Global Antimicrobial Resistance Research and Development Hub, or Global AMR R & D Hub.

Prominent among innovative and non-antibiotic therapeutic approaches are photonic (optics-, light-based) technologies, including antimicrobial photodynamic therapy, antimicrobial blue light, ultraviolet C radiation, light-based vaccination, etc. The most attractive advantages of photonic antimicrobial therapeutics lie in their ability to eradicate pathogens regardless of antibiotic resistance and in the fundamental improbability of pathogens themselves developing resistance to these photonic therapeutics due to the rather non-specific nature of the targets. In addition, rapid, accurate, and noninvasive diagnosis of infections using photonic strategies, such as Raman and infrared spectroscopy, fluorescence spectroscopy, plasmonics, etc., could play an important role by informing treatment during the critical initial window (< 3 hours) and potentially save lives; and monitoring the response of antimicrobial therapy will lead to therapeutic approaches adapted on the patient’s response, and, thus, personalized medicine.
PHOTONIC PREVENTION AND TREATMENT OF INFECTIONS AND INFLAMMATORY DISEASES

- Inactivation of pathogens (bacteria, mycobacteria, virus, fungi and parasites) using photonic approaches (antimicrobial photodynamic inactivation, antimicrobial blue light, ultraviolet irradiation, and etc.)
- Photonic-based antimicrobial therapy
- Combined antimicrobial therapies using photonic approaches and other antimicrobials.
- Photonic vaccination for the control of infections and inflammatory diseases
- Disinfection using light-based approaches
- Inactivation of virulence factors of pathogens using photonic approaches
- Mechanism of action of photonic-based antimicrobial approaches
- Development of novel photosensitizers in antimicrobial photodynamic therapy
- Light delivery in antimicrobial light-based therapy
- Drug delivery in antimicrobial photodynamic therapy
- Potential development of light-resistance by pathogenic microbes
- Toxicity of photonic-based antimicrobial therapy (e.g., cytotoxicity, genotoxicity) to the host cells and tissues

Submit your abstract today: spie.org/bios20call
Clinical and Translational Neurophotonics 2020 (BO200)

Conference Chairs: Steen J. Madsen, Univ. of Nevada, Las Vegas (USA); Victor X. D. Yang, Ryerson Univ. (Canada); Nitish V. Thakor, National Univ. of Singapore (Singapore)

Program Committee: David Abookasis, Ariel Univ. of Samaria (Israel); Frederic Leblond, Ecole Polytechnique de Montréal (Canada); Herbert Stepp, Ludwig-Maximilians-Univ. München (Germany)

SPECIAL ABSTRACT REQUIREMENTS
Submissions to this conference must include:
• 100-word text abstract (for online program)
• 250-word text abstract (for abstract digest)
• 2-page extended abstract (for committee review only). The extended abstract must be submitted as a separate PDF document limited to two pages, including tables and figures. Include author names and affiliations; text; any figures, tables, or images; and sufficient data to permit committee review.

Recent technological advances have opened exciting opportunities for lasers and optical techniques in neurosurgery and brain imaging. Therapeutic applications include: tumor debulking/removal via thermal or photochemical interactions, and spinal decompression and discectomy. Optical techniques have also shown promise in a number of diagnostic applications, including fluorescence-guided tumor resection, imaging of cortical function and intra-vascular examinations. Of special interest is the use of optical or other imaging modalities in the detection and therapy of neuro-degenerative diseases such as Alzheimer’s or Parkinson’s.

The purpose of this conference is to provide a forum for clinicians, scientists, engineers and manufacturers to report on current developments and to discuss future opportunities for optical techniques in neurosurgery and brain imaging.

Contributed papers are solicited concerning, but not limited to, the following areas:
• laser surgery in the brain and spine
• fluorescence-guided resection
• optical spectroscopy of normal brain and neoplastic tissue
• functional imaging of the brain using optical techniques
• photodynamic therapy in neurosurgery
• optical instrumentation and devices, including microscopes and endoscopes
• optical localization and registration techniques for neuronavigation
• fMRI/PET
• techniques for in vivo microscopy
• microscopic imaging and advanced microscopic techniques
• virtual reality and augmented reality visualization in the OR
• real-time functional imaging in the OR
• co-registration (optical and other imaging modalities)
• translational research.
CALL FOR PAPERS

Neural Imaging and Sensing 2020 (BO201)

Conference Chairs: Qingming Luo, Huazhong Univ. of Science and Technology (China); Jun Ding, Stanford Univ. Medical Ctr. (USA); Ling Fu, Huazhong Univ. of Science and Technology (China)

Program Committee: Robert R. Alfano, The City College of New York (USA); David A. Boas, Massachusetts General Hospital (USA); Shih-Chi Chen, The Chinese Univ. of Hong Kong (Hong Kong, China); Yu Chen, Univ. of Maryland, College Park (USA); Javier DeFelipe, Univ. Politécnica de Madrid (Spain); Hongwei Dong, Univ. of California, Los Angeles (USA); Congwu Du, Stony Brook Univ. (USA); Na Ji, Univ. of California, Berkeley (USA); Beop-Min Kim, Korea Univ. (Korea, Republic of); Pengcheng Li, HUST-Suzhou Institute for Brainsmatics (China); Byungkook Lim, Univ. of California, San Diego (USA); Francesco Saverio Pavone, European Lab. for Non-linear Spectroscopy (Italy); Darcy S. Peterka, Columbia Univ. (USA); Kambiz Pourrezaei, Drexel Univ. (USA); Claus-Peter Richter, Northwestern Univ. (USA); Anna W. Roe, Zhejiang Univ. (China); Oxana V. Semyachkina-Glushkovskaya, Saratov State Univ. (Russian Federation); Shy Shoham, Technion-Israel Institute of Technology (Israel); Shaoqun Zeng, Huazhong Univ. of Science and Technology (China)

SPECIAL ABSTRACT REQUIREMENTS

Submissions to this conference must include:
• 100-word text abstract (for online program)
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Genomics and proteomics have opened up an era providing new approaches and new tools for neuroscience research, particularly in optical neuroimaging. “Function follows form”, anatomic structure is the basis for understanding the brain’s function and brain diseases. Brain function depends on neuronal networks and so from a systems biology perspective, should be studied not only at the neuron level, but also at the neuronal networks and system levels. Optical imaging can now be applied at multiple levels from gene to molecular, from cellular to tissue and from organ to system levels to yield critical information bridging molecular structure and physiological function.

The purpose of this conference is to provide a forum for scientists, clinicians, engineers and manufacturers to report current developments and to discuss future opportunities for optical stimulating, modulating, manipulating, detecting, or imaging the brain or neural circuits at the gene, molecular, cellular, tissue, organ, or system level, in physiology and anatomy.

Topics will include, but are not limited to, the following:

NOVEL OPTICAL NEUROIMAGING AND SENSING
• high resolution optical imaging of synaptic physiology, in vivo and/or in vitro neural circuits and networks
• diffusion, fluorescence and polarization spectroscopies, optical coherence tomography, Doppler, photo acoustics, speckle, or optical intrinsic signal imaging for brain cortex activity and neurovascular physiology
• functional near-infrared imaging (fNIRI) for human brain activity, such as working memory
• diffusive optical tomography for animal or human brain studies
• optical imaging of brain-wide neuroanatomical architecture or connectivity
• in vivo fiber-based imaging.

BRAIN MODELS AND BIOMARKERS
• brain models and specimen preparation including mouse, treeshrew, marmoset, monkey, or human brain
• optical reporters, markers, dyes, nanoparticles, and molecular probes for brain models or neuronal circuits Image processing and visualization
• segmentation, identification and visualization of brain-wide dataset
• multimodal imaging integrating structural and functional information.

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Optogenetics and Optical Manipulation 2020 (BO202)

Conference Chairs: Samarendra K. Mohanty, Nanoscope Technologies, LLC (USA); E. Duco Jansen, Vanderbilt Univ. (USA)

Program Committee: Antoine Adamantidis, McGill Univ. (Canada); George J. Augustine, Duke-NUS Graduate Medical School (Singapore); Klaus B. Gerwert, Ruhr-Univ. Bochum (Germany); Xue Han, Boston Univ. (USA); Elizabeth M. Hillman, Columbia Univ. (USA); Richard Kramer, Univ. of California, Berkeley (USA); Alfred L. Nultall, Oregon Health & Science Univ. (USA); Anna W. Roe, Zhejiang Univ. (China); Ulrich T. Schwarz, Technische Univ. Chemnitz (Germany); Shy Shoham, Technion-Israel Institute of Technology (Israel); John P. Welsh, Univ. of Washington (USA); Rafael Yuste, Columbia Univ. (USA)

SPECIAL ABSTRACT REQUIREMENTS
Submissions to this conference must include:
• 100-word text abstract (for online program)
• 250-word text abstract (for abstract digest)
• 2-page extended abstract (for committee review only). The extended abstract must be submitted as a separate PDF document limited to two pages, including tables and figures. Include author names and affiliations; text; any figures, tables, or images; and sufficient data to permit committee review.

By combining genetic and optical methods, “optogenetics” has allowed control (stimulation or silencing) of electrically-activatable, genetically-targeted cells with high temporal precision. This has heavily impacted neuroscience research by allowing dissection of functioning of neuronal circuitry. Since its first in-vivo demonstration, optogenetics technology has been applied to freely moving mammals and could eventually form the basis of treatments of neurological disorders such as for vision restoration, psychiatric treatment and pain-control. Optogenetic technology is also impacting other biomedical research areas such as for control of cardiac function, stem cell differentiation and reprogramming of metabolic activities in mammalian cells. In all of these settings, optics is playing a crucial role in both delivering light for cellular control, and in some cases for imaging the consequences of this control. The introduction of non-linear optics has further allowed very precise and in-depth spatial control of optogenetic stimulation. Though fiber optic and waveguide technology is enabling delivery of light to targeted tissue regions, other photonic imaging technologies have the potential to significantly contribute to imaging read-outs of neural-cellular activities during optogenetic stimulation (e.g. intravital microscopy, diffuse-reflec-
tance, fluorescence, and SHG etc.). While a detailed understanding of tissue optics is essential for delivery of stimulation light, use of crystallography and spectroscopic methods will enhance the understand-
ing of the interaction processes between light and optogenetic molecules. Innovative schemes for delivery and control of light irradiation, including miniaturized light source, fiber optics, waveguides and special beams can potential-
ly improve optogenetic therapy. Optical microscopy, spectroscopy, and imaging techniques hold signifi-
cant promise for characterizing optogenetic probes and submissions in these areas are especially wel-
come. New therapeutic applications, including control of central and peripheral nervous system, cardiac system, stem cells as well as control of metabolic activities will also be topics of interest for this con-
ference. Contributions from all biomedical specialties and basic sciences are encouraged. Technical and scientific papers related to advancement in develop-
ment of optogenetic probes, their characterization, and applications, as well as other emerging hybrid optical technologies, coupled with new imaging and detection modalities are solicited. These include:

APPLICATIONS OF OPTOGENETIC MODULATION
• neural modulation for medical applications
• controlling stem cell activity and their differentiation
• manipulation of cardiac and other excitatory cellular systems
• reprogramming of metabolic activities
• dissection of neural circuitry: functional connectomics
• modulation of other cellular functions.

BIOPHYSICS AND SPECTROSCOPIC CHARACTERIZATION OF OPSINS
• characterization of opsins by FTIR, Raman and other optical spectroscopic methods
• elucidation of the molecular structure of opsins by crystallography
• novel electrophysiological evaluation methods
• modeling of opsin-photocycle.

NOVEL SOURCES FOR OPTOGENETIC STIMULATION
• two-photon optogenetics
• spatially and temporally modulated beams
• waveguides and light delivery methods for in-vivo applications
• µLED array based devices for prosthetic applications
• modeling propagation of stimulating light in tissue.

NEW OPSINS AND DELIVERY METHODS FOR OPTOGENETICS
• functionally-improved opsins with enhanced spectral and electrical properties
• viral vectors and new expression strategies
• optically-controlled delivery and gene expression
• advanced combinatorial optogenetic probes.

OTHER EMERGING HYBRID OPTICAL TECHNOLOGIES
• photochemical stimulation
• optoelectric activation
• optofluidic manipulation
• photothermal stimulation.

BIOPHYSICAL MECHANISMS OF INFRARED STIMULATION AND INHIBITION
Optical Coherence Tomography and Coherence Domain Optical Methods in Biomedicine XXIV (BO300)

Conference Chairs: James G. Fujimoto, Massachusetts Institute of Technology (USA); Joseph A. Izatt, Duke Univ. (USA)

Program Committee: Peter E. Andersen, Technical Univ. of Denmark (Denmark); Kostadinka Bizheva, Univ. of Waterloo (Canada); Stephen A. Boppart, Univ. of Illinois at Urbana-Champaign (USA); Zhongping Chen, Beckman Laser Institute and Medical Clinic (USA); Johannes de Boer, Vrije Univ. Amsterdam (Netherlands); Wolfgang Drexler, Medizinische Univ. Wien (Austria); Grigory V. Gelikonov, Institute of Applied Physics (Russian Federation); Christoph K. Hitzenberger, Medizinische Univ. Wien (Austria); Robert A. Huber, Univ. zu Lübeck (Germany); Rainer A. Leitgeb, Medizinische Univ. Wien (Austria); Xingde Li, Johns Hopkins Univ. (USA); Yingtian Pan, Stony Brook Univ. (USA); Adrian Gh. Podoleanu, Univ. of Kent (United Kingdom); Andrew M. Rollins, Case Western Reserve Univ. (USA); Marinko V. Sarunic, Simon Fraser Univ. (Canada); Guillermo J. Tearney, Wellman Ctr. for Photomedicine (USA); Valery V. Tuchin, Saratov State Univ. (Russian Federation), Tomsk State Univ. (Russian Federation), Institute of Precision Mechanics and Control of the RAS (Russian Federation); Ruikang K. Wang, Univ. of Washington (USA); Maciej Wojtkowski, Nicolaus Copernicus Univ. (Poland); Yoshiaki Yasuno, Univ. of Tsukuba (Japan)

SPECIAL ABSTRACT REQUIREMENTS

Submissions to this conference must include:
• 100-word text abstract (for online program)
• 250-word text abstract (for abstract digest)
• 3-page extended abstract (for committee review only). The extended abstract must be submitted as a separate PDF document limited to two pages, including tables and figures. Include author names and affiliations; text; any figures, tables, or images; and sufficient data to permit committee review.

Optical coherence tomography and other optical methods and instruments based on coherent light interactions with tissues and detection methods are promising for noninvasive medical diagnostics and monitoring a wide spectrum of pathologies as well as fundamental biomedical research. The focus of this conference will be on the physical and mathematical basis of coherence domain methods, new instrumentation and techniques and their applications in biomedical science and clinical practice. Directions of research and development in areas such as optical coherence tomography (OCT), low-coherence interferometry, speckle and speckle interferometry measurement and imaging technologies, polarized light diagnostic methods, coherent light microscopy, and coherence technologies for flow and functional imaging will be considered. Applications of coherence domain optical methods for biological studies and clinical applications will also be discussed.

Papers are solicited on the following and related topics:
• optical coherence tomography (OCT) systems, theory, image processing techniques in OCT
• spectral/Fourier domain and swept source OCT
• optical coherence microscopy (OCM) full-field OCT
• molecular, spectroscopic and functional OCT
• Doppler and polarization-sensitive OCT
• OCT angiography
• phase-contrast techniques
• novel light sources for OCT
• imaging devices and probes for OCT
• low-coherence interferometry and topography
• white-light interferometry
• novel contrast mechanisms
• clinical applications of OCT
• ophthalmic applications
• cardiovascular and intravascular applications
• cancer imaging
• endoscopic imaging
• small animal imaging
• developmental biology.

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As surgical systems and clinical diagnostics adapt to new methods, instrumentation and assay technology, the pace of system innovations continues to accelerate. Many technologies originally developed for other applications, e.g., defense, energy, and aerospace, have found applications in the medical industry/environment. This conference provides a forum for scientists, engineers, manufacturers, and clinical providers to present the most recent advances in instrumentation and methods of diagnostic and therapeutic guidance systems for clinical applications. The conference goal is to provide an interdisciplinary forum for state-of-the-art methods in instrumentation research and development of biomedical technologies, approaching the translation from research and development prototypes to user application. The emphasis will be on clinical translation and implementation. The conference will address the interests of researchers, applied scientists, engineers, and clinicians whose goal is to implement clinical systems with extended, improved performance capabilities. Papers are sought that describe the methodologies, instrumentation systems and analysis of biomedical optics technologies for clinical implementation. Topics will span the areas of instrumentation, system engineering, assay automation, delivery technology, and data management for biomedical diagnostics and surgical assistance in the clinical setting in developed countries as well as in developing countries. Examples include stereotactic systems developed for brain surgery, flexible micronavigation devices engineered for medical laser ablation treatments, real-time monitoring system of critical function, online sensing of biological assays, and digital pathology. Oral and poster sessions are planned in the following subject areas:

**CLINICAL DIAGNOSTIC SYSTEMS**
- minimally invasive diagnostics systems based on Fluorescence, Raman scattering, diffuse reflectance
- early screening applications
- clinical monitoring of early pathological or physiological states
- multi-modality diagnostic systems (optics combined with acoustic, ultrasound, MRI, PET, X-ray)
- component/system design, engineering, and performance of biomedical instruments
- microinstrumentation and miniaturized clinical systems
- integrated instrument systems
- high throughput systems.
- digital pathology
- automated data analysis algorithms
- point-of-care diagnostics
- diagnostics for personalized medicine

**ADVANCED SENSORS FOR MEDICINE**
- clinical applications of optical biosensors (enzyme, antibody, gene probe-based systems)
- physical sensors and chemical in vivo sensors
- biochip technologies
- bio-electrics and nanosecond pulsing technology
- sensors for burn diagnostics
- advances in assay automation and delivery technology.

**MEDICAL IMAGING TECHNIQUES AND DEVICES**
- Fluorescence, IR, OCT and other optical imaging systems
- advanced endoscopy techniques and devices
- smart catheters
- laser radar sensing and imaging
- RF radar imaging
- terahertz techniques and systems (imaging, spectroscopy, and modeling)
- optical methods of assessing structure and function
- trauma and critical care
- telemedicine, telesurgery
- virtual reality technologies.

**MEDICAL GUIDANCE SYSTEMS**
- image guidance
- tracking technology (optical, acoustic, etc.)
- stereotactic technology
- catheter navigation
- anatomical identification
- tumor demarcation, margin identification
- therapeutic assessment
- dexterity-enhanced surgery
- robotics-assisted surgery
- surgical simulators
- real-time feedback systems
- virtual reality techniques.
CALL FOR PAPERS

Optics and Biophotonics in Low-Resource Settings VI (BO302)

Conference Chairs: David Levitz, MobileODT Ltd. (Israel); Aydogan Ozcan, Univ. of California, Los Angeles (USA)

Program Committee: David Erickson, Cornell Univ. (USA); Gerard L. Coté, Texas A&M Univ. (USA); Wolfgang Drexler, Medizinische Univ. Wien (Austria); Matthew D. Keller, Intellectual Ventures Lab. (USA); Avi Rasooly, National Institutes of Health (USA); Anita Mahadevan-Jansen, Vanderbilt Univ. (USA); Chetan A. Patil, Temple Univ. (USA); Eric A. Swanson, OCT News (USA); Sebastian Wachsmann-Hogiu, McGill Univ. (Canada); Ian M. White, Univ. of Maryland, College Park (USA)

SPECIAL ABSTRACT REQUIREMENTS
Submissions to this conference must include:
• 100-word text abstract (for online program)
• 250-word text abstract (for abstract digest)
• An optional figure (for committee review only).
The figure, if provided, must be submitted as a separate PDF document.

Topics include:
• smartphone-based imaging, sensing and diagnostics systems
• mobile and miniature optical systems
• design adaptation for low-resource settings
• integrated optics and microfluidics
• translational research in low-resource settings
• low-cost optical and optically-guided therapeutics
• spectroscopy and spectral imaging
• low-cost optomechanical design
• energy efficient systems
• algorithms for mobile image analysis
• machine learning and computer vision for mobile imaging and sensing systems
• contrast agents for field-use or point-of-care
• mobile confocal and coherence-domain imaging
• polarization-based mobile imaging and/or detection methods.

Approximately 85% of the world’s population (6 billion people) lives outside OECD nations, where resources and facilities available to deliver medical care are limited. Optical technologies are uniquely positioned to enable emerging economies to improve the delivery of healthcare of their people. Optical methods can non-invasively assess the microstructure, function, and composition of tissues, as well as deliver targeted therapies. The revolution in digital electronics has significantly reduced both the price and size of components (sensors, light sources, computing units) critical to most optical systems. Integrating such optical components with compact microfluidics and low-cost biomarkers allows for building robust optical systems that are inexpensive and scalable.

This conference is designed to serve as a forum for those engineers, scientists, clinicians, and aid workers who are developing and delivering biophotonics-based solutions for healthcare delivery in low-resource settings. An emphasis is placed on mobility, cost-effectiveness, energy efficiency, and scalability, in pursuit of the ultimate goal of clinical validation and transitioning to the field.

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Design and Quality for Biomedical Technologies XIII (BO303)

Conference Chairs: Jeeseong Hwang, National Institute of Standards and Technology (USA); Gracie Vargas, The Univ. of Texas Medical Branch (USA)

Conference Co-Chairs: T. Joshua Pfefer, U.S. Food and Drug Administration (USA); Gracie Vargas, The Univ. of Texas Medical Branch (USA)

Program Committee: David W. Allen, National Institute of Standards and Technology (USA); Anthony J. Durkin, Beckman Laser Institute and Medical Clinic (USA); Robert J. Nordstrom, National Institutes of Health (USA); Ramesh Raghavachari, U.S. Food and Drug Administration (USA); Eric J. Seibel, Univ. of Washington (USA); Behrouz Shabestari, National Institutes of Health (USA); Gracie Vargas, The Univ. of Texas Medical Branch (USA); Rudolf M. Verdaasdonk, Vrije Univ. Medical Ctr. (Netherlands); William C. Vogt, U.S. Food and Drug Administration (USA); Heidrun Wabnitz, Physikalisch-Technische Bundesanstalt (Germany)

SPECIAL ABSTRACT REQUIREMENTS
Submissions to this conference must include:
• 100-word text abstract (for online program)
• 250-word text abstract (for abstract digest)
• 2-page extended abstract (for committee review only). The extended abstract must be submitted as a separate PDF document limited to two pages, including tables and figures. Include author names and affiliations; text; any figures, tables, or images; and sufficient data to permit committee review.

Rapid advances in optical technologies and computational power have brought about a revolution in biomedical diagnostics and therapeutics. However, these advances necessitate parallel progress in techniques used for development and evaluation.

This conference will focus on three key areas that are critical to the design and production of safe, effective, and commercially-viable biomedical devices and technologies:
1. systems and components which require unique solutions for biomedical applications.
2. the evaluation of quality and safety of biomedical imaging devices and technologies.
3. the establishment of device reliability, including failure and performance degradation.
4. the design and required performance characteristics of phantoms for optical devices in medicine.

This conference provides a unique forum for scientists and engineers from academia, industry and government to discuss issues that are relevant to all biomedical imaging modalities. Interactions between these parties should facilitate the development of biomedical devices and evaluation methods that will benefit medical/biological knowledge and patient care. Submissions pertaining to optical diagnostics and therapeutics for all fields of medicine as well as optical evaluation of pharmaceuticals and biotechnology products are solicited for this conference.

I. DEVICES
• optical and biophotonics devices and instruments for research and clinical applications
• biosensor, noninvasive photonics medical sensors
• biomedical instrumentation
• image guided biopsy, surgical and therapeutic device and technologies
• mobile and wearable devices, cost effective optics and devices
• point-of-care, preclinical device and technologies.

II. DESIGN
• tomography, polarization, confocal, multispectral, multiphoton, spectroscopic, and multimodal imaging systems
• optics for biomedical imaging technologies and devices
• illumination and detection geometry for imaging and spectroscopic systems
• fiber optic imaging systems
• novel optical sensing and detection systems
• micro-optics and MEMS based optical systems
• standards, detectors and other components
• maximum permissible light exposure levels in vivo
• development, validation, and application of computer-aided design tools.

III. QUALITY
• maximum permissible light exposure levels in vivo
• Quality by Design (QbD)
• device calibration and intercomparison
• standards in biomedical imaging and spectroscopy
• standards in devices and components
• standards in image/data processing and storage
• phantoms and test methods
• metrology
• development/evaluation of novel measurement tools
• computer-aided diagnosis algorithms
• critical metrics for assessing quality
• quality, compliance and regulatory issues related to biomedical devices
• statistical approaches for designing, evaluating, and validating medical device, databases, and technologies
• patient and user safety; photothermal, biochemical, etc.

IV. RELIABILITY
• physics, analysis, failure mechanisms and testing for failure
• aging, dormancy and component degradation
• computational and analytical modeling
determination of factors of safety
• reusability of new optical devices.

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Multimodal Biomedical Imaging XV (BO304)

Conference Chairs: Fred S. Azar, IBM Watson Health (USA); Xavier Intes, Rensselaer Polytechnic Institute (USA); Qianqian Fang, Northeastern Univ. (USA)

Program Committee: Caroline Boudoux, École Polytechnique de Montréal (Canada); Christophe Chefd’hotel, Ventana Medical Systems, Inc. (USA); Yu Chen, Univ. of Maryland, College Park (USA); Gultekin Gulsen, Univ. of California, Irvine (USA); Brian W. Pogue, Thayer School of Engineering at Dartmouth (USA); Arjun G. Yodh, Univ. of Pennsylvania (USA)

SPECIAL ABSTRACT REQUIREMENTS:
PEER REVIEW
Submission to this conference will follow the current thrust at large at SPIE BIOS and must include the following three documents submitted in separate files:
• A 100-word text abstract (for online program)
• A 250-word abstract text (for abstract digest)
• A 2-page extended abstract (for committee review only – not published). The extended abstract must be submitted as a separate document and is limited to two pages including all materials (table, figure, references, etc.).

All submissions will be peer-reviewed by the program committee to determine acceptance and presentation type.

Optical techniques offer the potential to contribute greatly to the expansion of clinical multimodality techniques. Their ability to image structural, functional, and molecular information at different spatial and temporal scales makes them very attractive to the biomedical community. There is critical need for new instrumental approaches and computational techniques, especially model-based and machine-learning/deep learning based image processing techniques and reconstructions, to provide rapid, accurate and cost-effective means for acquisition, quantification and characterization of multimodal data. Multimodality approach can be understood as the combination of multiple optical techniques in an instrument and/or fusion of an optical technique with other well-established imaging modalities such as CT, MRI, US, or PET. These instrumental and computational methods will enable faster acceptance of novel imaging modalities into viable clinical and/or pre-clinical systems. The applications are diverse and range from imaging at the cellular level to the whole body while incorporating molecular, functional and anatomical information.

The conference objectives are to provide a forum:
• to review and share recent developments in novel multimodal imaging techniques,
• to report development of novel computational methods, and
• to bring together the optical imaging and image analysis communities.

Topics include, but are not limited to:
• Multimodal imaging integrating structural, molecular and functional information.
• Multimodal microscopic imaging.
• Artificial Intelligence/Deep learning methodologies applied to biomedical imaging.
• 2D, 3D, 4D tomographic and/or multi-spectral imaging.
• Imaging analysis and/or image processing techniques applied to optical imaging (e.g. visualization, segmentation, registration).
• Multimodal imaging instrumentation and system design.
• Detection and diagnostic analysis techniques which may provide better quantitative and/or diagnostic insight into clinical and pre-clinical imaging (e.g. methods for quantitative measurements, computer-assisted diagnosis).
• Imaging analysis and/or image processing techniques used to combine optical imaging with other imaging modalities (e.g. MR, x-ray, PET).
• Image analysis, computational methods and reconstruction approaches which may help bring optical imaging into the clinic (visual rendering of complex data set, novel algorithms for assisted optical reconstruction).
• Clinical evaluation of these new technologies (physiological and functional interpretation of image data, visual perception and observer performance, validation of quantitative assessment of optical signatures in-vivo).

V. PHANTOMS
• applications of phantoms for performance comparison and validation of instruments
• 3D printed phantoms
• phantom design, fabrication, and validation procedures
• testing and uncertainty analysis
• dynamic methods.

Design and Quality for Biomedical Technologies XIII (BO303 continued)

VI. BIOMEDICAL IMAGING TECHNOLOGIES
• hyperspectral, spectroscopic techniques
• image enhancing techniques
• CMOS technologies for biomedical applications
• multi-modal techniques, including hybrid devices with non-optical (e.g., x-ray, MRI, ESR, ultrasound) components
• small animal imaging
• molecular imaging
• digital imaging and telemedicine.
Optical Fibers and Sensors for Medical Diagnostics and Treatment Applications XX (BO305)

Conference Chair: Israel Gannot, Johns Hopkins Univ. (USA), Tel Aviv Univ. (Israel)

Program Committee: Olga Bibikova, art photonics GmbH (Germany); James P. Clarkin, Polymicro Technologies, A Subsidiary of Molex Incorporated (USA); Ilko Ilev, U.S. Food and Drug Administration (USA); Jin U. Kang, Johns Hopkins Univ. (USA); Karl-Friedrich Klein, Technische Hochschule Mittelhessen (Germany); Pierre Lucas, The Univ. of Arizona (USA); Yuji Matsuura, Tohoku Univ. (Japan); Katy Roodenko, MAX IR Labs (USA); Angela B. Seddon, The Univ. of Nottingham (United Kingdom)

Optical components, devices and systems, both passive and active, operating in the X-ray ultra-violet (UV), visible (VIS), near-infrared (NIR) and mid-IR (MIR) spectral regions, for use in: medical, biological and environmental sensing, early disease diagnosis, disease progression or regression monitoring and medical treatment and surgery. Components, devices and systems including: waveguides sensors, lab-on-chip, light delivery devices, passive fibers, bright sources such as fiber lasers and supercontinuum generation, bundles and detectors. These are essential elements needed to perform biological and clinical laboratories and in-vivo medical procedures for the 21st century. This conference will cover various topics in these fields.

This year we will emphasize functionalization of fibers (core and tips) against disease markers.

The aim of the conference is to bring together researchers, scientists, engineers, clinicians, industrialists, entrepreneurs and students belonging to different disciplines who have a common interest in the development and use of optical sensing and fiber-based techniques and methodologies. We aim to create a synergistic environment for discussion and growth of the field.

The conference puts a strong emphasize on translation research as well commercialization. A special industry session will be incorporated.

The conference subject is particularly suitable to obtain the right balance among the various disciplines. To this aim, the papers should report on both technical and biomedical advances. Contributions focusing on the development of fibers, endoscopic delivery, and diagnostic systems sensing methods for applications in all biomedical areas are solicited.

The conference will cover the following topics:
- theory and simulations of fibers and sensors.
- fiber and sensors design and fabrication.
- minimal invasive, non-invasive and invasive applications.
- fibers for Theranostics.
- imaging bundles.
- biosensors for the medicine and biology.
- fiber sensors for physical, chemical, and biological applications.
- fibers covering an increasing number of laser output wavelengths – such as quantum cascade lasers, ultrafast lasers, X-ray lasers, and fiber lasers.
- short and energetic pulse delivery.
- smart surgical tools.
- photonic bandgap fibers.
- surgical and diagnostic procedures based on optical fibers and waveguides
- fiber based methods and systems
- safety, bio-compatibility and mechanical properties of fiber materials.
- sensors for smart medical home.
- sensors for remote rural areas.
- fiber systems for robotic applications.
- trans-endoscopic optical methods such as optical coherent tomography (OCT), confocal, Bragg sensing.
- feedback methods and systems for diagnostic and treatment optimization.
- fiber based welding and tissue soldering.
- hybrid sensors.
The goal of this conference is to present novel state-of-the-art work in non-invasive spectroscopic methods to detect the onset and progression of disease, including pre-malignancy and malignancy, and intra-operatively, and tissue and cells response to external conditions, including therapeutic intervention, unintended injury, and laser energy deposition. The conference will focus on work investigating the differences in single and multiphoton excitation optical signatures of normal and diseased tissues, and on understanding the underlying biochemical and structural changes of tissues and cells responsible for the observed spectroscopic signatures. It is worth noting that this symposium has hosted in recent years a number of contributions on the detection of disease using optical spectroscopy signatures of body fluids such as urine or blood plasma. As the field of metabolomics continues to grow, it is possible that “optical metabolomics” maybe a new frontier in the field of Optical Biopsy.

This conference covers a wide array of well-established optical techniques and novel approaches to diagnose tissues changes, including: in vivo and ex vivo fluorescence spectroscopy, Stokes shift spectroscopy, spectral imaging, Raman spectroscopy, multiphoton and photonic methods to modify the tissue and body fluids properties or functions implemented in vivo or ex vivo covering the technology development steps from bench-to-bedside. Compact pill smart spectral explorers, multi-spectral imagers, coherence effects, and hyper spectral imaging will be highlighted and covered, in part, by speakers.

Topics include:
• origin of tissue optical properties
• optical methods for tissue diagnosis and treatment
• methods for in vivo assessment of physiological state of tissue
• excitation, absorption, fluorescence spectroscopy and imaging
• Raman spectroscopy and imaging
• Resonance Raman spectroscopy
• inelastic light scattering spectroscopy and imaging
• stimulated Raman gain spectroscopy and imaging
• polarization and diffusive reflectance spectral imaging
• THz spectroscopy and imaging
• photoluminescence spectroscopy and imaging
• multi photon spectroscopy and imaging
• time resolved spectroscopy and imaging
• speckle and spatial Fourier frequencies spectroscopy for diagnoses
• ultraviolet diagnostic methods
• infrared diagnostic methods
• nano particle tagging and contrast agents
• chemo- and molecular targeting agents
• instrumentation of in vivo optical biopsy
• in vivo spectroscopy and imaging
• optical processes at the single cell level
• endoscopes and micro-endoscopes for optical biopsy
• novel methods for optical biopsy.
• optical biopsy mapping with linear excitation methods
• nonlinear optical biopsy mapping
• novel coherence methods
• instrumentation for in-vivo optical biopsy
• video spectral imaging and mapping of tissue
• STED nano-scale imaging
• noninvasive detection and imaging of cancer
• diabetes noninvasive detection
• assessment of tissue injury
• photonic applications in neuro science
• optical methods for brain diseases, Autism, Alzheimer
• optical metabolomics
• supercontinuum for medical and biological applications
• Stokes shift spectroscopy
• upper excite states for deeper penetration in tissue and brain
• NIR optical windows in 700 nm to 2500nm
• MIR optical window 3 μm to 25 μm
• coherent and non-contact photo-acoustic imaging
• tissue modification with light pulses
• laser tissue welding and real time monitoring
• dynamics of laser-tissue interactions
• integration of optical detection and therapy systems
• high resolution imaging methods for in vivo pathology
• rapid tissue microstructure imaging with intrinsic or extrinsic mechanisms
• lipidomics
• fluorescence lifetime imaging (FLIM)
• phosphorescence lifetime imaging (PLIM)
• FLIM of fast metabolic effects
• NADH / FAD fluorescence
• Clinical FLIM applications
• advanced multiphoton imaging
• in-vivo multiphoton tomography of human skin and others.
• in-vivo FLIM of the human retina
• protein interaction
• time-resolved single-molecule spectroscopy.
Microfluidics, BioMEMS, and Medical Microsystems XVIII (BO307)

Conference Chairs: Bonnie L. Gray, Simon Fraser Univ. (Canada); Holger Becker, microfluidic ChipShop GmbH (Germany)

Program Committee: Hatrice Altug, Ecole Polytechnique Fédérale de Lausanne (Switzerland); Brian W. Anthony, Massachusetts Institute of Technology (USA); Jaleine Tirapan Azpiroz, IBM Research - Brazil (Brazil); Yolanda Fintschenko, FounderTraction (USA); Bruce K. Gale, The Univ. of Utah (USA); Albert K. Henning, Aquarian Microsystems (USA); Yu-Cheng Lin, National Cheng Kung Univ. (Taiwan); Yuehe Lin, Pacific Northwest National Lab. (USA); Ian Papautsky, Univ. of Illinois at Chicago (USA); Bastian E. Rapp, Karlsruher Institut für Technologie (Germany); Thomas Stieglitz, Albert-Ludwigs-Universitat Freiburg (Germany); Sindy Kam-Yan Tang, Stanford Univ. (USA); Hayden K. Taylor, Univ. of California, Berkeley (USA); Bernhard H. Weigl, Intellectual Ventures Management, LLC (USA)

Conference Cosponsor: microfluidic ChipShop

SPECIAL ABSTRACT REQUIREMENTS

Submissions to this conference must include:

• 100-word text abstract (for online program)
• 250-word text abstract (for abstract digest)
• 2-page extended abstract (for committee review only). The extended abstract must be submitted as a separate PDF document limited to two pages, including tables and figures. Include author names and affiliations; text; any figures, tables, or images; and sufficient data to permit committee review.

The purpose of this conference is to provide an international technical forum to showcase recent advancements in microfluidics, BioMEMS, and medical Microsystems. Microfluidic devices and systems have created a tremendous interest in many application fields, including life sciences, point of care (POC) diagnostics, and environmental applications. They offer many advantages over the traditional macroscale systems, including compact size, disposability, higher speed and parallelism of analyses, increased functionality and decreased sample/reagent volumes. In the life sciences, recent research efforts have focused on bio/chemical analyses, pharmaceutical high-throughput systems, and biomaterial surface modification. The interaction of Microsystems with living cells and tissues opens a pathway to novel methods of medical diagnostics and therapeutics. Thus, the range of interests has expanded from the molecular scale over single cells to more complex biological systems, and finally, living organisms. Further, several conventional methods in medical engineering for diagnosis and therapy have also been shifting towards miniaturization and MEMS technologies, including minimally invasive surgery, in vivo and ex vivo monitoring, and smart implants. Last, but not least, environmental applications have focused on developing inexpensive sensors for in situ monitoring of contaminants in the environment for public safety or measuring a person's exposure to environmental contamination.

For many of these applications, microfluidics and other MEMS technologies are essential, as they provide the functional basis of many research tools as well as commercial devices and applications. Thus, over the past several years, there has been a significant increase in the activities associated with understanding, development, and application of microfluidic, mechanical and microfluidic devices and systems for BioMEMS and medical Microsystems.

Papers are solicited on the following major topics and other related subjects:

MICRO/NANO FLUIDIC COMPONENTS
• fluid delivery, transport, and control
• micro -valves, -pumps, -mixers, and -reactors
• microfluidic devices and systems
• microdroplet generation and manipulations
• micro-heating/cooling devices
• emerging microfluidic approaches (inertial microfluidics, electrofluidics, paper/textile microfluidics)
• optofluids
• CAD, modeling, and analysis.

MICROFABRICATION TECHNOLOGIES FOR MICROFLUIDICS AND BIOMEMS
• polymer microfabrication methods
• emerging fabrication technologies (e.g., 3D printing/additive manufacturing)
• fluidic modules and interconnects
• fluidic packaging and assembly
• microstructuring of organic materials
• functional materials for microfluidics and BioMEMS
• surface texturing and modification.

APPLICATIONS OF MICROFLUIDICS, BIOMEMS, AND MEDICAL MICROSYSTEMS
• point-of-care (POC) medical monitoring and diagnostics
• nano bio/medical sensors
• optofluids, on-chip waveguides and optical detection
• cell-based sensing devices and systems, flow cytometry
• implantable medical Microsystems
• sensors and systems for environmental monitoring
• sensors and systems for in vitro/in vivo monitoring and diagnosis
• cells, tissues, and organisms on-a-chip
• microfluidic-based drug development and analysis.

BEST STUDENT PAPER AWARD
A cash prize sponsored by microfluidic ChipShop GmbH will be awarded to the best student paper.

Judging and Requirements
Presentations and manuscripts will be judged based on scientific merit, impact, and clarity. Candidates for the award need to be the presenting author, a full-time student, must have conducted the majority of the research presented in the paper, and must submit their manuscript by the deadline in January 2020.

Nominations
To be considered, submit your abstract online, select “Yes” when asked if you are a full-time student, and select yourself as the speaker.
Biomedical Vibrational Spectroscopy 2020: Advances in Research and Industry (BO308)

Conference Chairs: Wolfgang Petrich, Roche Diagnostics GmbH (Germany); Zhiwei Huang, National Univ. of Singapore (Singapore)

Program Committee: Andrew J. Berger, Univ. of Rochester (USA); Rohit Bhargava, Univ. of Illinois at Urbana-Champaign (USA); Ania Mahadevan-Jansen, Vanderbilt Univ. (USA); Airton Abrahão Martin, Univ. Brasil (Brazil); Michael D. Morris, Univ. of Michigan (USA); Dieter Naumann, Robert Koch-Institut (Germany); Jürgen Popp, Institut für Photonische Technologien e.V. (Germany); Nicholas Stone, Gloucestershire Royal Hospital (United Kingdom)

Vibrational spectroscopy provides molecular specific information that has long been used in the field of biochemistry. Technical advances in the last decade have led to the application of vibrational spectroscopy to address many biological and biomedical problems. In particular, NIR and mid-IR absorption as well as Raman spectroscopy have received tremendous interest in biomedicine. Furthermore, special techniques such as SERS, CARS, TERS, or even MIR-laser spectroscopy have begun directing a lot of attention to the application in biology and medicine. The fingerprint nature of all of these techniques allows precise analysis of biological materials that can be used for applications ranging from the macroscopic to the micro and sub-microscopic levels. The development of diode lasers and novel designs of fiber optic probes have led to the potential of applying these techniques in vivo.

This year’s conference will be organized based on medical or biological systems rather than techniques to facilitate cross-fertilization of solutions to problems in implementation. Where feasible, the specific sessions will be co-localized with the specific clinical conference to ensure increased awareness of vibrational spectroscopy by clinicians. This year’s conference will focus on bringing together a variety of different fields within vibrational spectroscopy has played a powerful role in their development for a specific application. We would like to particularly encourage the participation of molecular processes in the field of tissues and cells. An added agenda will be interaction between research and industry and the synergy therein.

This call solicits abstracts in biomedical applications of vibrational spectroscopy as well as new discoveries in its implementation. This conference will encompass methodologies that probe vibrational energies at tissue, cell, sub-cellular and molecular levels.

Such modalities include but are not confined to:

• conventional Raman spectroscopy
• spatially offset Raman spectroscopy (SORS)
• Raman microscopy and microspectroscopy
• surface enhanced Raman spectroscopy (SERS)
• coherent anti-Stokes Raman spectroscopy (CARS)
• Tip-enhanced Raman spectroscopy (TERS)
• NIR and MIR spectroscopy
• NIR and MIR microscopy and microspectroscopy
• Mid-IR and THz laser spectroscopy.

The techniques may be applied in biology as well as medicine.

Potential areas of applications include but are not confined to:

• histopathology
• cytology
• tissue and cellular probes and processes
• sub-cellular and molecular probes and processes
• protein and DNA analysis
• pharmacology
• analysis of biological fluids such as blood
• infectious agents
• disease identification
• guidance of therapy
• microbiology.

Sessions will be organized according to medical application areas such as neurology, dermatology, endocrinology etc. and supplemented by a technical session.

Submit your abstract today: spie.org/bios20call
The Biophotonics in Sport, Exercise and Activity Monitoring Conference is a unique program for presentation, discussion, and exchange of state-of-the-art information related to the latest research and development of optics and photonics technologies applied in sensing and monitoring sports performance, exercise physiology, and body activity. With the increase in life expectancy, sports and exercise have become one of the critical components of healthy life and aging. It has been shown that continuous quantification of parameters related to exercise and body motion can enhance health consciousness in all age groups.

Until recently, static and dynamic monitoring of body performance and human physiologic parameters in sports, exercise, and daily activity have been seen as a sub-part of metabolic monitoring. However, it has been expanded so rapidly in the last decade, that a new niche of science and technology has been born with big impact in health and huge business potentials. Integration of engineering, exercise physiology, kinesiology, and rehabilitation sciences and skills have enabled novel research and application developments in recent years. Accordingly, the main objective of this conference program is to bring together scientists, researchers, manufacturers, and knowledge translators and users that are interested in novel applications of optics and photonics in human physiologic and performance monitoring in sport, activity, health, and disease.

Potential topics will include, but are not limited to, the following:

**SPORTS MONITORING FOR AN ACTIVE AND HEALTHY LIFESTYLE**
- sports biophotonics
- sport performance monitoring
- body function monitoring
- activity monitoring
- body movement monitoring
- exercise sensing
- wearable sporting sensors
- wearable optical sensors,
- telemetric body function monitoring
- remote body activity sensing.

**PHYSIOLOGIC PARAMETER SENSING**
- bio-sensing technologies
- physiologic monitoring
- telemetric organ function monitoring
- remote physiologic parameter sensing
- wearable devices.

**ACTIVITY MONITORING**
- body activity and positioning monitoring applied in work safety and occupational medicine
- injury prevention
- military personnel.

**WEARABLES SENSING**
- wearable devices and sensors to monitor real-time physiologic and movement parameters
- positioning and performance patterns in sport, exercise, health care, work safety, and military.

**HEALTH CARE AND REHABILITATION**
- rehabilitation engineering
- cardiovascular rehabilitation
- chronic disease rehabilitation
- emergency services
- aerospace medicine
- elderly care and fall prevention
- maternity and obstetrics monitoring
- organ transplant monitoring
- telemedicine.

**BIO-SIGNAL ANALYSIS**
- physiological signal analysis
- motion data analysis
- optical algorithm development
- healthcare monitoring algorithm development.

**JUDGING AND REQUIREMENTS**
Presentations and manuscripts will be judged based on scientific merit, novelty, and impact. To publish the full manuscript in the SPIE Digital Library, abstract must be presented at the conference (oral or poster). High impact presentations will be encouraged to submit a manuscript to one of the SPIE journals.
Optical Interactions with Tissue and Cells XXXI
(BO400)

Conference Chairs: Bennett L. Ibey, Air Force Research Lab. (USA); Norbert Linz, Univ. zu Lübeck (Germany)

Program Committee: Joel N. Bixler, Air Force Research Lab. (USA); Randolph Glickman, The Univ. of Texas Health Science Ctr. at San Antonio (USA); Steven L. Jacques, Oregon Health & Science Univ. (USA); Beop-Min Kim, Korea Univ. (Korea, Republic of); Alexander J. Makowski, Prozess Technologie (USA); Anouk L. Post, The Netherlands Cancer Institute (Netherlands); Jessica C. Ramella-Roman, Florida International Univ. (USA); William P. Roach, Vanderbilt Univ. (USA); Marissa Nicole Rylander, Virginia Polytechnic Institute and State Univ. (USA); Zachary D. Taylor, Univ. of California, Los Angeles (USA)

The basic mechanisms of laser tissue and cell interactions fall into three categories: photochemical, photomechanical, and photothermal. These mechanisms form a fundamental basis for the field but are now expanded to include the cellular and bio-molecular response to irradiation from lasers and laser systems both in vitro and in vivo. Understanding the fundamental mechanisms of interactions between light, tissue and cells is the basis for the development of future biomedical optic technologies that include both therapeutic and diagnostic applications.

A preliminary list of session topics is listed below. Please include these terms in abstracts for the purpose of organizing sessions.

• photothermal interactions
• photochemical and photo-oxidative interactions
• photomechanical effects
• mechanisms of pulsed laser ablation
• ultrafast pulsed laser interactions
• fundamental mechanisms in nanomedicine
• optical monitoring of tissue mechanics
• optical properties of tissues
• cellular micro-and nanosurgery
• cellular biomolecular response
• mechanistic studies of laser welding and soldering of tissue
• numerical approaches simulating laser-tissue interactions and response
• electromagnetic field bioeffects
• THz technology, sensing, and biological effects.

SAVE THE DATE

Abstracts Due: 24 July 2019
Author Notification: 30 September 2019
The contact author will be notified of acceptance by email.
Manuscripts Due: 8 January 2020

PLEASE NOTE: Submission implies the intent of at least one author to register, attend the conference, present the paper as scheduled, and submit a full-length manuscript for publication in the conference proceedings.

Submit your abstract today: spie.org/bios20call
Dynamics and Fluctuations in Biomedical Photonics XVII (BO401)

Conference Chairs: Valery V. Tuchin, Saratov State Univ. (Russian Federation); Tomsk State Univ. (Russian Federation), Institute of Precision Mechanics and Control of the RAS (Russian Federation); Martin J. Leahy, National Univ. of Ireland, Galway (Ireland); Ruikang K. Wang, Univ. of Washington (USA)

Program Committee: Wei R. Chen, Univ. of Central Oklahoma (USA); Joseph P. Culver, Washington Univ. School of Medicine in St. Louis (USA); Turgut Durduran, ICF0 - Institut de Ciències Fotòniques (Spain); Ling Fu, Huazhong Univ. of Science and Technology (China); Ekaterina I. Galanzha, Univ. of Arkansas for Medical Sciences (USA); Jana M. Kailerstorfer, Carnegie Mellon Univ. (USA); Brendan F. Kennedy, The Univ. of Western Australia (Australia); Sean J. Kirkpatrick, Michigan Technological Univ. (USA); Vesa Kiviniemi, Univ. of Oulu (Finland); Jürgen M. Lademann, Charité Universitätsmedizin Berlin (Germany); Kirill V. Larin, Univ. of Houston (USA); Iridia V. Larina, Baylor College of Medicine (USA); Jan Laufer, Martin-Luther-Univ. Halle-Wittenberg (Germany); Qingming Luo, Hainan Univ. (China); Teemu S. Myllylä, Univ. of Oulu (Finland); Inga Saknite, Vanderbilt Univ. Medical Ctr. (USA); Melissa C. Skala, Univ. of Wisconsin-Madison (USA); Peter H. Tomlins, Queen Mary Univ. of London (United Kingdom); Vladislav Toronov, Ryerson Univ. (Canada); Anna N. Yaroslavsky, Univ. of Massachusetts Lowell (USA); Vladimir P. Zharov, Univ. of Arkansas for Medical Sciences (USA); Dan Zhu, Huazhong Univ. of Science and Technology (China)

SPECIAL ABSTRACT REQUIREMENTS

Submissions to this conference must include the following:

• 100-word text abstract (for online program)
• 250-word text abstract (for abstract digest)
• 2-page extended abstract (for committee digest only). The extended abstract must be submitted as a separate PDF document limited to two pages, including tables and figures. Include author names and affiliations; text; any figures; tables, or images; and sufficient data to permit committee review.

All submissions will be reviewed by the Program Committee to determine acceptance. Extended abstracts will be used only for the purpose of review, and will not be published.

The conference will be devoted to recent developments and applications of biomedical photonics in functional monitoring, imaging, and control of dynamic processes. The goal of the conference is to gather optical and laser engineers, mathematicians and computer scientists, and biomedical professionals along with graduate and undergraduate students to facilitate future progress in the development of optical and laser technologies based on a dynamic sensing approaches to biomedical science and clinical applications.

This approach is intended to enhance technology development toward diagnosis and therapy of wide range of diseases such as those of the heart and vasculature, cancer, psoriasis, and mental illness, and promote a deeper understanding of the role of complex dynamics in biological development across all spatial scales from level of molecule, cell, tissue, and organ to organism and systemic functions.

Keynote and invited presentations will be organized on urgent topics of dynamics and fluctuations in biophotonics. The focus of the Panel Discussion this year will be on Biophotonics of Embryo Dynamics: Monitoring, Imaging, and Functional Control.

Papers are solicited on photonics technologies, including diffusion, fluorescence and polarization spectroscopies, OCT, Doppler, speckle, photoacoustics, and nanophotonics with sufficient time resolution for longitudinal estimation, monitoring, imaging and/or controlling of:

• dynamics, fluctuations and chaos in biology and medicine
• dynamics and fluctuations in developmental biology
• analysis of cilia dynamics
• brain and eye function
• optical control of biological functions and dynamic processes
• dynamics of heartbeat, fibrillary tremor, contractile activity of blood and lymph vessels, etc.
• bio-vibrations, tremor and breath measuring technologies and instruments
• microcirculation imaging and angiography
• dynamic oximetry
• cell proliferation and aggregation
• cell drug and dye uptake, nonlinear diffusion of metabolic and exogenous agents and nanoparticles in tissues
• intracellular flows and contractile activity of cells
• molecular agents, intelligent particles and collective behavior.
CALL FOR PAPERS

Photons Plus Ultrasound: Imaging and Sensing 2020 (BO402)

Conference Chairs: Alexander A. Oraevsky, TomoWave Labs, Inc. (USA); Lihong V. Wang, Caltech (USA)

Program Committee: Mark A. Anastasio, Washington Univ. in St. Louis (USA); Paul C. Beard, Univ. College London (United Kingdom); A. Claude Boccara, Institut Langevin Ondes et Images (France); Peter Burgholzer, Research Ctr. for Non Destructive Testing GmbH (Austria); Stanislav Y. Emelianov, Georgia Institute of Technology (USA); Rinat O. Esenaliev, The Univ. of Texas Medical Branch (USA); Martin Frenz, Univ. Bern (Switzerland); Miya Ishihara, National Defense Medical College (Japan); Chulhong Kim, Pohang Univ. of Science and Technology (Korea, Republic of); Changhui Li, Peking Univ. (China); Pai-Chi Li, National Taiwan Univ. (Taiwan); Andreas Mandelis, Univ. of Toronto (Canada); Srirang Manohar, Univ. of Twente (Netherlands); Vasilis Ntziachristos, Helmholtz Zentrum München GmbH (Germany); Matthew O’Donnell, Univ. of Washington (USA); Günther Paltauf, Karl-Franzens-Univ. Graz (Austria); Wiendelt Steenbergen, Univ. of Twente (Netherlands); Roger J. Zemp, Univ. of Alberta (Canada); Vladimir P. Zharov, Univ. of Arkansas for Medical Sciences (USA); Qifa Zhou, The Univ. of Southern California (USA); Quing Zhu, Washington Univ. in St. Louis (USA)

Conference Cosponsor: Seno Medical Instruments of San Antonio, Texas, will sponsor the “Best Paper Award" at this conference (Certificate of recognition to all coauthors and $3,000). To qualify for the Award, authors must submit a 2-page extended abstract at the time of Abstract submission, present their papers at the conference (oral or poster) and publish a full manuscript in the SPIE Proceedings. A special session will be organized at the conference dedicated to The Best Paper Award. A Certificate of The Best Paper will be presented at the Award Ceremony to be held as the last session of the Conference. Cash award will be delivered after the publication of the conference proceedings volume.

Topics that involve a combination of light and sound include:
• microscopy
• endoscopy
• intravascular microscopy
• computed tomography
• focal scanning imaging
• image reconstruction
• signal processing
• light sources
• ultrasonic transducers
• optical sensing of pressure or displacement
• contrast agents
• sensing (non-imaging)
• spectroscopy
• microwave or RF excitation of ultrasonic waves
• laser ultrasound
• quantitative imaging
• functional imaging
• molecular imaging
• multimodality imaging
• small animal imaging
• clinical imaging
• monitoring of therapy
• guiding surgery and biopsy
• ultrasonic encoding of light
• wavefront engineering
• other advances.

OPTIONAL EXTENDED ABSTRACTS

Submissions to this conference may include the following to improve the chance for acceptance:
• 100-word text abstract (for online program)
• 250-word text abstract (for abstract digest)
• Optional 2-page extended abstract (for committee review only). The extended abstract must be submitted as a separate PDF document limited to two pages, including tables and figures. Include author names and affiliations; text; any figures, tables, or images; and sufficient data to permit committee review.

All submissions will be reviewed by the Program Committee to determine acceptance. Extended abstracts will be used only for the purpose of review, and will not be published.

This conference will be dedicated to imaging, sensing, monitoring and spectroscopy based on the combination of light and sound by synergistically utilizing the high optical contrast and the high ultrasonic resolution at large tissue depths. The images based on optical contrast are complementary to images based on ultrasonic contrast. The hybrid technology such as optoacoustic/photoacoustic tomography can provide anatomical and functional imaging for comprehensive tissue characterization. It is also capable of providing high-resolution molecular imaging. The areas of interest include methods involving optically and thermally induced acoustic waves and acoustically modulated optical waves and a variety of laser-induced thermal and acoustic phenomena, covering basic research, instrumentation and applications. Biomedical applications include cancer detection, localization, and differentiation, detection of atherosclerotic plaques, vascular imaging and angiography.
Immunological responses are crucial in the treatment of diseases. Phototherapy (photothermal, photochemical, and photomechanical), often used in conjunction with immunotherapy, has shown promise in stimulating and enhancing host immune systems. Recently, many researchers have started human clinical studies using photo-immunotherapy. This conference will provide a forum for discussion and interaction among people from academia, industry, and health professions who are working in this area. It will serve as a bridge between technology development and clinical applications, in the field of phototherapy-related immune activities.

This conference will focus on induction, enhancement, mechanisms, and detection of immune responses induced by phototherapy and combination modalities. It will specifically address the issue of searching for an effective immunological modality for different diseases, ranging from autoimmune diseases to cancer, using optical methods. It will also address the issue of detecting immune activities, using modern technologies such as molecular and cellular imaging, as well as other imaging modalities. It will include research using different combinations of treatment and detection modalities, novel approaches for stimulations of systemic responses, innovative methods in monitoring and guiding photo-immunotherapy, and immunological responses related to nanotechnology-based phototherapeutics and diagnosis.

Preliminary session topics include:
- immunophotonics in diagnostics and therapeutics
- novel technologies in monitoring immune activities
- novel combination therapy in cancer treatment
- new approaches in inducing immune responses
- local and systemic effects of low intensity laser irradiation
- local and systemic effects of high intensity laser irradiation
- sensing and sensors for immune activities
- molecular imaging for immune responses
- in vitro and in vivo cellular and biomolecular responses
- photodynamic therapy and immune responses
- photoimmunotherapy in clinical applications
- light-induced vaccination.
CALL FOR PAPERS

Optical Elastography and Tissue Biomechanics VII (BO405)

Conference Chairs: Kirill V. Larin, Univ. of Houston (USA); Giuliano Scarcelli, Univ. of Maryland, College Park (USA)

Program Committee: Steven G. Adie, Cornell Univ. (USA); Albert Claude Boccara, Institut Langevin Ondes et Images (France); Brett E. Bouma, Wellman Ctr. for Photomedicine (USA); Stefan Catheline, Institut National de la Santé et de la Recherche Médicale (France); Zhongping Chen, Beckman Laser Institute and Medical Clinic (USA); Jürgen W. Czarske, TU Dresden (Germany); Kishan Dhokia, Univ. of St. Andrews (United Kingdom); Christine P. Hendon, Columbia Univ. (USA); Davide Iannuzzi, Vrije Univ. Amsterdam (Netherlands); Brendan F. Kennedy, The Univ. of Western Australia (Australia); Sean J. Kirkpatrick, Michigan Technological Univ. (USA); Matthew O’Donnell, Univ. of Washington (USA); Amy L. Oldenburg, The Univ. of North Carolina at Chapel Hill (USA); Gabriel Popescu, Univ. of Illinois (USA); Jannick P. Rolland, The Institute of Optics (USA); David D. Sampson, Univ. of Surrey (United Kingdom); Ian A. Sigal, Univ. of Pittsburgh (USA); Kandice Tanner, National Cancer Institute (USA); Peter Török, Imperial College London (United Kingdom); Ruikang K. Wang, Univ. of Washington (USA); Tianshi Wang, Erasmus MC (Netherlands); Vladislav V. Yakovlev, Texas A&M Univ. (USA); Seok Hyun A. Yun, Wellman Ctr. for Photomedicine (USA); Vladimir Y. Zaitsev, Institute of Applied Physics of the RAS (Russian Federation); Qifa Zhou, The Univ. of Southern California (USA)

SPECIAL ABSTRACT REQUIREMENTS

Submissions to this conference must include the following:
• 100-word text abstract (for online program)
• 250-word text abstract (for abstract digest)
• 2-page extended abstract (for committee review only). The extended abstract must be submitted as a separate PDF document limited to two pages, including tables and figures. Include author names and affiliations; text; any figures; tables, or images; and sufficient data to permit committee review.

All submissions will be reviewed by the Program Committee to determine acceptance. Extended abstracts will be used only for the purpose of review, and will not be published.

This conference is devoted to developments and applications of biomedical optics, biophotonics, ultrasound, MRI, and optical microscopy in the assessment of the biomechanics of cells and tissues. Optical elastography is the use of optics to characterize tissues and cells based on their elastic and viscoelastic mechanical properties. In deploying the high-resolution capability of optics, this rapidly emerging field builds on and complements related methods for biomechanics, such as atomic force microscopy, traction force microscopy and microrheology, and the fields of ultrasound and magnetic resonance elastography. Mechanical forces play an important role in the behavior and development of biological systems and disease at all spatial scales, from cells and their constituents, to tissues and organs. Such forces have a profound influence on the health, structural integrity, and normal function of cells and organs. At the same time, accurate knowledge of tissue biomechanical properties is important for the same reasons. Optical elastography and biomechanics methods will aid in the understanding and clinical diagnosis of a wide variety of diseases.

The multidisciplinarity of optical elastography and tissue and cell biomechanics will see this conference bring together technology and applications experts in bioengineering, biophysics, cell biology, clinical sciences, medical imaging, optical microscopy, optics and photonics, and tissue engineering. In so doing, we hope to contribute to the development of interdisciplinary connections between scientists, engineers, biologists and physicians interested in the broad field of tissue biomechanics.

Papers are solicited on biomedical optics, biophotonics, ultrasound elastography, MRI elastography, and biomechanical methods and technologies applied or related to estimation, monitoring, and functional assessment of the mechanical properties of normal and pathological biomaterials at all spatial scales, from cells and their constituents to tissues and organs. Relevant topics include (but are not limited to):
• optical elastography methods in general
• ultrasound elastography
• MRI elastography
• optical coherence tomography/elastography
• speckle and particle tracking, and holography
• signal processing methods for optical elastography
• quantitative methods, including combining modeling and measurement
• novel loading schemes, such as focused ultrasound, photothermal and magnetomotive
• methods for measuring viscoelastic properties in particular
• photoacoustics directed towards biomechanics
• Brillouin scattering for biomechanics
• optical tweezers applied to cellular and subcellular mechanical properties
• scanning probe and other nanoscale methods for biomechanics
• dynamic methods for characterizing tissue vibration, such as in the ear and vocal chords
• optical elastography applications in general
• in vivo elastography
• elastography applied to characterization of ex vivo and in vivo tissue pathology
• intraoperative elastography applications (such as in breast cancer, lung cancer and others)

CONTINUED NEXT PAGE
Optical Elastography and Tissue Biomechanics VII (BO405 continued)

- elastography in cardiology
- biomechanics of the eye
- ophthalmic applications of optical elastography
- hard tissue biomechanics in bones and dental applications
- biomechanics in animal models
- biomechanics in tissue engineering
- biomechanics in developmental biology
- microrheology measurements using optical techniques
- traction force microscopy and related methods
- cell mechanics methods (related to, e.g., motility, adhesion, and mechanotransduction).

Special Session is planned in collaboration with the conference BO107: Ophthalmic Technologies XXX, to highlight recent advances in the development of optical elastography methods for eye biomechanics. Authors are encouraged to submit abstracts that span this cross-conference topic to take advantage of this unique opportunity.

The Keynote Speaker for the 2020 program is Mathias Fink, Ecole Supérieure de Physique et de Chimie Industrielles de la Ville de Paris (France), giving a talk on Ultrasound Elastography.

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CALL FOR PAPERS

Frontiers in Ultrafast Optics: Biomedical, Scientific, and Industrial Applications XX (LA304)

Conference Chairs: Peter R. Herman, Univ. of Toronto (Canada); Michel Meunier, Ecole Polytechnique de Montréal (Canada); Roberto Osellame, CNR - Istituto di Fotonica e Nanotecnologie (Italy)

Program Committee: Craig B. Arnold, Princeton Univ. (USA); Yves Bellouard, Ecole Polytechnique Fédérale de Lausanne (Switzerland); Adela Ben-Yakar, The Univ. of Texas at Austin (USA); Alexander Heisterkamp, Leibniz Univ. Hannover (Germany); Denise M. Krol, Univ. of California, Davis (USA); Eric Mazur, Harvard Univ. (USA); Eric P. Mottay, Amplitude Systèmes (France); Beat Neuwenschwander, Berner Fachhochschule Technik und Informatik (Switzerland); Stefan Nolte, Friedrich-Schiller-Univ. Jena (Germany); Aleks Ovsianikov, Technische Univ. Wien (Austria); Christopher B. Schaffer, Cornell Univ. (USA); Jan Siegel, Instituto de Optica “Daza de Valdés” (Spain); Koji Sugioka, RIKEN (Japan); Mitsuhiro Terakawa, Keio Univ. (Japan); Alfred Vogel, Univ. zu Lübeck (Germany); Sascha Weller, TRUMPF Inc. (USA); Dvir Yelin, Technion-Israel Institute of Technology (Israel)

Cosponsors:

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This conference of related interest is part of LASE 2020 co-located at Photonics West
spie.org/lasecall

Recent advances in ultrafast laser technology have resulted in widespread availability of robust, practical laser sources. As a result, useful applications for these sources have emerged in many different fields, from micromachining and THz-imaging to nonlinear microscopy and semiconductor testing to laser surgery and communications. Now in its twentieth year, this conference is the premier venue for discussing the development of new ultrafast laser sources, the manipulation and characterization of ultrashort pulses as well as their use in biomedical, scientific and industrial applications. We anticipate a larger conference than ever that will bring together a multi-disciplinary group consisting of university researchers from diverse fields, as well as scientists and engineers from industry. A program that includes invited and tutorial presentations will provide the context for contributed talks and posters, and for stimulating discussions.

We encourage submission of papers on all aspects of applications of ultrafast lasers and on ultrafast laser technology development. In addition, all graduate and undergraduate students are encouraged to enter their submissions in the Student Competition for best presentation (see below).

General topics include, but are not limited to, the following areas:
- emerging ultrafast laser technologies and novel systems
- ultrafast laser source engineering for industrial and biomedical use
- characterization and measurement of ultrashort pulses
- ultrashort pulse delivery and beam manipulation
- ultrashort pulse propagation and nonlinear effects in materials
- interaction of ultrashort pulses with materials
- surface micromachining using ultrafast lasers
- ultrafast laser micromachining of transparent materials
- interactions and modification of biological tissues
- tissue and surgical applications of ultrashort pulse lasers
- optical manipulation of biological systems with ultrashort pulses
- micro and nano manipulation of cells and organelles, optical transfection
- ultrafast lasers in plasmonics, interaction with nanoparticles
- novel medical applications of ultrafast lasers
- generation and applications of x-ray ultrashort pulses.

STUDENT COMPETITION

Thanks to generous corporate sponsorship, we are happy to announce that a student competition will be held again this year. Due to the great success in previous years, the competition will be a general best student award, taking posters and talks into account. The winner will be announced and awarded a $1000 cash prize to the best student paper with the runner-up students receiving a cash prize as well.

Judging and Requirements

Contributions submitted by graduate and undergraduate students are eligible, both poster or talk. In order to ensure a fair evaluation the conference chairs and the program committee will judge the students within a special session held during the conference. Here, the students have to present a brief summary of their own talk or poster presented at our conference with a time limit of 5 minutes. Presentations will be judged based on content, scientific impact, organization, quality of presentation, and presenter’s mastery of the subject. Candidates for the award need to be the presenting author, a full-time student, must have conducted the majority of the research presented in the paper.

Nominations

To be considered, submit your abstract online, select “Yes” when asked if you are a full-time student, and select yourself as the speaker. Note that prior first prize holders may participate, but will not be eligible for a cash prize.
Now in its 30th year, this interdisciplinary conference addresses the knowledge continuum from molecular structure and fundamental mechanisms to biological, energy production, and medical applications, focusing on new approaches to imaging, manipulation, and analysis of biomolecules, cells and tissues, both in vitro and in vivo. The conference will report on the latest developments in functional and multispectral imaging, optogenetics, analysis, algorithms, quantification, separation, sorting, and standards for cells and tissues. The principal aim is to further improve the interdisciplinary dialogue between those who design and implement critical technologies and the primary users who study important problems that drive developments, in order to advance translational research. Reports of original research contributions are solicited on the following topics:

FUNCTIONAL IMAGING OF BIOMOLECULES, LIVE CELLS AND TISSUES:
- light including time-lapse microscopy of living cells and tissues (2D, 3D, 4D)
- spectral and multiphoton imaging of multiple cellular and tissue components
- side, orthogonal, or other angles illumination
- new and automated methods for monitoring biological structure, the effects of pharmaceuticals, and physiology
- microscopic imaging of electric potentials and events
- mesoscopic (microscopic resolution in vivo) tissue imaging
- multimode and multimodality tissue imaging in vivo

BIOPHOTONIC TECHNIQUES FOR REGENERATIVE MEDICINE:
- stem cell characterization in vitro
- stem cell imaging and tracking in vivo
- in vivo studies of immunologic events
- imaging methods in organ transplantation and graft monitoring
- creation and functional monitoring of tissue engineering constructs
- imaging of tissue oxygenation and vascularization

OPTICAL MANIPULATION OF CELLS AND TISSUES:
- cell micromanipulation using optical trapping (laser tweezers)
- cellular effects of localized energy deposition into micro- and nano-absorbers
- cells and biomolecules in micro- and nano-confined spaces
- scanning probe microscopy of cells and surface-immobilized biomolecules

SPECTRAL IMAGING AND MULTIPARAMETER MEASUREMENTS (MICROSCOPIC AND MACROSCOPIC):
- spectral pathology and endoscopy
- digital imaging and holography for quantitative tissue and cellular pathology
- small animal imaging
- bioenergy applications
- food quality, food defense and food safety applications
- forensic applications
- tools and approaches for combining optical and other measurements
- tools and approaches for combining several optical imaging methods
- advanced registration and visualization, and cell architecture studies

ADVANCED QUANTITATIVE CELL (CYTOMICS) AND TISSUE (HISTOMICS) ANALYSIS:
- fluorescence and luminescence imaging including lifetime and two-photon imaging
- Raman, refractive index, polarization, isotope, ultrasonic, photo-acoustic and other modalities based imaging instrumentation and technology
- probes, including new dyes, mass (isotopes) tags, bioluminescence, and the presence of oxygen
- nanoparticle based imaging
- imaging in flow of cells
- light-scattering, dark field and light-sheet based imaging
- lens-free microscopy
- high-throughput cytometry
- whole slide imaging
- in situ diagnostic applications
- technologies for multispectral and multiparameter imaging, including acquisition, autofluorescence reduction, segmentation and analysis methods
- new components for cytometry instrumentation, including ultraminiature and nano- systems
- clinical and research applications of cytometry, with emphasis on new and unusual approaches
- new methods for cell separation including high-speed, optical and magnetic-paramagnetic sorting
- rare event detection
- circulating stem, fetal, cancer, colony forming and other rare cells
- mutant selection
- medical problems in need of advanced quantitative cell or tissue analysis
• quality control and other demonstrations of the reliability and quality of measurements
• Microarrays for biomolecules, cells, three-dimensional (3D) cultures (spheroids) and tissues
• printing technologies
• readout methods, including image analysis and quantification
• applications of microarrays in diagnostics and drug discovery

BIOINFORMATICS, IMAGE AND DATA PROCESSING, QUANTIFICATION, STANDARDS, AND DISPLAY METHODS:
• cell-based high-throughput and high-content screening clustering algorithms
• analytical quantification, including new methods for multiparameter cell and tissue analysis and data manipulation including the application of chemometric analysis techniques
• automated 3D image processing, including tracking of tissue section surfaces, image segmentation, and fluorimetry/densitometry
• software standards including those based upon the web, scientific and/or medical organizations and/or societies and regulatory requirements for spectroscopy, flow cytometry, and digital imaging including pathology
• software for quality control including reproducibility
• image formats, databasing, and retrieval
• advanced image registration and display, including co-display of multimodality image sets
• whole slide imaging

MONITORING OF PILOT AND INDUSTRIAL CELL AND TISSUE GROWTH AND PRODUCTION FOR:
• biomedical products applications
• tissue engineering
• energy applications.

JOINT SESSION
Biomedical Imaging and Cell Manipulation using a Digital Micromirror or other Micro-Electro-Mechanical Systems (MEMS) Array Device
This special joint session is in conjunction with OPTO conference OE203: Emerging Digital Micromirror Device Based Systems and Applications XII. The utilization of the DMD and other optical MEMS arrays to manipulate light has numerous medical applications ranging from cancer detection to operating room aids to the manipulation of individual cells.
Papers are solicited that address the uses of a DMD and other Optical MEMS arrays with:
• 3D medical visualization
• confocal microscopes
• cytometers
• hyperspectral imaging
• image-guided intervention
• microscopy
• optoelectronic tweezers
• organs on a chip
• oxygenation measurements
• phototherapy
• selectable wavelength light sources
• spectroscopy (including mobile spectroscopy)
• structured light or 3D imaging
• tissue illumination.

SAVE THE DATE
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Author Notification: 30 September 2019
The contact author will be notified of acceptance by email.
Manuscripts Due: 8 January 2020

PLEASE NOTE: Submission implies the intent of at least one author to register, attend the conference, present the paper as scheduled, and submit a full-length manuscript for publication in the conference proceedings.

Submit your abstract today: spie.org/bios20call
MultPhoton Microscopy in the Biomedical Sciences XX (BOS01)

Conference Chairs: Ammasi Periasamy, Univ. of Virginia (USA); Peter T. C. So, Massachusetts Institute of Technology (USA); Karsten König, Univ. des Saarlandes (Germany), JenLab GmbH (Germany)

Program Committee: Holly Aaron, Univ. of California, Berkeley (USA); Margarida Barroso, Albany Medical College (USA); Wolfgang Becker, Becker & Hickl GmbH (Germany); Paul J. Campagnola, Univ. of Wisconsin-Madison (USA); Ji-Xin Cheng, Purdue Univ. (USA); Alberto Diaspro, Istituto Italiano di Tecnologia (Italy); Chen-Yuan Dong, National Taiwan Univ. (Taiwan); Kevin W. Eliceiri, Univ. of Wisconsin-Madison (USA); Scott Fraser, The Univ. of Southern California (USA); Katsumasa Fujita, Osaka Univ. (Japan); Enrico Gratton, Univ. of California, Irvine (USA); Min Gu, RMIT Univ. (Australia); Stefan W. Hell, Max-Planck-Institut für Biophysikalische Chemie (Germany); Fu-Jen Kao, National Yang-Ming Univ. (Taiwan); Arnd K. Krueger, Newport Spectra-Physics GmbH (Germany); Darryl McCoy, Coherent Scotland Ltd. (United Kingdom); Wei Min, Columbia Univ. (USA); Junle Qu, Shenzhen Univ. (China); Angelika C. Rueck, Univ. Ulm (Germany); Klaus Suhling, King’s College London (United Kingdom); Yunsheung Sun, ISS, Inc. (USA); Karissa Tilbury, Univ. of Maine (USA); Steven S. Vogel, National Institutes of Health (USA); Xiaoliang S. Xie, Harvard Univ. (USA); Peking Univ. (China); Chris Xu, Cornell Univ. (USA); Elena V. Zagaynova, Nizhny Novgorod State Medical Academy (Russia); Bernhard Zimmermann, Carl Zeiss Jena GmbH (Germany)

Conference Cosponsors:

JENLAB YOUNG INVESTIGATOR AWARD
We encourage graduate students, postdocs, and scientists or junior faculty who are not more than 32 years old to apply for the JenLab Young Investigator Award. To be eligible for this $2000 cash award, participants must:

• be both the primary author and presenter of an accepted abstract for poster presentation
• submit the proceedings paper by the due date, prior to the meeting, for review by the selection committee
• self-nominate by entering “JenLab Young Investigator Award” as a keyword in the abstract
• qualified abstracts will be chosen for a 5-minute oral presentation
• Selection of final two (winner and runner-up) is based on abstract, proceedings manuscript, and 5-minute oral presentation.
• The winner will receive $1500 and the runner-up $500.

Submitted proceedings manuscripts may be resubmitted to the Journal of Biomedical Optics (please visit http://spie.org/jbo for details). Prize donated by JenLab GmbH, Germany.

STUDENT POSTER SESSION COMPETITION
Graduate students and postdoctoral fellows are welcome to participate in the poster session competition of the conference on Multiphoton Microscopy in the Biomedical Sciences. There is a cash award ($500/award) for the winner(s). The winner(s) will be informed in person or by email and must receive the award in person in the conference hall. Participants should follow the rules and regulations of SPIE for submission of their abstract and manuscript. Participants should also register their names for the competition with the Conference Chairs or Session Chairs during the first day of the conference.

Submitted proceedings manuscripts may be resubmitted to the Journal of Biomedical Optics (please visit http://spie.org/jbo for details). Prize donated by the Conference Sponsors.
CALL FOR PAPERS

SPECIAL ABSTRACT REQUIREMENTS
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• 100-word text abstract (for online program)
• 250-word text abstract (for abstract digest)
• 2-page extended abstract (for committee review only). The extended abstract must be submitted as a separate PDF document limited to two pages, including tables and figures. Include author names and affiliations; text; any figures; tables, or images; and sufficient data to permit committee review.

All submissions will be reviewed by the Program Committee to determine acceptance. Extended abstracts will be used only for the purpose of review, and will not be published.

Multiphoton microscopy has been established as the 3D imaging method of choice for studying biomedical specimens, from single cells to whole animals, with sub-micron resolution during 1990. Three decades have passed since the realization of two-photon microscopy, and the ever-expanding scope of applications and continuing instrumental innovations require a forum where new ideas can be exchanged and presented. Our conference in the SPIE BIOS 2020 meeting continues to address this need. We started the multiphoton conference in 2001. We hope you will join us in February 2020 to celebrate the successful growth of the multiphoton conference for the last 20 years.

Submitted proceedings manuscripts may also be submitted to the Journal of Biomedical Optics (please visit http://spie.org/jbo for details).

Topics include:
• multiphoton (one- or two- or three- or more photons) microscopy theory and system development
• multiphoton (MP) in wide-field and laser scanning confocal microscopy
• infrared lasers for MP systems (femtosecond vs. picosecond vs. CW)
• tissue engineering, endoscopy and intravital or in vivo imaging using multiphoton microscopy
• endogenous molecular (NADH/FAD/Tryptophan) imaging, energy metabolism and its applications
• harmonic generation microscopy (SHG, THG) and its applications
• two-photon light sheet microscopy
• fluorescence resonance energy transfer imaging (FRET)
• fluorescence lifetime imaging (frequency and time domain) (FLIM) and its applications
• fluorescence correlation spectroscopy and image cross correlation spectroscopy (FCS, ICCS)
• fluorescence recovery after photobleaching (FRAP), uncaging and photoactivation
• various biological applications including developmental, neurobiology, plant biology, calcium and pH imaging
• photodynamic therapy (PDT) and clinical imaging
• photo-thermal, -chemical and -mechanical effects of IR radiation
• laser safety and other related applications.

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Submit your abstract today: spie.org/bios20call
Three-Dimensional and Multidimensional Microscopy: Image Acquisition and Processing XXVII (BO502)

Conference Chairs: Thomas G. Brown, Univ. of Rochester (USA); Tony Wilson, Univ. of Oxford (United Kingdom); Laura Waller, Univ. of California, Berkeley (USA)

Program Committee: Martin Booth, Univ. of Oxford (United Kingdom); Charles A. DiMarzio, Northeastern Univ. (USA); Jonathan T.C. Liu, Univ. of Washington (USA); Raimund J. Ober, Texas A&M Univ. (USA); Chrysanthi Preza, The Univ. of Memphis (USA); Monika Ritsch-Marte, Medizinische Univ. Innsbruck (Austria); Zachary J. Smith, Univ. of Science and Technology of China (China)

This conference is a venue for advances in multidimensional microscopy, including confocal, fluorescence, polarization and nonlinear microscopy, with coherent and partially coherent systems. While many of the instruments are oriented toward biomedical imaging, the scope includes applications such as materials science, industrial inspection, and nanoscale metrology. Many microscopes are now fully integrated systems, including computer hardware and software. It is hoped that the broad range of relevant topics being presented at this conference will serve to encourage interaction among instrumentation engineers, computer image analysts, and researchers in the various fields of application.

We consider papers that cover overall system design, as well as more specialized areas: optical image formation, image recording, deconvolution and image restoration in two, three, or more dimensions, image classification, and digital methods of producing and displaying the resulting reconstruction. We especially encourage submission of articles on novel optical and digital techniques for imaging or detecting nanoscale object features, coherence-based imaging and image reconstruction, and full-field quantitative phase imaging, including hardware, models, algorithms and applications.

A unique aspect of the multidimensional microscopy conference is that, while the conference is organized within the BIOS program, applications extend far beyond biomedical. A typical program includes in-depth description of new instrumental methods (for example, innovative use of coherence and illumination), computational methods, and also examples of the use of multidimensional microscopy both in biological and nonbiological systems. The ‘multiple dimensions’ can be spatial dimensions, but can also include spatiotemporal imaging, polarization imaging, phase imaging, etc. Many instrumental innovations that now have entire conferences devoted to their use had their origins within the multidimensional microscopy conference.

Single Molecule Spectroscopy and Superresolution Imaging XIII (BO503)

Conference Chairs: Ingo Gregor, Georg-August-Univ. Göttingen (Germany); Felix Koberling, PicoQuant GmbH (Germany); Rainer Erdmann, PicoQuant GmbH Berlin (Germany)

Program Committee: Andrea M. Armani, The Univ. of Southern California (USA); Michael Börßch, Friedrich-Schiller-Universität Jena (Germany); Christian Eggeling, Univ. of Oxford (United Kingdom), Friedrich-Schiller Univ. Jena (Germany); Jörg Enderlein, Georg-August-Univ. Göttingen (Germany); Paul M. W. French, Imperial College London (United Kingdom); Ewa M. Goldys, The Univ. of New South Wales (Australia); Zygmunt Karol Gryczynski, Univ. of North Texas Health Science Ctr. at Fort Worth (USA), Texas Christian Univ. at Fort Worth (USA); Mike Heilemann, Goethe-Univ. Frankfurt am Main (Germany); Johan Hofkens, KU Leuven (Belgium); Zhen-Li Huang, Huazhong Univ. of Science and Technology (China); Markus Sauer, Univ. Bielefeld (Germany); Shimon Weiss, Univ. of California, Los Angeles (USA); Andong Xia, Institute of Chemistry (China)

Conference Cosponsor:

In the focus of this conference are all fields of optical single molecule spectroscopy and superresolution imaging, ranging from fundamental physics, technical and methodological questions, towards applications in chemical, biological and biomedical research as well as medical diagnostics. It provides a state-of-the-art interdisciplinary forum for information exchange on new technological developments, advanced applications, and fundamental questions of the field.

Ultra-sensitive spectroscopic techniques have become an important tool in fundamental biological and biomedical research, allowing study of the function and interaction of individual biomolecules. Improving and extending the existing arsenal of techniques for studying specific biological and biochemical questions on a single molecule level is of paramount interest for the life-science community.

This conference puts special emphasis on time resolved methods of fluorescence spectroscopy and imaging which allow for investigating not only structural properties but also the function of molecular processes, down to the single molecule level. Therefore, we encourage to submit work related also to Fluorescence Lifetime Imaging (FLIM), Advanced single-molecule techniques such as Fluorescence Correlation Spectroscopy (FCS), Fluorescence Coincidence Analysis or single-molecule burst analysis are also favorite subjects of this conference. In particular Förster resonance energy transfer (FRET) analysis frequently benefits from theses time-resolved methods and this conference will be an excellent platform to discuss their application at the molecular level.
A topic of particular interest has become the employment of the single-molecule nature of fluorescence excitation and emission to achieve sub-diffraction super-resolution in fluorescence microscopy. It has opened previously unknown opportunities to image live cells in the optical far field with unprecedented optical resolution. This resulted in new microscopy modalities such as Stimulated Emission Depletion (STED) microscopy, single molecule localization microscopy (PALM, STORM, dSTORM, GSD-IM), stochastic optical fluctuation microscopy (SOFI), or structured illumination microscopy (SIM) and imaging scanning microscopy (ISM) techniques. The conference provides an interdisciplinary platform for these new and exciting developments in fluorescence imaging.

The need for ultrasensitive and specific biomedical diagnostics requires development of optical and photonic detection/sensing technologies capable of reaching the single molecule level. The technical challenges to rapidly and specifically detect chemical and biological agents at minimal concentration levels are enormous and largely yet to be realized. All spectroscopic techniques (optical spectroscopy, fluorescence spectroscopy, elastic scattering, Raman scattering, IR spectroscopy, terahertz spectroscopy) as well as the chemical and biological sciences themselves including genetically encoded fluorescent markers and (photoswitchable) labels, are potentially critical components for a multidisciplinary approach to ultrasensitive sensing and diagnostics.

Invited and contributed papers are solicited concerning, but not limited to, the following areas:
- techniques and methods of single molecule (SM) detection
- techniques and methods of SM spectroscopy (such as FCS, FLCS, FLIM, FRET)
- techniques and methods for fluorescence lifetime imaging (FLIM) with one, two, or three photon excitation
- techniques of single molecule manipulation
- superresolution fluorescence imaging (STED, PALM, (d)STORM, GSD-IM, SOFI, SIM and related techniques)
- labels and markers for single molecule techniques like ultrastable organic molecules, photoswitchable molecules/proteins, nanodiamonds, etc.
- advanced fluorescence imaging like (time-resolved) two- and three-photon fluorescence microscopy or (time-resolved) Raman spectroscopy
- multi-modal SM detection such as combining AFM with confocal microscopy
- correlative microscopy such as combining optical and electron microscopy
- fundamental aspects of SM spectroscopy
- biophysical applications of SM spectroscopy and imaging
- medical applications of SM spectroscopy and imaging
- ultrasensitive biomedical diagnostics
- high-throughput screening applications
- chemical and biochemical sensing photonic materials for ultrasensitive optical detection
- microfluidics and capillary devices.

The 2020 conference program will include invited presentations from the following speakers:
- MINFLUX: Achieving the ultimate resolution limit in fluorescence microscopy, Francisco Balzarotti, Max-Planck-Institut für Biophysikalische Chemie (Germany)

Young scientists (age 30 or below and not yet full faculty members) are encouraged to participate in this best paper competition, which offers a $1000 USD cash award. Participants must be both the primary author and presenter of an accepted abstract to be eligible. Please select also “PicoQuant Young Investigator Award” as the last Topic in the abstract submission wizard in order to be considered. This award is sponsored by PicoQuant GmbH Berlin and presented Sunday afternoon.

Submit your abstract today: spie.org/bios20call
Optical Diagnostics and Sensing XX: Toward Point-of-Care Diagnostics (BO504)

Conference Chair: Gerard L. Coté, Texas A&M Univ. (USA)

Program Committee: Zane A. Arp, U.S. Food and Drug Administration (USA); Brent D. Cameron, The Univ. of Toledo (USA); Blaž Cugmas, Univ. of Latvia (Latvia); H. Michael Heise, Fachhochschule Südwestfalen (Germany); Kristen C. Maitland, Texas A&M Univ. (USA); Mike J. McShane, Texas A&M Univ. (USA); Kenith E. Meissner II, Swansea Univ. (United Kingdom); Timothy J. Muldoon, Univ. of Arkansas (USA); Aydogan Ozcan, Univ. of California, Los Angeles (USA); Babak Shadgan, International Collaboration On Repair Discoveries (Canada)

SPECIAL ABSTRACT REQUIREMENTS

Submissions to this conference must include the following:

- 100-word text abstract (for online program)
- 250-word text abstract (for abstract digest)
- 2-page extended abstract (for committee review only). The extended abstract must be submitted as a separate PDF document limited to two pages, including tables and figures. Include author names and affiliations; text; any figures; tables, or images; and sufficient data to permit committee review.

All submissions will be reviewed by the Program Committee to determine acceptance. Extended abstracts will be used only for the purpose of review, and will not be published.

The focus of this conference will be on invasive and noninvasive optical methods for the diagnostics and sensing of all types of biological fluids: blood, lymph, saliva, mucus, gastric juice, urine, aqueous humor, semen, etc. both in vitro and in vivo with, for example, point-of-care microfluidic technologies, mobile technology platforms such as cell phones and tablets, and/or wearable photonic technologies.

The techniques to monitor the fluids and optical properties of these fluids will be discussed including: elastic, quasi-elastic, and inelastic (Raman) light scattering, surface enhanced Raman (SERS) techniques, Doppler flowmetry, spectrophotometry, polarimetry, diffraction, holography, speckle, fluorescence, imaging, and related spectroscopic and microscopic techniques. Studies of biological fluid components on cellular and macromolecular levels, as well as non-destructive measurements of analyte content, will be presented. Theoretical and model studies, as well as clinical applications of the developed optical methods and instrumentation, will be outlined. Diagnostics and sensing systems for point-of-care and global health applications are particularly encouraged.

Suggested topics include, but are not limited to, the following areas:

- wearable photonic technologies
- mobile technology platforms
- point-of-care diagnostic and sensing systems
- global health diagnostics and sensing systems
- in-home diagnostics and monitoring systems
- glucose monitoring approaches
- analyte monitoring in vivo and in vitro
- biological fluid spectroscopy and imaging
- local flow velocity measurement
- blood microcirculation and tissue perfusion monitoring
- blood cell and macromolecular interaction and aggregation sensing
- blood cell deformation, orientation, diffusion, and sedimentation imaging
- fluid viscosity measurement
- effects of physical and chemical factors on fluid composition, rheological, and other properties
- disease diagnostic potential of optical techniques.
Adaptive Optics and Wavefront Control for Biological Systems VI (BOS05)

Conference Chairs: Thomas G. Bifano, Boston Univ. (USA); Sylvain Gigan, Lab. Kastler Brossel (France); Na Ji, Univ. of California, Berkeley (USA)

Program Committee: Jacopo Bertolotti, Univ. of Exeter (United Kingdom); Martin J. Booth, Univ. of Oxford (United Kingdom); Wonshik Choi, Korea Univ. (Korea, Republic of); Tomáš Čizmár, Univ. of Jena (Germany); Meng Cui, Purdue Univ. (USA); John M. Girkin, Durham Univ. (United Kingdom); Benjamin Judkewitz, Charité Universitätsmedizin Berlin (Germany); Ori Katz, The Hebrew Univ. of Jerusalem (Israel); Peter A. Kner, The Univ. of Georgia (USA); Pablo Loza-Alvarez, ICFO - Institut de Ciències Fotòniques (Spain); Allard P. Mosk, Utrecht Univ. (Netherlands); Rafael Piestun, Univ. of Colorado Boulder (USA); Laura Waller, Univ. of California, Berkeley (USA); Monika Ritsch-Marte, Medizinische Univ. Innsbruck (Austria); Lei Tian, Boston Univ. (USA)

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SPECIAL ABSTRACT REQUIREMENTS

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• 100-word text abstract (for online program)
• 250-word text abstract (for abstract digest)
• 2-page extended abstract (for committee review only). The extended abstract must be submitted as a separate PDF document limited to two pages, including tables and figures. Include author names and affiliations; text; any figures; tables, or images; and sufficient data to permit committee review.

All submissions will be reviewed by the Program Committee to determine acceptance. Extended abstracts will be used only for the purpose of review, and will not be published.

Wavefront engineering has greatly expanded the capability of optical microscopy and measurements in biological systems. Recent breakthroughs in measuring and controlling optical wavefront have led to many important applications, including deep tissue microscopy with improved imaging quality and depth, optical tweezers with sophisticated shape and momentum distribution, and three-dimensionally patterned optogenetic excitation. This conference will bring together leading experts in a variety of research fields that employ innovative wavefront control technologies for biomedical applications.

Technical papers concerning the following aspects of adaptive optics are appropriate for submission and consideration:
• adaptive optics for microscopy, optical coherence tomography and ophthalmology
• guide-star probes for wavefront measurement and light guiding in biological tissues
• imaging neural connectivity and function deep in brain tissue
• focusing light through scattering tissues (optimization, transmission matrix)
• imaging with multimode fibers
• wavefront shaping for photoacoustic and acousto-optical imaging
• applications of time-reversal and optical phase conjugation in biological imaging
• mesoscopic effects and their applications to imaging and light delivery (open channels, memory effect)
• shaped beams for light sheet and structured illumination microscopy
• computational optical imaging techniques
• wavefront shaping devices (deformable mirrors, spatial light modulators, MEMS, active lenses).

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Quantitative Phase Imaging VI (BO506)

Conference Chairs: Yang Liu, Univ. of Pittsburgh (USA); Gabriel Popescu, Univ. of Illinois (USA); YongKeun Park, KAIST (Korea, Republic of)

Program Committee: Tatiana Alieva, Univ. Complutense de Madrid (Spain); George Barbastathis, Massachusetts Institute of Technology (USA); Pietro Ferraro, Istituto di Scienze Applicate e Sistemi Intelligenti “Eduardo Caianiello” (Italy); Elena Holden, Executive Strategic Advisory, Biotech and IVD (USA); Björn Kemper, Westfälische Wilhelms-Univ. Münster (Germany); Myung K. Kim, Univ. of South Florida (USA); Jerome Mertz, Boston Univ. (USA); Aydogan Ozcan, Univ. of California, Los Angeles (USA); Demetri Psaltis, École Polytechnique Fédérale de Lausanne (Switzerland); Monika Ritsch-Marte, Medizinische Univ. Innsbruck (Austria); Peter T. C. So, Massachusetts Institute of Technology (USA); Laura Waller, Univ. of California, Berkeley (USA); Renjie Zhou, The Chinese Univ. of Hong Kong (Hong Kong, China)

Conference Cosponsors:

SPECIAL ABSTRACT REQUIREMENTS

Submissions to this conference must include the following:
• 100-word text abstract (for online program)
• 250-word text abstract (for abstract digest)
• One figure and caption with preliminary results.
All submissions will be reviewed by the Program Committee to determine acceptance. Abstracts and figures will be used only for the purpose of review, and will not be published.

Quantitative phase imaging (QPI) refers to measuring at each point in the field of view the optical path length shift introduced by a specimen. This measurement allows for label-free and quantitative assessment of cells and tissues. The quantitative phase images of specimens are related to their refractive index distribution, an intrinsic optical property, which plays an important role in the study of pathophysiology of many diseases. This rapidly emerging field enables the investigation of cells and tissues in terms of morphology and dynamics with nanoscale sensitivity over temporal scales from milliseconds to days. Accurate determination of intrinsic properties, optical, chemical, and mechanical, is likely to help with both basic understanding of cell function and interpretation of pathological states. Employing the principles of interferometry and holography, QPI provides unique capabilities not only for imaging, but for propagation of optical fields as well. As a result, QPI can be used to improve image quality of instruments affected by aberrations, i.e., QPI provides opportunities for non-iterative adaptive optics. With reliable phase information, an imaging instrument becomes also a powerful device for measuring light scattering. Thus, quantitative phase imaging has recently bridged the gap between the imaging and scattering disciplines. This approach is called Fourier transform light scattering, as it represents the spatial analog to Fourier transform spectroscopy. Using QPI, one can easily measure angular scattering from a single cell, which offers opportunities for label-free cell sorting.

This conference is a forum for disseminating the development of methodologies of QPI and their applications to studying specimens. The multidisciplinary nature of QPI will see this conference bring together technology and application experts in electrical and bioengineering, physics and biophysics, cell biology, analytical chemistry, clinical sciences, medical imaging, optics and photonics, and tissue engineering. We will contribute to the development of interdisciplinary bonds in supporting scientists, engineers, biologists and physicians interested in the broad field of label-free quantitative phase imaging.

Papers are solicited on biomedical optics, biophotonics methodologies and applications in the broad area of QPI. Technology development activities are expected to advance the current state of the art in, for example: spatial phase sensitivity, temporal phase sensitivity, acquisition rate, resolution, tomographic reconstruction, spectroscopic content, throughput, phase reconstruction, phase unwrapping, image processing algorithms, user friendliness, etc. Application activities are expected to target specific biological questions, including: quantifying, monitoring, and functionally assessing the normal and pathological states in live cells and tissues from subcellular to organ scales.

Relevant topics include, but are not limited to:

**QPI METHODOLOGIES**
• methods for QPI in general
• digital holography for QPI applications
• off-axis interferometric methods
• phase shifting interferometric methods
• common path interferometry for QPI
• QPI using transport of intensity equation or ptychography
• low-coherence interferometry for QPI
• phase-sensitive optical coherence tomography and microscopy
• multimodal techniques: QPI plus other methods (e.g., fluorescence)
• using QPI to retrieve scattering information from cells and tissues
• Fourier-transform light scattering
• use QPI for adaptive optics or wavefront shaping techniques
• numerical field propagation and time-reversal applications
• optical manipulation and QPI
• probes for QPI, such as nanoparticles.

**ALGORITHMS AND IMAGING PROCESSING IN QPI**
• coherence effects in QPI
• image processing methods for QPI
• field and phase retrieval algorithms
• phase unwrapping algorithms
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ALGORITHMS AND IMAGING PROCESSING IN QPI
• coherence effects in QPI
• image processing methods for QPI
• field and phase retrieval algorithms
• phase unwrapping algorithms
• machine learning algorithms for QPI.

QPI OF CELL & TISSUE STUDIES
• quantitative phase imaging of cells
• quantitative phase imaging of tissues
• cell physiology using QPI
• biomechanics of cells and tissue using QPI
• quantitative phase imaging in neuroscience
• quantitative phase imaging in biophysics
• rheology measurements using QPI techniques
• single cell mechanics, motility, and adhesion study using QPI.

CLINICAL APPLICATIONS OF QPI
• quantitative phase imaging in tissue pathology
• quantitative phase imaging in hematology
• medical diagnosis using refractive index values or QPI in general.

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Submit your abstract today: spie.org/bios20call
High-Speed Biomedical Imaging and Spectroscopy V (BOS08)

Conference Chairs: Kevin K. Tsia, The Univ. of Hong Kong (Hong Kong, China); Keisuke Goda, The Univ. of Tokyo (Japan)

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Conference Cosponsors:

SPECIAL ABSTRACT REQUIREMENTS

Submissions to this conference must include the following:

• 100-word text abstract (for online program)
• 250-word text abstract (for abstract digest)
• 2-page extended abstract (for committee review only). The extended abstract must be submitted as a separate PDF document limited to two pages, including tables and figures. Include author names and affiliations; text; any figures; tables, or images; and sufficient data to permit committee review.
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Real-time capture and analysis of fast, non-repetitive, dynamical events has long been a challenging problem in the field of instrumentation for biomedical research. Notable examples include momentous efforts on establishing high-speed optical spectroscopy with high spectral resolution and wide spectral range (e.g., Raman spectroscopy, Fourier-transform infrared spectroscopy, THz spectroscopy, and fluorescence detection) and high-speed optical microscopy with high spatial resolution and wide field of view (e.g., light-sheet microscopy, ultrafast imaging, photoacoustic microscopy, super-resolution fluorescence microscopy, and image cytometry). The development of such high-speed optical instruments is driven by the need for better understanding dynamical processes in biological systems such as neural activity and calcium transport as well as for high-throughput quantitative analysis of heterogeneous cell populations such as blood cells and stem cells. The big data produced by the high-speed optical instruments is well aligned with the pressing need for progressively larger biomedical datasets for efficient and accurate data analysis with the help of machine learning (e.g., deep learning) to make better decisions in biomedical research and clinical diagnosis.

The aim of this Conference is to bring researchers specialized in high-speed optical bioinstrumentation, data management, and high-speed signal/image processing together in a single multidisciplinary forum. With the presentations of the latest developments, this Conference is intended to serve as an arena to promote idea exchanges, interdisciplinary collaborations, and technological advancements in this new and exciting field of high-speed optical bio-instrumentation with focuses on its future trend and development.

This conference intends to cover, but not limited to, the following topics:

METHODS FOR HIGH-SPEED OPTICAL SPECTROSCOPY AND IMAGING

• High-speed spectroscopy and fluorescence detection
• High-throughput and high-content live cell imaging/microscopy
• Ultrafast imaging techniques
• High-throughput lensless microscopy
• High-throughput light-sheet microscopy
• High-speed photoacoustic imaging
• High-speed super-resolution imaging
• High-speed coherent Raman spectroscopy/imaging (e.g., SRS, CARS)

BIOMEDICAL APPLICATIONS OF HIGH-SPEED OPTICAL SPECTROSCOPY AND IMAGING

• Volumetric imaging
• Neural imaging
• Flow cytometry
• Image cytometry
• High-throughput and high-content screening
• High-throughput histopathology
• Real-time functional in vivo imaging
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COMPUTATIONAL METHODS FOR SIGNAL/IMAGE PROCESSING AND BIG DATA MANAGEMENT
• Instrumentation for real-time computational imaging/spectroscopy (e.g., FPGA, GPU)
• Computationally efficient algorithms
• Data compression and compressive sensing
• High-speed digital signal/image processing
• High-dimensional image analysis
• Data mining

MACHINE LEARNING FOR HIGH-SPEED OPTICAL SPECTROSCOPY AND IMAGING
• Support vector machines
• Deep learning
• Artificial neural networks
• Efficient classification algorithms

BEST PRESENTATION AWARDS
We are pleased to announce that Hamamatsu, PiPhotonics, and Hitachi High-Tech will sponsor six Best Presentation Awards for this Conference, with a total cash prize of $3000: two Hamamatsu Best Paper Awards ($500 each), two PiPhotonics Best Paper Awards ($500 each), and two Hitachi High-Tech Best Paper Awards ($500 each). Participants must be both the primary author and presenter of an accepted abstract to be eligible. Qualifying presentations will be evaluated by the awards committee. The winners will be notified at the end of, or after, the meeting.

PRIZES DONATED BY:
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SAVE THE DATE
Abstracts Due:
24 July 2019
Author Notification:
30 September 2019
The contact author will be notified of acceptance by email.
Manuscripts Due:
8 January 2020
PLEASE NOTE: Submission implies the intent of at least one author to register, attend the conference, present the paper as scheduled, and submit a full-length manuscript for publication in the conference proceedings.

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Label-free biomedical imaging and sensing refers to optical measurements performed on biological samples or living organisms without the need for utilizing labeling agents. Label-free imaging of cells in vitro is specifically of interest, since isolated cells are optically transparent and regular bright-field imaging does not present enough imaging contrast. Labeling agents, such as fluorescent dyes or labels using antibodies, can create molecular specificity and enhance contrast but they might interfere with the biological phenomena measured, and thus are not always allowed. In addition, some biological targets do not have suitable labeling agents. In vivo imaging of living organisms, and humans in particular, should be preferably performed without using labeling agents, due to possible hazardous effects induced by these agents.

Optical detection methods for label-free imaging and sensing are typically based on internal contrast mechanisms of the sample; for example, its ability to delay the light interacting with the sample due to refractive index changes, or its ability to create unique optical spectroscopic, auto-fluorescence, or birefringence or acoustic signatures. In addition, the substrate holding the sample during measurement can be used to enhance the detection and monitor of the sample properties via various effects, including Plasmon resonance, total internal reflection, etc. Furthermore, life science tools, such as optogenetics or gene expression methods, can be applied to achieve molecular specificity in living objects.

Label-free imaging and sensing in the nanoscale, including tracking of single molecules, is of high interest as well. Specifically, label-free optical nanoscopy is still considered as an unsolved challenge in this field.

This conference will gather scientists from various disciplines, who are interested in optical imaging and sensing of biological substances without using labeling: physicists and engineers on the one hand, chemists and life scientists performing optical label-free sensing on the other hand. Keynote presentations for 2019 included:

- X. Sunney Xie, Peking Univ. (China) presenting Stimulated Raman scattering microscopy: label-free vibrational imaging for biology and medicine
- Lihong V. Wang, Caltech (USA) presenting World’s deepest-penetration and fastest cameras: photoacoustic tomography and compressed ultrafast photography

Relevant topics include, but are not limited to:

- Phase imaging (Zernike’s, differential interference contrast (DIC), holography, optical diffraction tomography (ODT), etc.)
- Coherent vibrational scattering techniques (CARS/SRS)
- Spontaneous Raman imaging
- Interferometric and coherence gated imaging (optical coherence tomography, etc.)
- Polarization and birefringence imaging
- Dark-field microscopy
- Brillouin microscopy (spontaneous and stimulated)
- High harmonic generation and nonlinear imaging and sensing
- Auto-fluorescence imaging and sensing
- Hyperspectral imaging and sensing
- Total internal reflection imaging and sensing
- Acoustic and photoacoustic imaging
- Plasmonic sensors
- Fiber-optics-based label-free bio-detectors
- Label-free imaging in the nano-scale
- On-chip implementations of label-free sensors
- Preclinical, clinical, and life science applications
- Label-free imaging using optogenetic and gene expression tools.
Advanced Chemical Microscopy for Life Science and Translational Medicine (BO510)

Conference Chairs: Ji-Xin Cheng, Boston Univ. (USA); Wei Min, Columbia Univ. (USA); Garth J. Simpson, Purdue Univ. (USA)

Program Committee: Rohit Bhargava, Univ. of Illinois (USA); Sophie Brasselet, Institut Fresnel (France); Minhaeng Cho, Korea Univ. (Korea, Republic of); Marcus T. Cicerone, Georgia Institute of Technology (USA); Conon L. Evans, Wellman Ctr. for Photomedicine (USA); Hanieh Fattahi, Max-Planck-Institut für Quantenoptik (Germany); Dan Fu, Univ. of Washington (USA); Katsumasa Fujita, Osaka Univ. (Japan); Zhiwei Huang, National Univ. of Singapore (Singapore); Minbiao Ji, Fudan Univ. (China); Anita Mahadevan-Jansen, Vanderbilt Univ. (USA); Julian Moger, Univ. of Exeter (United Kingdom); Yasuyuki Ozeki, The Univ. of Tokyo (Japan); Ammasi Periasamy, Univ. of Virginia (USA); Dario Polli, Politecnico di Milano (Italy); Jürgen Popp, Leibniz-Institut für Photonische Technologien e.V. (Germany); Eric O. Potma, Univ. of California, Irvine (USA); Hervé Rigneault, Institut Fresnel (France); Lingyan Shi, Columbia Univ. (USA); Chi-Kuang Sun, National Taiwan Univ. (Taiwan); Meng Wang, Baylor College of Medicine (USA); Warren S. Warren, Duke Univ. (USA); Jesse W. Wilson, Colorado State Univ. (USA); Xiaoliang Sunney Xie, Peking Univ. (China); Xiaoji G. Xu, Lehigh Univ. (Canada); Shuhua Yue, Beihang Univ. (China)

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Chemical microscopy utilizing spectroscopic signals as molecular fingerprints enables mapping of chemical composition in space and time. With such capacity, chemical microscopy opens a new way to visualize the orchestra of molecules and/or biological structures inside living systems. Over the past two decades, a number of advanced chemical imaging platforms have emerged, including coherent anti-Stokes Raman scattering microscopy, stimulated Raman scattering microscopy, transient absorption microscopy, infrared photothermal microscopy, and imaging with advanced chemical probes. These advances are enabling high-speed, high-resolution spectroscopic imaging of living systems. Applications of these modalities have led to discoveries of biomarkers defining cancer aggressiveness, drug resistance, and other conditions. Miniaturization of chemical imaging platforms is enabling on-site clinical investigation of human specimens and in vivo measurements by endoscopy in a label-free manner. Commercialization of the chemical imaging modalities has allowed broader use of the technologies. The volume of data potentially accessible in hyperspectral chemical imaging provides both challenges and opportunities for compositional and functional analysis. This conference aims to bring together experts in photonics, life science, medicine, data science, and industrial leaders to foster the growth of this exciting field.

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Biomedical Applications of Light Scattering X (BO511)

Conference Chairs: Adam Wax, Duke Univ. (USA); Vadim Backman, Northwestern Univ. (USA)

Program Committee: Irving J. Bigio, Boston Univ. (USA); Stephen A. Boppart, Univ. of Illinois (USA); Dirk J. Faber, Academisch Medisch Ctr. (Netherlands); Steven L. Jacques, Tufts Univ. (USA); Ofer Levi, Univ. of Toronto (Canada); Lev T. Perelman, Harvard Univ. (USA); Brian W. Pogue, Thayer School of Engineering at Dartmouth (USA); Bruce J. Tromberg, National Institute of Biomedical Imaging and Bioengineering (USA)

Light scattering techniques are under development as biomedical diagnostics for their ability to accurately and precisely determine structures within biological samples. Clinical applications have included detecting pre-cancerous and cancerous tissue states both in vivo and with ex vivo biopsy samples, characterizing the mechanical properties of cells and tissues for identifying disease and for assessing the presence and concentration of biochemicals for diagnostic purposes. The development of these clinical modalities has relied upon implementing light scattering instruments, creating models of light scattering by normal and diseased tissues and devising new analysis methods. In addition, light scattering has also been employed in pre-clinical cell biology studies which seek to detect structural changes of sub-cellular components such as mitochondria and cell nuclei. Improved understanding of the relationship between light scattering signals and underlying morphological changes has relied upon these pre-clinical studies in developing new clinical modalities.

The use of light scattering techniques for biomedical applications has produced a significant presence at Photonics West. This conference revives a focused conference on biomedical applications of light scattering.

Papers are solicited on (but not restricted to) the following areas:

- Clinical applications of light scattering methods, including:
  - dynamic light scattering
  - speckle contrast imaging
  - elastic scattering spectroscopy
  - polarized light scattering spectroscopy
  - low coherence light scattering
  - diffuse reflectance spectroscopy
  - enhanced backscattering spectroscopy
  - Applications of light scattering for identifying biochemicals
  - Light scattering methods for assessing structural properties of cells and tissues for clinical diagnostics, such as cancer detection
  - Methods for determination of biological structure based on analysis of optical properties
  - Pre-clinical cell biology investigations using light scattering, including:
    - light scattering microscopy
    - goniometry
  - Light scattering instrumentation for biomedical diagnostics, including:
    - confocal microscopy
    - spectroscopic optical coherence tomography
    - Novel light scattering techniques for clinical applications
    - Quantitative phase imaging for assessing scattering features
    - Theoretical modeling of light scattering for clinical applications, including:
      - numerical modeling
      - analytical treatments
    - Experimental and modeling studies of microscopic origins of light scattering in tissue.
Nanoscale Imaging, Sensing, and Actuation for Biomedical Applications XVII

Conference Chairs: Dror Fixler, Bar-Ilan Univ. (Israel); Ewa M. Goldys, The Univ. of New South Wales (Australia)

Conference Co-Chair Sebastian Wachsmann-Hogiu, Univ. of California, Davis (USA)

Program Committee: Vasily N. Astratov, The Univ. of North Carolina at Charlotte (USA); Lorena Betancor, Univ. ORT Uruguay (Uruguay); Henry Hess, Columbia Univ. (USA); Małgorzata Jędrzejewska-Szczerska, Gdansk Univ. of Technology (Poland); Sung Jin Kim, Univ. of Miami (USA); James F. Leary, Purdue Univ. (USA); Brian D. MacCraith, Dublin City Univ. (Ireland); Alzbeta Mareck Chorvatova, International Laser Ctr. (Slovakia); Paras N. Prasad, Univ. at Buffalo (USA); Sharon M. Weiss, Vanderbilt Univ. (USA)

Conference CoSponsor: Prizmatix

Novel applications and/or solutions to technological problems involving i) the use of nanostructures, nanoparticles, metamaterials and nanostructured materials for biological applications; ii) photonic studies of nanoscale interactions in biology and medicine; and iii) the use of biological materials/templates for the development of nanostructured nanophotonic imaging and sensing devices are significant foci of both industrial and academic research. These applications and solutions are inherently interdisciplinary by nature and thus require a seamless transfer of knowledge between physics, chemistry, biology, medicine and engineering.

Recent integrative research efforts have included, for example, (a) nanotechnology (fabrication and application) as a tool in developing new, and improving existing, optical imaging techniques for real-time sub-wavelength imaging of cellular processes, (b) developing the next generation of nano-biosensors for improving biological / chemical sensing applications, (c) using nanoparticles / nanostructures for optical engineering of methodologies for targeting and treatment of disease, (d) applying computer and information technologies in the development of new models and data analysis for understanding cellular mechanisms, (e) developing new photonic devices and systems that are hybrids of traditional polymeric and semiconductor materials with biological materials; (f) very large scale and/or very sensitive detection down to single molecule level for drug discovery and diagnostics applications, such as nanoarrays; and (g) quantum computing and machine learning to biomedical applications.

The objective of this conference is to bring together scientists and researchers interested in the latest advances in the advancement of materials and methods that combine nanophotonics with biology. More specifically, this conference is to discuss the development of processing, characterization, and simulation of bioinspired and bioderived nanophotonic structures, metamaterials for sub-wavelength imaging, nanoscale interactions in biological systems, functionalized nanoparticles for biological applications and the use of nanostructures / nanoparticles for high throughput analysis (nanoarrays).

The conference will focus on three streams of contributions:
- nanoparticle use in imaging and sensing
- nanostructures used for nanoscale / sub-wavelength imaging
- nanospectroscopy and nano-scale sensing for biomedical applications
- label-free super-high resolution nanoscale imaging

Papers from industry, government, academia, and other research organizations are solicited on the following and related topics:

FUNDAMENTALS (MATERIALS AND TOOLS)
- studies of cellular and membrane biophysics using nanophotonics (nanoparticles and nano-optics)
- characterization of nanoscale interactions in biological systems, e.g., near-field microscopy, scanning
- force microscopy
- development of sub-wavelength imaging (e.g., hyperlenses from metamaterials)
- nanocomposites of inorganic/organic hybrids for biophotonics
- biological templates for fabrication of nanophotonic devices
- bio-inspired and bio-derived nanostructured materials
- localized fluorescence spectroscopy using nanostructures and nanoparticles
- modeling and simulations of bio/nanophotonics
- manipulation of biomolecules and cells at the nano-level
- label-free imaging below the diffraction limit
- new concepts in Stimulated Emission Depletion (STED) microscopy
- femtosecond Stimulated Raman Spectroscopy (FSRS)
- quantum computing improves imaging, diagnosis, treatment.

TECHNOLOGY (DEVICES)
- nanoscale device design and processing for biomedical applications
- biological sensors based on nanophotonic structures (e.g. photonic bandgap materials, porous silicon, metamaterials)
- multifunctional nanoparticles (targeting, imaging, and treatment)
- hybrid bionanodevices, e.g. molecular motors and nanofluidics
- special light sources and detectors for biomedical applications
- machine learning algorithms and artificial intelligence to deliver real time results.

APPLICATIONS
- optical imaging using nanophotonics principles (nanostructures, nanoparticles, etc.)
- in vitro and in vivo applications of nanophotonics (functionalized nanoparticles, surfaces, etc.)
- biomedical instrumentation development (nanosensors or nanoscale imagers).

Two “Young Investigator Awards”, 500 US$ each, sponsored by Prizmatix Ltd., will be awarded for notable contributions by young scientists presenting their work at the Conference.
Ongoing rapid progress in the synthesis of a variety of biofunctionalized colloidal nanoparticles with fascinating electronic, magnetic, and optical properties not associated with bulk materials symbolizes a fundamental breakthrough in physics and chemistry of condensed matter, which significantly extends our knowledge about the nature of materials and our abilities to manipulate their properties. Inorganic nanostructures that interface with biological systems are attracting an increasingly widespread interest in biology and medicine. Quantum dot intravascular probes can be used in a remarkable number of biomedical applications, such as highly specific markers for cellular microscopy, flow cytometry, DNA and protein chips, immunohistochemical investigations, histology, cancer detection, in situ hybridization, PCR DNA detection, biochemical and cell-based drug screening, single molecule studies, and correlation spectroscopy. There are abundant opportunities for improved or completely novel probes and seemingly endless new applications. Also plasmonic and magnetic nanoparticles can be used for a large number of biomedical applications.

This conference will consider biomedical applications of colloidal nano- and micro-particles, as well as recent advances in new materials and methods of synthesis, coating, and bioconjugation. Its objective is to provide a widely interdisciplinary forum for practicing clinicians, biomedical scientists, development engineers, physicists, and chemists specializing in different fields to benefit from each other’s expert knowledge and to create trend-setting interdisciplinary links that will accelerate progress in this field.

Previously unpublished experimental and theoretical papers are solicited on the following and related topics:

- synthesis of colloidal nanoparticles such as II-VI, I-VII, III-V, and group-IV semiconductor quantum dots; ternary compounds; core-shell nanoparticles; nano-onions; nanoshells; plasmonic nanoparticles; metal nanoparticles; magnetic nanoparticles; shape and size control; assembly of nanoparticles to bigger (micro) particles
- synthesis of colloidal microparticles such as layer-by-layer assembled capsules
- bioconjugation and biolabeling; bioconjugate chemistry; dendron ligands; thiol and oligonucleotide coatings; phospholipid micelles; biotin/avidin; sticky polymers; targeting peptides; target specificity
- measurement techniques; microscopy (AFM, SFM, STM, HRTEM, SNOM); XRD; spectroscopy (FTIR, EELS, ICP, DFS); spectroscopy of single quantum dots; multiphoton spectroscopy; frequency upconversion; magnetic sensing and imaging; plasmon spectroscopy; dynamic light scattering
- physics and characterization of colloidal nanoparticles; electronic structure, band alignment; dielectric screening; optical, electronic, and magnetic properties; excitons and biexcitons; quantum efficiency; intraband transitions; spin dynamics; blinking mechanisms; surface-enhanced Raman spectroscopy; plasmons
- theoretical and experimental studies of interactions with surrounding ambient, including dynamics and electronic structures
- numerical modeling; multiscale modeling; density functional modeling; molecular dynamics; Brownian dynamics; quantum Monte Carlo simulations
- biomolecular sensing; FRET; molecular interactions
- biocompatibility; development of non-toxic nanoparticles; intracellular behavior; long-term effects
- biological applications of colloidal nanoparticles; in vitro and in vivo imaging; biology at molecular level; receptor-ligand interactions; protein folding/unfolding; DNA conjugation, sequencing, and assembly; cell motility; gene expression mutation, etc.
- medical applications of colloidal nanoparticles; immuno-fluorescent assays; applications in neuroscience; drug delivery and screening; cancer diagnostics and therapy; screening; biomechanics; etc.
CALL FOR PAPERS

Reporters, Markers, Dyes, Nanoparticles, and Molecular Probes for Biomedical Applications XII (BO602)

Conference Chairs: Samuel Achillefu, Washington Univ. School of Medicine in St. Louis (USA); Ramesh Raghavachari, U.S. Food and Drug Administration (USA)

Program Committee: Mingfeng Bai, Vanderbilt Univ. Medical Ctr. (USA); Mikhail Y. Berezin, Washington Univ. School of Medicine in St. Louis (USA); Richard B. Dorshow, MediBeacon Inc. (USA); Jelena M. Janjic, Duquesne Univ. (USA); Hisataka Kobayashi, National Cancer Institute (USA); Ashok Kumar Mishra, Indian Institute of Technology Madras (India); Dolonchampa Maji, Washington Univ. School of Medicine in St. Louis (USA); Gabor Patonay, Georgia State Univ. (USA); Attila Tarnok, Univ. Leipzig (Germany); Deepa Venkitesh, Indian Institute of Technology Madras (India)

OPTIONAL EXTENDED ABSTRACTS

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Chemical and genetic sensors, reporters, and molecular probes are the cardinal elements in molecular imaging and analyses of normal and pathophysiological processes at the cellular and molecular levels. Diverse molecular designs with unique optical signatures have been developed and are currently used to sense the presence and activity of molecular targets that characterize specific biological processes. These have been used to probe human diseases, explore the mechanisms of pathogenesis, monitor drug efficacy, discriminate healthy from diseased tissues, and assess therapeutic outcomes. These applications deploy molecular probes over a range of scales from microscopy and subcellular resolution to optical tomography of entire organisms. Development and use of these probes typically involve multidisciplinary teams that have assembled to address specific biological questions.

The objective of this conference is to provide a forum to present and collate significant and exciting studies involving chemically or biologically developed optical molecular probes that have been used in biomedical research. Papers appropriate for this solicitation include, but are not limited to studies performed with dyes, bioluminescent enzymes, photoprobes such as GFP, activatable probes, receptor-, tissue-, or function-specific probes, nonspecific contrast effectors, nanoparticles, quantum dots, and multimodal molecular probes, monitoring molecular and physiological processes in cell and living organisms, clinical use of imaging agents, and applications of biomarkers and sensors in medicine and biology. This conference will target state-of-the-art studies where these probes have been used, in vitro or in vivo, and encompasses a wide variety of applications. To accommodate the multidisciplinary nature of the conference, papers are requested from a variety of subject areas, including the following topics:

DESIGN, SYNTHESIS, DEVELOPMENT, OR ANALYSES OF NEAR-INFRARED AND OTHER FLUORESCENT DYES
• novel dyes (fluorescent, absorption, and environment-sensitive dyes)
• novel luminescent probes
• absorption-, fluorescent-, and light scattering-based agents

DESIGN, SYNTHESIS, DEVELOPMENT, AND ANALYSES OF NANO PARTICLES
• caged complexes or chelated optical markers
• quantum dots, micro- and nanoparticles

DEVELOPMENT OF BIOLUMINESCENCE AND FLUORESCENT PROTEINS, INTRINSIC PROBES, AND MOLECULAR REPORTERS
• function-specific chemical and biological sensors
• molecular beacons

MARKERS FOR MEMBRANE POTENTIAL, ELECTROLYTES, AND PH REGULATIONS
• structure-dependent spectroscopy
• intracellular and extracellular pH measurements
• functional analysis of biological processes in cells and animals

IN VITRO AND IN VIVO APPLICATIONS OF CONTRAST AGENTS AND MOLECULAR PROBES
• genomics and proteomics, including gene expression biological assays, including immunoassays, cell internalization, receptor binding, LRET, FRET and FISH studies
• physiologic function monitoring, including molecular and cellular events, pH, electrolytes, metabolites, minerals, and membrane potential
• in vivo organ function monitoring
• molecular, cellular, and tissue imaging
• site-specific delivery mechanisms and endoscopy methods
• multicolor and multimodality imaging systems and upconversion markers
• real-time monitoring of disease progression or regression
• tandem diagnostic and therapeutic interventions
• molecular ruler design and application
• monitoring treatment response
• contrast agents for imaging applications

CONTINUED BOTTOM NEXT PAGE
The goal of this conference is to provide an interdisciplinary forum for state-of-the-art methods and instrumentation related to the new research area of plasmonics and related nanosystems and their applications in biology and medicine. Plasmonics refers to the investigation, development and applications of enhanced electromagnetic properties of metallic nanostructures. The term plasmonics is derived from plasmons, which are the quanta associated with longitudinal waves propagating in matter through the collective motion of large numbers of electrons. Incident light irradiating these surfaces excites conduction electrons in the metal, and induces excitation of surface plasmons leading to enormous electromagnetic enhancement.

A forum that integrates interdisciplinary research and development is critically needed for scientists, engineers, and clinical providers to present the most recent advances in instrumentation and methods as well as biomedical applications in the new field of plasmonics in biology and medicine.

The focus is on the following topics:
• properties of metallic nanostructures
• nanophotonics systems
• plasmonics-based sensors
• surface plasmon resonance (SPR) sensing systems
• surface-enhanced Raman scattering (SERS) and biomedical applications
• surface-enhanced luminescence (SEL) and biomedical applications
• bioprobes and nanopropes
• nanosensors
• nanocharchitectures and nanooptics
• fabrications of nanostructured substrates
• spectroscopies related to plasmonics
• single-molecule spectroscopy
• single-molecule manipulation
• cellomics using nanoparticle technology
• metallonomics detection using plasmonics
• nanosystems for drug delivery
• metal nanoscale contrast agents for medical diagnostics
• photonic atoms
• metal-enhanced fluorescence MEF
• surface plasmon-coupled emission SPCE.
CALL FOR PAPERS

Frontiers in Biological Detection: From Nanosensors to Systems XII (BO604)

Conference Chairs: Amos Danielli, Bar-Ilan Univ. (Israel); Benjamin L. Miller, Univ. of Rochester Medical Ctr. (USA); Sharon M. Weiss, Vanderbilt Univ. (USA)

Program Committee: Andrea M. Armani, The Univ. of Southern California (USA); Nathaniel C. Cady, SUNY Polytechnic Institute (USA); Xudong Fan, Univ. of Michigan (USA); Jason A. Guicheteau, U.S. Army Edgewood Chemical Biological Ctr. (USA); Laura Maria Lechuga, Institut Català de Nanociència i Nanotecnologia (ICN2) (Spain); Francesco Michelotti, Sapienza Univ. di Roma (Italy); Michael J. Sailor, Univ. of California, San Diego (USA); Christopher C. Striemer, Adarza Biosystems, Inc. (USA); Yuze Alice Sun, The Univ. of Texas at Arlington (USA)

Conference Cosponsor:

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All submissions will be reviewed by the Program Committee to determine acceptance. Extended abstracts will be used only for the purpose of review, and will not be published.

Topics of interest include but are not limited to:

• new sensing platforms
• ultrasensitive (single pathogen) detection methods
• utilization of nanomaterials and new optically responsive materials for pathogen detection
• miniaturized optic components such as microring resonators, photonic crystals, integrated optical waveguides, and nanoparticles
• label-free vs. tagged detection systems
• organic and inorganic platforms
• probe design
• strategies to eliminate non-specific binding
• integration of optics and microfluidics
• systems demonstrations
• integrated photonics systems and manufacturing
• new applications for environmental, medical, and food testing.

Limited assistance with travel costs may be available for junior faculty presenting in this conference. Please contact the conference organizers when submitting your abstract to be considered for a travel award. The conference will also be presenting awards for the best oral presentations given by a student.

Detection of biological materials, from DNA strands, to proteins, to whole pathogens, is increasingly becoming a concern throughout society, not only in diagnostic laboratories in hospitals but also for on-site uses by health care providers or soldiers. From monitoring incidence of drug-resistant bacteria in hospitals and detecting harmful pathogens for homeland security to ensuring that our food is safe and our water clean, new, simple, inexpensive, sensitive, and fast methods of identifying biological molecules and pathogens are a pressing need. Optical solutions promise to provide many of these advantages and as a result many platforms for optical detection are being demonstrated in the laboratory. The deployment of bio-detection systems however requires that stringent specifications be met, for example in terms of sensitivity, false-positive and false-negative assessments, automated sample processing and analysis, system design and integration, and low cost.

This conference seeks to gather scientists, engineers and users active in biological detection. Contributions are sought in all areas, from novel optical detection platforms to nanosensors to system integration and commercialization.

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Follow these instructions to develop a successful abstract and accompanying manuscript for the conference and for publication in the Proceedings of SPIE in the SPIE Digital Library.

How to submit an abstract

1. Browse the conference program and select one conference that most closely matches the topics in your abstract. You may submit your abstract to only one conference.
2. Click “Submit an Abstract” from within the conference you’ve chosen, and you’ll be prompted to sign in to your spie.org account to complete the submission wizard.
3. If your submission is related to an application track, indicate the appropriate track when prompted during the submission process.

What you will need to submit

A completed electronic submission should include the following:
1. Title
2. Author(s’) information
3. 250-word abstract for technical review
4. 100-word summary for the program
5. 2-3 page extended summary for technical review (select conferences; if summaries are required, this is indicated in the individual conference Call for Papers)
6. Keywords used in search for your paper (optional)
7. Your decision on publishing your presentation recording to the SPIE Digital Library (slide capture and audio)
8. Some conferences may indicate additional requirements in the Call for Papers (for example: instructions for competing for awards)

Note: Only original material should be submitted. Commercial papers, papers with no new research/development content, and papers with proprietary restrictions will not be accepted for presentation.

Submission agreement

Presenting authors, including keynote, invited, oral, and poster presenters, agree to the following conditions by submitting an abstract:
1. Pay the author registration fee
2. Attend the meeting
3. Present at the scheduled time
4. Pay my manuscript in the SPIE Digital Library
5. Obtain funding for registration fees, travel, and accommodations, independent of SPIE, through their sponsoring organizations
6. Ensure that all clearances, including government and company clearance, have been obtained to present and publish. If you are a DoD contractor in the USA, allow at least 60 days for clearance.

Review and program placement

• To ensure a high-quality conference, all submissions will be assessed by the Conference Chair/Editor for technical merit and suitability of content.
• Conference Chair/Editors reserve the right to reject for presentation any paper that does not meet content or presentation expectations.
• Final placement in an speaker or poster session is subject to the Chairs’ discretion.

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Contact information

For questions about your presentation, submitting an abstract post-deadline, or the meeting, contact your Conference Program Coordinator.
For questions about your manuscript, contact AuthorHelp@spie.org.
Add an application track to help get your presentation noticed

When submitting an abstract, add an application track during the submission process to increase the visibility of your presentation in the program. Application tracks offer a second presentation listing so participants can easily locate presentations in the program on their area of interest.

APPLICATION TRACK
Instructions
1. Select a conference online, click “Submit an Abstract,” and follow the instructions.
2. Indicate the appropriate track when prompted during the submission process.

Accepted presentations will be listed in both the conference and application track listing in the program.

Translational Research
SPIE Translational Research 2020 will highlight the latest R&D with high potential to impact healthcare.
- Photonic Therapeutics and Diagnostics
- Neurophotonics, Neurosurgery, and Optogenetics
- Clinical Technologies and Systems
- Tissue Optics, Laser Tissue Interaction, and Tissue Engineering
- Biomedical Spectroscopy, Microscopy, and Imaging
- Nano/Biophotonics

TRACK CHAIRS:
- Aaron Aguirre
  Massachusetts General Hospital (USA)
- Gabriela Apiou
  Harvard Medical School, Wellman Ctr. for Photomedicine, Massachusetts General Hospital (USA)

Brain
SPIE Brain 2020 will highlight technologies that increase our understanding of the brain
- Clinical and Translational Neurophotonics, Optogenetics, and Optical Manipulation
- Clinical Technologies, Laser Tissue Interaction, and Tissue Engineering
- Spectroscopy, Microscopy, Imaging, Nanobiophotonics, and LASE
- Neurotechnology plenary speakers and details

TRACK CHAIRS:
- David A. Boas
  Boston Univ. (USA)
- Elizabeth Hillman
  Columbia Univ. (USA)

3D Printing
SPIE 3D Printing 2020 highlights technologies enabling additive manufacturing.
- Additive Manufacturing
- Selective Laser Melting, Laser Sintering, Laser Photopolymerization
- Novel Materials, Protean Materials, and Laser Interactions
- Software that Increases Efficiencies and Speed
- In-situ Sensors or Probes to Verify and Quantify Additive Manufacturing Processes in Real Time
- Conformal Photonics/Electronics

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**LASE**
Topics include laser source engineering, nonlinear optics and beam guiding, laser manufacturing, laser micro/nano applications, 3D manufacturing, and more.

**OPTO**
Topics include optoelectronic materials and devices, photonic integration, displays and holography, nanotechnologies in photonics, advanced quantum and optoelectronic applications, semiconductor lasers and LEDs, MOEMS-MEMS, optical communications: devices to systems.

Application tracks highlight specific topics
Easily locate applicable content in the program related to these important topics.
- Translational Research
- Brain
- 3D Printing

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