SPIE. PHOTONICS WEST BIOS

BiOS 2021 CALL FOR PAPERS

IMPORTANT NEWS:
Photonics West moves to 6-11 March

BiOS

CALL FOR PAPERS

Submit abstracts by 26 August 2020

6–11 March 2021
The Moscone Center
San Francisco, California, USA

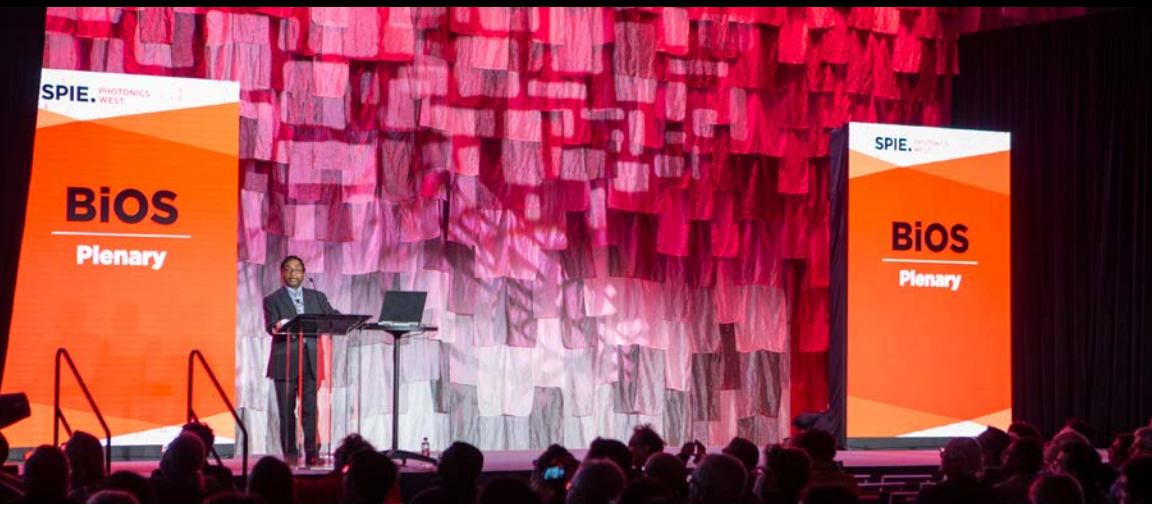
spie.org/BiOS21call
#PhotonicsWest

SPIE. PHOTONICS WEST BIOS

The Moscone Center
San Francisco, California, USA

Conferences and Courses
6–11 March 2021

Two Exhibitions
BiOS Expo: 6–7 March 2021
Photonics West: 9–11 March 2021



Present your work at BiOS 2021

The largest biophotonics, biomedical optics, and imaging conference

2021 BiOS technical tracks

Explore these technical areas to find the right conference to submit your research.

- 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

APPLICATION TRACKS

Increase the visibility of your paper by including it in an appropriate application track.

- Translational Research
- Brain
- 3D Printing
- COVID-19 Research

Submit abstracts by **26 August 2020**

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Plan to Participate

BiOS is the world's largest international biomedical optics conference, encompassing clinical, translational, and fundamental research and development in the field of biomedical optics and photonics. It provides the premier technical forum for reporting and learning about the latest research and development, as well as for launching new applications and technologies.

BiOS is part of SPIE Photonics West, the largest biophotonics, laser, optoelectronics, and industrial manufacturing event in North America, with more than 5,500 technical attendees from more than 50 countries. Special events include hot topics presentations, the BiOS Expo, focus on translational research, updates on brain initiatives, and new for 2021, a focus on COVID-19 research.

We look forward to your help in disseminating relevant research that positively impacts everyday life in the societies around the world.

Symposium Chairs

Jennifer Barton,
The Univ. of Arizona
(USA)

Wolfgang Drexler,
Medical Univ. of Vienna
(Austria)

Important news: Photonics West moves to 6-11 March

The new 2021 dates provide more space at The Moscone Center to accommodate the program and the exhibition as we implement new meeting guidelines and requirements. We will be working hard to ensure a safe and productive opportunity to meet together, following health and government guidelines. We hope you will plan to join us – a few weeks later than usual – in 2021.

New abstract submission date: 26 August

Contents

PHOTONIC THERAPEUTICS AND DIAGNOSTICS

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

NEUROPHOTONICS, NEUROSURGERY, AND OPTOGENETICS

Program Track Chairs: **David A. Boas,** Boston Univ. (USA); **Elizabeth Hillman,** Columbia Univ. (USA)

CLINICAL TECHNOLOGIES AND SYSTEMS

Program Track Chairs: **Tuan Vo-Dinh,** Duke Univ. (USA); **Anita Mahadevan-Jansen,** Vanderbilt Univ. (USA)

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)

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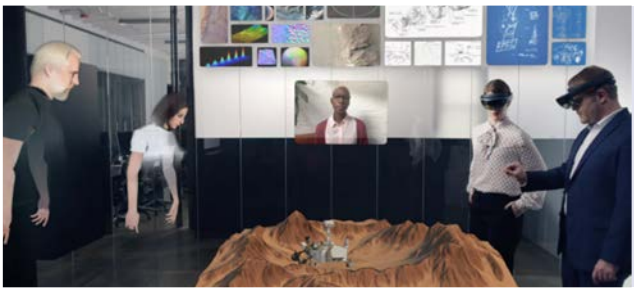
NANO/BIOPHOTONICS

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

CHECK CONFERENCES FOR SPECIFIC SUBMISSION REQUIREMENTS

Submission requirements for BiOS conferences vary. See the individual Call for Papers for details and specific submission guidelines.



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7–9 March 2021

Learn more: spie.org/XR21call

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Tony Wilson, Univ. of Oxford (United Kingdom)
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Mei Wu, Harvard Medical School (USA)
Victor X. Yang, Ryerson Univ. (Canada)
Haishan Zeng, BC Cancer Research Ctr. (Canada)

Photonics in Dermatology and Plastic Surgery 2021 (BO100)

Conference Chairs: **Bernard Choi,** Beckman Laser Institute and Medical Clinic (USA); **Haishan Zeng,** BC Cancer Research Ctr. (Canada)

Program Committee: **Mihaela Balu,** Beckman Laser Institute and Medical Clinic (USA); **Anthony J. Durkin,** Beckman Laser Institute and Medical Clinic (USA); **Conor L. Evans,** Wellman Ctr. for Photomedicine (USA); **Manu Jain,** Memorial Sloan-Kettering Cancer Ctr. (USA); **Hanna Jonasson,** Linköping Univ. (Sweden); **Kristen M. Kelly M.D.,** Univ. of California, Irvine School of Medicine (USA); **Boris Majaron,** Jožef Stefan Institute (Slovenia); **Milind Rajadhyaksha,** Memorial Sloan-Kettering Cancer Ctr. (USA); **Jessica C. Ramella-Roman,** Florida International Univ. (USA); **Lise Lyngsnes Randeberg,** Norwegian Univ. of Science and Technology (Norway); **Rolf B. Saager,** Beckman Laser Institute and Medical Clinic (USA); **InSeok Seo,** Johnson & Johnson Consumer Products (USA); **Eric R Tkaczyk,** Department of Veterans Affairs, Vanderbilt Univ. Medical Ctr. (USA); **Hequn Wang,** Johnson & Johnson Consumer Products (USA); **Ruikang K. Wang,** Univ. of Washington (USA)

This conference focuses on the use of optics and photonics to diagnose, characterize, monitor, and treat dermatological conditions, including (but not limited to) skin cancer, abnormal cutaneous vasculature, and wounds. The development of highly selective lasers has transformed the clinical practice of dermatology and plastic surgery by enabling the removal of vascular lesions, pigmented lesions, tattoos, and hair, all without scarring. These important examples of selective photothermal injury continue to be refined and extended. The potential for laser or non-laser applications in skin diagnosis, imaging, and treatment for burn wounds and other conditions such as psoriasis, acne, and vitiligo far exceeds their present use. Submissions on novel approaches to treat cutaneous conditions are welcome.

A detailed understanding of skin optics, photothermal, photoacoustic, and photobiological processes continues to emerge. Optical spectroscopy, microscopy, machine learning, and multiscale/multimodal imaging techniques hold significant promises in skin lesion diagnosis and skin therapy monitoring, and submissions in these areas are especially welcome. Laser/tissue interaction, therapeutics, and diagnostics relating to light and skin, as well as competing technologies in the same scope, are also invited. Studies on the development and application of artificial intelligence and machine learning approaches to analysis of data collected from the skin are also welcome.

Contributions from all medical, dental, and veterinary specialties, military-related applications, and basic sciences contributions are encouraged. We welcome presentations that focus on translational research in dermatology and plastic surgery.

Save the date

ABSTRACTS DUE: 26 AUGUST 2020

AUTHOR NOTIFICATION: 2 NOVEMBER 2020

The contact author will be notified of acceptance by email.

MANUSCRIPTS DUE: 16 FEBRUARY 2021

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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Advanced Photonics in Urology (BO101)

Conference Chairs: **Hyun Wook Kang,** Pukyong National Univ. (Korea, Republic of); **Ronald Sroka,** Laser-Forschungslabor (Germany)

Program Committee: **Geoffrey N. Box M.D.,** The Ohio State Univ. (USA); **Ralf Brinkmann,** Medizinisches Laserzentrum Lübeck GmbH (Germany); **Kin F Chan,** Simpson Interventions (USA); **Nathaniel M. Fried,** The Univ. of North Carolina at Charlotte (USA); **Thomas Hasenberg,** Boston Scientific Corp. (USA); **Joseph C. Liao,** Stanford Univ. (USA); **William W. Roberts M.D.,** Univ. of Michigan Health System (USA); **Babak Shadgan M.D.,** The Univ. of British Columbia (Canada); **Stefan B. Spaniol,** LifePhotonic GmbH (Germany); **Frank Strittmatter,** Laser-Forschungslabor (Germany); **Joel M. Teichman M.D.,** St. Paul's Hospital (Canada); **Matthias Trottmann,** Univ. München (Germany); **Rudolf M. Verdaasdonk,** Vrije Univ. Medical Ctr. (Netherlands); **Hui Wang,** Miami Univ. (USA); **Jian J. Zhang,** Boston Scientific Corp. (USA)

Conference Cosponsor: Boston Scientific — Advancing science for life™

High technology in urology includes many new but also routine uses of light sources and light detection systems for diagnosis and treatment, including their combination as feedback-system. Selective photodiagnosis and phototherapy are under investigation or on their way to clinical use. Endoscopic approaches as well as robotic assisted light applications enable minimally invasive and high precision tissue differentiation thus supporting cutting and ablation during surgery. Further energy-based treatments (RF, HIFU, ...) are also being applied for tissue destruction in urology.

This conference covers the use of lasers and thermal energy based technologies for treatment and of light excitation and detection for diagnosis in urology. Attendees (scientists, engineers, clinicians) are encouraged and motivated to share ideas, experiments and technical information in this interdisciplinary flied. Regarding the diversity of experiments and studies also non-positive results should be presented and discussed.

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

LASERS AND LIGHT SOURCES FOR THERAPY AND DIAGNOSIS

- 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 electroporation (IRE)
- Tissue treatment effects and healing responses after energy-based treatments.

TISSUE IMAGING FOR DIAGNOSTICS

- Cellular/molecular imaging, probing, and optical biopsy in urology
- Artificial phantoms for reproducible experiments
- 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
- Use of artificial intelligence (AI) in urology e.g. prognosis, differentiation, ...
- AR/VR in the urological OR
- training, teaching and education in urology
- Clinical trials (single case experience to phase II-studies).

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 2021 (BO102)

Conference Chairs: **Brian J. F. Wong M.D.,** Beckman Laser Institute and Medical Clinic (USA); **Justus F. Ilgner M.D.,** 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
- CO_2 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.

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Endoscopic Microscopy XVI (BO103)

Conference Chairs: **Guillermo J. Tearney M.D.,** 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); **Matthew Brenner M.D.,** 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 M.D.,** Massachusetts General Hospital (USA); **Stephen Lam M.D.,** 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.

Diagnostic and Therapeutic Applications of Light in Cardiology 2021 (BO104)

Conference Chairs: **Laura Marcu,** Univ. of California, Davis (USA); **Gijs van Soest,** Erasmus MC (Netherlands)

Program Committee: **Christos Bourantas,** St. Bartholomew's Hospital (United Kingdom); **Kenton W. Gregory M.D.,** Oregon Medical Laser Ctr. (USA); **Christine P. Hendon,** Columbia Univ. (USA); **Stanislav Y. Emelianov,** Georgia Institute of Technology (USA); **Guillermo J. Tearney M.D.,** Massachusetts General Hospital (USA)

The expanding use of optical imaging and spectroscopy techniques by clinicians in cardiovascular medicine has spurred a wave of scientific research and technical innovation towards new diagnostic modalities in this field. Characterization of coronary atherosclerotic plaque, imaging of therapeutic devices such as stents, and detection of arrhythmogenic changes in the myocardium, all benefit from the resolution and tissue type specificity offered by optics. Therapeutic use of light and lasers continues to find new, targeted applications, aiming for safer interventions with more predictable outcomes. Examples include laser angioplasty, pacemaker lead removal, and ablation of erratic conduction paths in the cardiac wall. Specialized microscopic techniques have revealed myriad details of embryonic cardiac development.

Scientists, engineers, clinical researchers and industry partners meet here to discuss new advances of using light for cardiovascular science and medicine. The aim is to benefit patients, physicians, and fundamental cardiac research. To this end, the conference stimulates collaboration and interdisciplinary exchange, which are paramount for generating new insights and for rearing new technologies towards a role in effective, safe and fast interventions.

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

- imaging of coronary artery disease: OCT, fluorescence, angioscopy, photoacoustics
- optical characterization of atherosclerosis: polarization, spectroscopy, speckle techniques
- optical methods of assessing cardiovascular structure, biomechanics and function
- blood, coagulation and thrombogenesis
- cardiomyopathies
- myocardial ablation
- laser revascularization
- light-tissue interaction of the heart and vessels
- cardiac optogenetics
- photodynamic therapy
- cardiac development
- vascular constructs development (bioengineered tissue)
- image analysis and processing, including machine learning techniques
- new catheters/devices for diagnosis, intervention guidance and therapy
- new light sources, fibers, scanners and other components
- optical studies of the cardiovascular system in animal models
- contrast agents for cardiovascular diagnosis and therapy
- non-invasive technologies for cardiovascular health
- clinical applications
- translation of technology from bench to industry and clinic.

Save the date

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Multiscale Imaging and Spectroscopy (BO105)

Conference Chairs: **Paul J. Campagnola,** Univ. of Wisconsin-Madison (USA); **Kristen C. Maitland,** Texas A&M Univ. (USA); **Darren M. Roblyer,** Boston Univ. (USA)

Program Committee: **Ji-Xin Cheng,** Boston Univ. (USA); **Kevin W. Eliceiri,** Univ. of Wisconsin-Madison (USA); **Irene Georgakoudi,** Tufts Univ. (USA); **Anita Mahadevan-Jansen,** Vanderbilt Univ. (USA); **Andrew M. Rollins,** Case Western Reserve Univ. (USA); **Melissa C. Skala,** Univ. of Wisconsin-Madison (USA); **Alex J. Walsh,** Texas A&M Univ. (USA)

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.

Lasers in Dentistry XXVII (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 M.D.,** 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
- CO_2 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: 26 AUGUST 2020

AUTHOR NOTIFICATION: 2 NOVEMBER 2020

The contact author will be notified of acceptance by email.

MANUSCRIPTS DUE: 16 FEBRUARY 2021

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Submit your abstract today: **spie.org/bios21call**

Ophthalmic Technologies XXXI (BO107)

Conference Chairs: **Daniel X. Hammer,** U.S. Food and Drug Administration (USA); **Karen M. Joos,** Vanderbilt Univ. (USA); **Daniel V. Palanker,** Stanford Univ. (USA)

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 Farsiu,** Duke Univ. (USA); **Arthur Ho,** Brien Holden Vision Institute (Australia); **Anthony N. Kuo M.D.,** Duke Univ. School of Medicine (USA); **Kirill V. Larin,** Univ. of Houston (USA); **Ezra Maguen,** American Eye Institute (USA); **Fabrice Manns,** Univ. of Miami (USA); **Susana Marcos,** Instituto de Óptica "Daza de Valdés" (Spain); **Donald T. Miller,** Indiana Univ. (USA); **Derek Nankivil,** Johnson & Johnson Vision Care, Inc. (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); **Per G. Söderberg,** Uppsala Univ. (Sweden); **Peter Soliz,** VisionQuest Biomedical, LLC (USA); **Yuankai K. Tao,** Vanderbilt Univ. (USA); **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.

You are invited to submit papers to Ophthalmic Technologies XXXI - 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
- femtosecond laser applications
- artificial cornea and keratoprostheses
- 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.

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.

PASCAL ROL AWARD

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 2020 recipient of the Pascal Rol Award was Ayoub Lassoued 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 2021 speaker will be Prof. Dan Schwartz from University of California, San Francisco.

Visualizing and Quantifying Drug Distribution in Tissue V (BO108)

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

Program Committee: **Zane A. Arp,** U.S. Food and Drug Administration (USA); **Eric G. Solon,** Madrigal Pharmaceuticals, Inc. (USA); **Alex J. Walsh,** Morgridge Institute for Research (USA); **Cristina L. Zavaleta,** The Univ. of Southern California (USA)

The imaging technologies used today for visualizing and quantifying drugs within tissue are limited and serve as an unfortunate bottleneck in the development of pharmaceutical compounds. Regulatory guidelines for drug development require thorough understanding of the disposition of pharmaceutical compounds in the body through absorption, distribution, metabolism and excretion (ADME). Tools for imaging pharmacokinetic and pharmacodynamic information are largely confined to expensive and time-consuming techniques such as mass spectrometry and autoradiography. These approaches notably cannot readily be carried out in vivo in human subjects today.

The objective of this conference is to bring together scientists and researchers spanning the fields of imaging, chemistry, physics, engineering, medicinal chemistry and pharmaceutical development to stimulate discussions and broaden the availability of imaging modalities for the visualization and quantification of drug distribution in tissue. The applications of these methods can span the full gamut of the drug development and testing process, from in vitro through ex vivo, up to in vivo preclinical and clinical deployment.

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 and are limited to:

OPTICAL AND PHOTONIC IMAGING MODALITIES

- Fluorescence microscopy techniques
- Raman and coherent Raman based imaging tools
- Infrared microscopy
- Photoacoustic imaging
- X-ray based methods.

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

- Early drug screening such as in vitro high throughput assay (HTA)
- Preclinical development such as ex vivo diffusion and distribution, and in vivo studies involving dose-ranging, minimum therapeutic dose, minimum inhibitory concentration, ADME and toxicology.
- Clinical development involving drug pharmacokinetics and pharmacodynamics for safe and efficacious use.

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.

Save the date

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Optical Methods for Tumor Treatment and Detection: Mechanisms and Techniques in Photodynamic Therapy XXX (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,** Tufts Univ. (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 XVI (BO110)

Conference Chairs: **Praveen Arany,** Univ. at Buffalo (USA); **James D. Carroll,** THOR Photomedicine Ltd. (United Kingdom); **Ann Liebert,** Australasian Research Institute (Australia)

Program Committee: **Clark E. Tedford,** LumiThera (USA); **Chris Castel,** CareWear Corp. (USA); **Jeri-Anne Lyons,** Univ. of Wisconsin-Milwaukee (USA); **Mei X. Wu M.D.,** Harvard Medical School (USA), Wellman Ctr. for Photomedicine (USA); **Michael L. Denton,** Air Force Research Lab. (USA); **Tomas Hode,** Immunophotonics, Inc. (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 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.

Save the date

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

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

Conference Co-Chair: **Brian W. Pogue,** Thayer School of Engineering at Dartmouth (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 Ntziachristos,** Helmholtz Zentrum München GmbH (Germany), Technical Univ. of Munich (Germany); **Keith D. Paulsen,** Thayer School of Engineering at Dartmouth (USA); **Eben L. Rosenthal M.D.,** 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 M.D.,** Univ. of Michigan (USA); **Brian C. Wilson,** Ontario Cancer Institute (Canada)

SPECIAL ABSTRACT REQUIREMENTS

Submissions to this conference must include:

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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 consoildate 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.

Save the date

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Photonic Diagnosis, Monitoring, Prevention, and Treatment of Infections and Inflammatory Diseases 2021 (BO112)

Conference Chairs: **Tianhong Dai,** Wellman Ctr. for Photomedicine (USA), Massachusetts General Hospital (USA), Harvard Medical School (USA); **Jürgen Popp,** Leibniz-Institut für Photonische Technologien e.V. (Germany); **Mei X. Wu M.D.,** Harvard Medical School (USA)

Program Committee: **Alba Alfonso García,** Univ. of California, Davis (USA); **Alessandro M. Deana,** UNINOVE (Brazil); **Alessandra Nara de Souza Rastelli D.D.S.,** Univ. Estadual Paulista "Júlio de Mesquita Filho" (Brazil); **Pu-Ting Dong,** Boston Univ. (USA); **Walfre Franco,** Wellman Ctr. for Photomedicine (USA); **Michael R. Hamblin,** Wellman Ctr. for Photomedicine (USA); **Leon G. Leanse,** Massachusetts General Hospital (USA); **Kristen C. Maitland,** Texas A&M Univ. (USA); **Akilan Palanisami,** Wellman Ctr. for Photomedicine (USA), Massachusetts General Hospital (USA), Harvard Medical School (USA); **Wei-Chuan Shih,** Univ. of Houston (USA); **Ying Wang M.D.,** Chinese PLA General Hospital (China)

SPECIAL ABSTRACT REQUIREMENTS

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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 diagnostics and therapeutics 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.

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.

continued next page

Photonic Diagnosis, Monitoring, Prevention, and Treatment of Infections and Inflammatory Diseases 2021 (BO112 continued)

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
- Light-assisted delivery of antimicrobials
- Photoimmunotherapy for microbial infections.

Clinical and Translational Neurophotonics 2021

(BO200)

Conference Chairs: **Victor X. D. Yang,** Univ. of Toronto (Canada), Ryerson Univ. (Canada); **Jana M. Kainerstorfer,** Carnegie Mellon Univ. (USA)

Program Committee: **Steen J. Madsen,** Univ. of Nevada, Las Vegas (USA); **Nitish V. Thakor,** National Univ. of Singapore (Singapore); **David Abookasis,** Ariel Univ. of Samaria (Israel); **Frederic Leblond,** Ecole Polytechnique de Montréal (Canada); **Herbert Stepp,** Ludwig-Maximilians-Univ. München (Germany); **Cuiru Sun,** Tianjin Univ. (China)

SPECIAL ABSTRACT REQUIREMENTS

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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 or functional diseases such as Alzheimer's, Parkinson's, and epilepsy.

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.

Save the date

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Neural Imaging and Sensing 2021 (BO201)

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

Program Committee: **David A. Boas,** Boston Univ. (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); **Sergio Fantini,** Tufts 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); **Francesco Saverio Pavone,** European Lab. for Non-linear Spectroscopy (Italy); **Leilei Peng,** Wyant College of Optical Sciences (USA); **Darcy S. Peterka,** Columbia 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)

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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 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.

Save the date

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Optogenetics and Optical Manipulation 2021 (BO202)

Conference Chairs: **Samarendra K. Mohanty,** Nanoscope Technologies, LLC (USA); **Anna W. Roe,** Zhejiang Univ. (China); **Shy Shoham,** NYU Langone Health (USA)

Program Committee: **Antoine Adamantidis,** McGill Univ. (Canada); **George J. Augustine,** The Lee Kong Chian School of Medicine (Singapore); **Klaus B. Gerwert,** Ruhr-Univ. Bochum (Germany); **Xue Han,** Boston Univ. (USA); **Elizabeth M. Hillman,** Columbia Univ. (USA); **E. Duco Jansen,** Vanderbilt Univ. (USA); **Richard Kramer,** Univ. of California, Berkeley (USA); **Alfred L. Nuttall,** Oregon Health & Science Univ. (USA); **Darcy S. Peterka,** Columbia Univ. (USA); **Michelle Y. Sander,** Boston Univ. (USA); **Ulrich T. Schwarz,** Technische Univ. Chemnitz (Germany); **Cuiru Sun,** Tianjin Univ. (China); **John P. Welsh,** Univ. of Washington (USA)

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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 readouts of neural/cellular activities during optogenetic stimulation (e.g. intravital microscopy, diffuse-reflectance, 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 understanding 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 potentially improve optogenetic therapy. Optical microscopy, spectroscopy, and imaging techniques hold significant promise for characterizing optogenetic probes and submissions in these areas are especially welcome. 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 conference. Contributions from all biomedical specialties and basic sciences are encouraged. Technical and scientific papers related to advancement in development of optogenetics 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 XXV

(BO300)

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

Program Committee: **Peter E. Andersen,** Technical Univ. of Denmark (Denmark); **Kostadinka Bizheva,** Univ. of Waterloo (Canada); **Stephen A. Boppart M.D.,** 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 M.D.,** 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: PEER REVIEW

Submissions to this conference are due no later than 2 September 2020 (later than the main BiOS due date) and must include the following:

- 100-word text abstract (for online program)
- 250-word text abstract (for abstract digest)
- 3-page PDF summary (for committee review). Expanded content is not necessary and will not be considered; please limit your summary to 3 pages.

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.

Save the date

ABSTRACTS DUE: 26 AUGUST 2020

AUTHOR NOTIFICATION: 2 NOVEMBER 2020

The contact author will be notified of acceptance by email.

MANUSCRIPTS DUE: 16 FEBRUARY 2021

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/bios21call**

Advanced Biomedical and Clinical Diagnostic and Surgical Guidance Systems XIX (BO301)

Conference Chairs: **Caroline Boudoux,** Polytechnique Montréal (Canada); **James W. Tunnell,** The Univ. of Texas at Austin (USA)

Program Committee: **Daniel X. Hammer,** U.S. Food and Drug Administration (USA); **Dirk J. Faber,** Amsterdam UMC (Netherlands); **Christine P. Hendon,** Columbia Univ. (USA); **Zhiwei Huang,** National Univ. of Singapore (Singapore); **Beop-Min Kim,** Korea Univ. (Korea, Republic of); **Muyinatu A. Lediju Bell,** Johns Hopkins Univ. (USA); **Anita Mahadevan-Jansen,** Vanderbilt Univ. (USA); **Hui Min Leung,** Massachusetts General Hospital (USA); **Francisco E. Robles,** Georgia Institute of Technology & Emory Univ. School of Medicine (USA); **Tuan Vo-Dinh,** Fitzpatrick Institute For Photonics, Duke Univ. (USA)

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.

Optics and Biophotonics in Low-Resource Settings VII (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,** Acacia Communications, Inc. (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.

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.

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.

Save the date

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Design and Quality for Biomedical Technologies XIV (BO303)

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

Conference Co-Chair: **T. Joshua Pfefer,** U.S. Food and Drug Administration (USA)

Program Committee: **David W. Allen,** National Institute of Standards and Technology (USA); **Anthony J. Durkin,** Beckman Laser Institute and Medical Clinic (USA); **Sang-Won Lee,** Korea Research Institute of Standards and Science (Korea, Republic of); **Rongguang Liang,** Wyant College of Optical Sciences (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); **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 progresses 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 biophotonic 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
- micro-optics and MEMS based optical systems
- sources, 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.

continued next page

Design and Quality for Biomedical Technologies XIV (BO303 continued)

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.

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.

VI. Biomedical Imaging Technologies
- hyperspectral, spectroscopic techniques
- 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.

Multimodal Biomedical Imaging XVI (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,** Ecole Polytechnique de Montréal (Canada); **Yu Chen,** Univ. of Maryland, College Park (USA); **Gultekin Gulsen,** Univ. of California, Irvine (USA); **Kirill V. Larin,** Univ. of Houston (USA); **Brian W. Pogue,** Thayer School of Engineering at Dartmouth (USA); **Sava Sakadžic,** Massachusetts General Hospital (USA); **Vivek J. Srinivasan,** Univ. of California, Davis (USA); **Arjun G. Yodh,** Univ. of Pennsylvania (USA)

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
- 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, classifications, etc)
- machine-learning and deep-learning based image data analysis
- artificial Intelligence and machine learning for inverse problem and data fusion
- 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 translate 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 performances, validation of quantitative assessment of optical signatures in-vivo).

Save the date

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AUTHOR NOTIFICATION: 2 NOVEMBER 2020

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MANUSCRIPTS DUE: 16 FEBRUARY 2021

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:

Optical Fibers and Sensors for Medical Diagnostics, Treatment and Environmental Applications XXI (BO305)

Conference Chairs: **Israel Gannot,** Johns Hopkins Univ. (USA), Tel Aviv Univ. (Israel); **Katy Roodenko,** MAX IR Labs (USA);

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); **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.

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 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.

Save the date

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Optical Biopsy XVIII: Toward Real-Time Spectroscopic Imaging and Diagnosis (BO306)

Conference Chairs: **Robert R. Alfano,** The City College of New York (USA); **Stavros G. Demos,** Univ. of Rochester Laboratory for Laser Energetics (USA); **Angela B. Seddon,** The Univ. of Nottingham (United Kingdom)

Program Committee: **Nicole J. Crane,** Naval Medical Research Ctr. (USA); **Amir Gandjbakhche,** National Institutes of Health (USA); **Israel Gannot,** Johns Hopkins Univ. (USA), Tel Aviv Univ. (Israel); **Michael G Giacomelli,** Univ. of Rochester (USA); **Zhiwei Huang,** National Univ. of Singapore (Singapore); **Nicusor V. Iftimia,** Physical Sciences Inc. (USA); **Igor V. Meglinski,** Univ. of Oulu (Finland); **Yang Pu,** MicroPhotoAcoustics, Inc. (USA); **Milind Rajadhyaksha,** Memorial Sloan-Kettering Cancer Ctr. (USA); **Lingyan Shi,** Univ. of California, San Diego (USA); **Gennady B. Shvets,** Cornell Univ. (USA); **Ganesan Singaravelu,** Anna Univ., Chennai (India); **Binlin Wu,** Southern Connecticut State Univ. (USA); **Min Xu,** Hunter College (USA); **Anna N. Yaroslavsky,** Univ. of Massachusetts Lowell (USA); **Siavash Yazdanfar,** Corning Incorporated (USA)

The goal of this conference is to present novel state-of-the-art work in non-invasive spectroscopic and imaging 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. There will also be a fast spectral data processing focus, with a view to real-time diagnostics through spectra, and including reservoir computing, biomimetic approaches, machine learning, and kernel methods, like SVMs (support-vector-machines). 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, Stimulated Raman ,resonance Raman , 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
- Complex Vector Vortex light propagation and imaging
- dynamics of laser-tissue interactions

continued next page

Optical Biopsy XVIII: Toward Real-Time Spectroscopic Imaging and Diagnosis (BO306 continued)

- 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 spectroscopy
- NEW event thrust on fast spectral data processing focus, with a view to real-time diagnostics through spectra, and including reservoir computing, biomimetic approaches, machine learning, and kernel methods, like SVMs (support-vector-machines) and AI.

Save the date

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Microfluidics, BioMEMS, and Medical Microsystems XIX (BO307)

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

Conference Co-Chair: **Bastian E. Rapp,** Univ. of Freiburg (Germany)

Program Committee: **Hatice Altug,** Ecole Polytechnique Fédérale de Lausanne (Switzerland); **Brian W. Anthony,** Massachusetts Institute of Technology (USA); **Jaione Tirapan Azpiroz,** IBM Research - Brazil (Brazil); **Colin Dalton,** Univ. of Calgary (Canada); **Yolanda Fintschenko,** FounderTraction (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); **Thomas Stieglitz,** Albert-Ludwigs-Univ. Freiburg (Germany); **Sindy Kam-Yan Tang,** Stanford Univ. (USA); **Hayden K. Taylor,** Univ. of California, Berkeley (USA); **Julian Thiele,** Leibniz-Institut für Polymerforschung Dresden e.V. (Germany); **Bernhard H. Weigl,** Intellectual Ventures Management, LLC (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.

The purpose of this conference is to provide an international technical forum to showcase recent advances 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 existing 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 micromechanical 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
- nanofluidic devices and systems
- microdroplet generation and manipulations
- micro-heating/cooling devices
- emerging microfluidic approaches (inertial microfluidics,electrofluidics, paper/textile microfluidics)
- optofluidics
- 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.

continued next page

Microfluidics, BioMEMS, and Medical Microsystems XIX
(BO307 continued)

APPLICATIONS OF MICROFLUIDICS, BIOMEMS, AND MEDICAL MICROSYSTEMS

- point-of-care (POC) medical monitoring and diagnostics
- nano bio/medical sensors
- optofluidics, 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 2021.

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.

Save the date

ABSTRACTS DUE: 26 AUGUST 2020

AUTHOR NOTIFICATION: 2 NOVEMBER 2020

The contact author will be notified of acceptance by email.

MANUSCRIPTS DUE: 16 FEBRUARY 2021

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/bios21call**

Biophotonics in Exercise Science, Sports Medicine, Health Monitoring Technologies, and Wearables (BO308)

Conference Chairs: **Babak Shadgan,** International Collaboration On Repair Discoveries (Canada); **Amir H. Gandjbakhche,** Eunice Kennedy Shriver National Institute of Child Health and Human Development (USA)

Program Committee: **Willy N. J. M. Colier,** Artinis Medical Systems B.V. (Netherlands); **Guy D. Dumont,** The Univ. of British Columbia (Canada); **Marco Ferrari,** Univ. degli Studi dell'Aquila (Italy); **Takafumi Hamaoka M.D.,** Tokyo Medical Univ. (Japan); **Andrew J. Macnab M.D.,** The Univ. of British Columbia (Canada); **Anita Mahadevan-Jansen,** Vanderbilt Univ. (USA); **Patrick Neary,** Univ. of Regina (Canada); **Lonnie Petersen,** Univ. of California, San Diego (USA); **T. Joshua Pfefer,** U.S. Food and Drug Administration (USA); **W. Darlene Reid,** Univ. of Toronto (Canada); **Behrouz Shabestari,** National Institute of Biomedical Imaging and Bioengineering (USA); **Robert V. Warren,** Beckman Laser Institute and Medical Clinic (USA)

Conference Co-Sponsors: HAMAMATSU PHOTON IS OUR BUSINESS **EBA Japan Co., Ltd.**

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.

BEST PAPER AWARDS

SPONSORED BY
Hamamatsu and **EBA Japan Co., LTD**

Candidates for best paper awards need to be the presenting author. Cash awards will be delivered after the publication of the conference proceedings volume.

continued next page

Optical Tomography and Spectroscopy of Tissue XIV (BO309)

Conference Chairs: **Sergio Fantini,** Tufts Univ. (USA); **Paola Taroni,** Politecnico di Milano (Italy)

Program Committee: **Erin M. Buckley,** Emory Univ. (USA); **Regine Choe,** Univ. of Rochester (USA); **Hamid Dehghani,** The Univ. of Birmingham (United Kingdom); **Mamadou Diop,** Lawson Health Research Institute (Canada); **Amir H. Gandjbakhche,** National Institutes of Health (USA); **Sylvain Gioux,** Lab. des sciences de l'Ingénieur, de l'Informatique et de l'Imagerie (France); **Andreas H. Hielscher,** Columbia Univ. (USA); **Shudong Jiang,** Thayer School of Engineering at Dartmouth (USA); **Jana M. Kainerstorfer,** Carnegie Mellon Univ. (USA); **Anand T. N. Kumar,** Athinoula A. Martinos Ctr. for Biomedical Imaging (USA); **Frederic Leblond,** Ecole Polytechnique de Montréal (Canada); **Mark J. Niedre,** Northeastern Univ. (USA); **Eiji Okada,** Keio Univ. (Japan); **Thomas D. O'Sullivan,** Univ. of Notre Dame (USA); **Antonio Pifferi,** Politecnico di Milano (Italy); **Anne Planat-Chrétien,** CEA-LETI (France); **Valentina Quaresima,** Univ. degli Studi dell'Aquila (Italy); **Darren M. Roblyer,** Boston Univ. (USA); **Ilias Tachtsidis,** Univ. College London (United Kingdom); **Yukio Ueda,** Hamamatsu Photonics K.K. (Japan); **Heidrun Wabnitz,** Physikalisch-Technische Bundesanstalt (Germany); **Anna N. Yaroslavsky,** Univ. of Massachusetts Lowell (USA); **Quing Zhu,** Washington Univ. in St. Louis (USA)

SPECIAL ABSTRACT REQUIREMENTS

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- 100-word text abstract (for online program)
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Medical imaging based on near infrared (NIR) illumination is a powerful and cost-effective approach for characterizing thick tissues. Technological developments using principles of Diffuse Optical Spectroscopy (DOS), Diffuse Optical Imaging (DOI), Diffuse Optical Tomography (DOT), and Diffuse Correlation Spectroscopy (DCS) have helped drive significant advances in quantitative, model-based NIR methods. Diffuse optical technologies account for the effects of multiple light scattering in tissue and have been applied to a broad variety of problems in biology and medicine spanning from cancer and wound healing to muscle function and brain imaging. Many of these methods are designed to provide functional diagnostic information about tissue physiology in real or near-real time. Capabilities include characterization and localization of endogenous absorption and scattering contrast and the use of exogenous absorption, fluorescence, and scattering agents for enhancing cellular and molecular specificity.

Endogenous hemoglobin absorption and tissue scattering provides a particularly powerful and unique capability of diffuse optical methods in their ability to measure tissue oxygen utilization and blood flow. Exogenous optical contrast elements as imaging biomarkers that are predictive of disease and clinical outcome are a topic of major interest and activity. The combination of intrinsic and extrinsic contrast elements into multi-modality DOI platforms provides functional, dynamic images with capabilities that rival, and in some cases exceed, conventional radiologic imaging approaches. Similarly, the combination of diffuse optical methods with established anatomic imaging technologies such as MRI, ultrasound, and x-ray imaging is a powerful strategy that can significantly enhance information content. As a result, diffuse optical methods provide cost-effective solutions for diagnostic imaging and therapeutic guidance as either "stand-alone" or integrated "multi-modality" platforms.

This conference emphasizes all aspects of diffuse optical methods in tissues, including novel hardware and instrumentation, modeling and computation, and applications in human subjects and pre-clinical models.

Suggested topics include the following:

THEORY AND MODELING

- Advances in the formulation of forward and inverse problems, methods that account for tissue heterogeneity, and understanding limits of image resolution and contrast
- Transport theory, diffusion theory, Monte Carlo simulations, numerical methods
- Fundamental properties of photon density waves (PDW) and methods for control and measurement of PDWs.

INSTRUMENTATION AND METHODS

- Novel hardware, probe, and imaging designs including improved signal processing, advances in sources and detectors, novel imaging geometries to enhance speed, signal-to-noise ratio, and information content
- Tissue phantoms and protocols for performance assessment
- Multi-modality platforms, image co-registration and data visualization
- Methods to elucidate the physiological meaning of endogenous optical contrast, including dynamic signals, vascular reactivity, and effects of dynamic perturbations
- Specialized technologies for small animal model imaging
- Exogenous absorption, scattering, and fluorescence contrast agents for enhanced cellular and molecular specificity
- Cost-effectiveness, reducing barriers to access, and miniaturization of instrumentation
- Design and applications of wearable devices.

APPLICATIONS

- Non-invasive cerebral spectroscopy and imaging: normal brain function, neuro-degeneration, brain trauma, and neuro-pathologies
- Non-invasive spectroscopy and imaging of skeletal-muscular systems, including joints, bones, and muscle
- Non-invasive spectroscopy and imaging of normal breast function, hormonal stimulation, disease risk, breast pathologies, and monitoring of response to cancer therapy
- Spectroscopy and imaging of tissues for diagnostic evaluations or physiological monitoring
- Spectroscopy and imaging of tissue for monitoring therapeutic interventions such as response to chemo-, radiation-, preventative, and hormonal therapies
- Image-guided diagnosis, treatment, therapy, and surgical planning
- Correlation of optical imaging biomarkers with gold standard methods, clinical endpoints, and validation in multi-center settings
- Minimally-invasive, intra-operative settings.

Save the date

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MANUSCRIPTS DUE: 16 FEBRUARY 2021

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Submit your abstract today: **spie.org/bios21call**

Optical Interactions with Tissue and Cells XXXII (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); **Patience T. Mthunzi-Kufa,** CSIR National Laser Ctr. (South Africa); **Anouk L. Post,** The Netherlands Cancer Institute (Netherlands); **William P. Roach,** Vanderbilt Univ. (USA)

The Optical Interactions with Tissue and Cells conference addresses the complex interaction of light with biological tissues. This interaction, governed by the inherent properties of the light, such as, intensity, wavelength, polarization and coherence, results in complex multiphysical interaction mechanism(s) (photothermal, photomechanical, plasma formation, photochemical). The modeling, experimental measurement and validation, and application of this interaction to measure unique changes in a biological system is core to this conference. This conference reaches beyond just the optical wavelengths to include lower frequencies in the RF (radio frequency) and THz (terahertz) regions. Investigation of the fundamental mechanisms of laser tissue and cell interactions is gaining further importance for innovative clinical applications due to its increasing use in surgery in combination with optical imaging. The field has expanded to include not only bulk tissue responses, but also cellular and molecular responses to electromagnetic irradiation at the in vitro and in vivo level. With the growing use of artificial intelligence and deep learning, modeling of light propagation can be used at a completely different level to predict the relevant interaction mechanisms. Beyond advancing the modeling and measurement of EM interactions, this conference is also focused on innovative methods for teaching biophotonics to the next generation of optical engineers. Understanding the fundamental mechanisms of interactions between optical radiation, tissue, and cells is the basis for the development of future biomedical optic technologies that include both therapeutic and diagnostic applications.

The presenters of posters will be asked to participate in a speed poster session. This will be a 3-4 minute presentation of your poster at the start of the poster session. This will ensure that all accepted abstracts of this conference will receive an opportunity to present their work. At the end of the conference awards will be given out for best presentation and best poster.

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

- novel applications of lasers and light in biomedicine/nanomedicine
- photothermal, photochemical, photo-oxidative, and photomechanical interactions
- mechanisms of pulsed laser ablation
- ultrafast laser phenomena in cells and tissue
- optical monitoring of tissue mechanics
- optical properties of tissues and cells
- micro-and nanosurgery in cells and tissues (dissection, tissue welding, ablation)
- biomolecular and biophysical response of cells and tissues to electromagnetic waves
- photonics based diagnostics for communicable and non-communicable diseases
- numerical approaches simulating laser-tissue interactions and response
- advanced numerical methods for modeling light tissue interaction (machine learning/neural networks)
- advanced imaging approaches (IVIS, MRI, CT, etc.) to visualize electromagnetic tissue interaction and resolve in vivo optical properties
- signal modeling as a function of tissue optical properties
- education and training in biophotonics.

Save the date

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Dynamics and Fluctuations in Biomedical Photonics XVIII (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,** ICFO - Institut de Ciències Fotòniques (Spain); **Ling Fu,** Huazhong Univ. of Science and Technology (China); **Ekaterina I. Galanzha,** Univ. of Arkansas for Medical Sciences (USA); **Michael W. Jenkins,** Case Western Reserve Univ. (USA); **Jana M. Kainerstorfer,** 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); **Irina 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); **Andrew M. Rollins,** Case Western Reserve Univ. (USA); **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); **Chao Zhou,** Washington Univ. in St. Louis (USA); **Dan Zhu,** Huazhong Univ. of Science and Technology (China)

SPECIAL ABSTRACT REQUIREMENTS

Submissions to this conference must include the following:

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- 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 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 Health Apps.

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 cellular dynamics including cilia
- 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
- optical angiography and lymphography
- tissue and cell optical clearing
- dynamic signal capture with mobile apps.

Photons Plus Ultrasound: Imaging and Sensing 2021 (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); **Sarah E. Elizabeth Bohndiek,** Univ. of Cambridge (United Kingdom); **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); **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); **Daniel Razansky,** ETH Zurich (Switzerland); **Wiendelt Steenbergen,** Univ. of Twente (Netherlands); **Xueding Wang,** Univ. of Michigan (USA); **Roger J. Zemp,** Univ. of Alberta (Canada); **Qifa Zhou,** The Univ. of Southern California (USA); **Quing Zhu,** Washington Univ. in St. Louis (USA)

Conference Cosponsors: SENO MEDICAL, PHOTOACOUSTICS

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 (this option makes submissions eligible for the Best Paper or the Best Poster award nominations). 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.

Post-deadline submissions might be accepted contingent upon confirmation of exceptional quality of research as determined by the Program Committee. The latest date for post-deadline submissions is January 4. Decision regarding acceptance of post-deadline submissions will be made one week before the conference.

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.

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.

BEST PAPER AWARD AND BEST POSTER AWARD

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 cash award).

Photoacoustics Journal, Elsevier, will sponsor the "Best Poster Award" at this conference (Certificate of recognition to all coauthors and $1,500 cash award).

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 and The Best Poster Awards. A Certificate of The Best Paper or The Best Poster 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.

Biophotonics and Immune Responses XVI (BO403)

Conference Chair: **Wei R. Chen,** Univ. of Central Oklahoma (USA)

Program Committee: **Sandra O. Gollnick,** Roswell Park Comprehensive Cancer Ctr. (USA); **Tomas Hode,** Immunophotonics, Inc. (USA); **Yih-Chih Hsu,** Chung Yuan Christian Univ. (Taiwan); **Vyacheslav Kalchenko M.D.,** Weizmann Institute of Science (Israel); **Satoshi Kashiwagi,** Massachusetts General Hospital (USA); **Mladen Korbelik,** BC Cancer Research Ctr. (Canada); **Hong Liu,** The Univ. of Oklahoma (USA); **Mark F. Naylor,** Dermatology Associates of San Antonio (USA); **Junle Qu,** Shenzhen Univ. (China); **Oxana V. Semyachkina-Glushkovskaya,** Saratov State Univ. (Russian Federation); **Robert T. van Kooten,** Amsterdam UMC (Netherlands); **Xunbin Wei,** Shanghai Jiao Tong Univ. (China); **Sihua Yang,** South China Normal Univ. (China); **Zhihong Zhang,** Huazhong Univ. of Science and Technology (China); **Feifan Zhou,** Shenzhen Univ. (USA)

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 also 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
- image-guided immunotherapy.

Save the date

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Optical Elastography and Tissue Biomechanics VIII (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); **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 Dholakia,** Univ. of St. Andrews (United Kingdom); **Jochen R. Guck,** TU Dresden (Germany); **Christine P. Hendon,** Columbia Univ. (USA); **Brendan F. Kennedy,** The Univ. of Western Australia (Australia); **Sean J. Kirkpatrick,** Michigan Technological Univ. (USA); **Susana Marcos,** Instituto de Óptica "Daza de Valdés" (Spain); **Seemantini K. Nadkarni,** Wellman Ctr. for Photomedicine (USA); **Matthew O'Donnell,** Univ. of Washington (USA); **Amy L. Oldenburg,** The Univ. of North Carolina at Chapel Hill (USA); **Cynthia J. Roberts,** The Ohio State Univ. (USA); **Jannick P. Rolland,** Univ. of Rochester (USA); **David D. Sampson,** Univ. of Surrey (United Kingdom); **Ian A. Sigal,** Univ. of Pittsburgh (USA); **Peter T. C. So,** Massachusetts Institute of Technology (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)

Conference Cosponsor: THORLABS

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
- multimodal 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)
- 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).

JOINT SESSION

Special Session is planned in collaboration with the conference BO107: Ophthalmic Technologies XXXI, 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.

Save the date

ABSTRACTS DUE: 26 AUGUST 2020

AUTHOR NOTIFICATION: 2 NOVEMBER 2020

The contact author will be notified of acceptance by email.

MANUSCRIPTS DUE: 16 FEBRUARY 2021

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/bios21call**

Polarized light and Optical Angular Momentum for biomedical diagnostics (BO406)

Conference Chairs: **Jessica C. Ramella-Roman,** Florida International Univ. (United States); **Hui Ma,** Tsinghua Univ. Shenzhen International Graduate School (China); **Tatiana Novikova,** Lab. de Physique des Interfaces et des Couches Minces (France)

Conference Co-Chairs: **Daniel S. Elson,** Imperial College London (United Kingdom); **I. Alex Vitkin,** Univ. Health Network (Canada)

Program Committee: **Sophie Brasselet,** Institut Fresnel (France); **Christian Brosseau,** Univ. de Bretagne Occidentale (France); **Juan Campos,** Univ. Autònoma de Barcelona (Spain); **Russell A. Chipman,** Wyant College of Optical Sciences (United States); **Anabela Da Silva,** Institut Fresnel (France); **Nirmalya Ghosh,** Indian Institute of Science Education and Research Kolkata (India); **Viktor Gruev,** Univ. of Illinois (United States); **George S. D. Gordon,** The Univ. of Nottingham (United Kingdom); **Francois Hache,** Lab. d'Optique et Biosciences (France); **Steven L. Jacques,** Univ. of Washington (United States); **Olga Korotkova,** Univ. of Miami (United States); **Yanqiu Li,** Nikon Corp. (Japan); **Igor V. Meglinski,** Univ. of Oulu (Finland); **Razvigor Ossikovski,** Lab. de Physique des Interfaces et des Couches Minces (France); **Angelo Pierangelo,** Lab. de Physique des Interfaces et des Couches Minces (France); **Valery V. Tuchin,** Saratov State Univ. (Russian Federation); **Anna N. Yaroslavsky,** Univ. of Massachusetts Lowell (United States)

Recent progress in using polarized light and Optical Angular Momentum for biomedical diagnostics at both tissue and cellular levels is attracting academic and industrial interest. The development and clinical implementation of new techniques, as well as translation of approaches developed by other scientific communities working in the fields of ellipsometry, astrophysics, photoelastography, etc. to the medical field can broaden the diagnostics toolkit of healthcare professionals.

This conference targets new methodologies and findings of polarized light and Optical Angular Momentum for in vitro, pre-clinical and clinical applications for biomedical diagnostics. A special focus of the conference is on the translation of polarimetric modalities to clinical settings. Scientific papers are solicited related to advanced polarimetric instrumentation, modeling, and applications of polarized light that push beyond the current state of sensitivity, specificity and applicability of different biomedical fields. These include:

PROPERTIES OF TISSUES

- Tissue scattering and depolarization
- Tissue birefringence, diattenuation, Poincare sphere
- Imaging of polarization properties
- Validation of polarimetric approaches
- Optical Angular Momentum and tissue interaction

NOVEL POLARIMETRIC TECHNIQUES AND METHODS

- Mueller-Stokes polarimetry,
- Polarized light microscopy
- Polarized light endoscopy
- Fluorescence anisotropy
- Circular dichroism
- Optical Angular Momentum

BIOMEDICAL APPLICATIONS OF POLARIZED LIGHT

- Reproductive medicine
- Ophthalmology
- Neurosurgery
- Gastroenterology
- Cardiac
- Dermatology

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

Conference Chairs: **Peter R. Herman,** Univ. of Toronto (Canada); **Michel Meunier,** Polytechnique 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 John A. Paulson School of Engineering and Applied Sciences (USA); **Eric P. Mottay,** Amplitude Systèmes (France); **Beat Neuenschwander,** 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 Óptica "Daza de Valdés" (Spain); **Koji Sugioka,** RIKEN Ctr. for Advanced Photonics (Japan); **Mitsuhiro Terakawa,** Keio Univ. (Japan); **Alfred Vogel,** Univ. of Lübeck (Germany); **Sascha Weiler,** TRUMPF Inc. (USA); **Dvir Yelin,** Technion-Israel Institute of Technology (Israel)

Conference Cosponsors: Amplitude, TRUMPF

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
- 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
- direct writing of integrated photonic devices
- interactions and modification of biological tissues
- tissue and surgical applications of ultrashort pulse lasers
- optical manipulation of biological systems with ultrashort pulses
- novel medical applications of ultrafast lasers
- ultrafast lasers in plasmonics, interaction with nanoparticles
- generation and applications of x-ray ultrashort pulses
- characterization and measurement of ultrashort pulses
- ultrashort pulse delivery and beam manipulation.

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.

NOMINATIONS

To nominate yourself, you must:

- be a graduate or undergraduate full-time student
- have conducted the majority of the work to be presented
- submit your abstract online by the deadline
- be the submitting author and select "Yes" when asked if you are a full-time student
- select yourself as the speaker
- under TOPIC selection, choose "Consider for Best Student Paper Award"
- make the oral presentation
- attend the competition onsite and present a 5-minute summary (see below).

COMPETITION 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 will present a brief summary of their original 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, and must have conducted the majority of the research presented in the paper.

Imaging, Manipulation, and Analysis of Biomolecules, Cells, and Tissues XIX (BO500)

Conference Chairs: **Irene Georgakoudi,** Tufts Univ. (USA); **Attila Tarnok,** Univ. Leipzig (Germany)

Conference Co-Chair: **James F. Leary,** Purdue Univ. (USA)

Program Committee: **Alba Alfonso García,** Univ. of California, Davis (USA); **Vadim Backman,** Northwestern Univ. (USA); **Adela Ben-Yakar,** The Univ. of Texas at Austin (USA); **Stephen A. Boppart,** Beckman Institute for Advanced Science and Technology (USA); **Christopher H. Contag,** Michigan State Univ. (USA); **Kishan Dholakia,** Univ. of St. Andrews (United Kingdom); **Paul M. W. French,** Imperial College London (United Kingdom); **Yuval Garini,** Bar-Ilan Univ. (Israel); **Keisuke Goda,** The Univ. of Tokyo (Japan); **Sona Hosseini,** Jet Propulsion Lab. (USA); **Jessica P. Houston,** New Mexico State Univ. (USA); **Bo Huang,** Univ. of California, San Francisco (USA); **Jae Youn Hwang,** Daegu Gyeongbuk Institute of Science & Technology (Korea, Republic of); **Anna Khimchenko,** Massachusetts General Hospital (USA); **Charles P. Lin,** Wellman Ctr. for Photomedicine (USA); **Sacha Loiseau,** Mauna Kea Technologies (France); **Mary-Ann Mycek,** Univ. of Michigan (USA); **Ramesh Raghavachari,** U.S. Food and Drug Administration (USA); **Volker Schweikhard,** Leica Microsystems CMS GmbH (Germany); **Nektarios Tavernarakis,** Foundation for Research and Technology-Hellas (Greece); **Sebastian Wachsmann-Hogiu,** McGill Univ. (Canada); **Elena V. Zagaynova M.D.,** Privolzhsky Research Medical Univ. (Russian Federation)

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.

Multiphoton Microscopy in the Biomedical Sciences XXI (BO501)

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); **Michelle Digman,** Univ. of California, Irvine (USA); **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); **Na Ji,** Univ. of California, Berkeley (USA); **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); **Lingyan Shi,** Univ. of California, San Diego (USA); **Klaus Suhling,** King's College London (United Kingdom); **Yuansheng Sun,** ISS, Inc. (USA); **Karissa Tilbury,** Univ. of Maine (USA); **Steven S. Vogel,** National Institutes of Health (USA); **Xiaoliang S. Xie,** Peking Univ. (USA); **Chris Xu,** Cornell Univ. (USA); **Elena V. Zagaynova,** Nizhny Novgorod State Medical Academy (Russian Federation); **Bernhard Zimmermann,** Carl Zeiss Jena GmbH (Germany)

Conference Cosponsor:

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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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
- 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.
- 5 minutes oral presentation for the qualified abstracts . Selection of final two (winner and runner-up) is based on abstract, proceeding manuscript and 5 minutes 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 proceeding manuscripts are allowed for resubmission to the Journal of Biomedical Optics (please visit http://spie.org/jbo for details). Prize donated by the Conference Sponsors.

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 2021 meeting continues to address this need. We started the multiphoton conference in 2001. We hope you will join us in January 2021 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) and its applications
- 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.

Three-Dimensional and Multidimensional Microscopy: Image Acquisition and Processing XXVIII (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); **Chrysanthe 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.

Save the date

ABSTRACTS DUE: 26 AUGUST 2020

AUTHOR NOTIFICATION: 2 NOVEMBER 2020

The contact author will be notified of acceptance by email.

MANUSCRIPTS DUE: 16 FEBRUARY 2021

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/bios21call**

Single Molecule Spectroscopy and Superresolution Imaging XIV (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 Börsch,** Friedrich-Schiller-Univ. 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: PicoQuant

In the focus of this conference are all fields of optical single molecule spectroscopy and super resolution 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 biophysical 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 superresolution 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.

PICOQUANT YOUNG INVESTIGATOR AWARD

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.

Optical Diagnostics and Sensing XXI: 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)

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 nondestructive 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
- disease diagnostic potential of optical techniques.

Adaptive Optics and Wavefront Control for Biological Systems VII (BO505)

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 Čižmár,** 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)

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.

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).

Save the date

ABSTRACTS DUE: 26 AUGUST 2020

AUTHOR NOTIFICATION: 2 NOVEMBER 2020

The contact author will be notified of acceptance by email.

MANUSCRIPTS DUE: 16 FEBRUARY 2021

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/bios21call**

Quantitative Phase Imaging VII (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,** Ecole 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)

SPECIAL ABSTRACT REQUIREMENTS

Submissions to this conference include the following:

- 100-word text abstract (for online program) (REQUIRED)
- 250-word text abstract (for abstract digest) (REQUIRED)
- **OPTIONAL:** one figure and caption with preliminary results. This must be submitted as a separate PDF document.

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

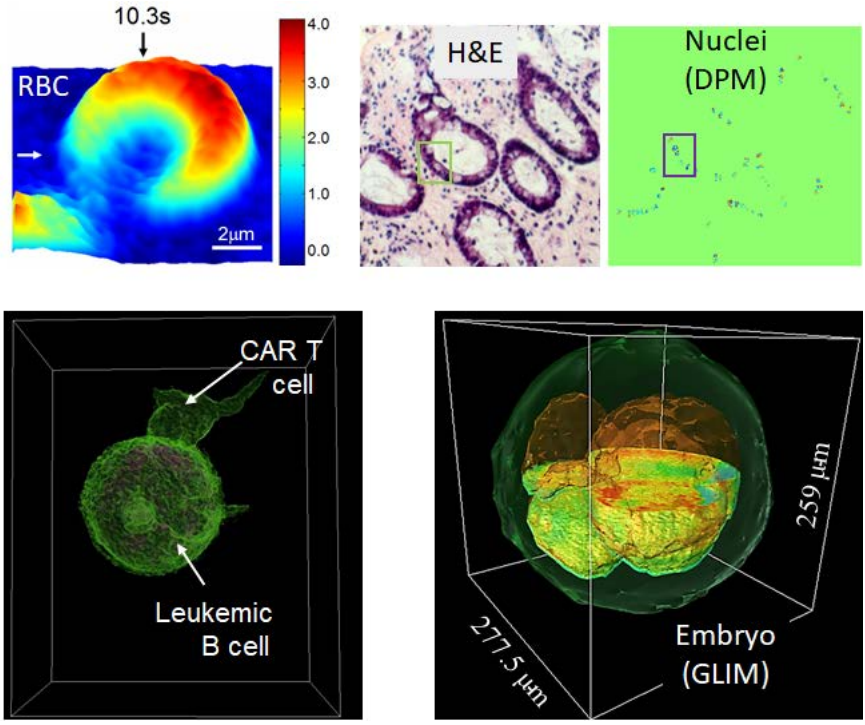
- coherence effects in QPI
- image processing methods for QPI
- field and phase retrieval algorithms
- phase unwrapping algorithms
- machine learning algorithms for QPI.

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.



High-Speed Biomedical Imaging and Spectroscopy VI (BO508)

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

Program Committee: **Steven G. Adie,** Cornell Univ. (USA); **Hongwei Chen,** Tsinghua Univ. (China); **Shi-Wei Chu,** National Taiwan Univ. (Taiwan); **Meng Cui,** Purdue Univ. (USA); **Qionghai Dai,** Tsinghua Univ. (China); **Martí Duocastella,** Istituto Italiano di Tecnologia (Italy); **Mark Foster,** Johns Hopkins Univ. (USA); **Katsumasa Fujita,** Osaka Univ. (Japan); **Liang Gao,** Univ. of Illinois at Urbana-Champaign (USA); **Nobuyuki Hashimoto,** Citizen Watch Co., Ltd. (Japan); **Jessica P. Houston,** New Mexico State Univ. (USA); **Bo Huang,** Univ. of California, San Francisco (USA); **Bahram Jalali,** Univ. of California, Los Angeles (USA); **Chulhong Kim,** Pohang Univ. of Science and Technology (Korea, Republic of); **Thomas Klein,** Optores GmbH (Germany); **Edmund Y. Lam,** The Univ. of Hong Kong (Hong Kong, China); **Cheng Lei,** Wuhan Univ. (China); **Tzu-Ming Liu,** Univ. of Macau (Macao, China); **Yu-Hwa Lo,** Univ. of California, San Diego (USA); **Hideharu Mikami,** The Univ. of Tokyo (Japan); **Nao Nitta,** CYBO, Inc. (Japan); **Yasushi Okada,** RIKEN Quantitative Biology Ctr. (Japan); **YongKeun Park,** KAIST (Korea, Republic of); **Adrian Podoleanu,** Univ. of Kent (United Kingdom); **Dario Polli,** Politecnico di Milano (Italy); **Eric O. Potma,** Univ. of California, Irvine (USA); **Tim Ragan; Guohai Situ,** Shanghai Institute of Optics and Fine Mechanics, Chinese Academy of Sciences (China); **Peter T. C. So,** Massachusetts Institute of Technology (USA); **Lei Tian,** Boston Univ. (USA); **Benjamin J. Vakoc,** Wellman Ctr. for Photomedicine (USA); **Laura Waller,** Univ. of California, Berkeley (USA); **Chao Wang,** Univ. of Kent (United Kingdom); **Lihong V. Wang,** Caltech (USA); **Kenneth Y. Wong,** The Univ. of Hong Kong (Hong Kong, China); **Yicong Wu,** National Institutes of Health (USA); **Takeshi Yasui,** Tokushima Univ. (Japan); **Tomokazu Yoshida,** Sysmex Corp. (Japan); **Zeev Zalevsky,** Bar-Ilan Univ. (Israel)

Conference Cosponsors: HAMAMATSU PHOTON IS OUR BUSINESS; Pi PHOTONICS, INC. HOLOLIGHT; Hitachi High-Tech; nac IMAGE TECHNOLOGY

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.
- Supplementary files (optional). Any supplementary file that may help reviewers can be submitted with the abstracts.

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.

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, 4D 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 bioinstrumentation 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 IMAGING AND SPECTROSCOPY

- high-speed spectroscopy and fluorescence detection
- high-throughput imaging
- ultrafast imaging techniques
- 4D imaging (high-speed volumetric imaging)
- high-throughput lensless microscopy
- high-throughput light-sheet microscopy
- high-speed photoacoustic imaging
- high-speed super-resolution imaging

- high-speed multiphoton fluorescence imaging
- high-speed coherent Raman spectroscopy/ imaging (e.g., SRS, CARS)
- biomedical applications of high-speed optical spectroscopy and imaging
- neural imaging
- flow cytometry
- image cytometry
- high-throughput screening
- high-content screening
- high-throughput histopathology
- real-time functional in vivo imaging.

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

- deep learning
- artificial neural networks
- efficient classification and inference algorithms.

Save the date

ABSTRACTS DUE: 26 AUGUST 2020

AUTHOR NOTIFICATION: 2 NOVEMBER 2020

The contact author will be notified of acceptance by email.

MANUSCRIPTS DUE: 16 FEBRUARY 2021

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/bios21call**

Label-free Biomedical Imaging and Sensing (LBIS) 2021 (BO509)

Conference Chairs: **Natan T. Shaked,** Tel Aviv Univ. (Israel); **Oliver Hayden,** Technische Univ. München (Germany)

Program Committee: **Shi-Wei Chu,** National Taiwan Univ. (Taiwan); **Adam de la Zerda,** Stanford Univ. School of Medicine (USA); **Pietro Ferraro,** Istituto di Scienze Applicate e Sistemi Intelligenti "Eduardo Caianiello" (Italy); **Jochen R. Guck,** TU Dresden (Germany); **Bahram Jalali,** Univ. of California, Los Angeles (USA); **Alexander T. Khmaladze,** Univ. at Albany (USA); **Pierre P. Marquet,** Ctr. de Recherche de l'Univ. Laval Robert-Giffard (Canada); **Jürgen Popp,** Friedrich-Schiller-Univ. Jena (Germany); **Francisco E. Robles,** Georgia Institute of Technology & Emory Univ. School of Medicine (USA); **Melissa C. Skala,** Univ. of Wisconsin-Madison (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); **Yihui Wu,** Changchun Institute of Optics, Fine Mechanics and Physics (China); **Yizheng Zhu,** Virginia Polytechnic Institute and State Univ. (USA)

Label-free biomedical optical 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, and 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 2020 included:

- **Aydogan Ozcan, Univ. of California, Los Angeles (USA)**, *Deep learning-enabled holography*
- **Jürgen Popp, Leibniz-Institut für Photonische Technologien e.V. (Germany)**, *Rapid theranostics by multicontast spectroscopy/imaging*
- **Ji-Xin Cheng, Boston Univ. (USA)**, *Label-free chemical microscopy for Life science and translational medicine*
- **Guillermo J. Tearney, Massachusetts Institute of Technology (USA)**, *Seeing the unseen in patients: Advancing disease prevention and treatment through microimaging*

Relevant topics include, but are not limited to:

- Phase imaging (Zernike's, differential interference contrast (DIC), holography, optical diffraction tomography (ODT), etc.)
- Coherent Raman spectroscopy techniques (CARS, SRS, etc.)
- 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 2021 (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); **Stephen A. Boppart,** Univ. of Illinois (USA); **Sophie Brasselet,** Institut Fresnel (France); **Minhaeng Cho,** Korea Univ. (Korea, Republic of); **Marcus T. Cicerone,** Georgia Institute of Technology (USA); **Hilton B. de Aguiar,** Ecole Normale Supérieure (France); **Conor 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); **Wei E. Huang,** Univ. of Oxford (United Kingdom); **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); **Sapun H. Parekh,** The Univ. of Texas at Austin (USA); **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); **Rohith K. Reddy,** Univ. of Houston (USA); **Hervé Rigneault,** Institut Fresnel (France); **Lingyan Shi,** Univ. of California, San Diego (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)

Conference Cosponsors: PHOTOTHERMAL SPECTROSCOPY CORP, A·P·E, Leica MICROSYSTEMS, DRS DAYLIGHT SOLUTIONS, VibroniX "Better Diagnosis. Better Treatment", HORIBA Scientific, mks, Spectra-Physics®

OPTIONAL EXTENDED ABSTRACTS

Submissions to this conference may include the following to improve the chance for acceptance:

- 100-word text abstract (for online program) (REQUIRED)
- 250-word text abstract (for abstract digest) (REQUIRED)
- 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. **Optional**, however, authors are encouraged to submit a two-page extended abstract to be considered for best paper award.

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.

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 are 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.

Topics include, but are not limited to:

- coherent anti-Stokes Raman scattering microscopy, innovations and applications
- stimulated Raman scattering microscopy, innovations and applications
- transient absorption microscopy, innovations and applications
- thototherm al and photoacoustic microscopy, innovations and applications
- linear and nonlinear infrared microscopy, innovations and applications
- second-harmonic, third-harmonic and sum-frequency microscopy
- new advances in spontaneous Raman microscopy
- advanced data mining methods
- machine learning in chemical microscopy
- chemical endoscopy, innovations and applications
- miniaturization, advances and challenges
- novel laser sources for chemical imaging
- novel molecular probes for chemical imaging
- clinical applications of chemical imaging
- AFM-based chemical microscopy
- commercialization.

Biomedical Applications of Light Scattering XI

(BO511)

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

Program Committee: **Irving J. Bigio,** Boston Univ. (USA); **Nada N. Boustany,** Rutgers, The State Univ. of New Jersey (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); **Mary-Ann Mycek,** Univ. of Michigan (USA); **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 maintained a significant presence at Photonics West. This conference continues a focused forum 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.

Save the date

ABSTRACTS DUE: 26 AUGUST 2020

AUTHOR NOTIFICATION: 2 NOVEMBER 2020

The contact author will be notified of acceptance by email.

MANUSCRIPTS DUE: 16 FEBRUARY 2021

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/bios21call**

Nanoscale Imaging, Sensing, and Actuation for Biomedical Applications XVIII (BO600)

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

Program Committee: **Vasily N. Astratov,** The Univ. of North Carolina at Charlotte (USA); **Lorena Betancor,** Univ. ORT Uruguay (Uruguay); **Henry Hess,** Columbia Univ. (USA); **Malgorzata Jędrzejewska-Szczerska,** Gdansk Univ. of Technology (Poland); **Sinyoung Jeong,** Massachusetts General Hospital (USA); **Sung Jin Kim,** Univ. of Miami (USA); **Brian D. MacCraith,** Dublin City Univ. (Ireland); **Alzbeta Marcek Chorvatova,** International Laser Ctr. (Slovakia); **Paras N. Prasad,** Univ. at Buffalo (USA)

Conference Cosponsor: **Prizmatix**

OPTIONAL EXTENDED ABSTRACTS

Submissions to this conference may include the following to improve the chance for acceptance:

- 100-word text abstract (for online program) (REQUIRED)
- 250-word text abstract (for abstract digest) (REQUIRED)
- 2-page extended abstract (for committee review only). In order to be nominated for the award an extended abstract must be submitted. We are expecting to get 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.

All submissions will be peer-reviewed by the Program Committee. Include author names and affiliations; text; any figures, tables, or images; and sufficient data to permit committee review.Extended abstracts will be used only for the purpose of peer review for Prizmatix young investigator awards, and will not be published.

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 nanstructured 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.

continued next page

Nanoscale Imaging, Sensing, and Actuation for Biomedical Applications XVIII (BO600 continued)

TECHNOLOGY (DEVICES)

- nanoscale device design and processing for biological 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).

AWARDS

Three "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 (talk or poster).

In order to be nominated for the award an extended abstract must be submitted.

We are expecting to get **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.

All submissions will be peer-reviewed by the Program Committee. Extended abstracts will be used only for the purpose of peer review for Prizmatix Young Investigator Awards, and will not be published.

Save the date

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Colloidal Nanoparticles for Biomedical Applications XVI (BO601)

Conference Chairs: **Marek Osiński,** The Univ. of New Mexico (USA); **Antonios G. Kanaras,** Univ. of Southampton (United Kingdom)

Program Committee: **Ramón Alvares-Puebla,** Univ. de Vigo (Spain); **James B. Delehanty,** U.S. Naval Research Lab. (USA); **Allison M. Dennis,** Boston Univ. (USA); **Swarnapali De Silva Indrasekara,** The Univ. of North Carolina at Charlotte (USA); **Erik Dujardin,** Ctr. d'Elaboration de Matériaux et d'Etudes Structurales (France); **Laura Fabris,** Rutgers, The State Univ. of New Jersey (USA); **Hedi Mattoussi,** Florida State Univ. (USA); **Igor Medintz,** U.S. Naval Research Lab. (USA); **Jay L. Nadeau,** Portland State Univ. (USA); **Kelly L. Nash,** The Univ. of Texas at San Antonio (USA); **Wolfgang J. Parak,** Univ. Hamburg (Germany); **Ute Resch-Genger,** Bundesanstalt für Materialforschung und -prüfung (Germany); **Emmanuel Stratakis,** Foundation for Research and Technology-Hellas (Greece); **Claudia Tortiglione,** Istituto di Scienze Applicate e Sistemi Intelligenti "Eduardo Caianiello" (Italy); **Chih-Chung Yang,** National Taiwan Univ. (Taiwan); **Junjie Zhu,** Nanjing Univ. (China)

Conference Cosponsor: Ocean Insight

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, immunoassays for diagnostics, 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, TEM, 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.

YOUNG INVESTIGATOR AWARDS

The Ocean Insight Young Investigator Awards will be given for the best contributed oral papers presented by a leading author who is either a graduate student or has graduated within less than five years of the paper submission date. Two prizes will be awarded. The First Prize will consist of a $1,000 cash prize for the Young Investigator and $2,000 Ocean Insight equipment credit for the laboratory where the work was performed. The Second Prize will consist of a $500 cash prize for the Young Investigator and $1,000 Ocean Insight equipment credit for the laboratory where the work was performed. To be eligible, manuscripts of self-nominating authors must be received by the due date. Self-nominations should be sent to osinski@chtm.unm.edu prior to manuscript submission deadline and should include a brief CV of the leading author.

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

Conference Chairs: **Samuel Achilefu,** 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); **Dolonchampa Maji,** Washington Univ. School of Medicine in St. Louis (USA); **Ashok Kumar Mishra,** Indian Institute of Technology Madras (India); **Gabor Patonay,** Georgia State Univ. (USA); **Attila Tarnok,** Univ. Leipzig (Germany); **Deepa Venkitesh,** Indian Institute of Technology Madras (India)

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.

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 subcelluar 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, photoproteins 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 NANOPARTICLES

- 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.

TIME-RESOLVED TISSUE SPECTROSCOPY FOR MEDICAL DIAGNOSIS AND IMAGING

- fluorescence lifetime spectroscopy and imaging
- fluorescence lifetime of endogenous and exogenous fluorescent materials and molecules
- time-resolved fluorescence methods based on endogenous and exogenous molecules.

BIOMARKERS

- new disease biomarkers
- imaging disease biomarkers
- methods for identify and amplify signals for imaging biomarkers.

PATHWAY TO CLINICAL TRANSLATION OF IMAGING PROBES AND NANOMATERIALS

- human studies using imaging agents
- challenges of human translational studies with contrast agents and optical probes
- regulatory issues related to human studies by optical methods.

Plasmonics in Biology and Medicine XVIII (BO603)

Conference Chairs: **Tuan Vo-Dinh,** Duke Univ. (USA); **Ho-Pui A. Ho,** The Chinese Univ. of Hong Kong (Hong Kong, China); **Krishanu Ray,** Univ. of Maryland School of Medicine (USA)

Program Committee: **Hatice Altug,** Ecole Polytechnique Fédérale de Lausanne (Switzerland); **A. Claude Boccara,** Ecole Supérieure de Physique et de Chimie Industrielles (France); **Michael T. Canva,** Lab. Charles Fabry (France); **Andrew M. Fales,** U.S. Food and Drug Administration (USA); **Dror Fixler,** Bar-Ilan Univ. (Israel); **Christopher D. Geddes,** Univ. of Maryland, Baltimore (USA); **Zygmunt Karol Gryczynski,** Univ. of North Texas Health Science Ctr. at Fort Worth (USA); **Naomi J. Halas,** Rice Univ. (USA); **Jiri Homola,** Institute of Photonics and Electronics of the ASCR, v.v.i. (Czech Republic); **Joseph R. Lakowicz,** Univ. of Maryland School of Medicine (USA); **Laura Maria Lechuga,** Institut Català de Nanociència i Nanotecnologia (ICN2) (Spain); **Martin Maiwald,** Ferdinand-Braun-Institut, Leibniz-Institut für Höchstfrequenztechnik (Germany); **Shuming Nie,** Emory Univ. (USA); **Sang-Hyun Oh,** Univ. of Minnesota, Twin Cities (USA); **Jürgen Popp,** Leibniz-Institut für Photonische Technologien e.V. (Germany); **Wei-Chuan Shih,** Univ. of Houston (USA); **P. James Schuck,** Columbia Univ. (USA); **Bernd Sumpf,** Ferdinand-Braun-Institut, Leibniz-Institut für Höchstfrequenztechnik (Germany); **Richard P. Van Duyne,** Northwestern Univ. (USA)

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 nanoprobes
- nanosensors
- nanoarchitectures and nanooptics
- fabrications of nanostructured substrates
- spectroscopies related to plasmonics
- single-molecule spectroscopy
- single-molecule manipulation
- single-cell analysis
- cellomics using nanoparticle technology
- metallonomics detection using plasmonics
- nanosystems for drug delivery
- metal nanoparticle contrast agents for medical diagnostics
- photonic atoms
- metal-enhanced fluorescence MEF
- surface plasmon-coupled emission SPCE.

Save the date

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AUTHOR NOTIFICATION: 2 NOVEMBER 2020

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Submit your abstract today: **spie.org/bios21call**

Frontiers in Biological Detection: From Nanosensors to Systems XIII (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); **M. Imran Cheema,** Lahore Univ. of Management Sciences (Pakistan); **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)

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.

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.

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
- A portion of the conference will focus on **integrated photonic sensors**; submissions in this topic area are particularly encouraged.

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.

Integrated Sensors for Biological and Neural Sensing (BO605)

Conference Chair: **Hooman Mohseni,** Northwestern Univ. (USA)

The explosion of research and development in the field of chip-scale and integrated BiOSensors over the last decade has led to new discoveries over a wide variety of areas. Chip-scale sensors are now capable of imaging and sensing biological chemistry and signals with unprecedented accuracy and speed. These have a growing impact in commercial, medical, research, and homeland security applications. They are poised to take the next step in integration with other mature technologies leading to a potential revolution in personalized medicine. The robustness of multi-modal sensing and sensor fusion schemes, enhanced by a growing number of machine learning approaches, have led to a significant attention to integration of a plurality of different sensors into small, and preferably single-chip sensing micro-systems. A major purpose of this conference is to bring together researchers and engineers who work on the different aspects of these intriguing areas, and thus to provide an interdisciplinary atmosphere to foster new innovations in integrated chip-scale and cellular-scale nano-sensing, neural sensing, bioMEMS, as well as the new data sciences and hardware tools that support and enable these innovations. The conference includes, but is not limited to, the following topics:

- implantable sensors and stimulators
- chip-scale neural sensing and stimulation
- soft implantable electronics and optoelectronics
- cellular-scale BiOSensors
- lab-on-chip
- biodegradable BiOSensors
- bio energy harvesters
- single-cell analysis and detection
- soft microfluidics
- chip-scale medical imaging
- mobile diagnostics and personal health.

Save the date

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VENUE

The Moscone Center
747 Howard Street
San Francisco, CA 94103-3118 USA

San Francisco is often called "Everybody's Favorite City," a title earned by its scenic beauty, cultural attractions, diverse communities, and world-class cuisine. Visitors rate the atmosphere and ambience as their top reason for visiting San Francisco. Measuring 49 square miles, this walkable city is dotted with landmarks like the Golden Gate Bridge, cable cars, and Alcatraz.

REGISTRATION

SPIE Photonics West registration will be available November 2020

All participants, including invited speakers, contributed speakers, session chairs, co-chairs, and committee members, must pay a registration fee. Authors, coauthors, program committee members, and session chairs are accorded a reduced symposium registration fee.

Fee information for conferences, courses, a registration form, and technical and general information will be available on the SPIE website in November 2020.

HOTEL INFORMATION

Opening of the hotel reservation process for SPIE Photonics West 2021 is scheduled for August 2020. SPIE will arrange special discounted hotel rates for SPIE conference attendees.

The website will be kept current with any updates.

STUDENT AUTHOR TRAVEL GRANTS

The Society offers a small number of supplemental travel grants to eligible and selected SPIE student members who are authors, and plan to present and publish an accepted paper at an SPIE meeting. For more information visit:
spie.org/membership/student-services/student-author-travel-grants

CLEARANCE INFORMATION

If government and/or company clearance is required to present and publish your presentation, start the process now to ensure that you receive clearance if your paper is accepted.

IMPORTANT NEWS FOR ALL VISITORS FROM OUTSIDE THE UNITED STATES

Find important requirements for visiting the United States on the SPIE Photonics West website. There are new steps that ALL visitors to the United States need to follow.

Online at: spie.org/visa

SPIE. SPIE is the international society for optics and photonics, an educational not-for-profit organization founded in 1955 to advance light-based science, engineering, and technology. The Society serves more than 255,000 constituents from 183 countries, offering conferences and their published proceedings, continuing education, books, journals, and the SPIE Digital Library. In 2019, SPIE provided more than $5.6 million in community support including scholarships and awards, outreach and advocacy programs, travel grants, public policy, and educational resources.

Present your research at SPIE Photonics West

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 the conference(s) that most closely matches the topics of the research you wish to present. *Important: each abstract may be submitted to one conference only.*
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.

   BiOS › | LASE › | OPTO ›

3. If your submission is related to an application track, indicate the appropriate track when prompted during the submission process.

   Translational Research › | Brain › | 3D Printing › | COVID-19 ›

What you will need to submit

A completed electronic submission should include the following:

- Title
- Author(s) information
- 250-word abstract for technical review
- 100-word summary for the program
- Keywords used in search for your paper (optional)
- Your decision on publishing your presentation recording to the SPIE Digital Library (slide capture and audio)
- Check the individual conference Call for Papers for additional requirements (for example, some conferences require 2- to 3-page extended summary for technical review, or have 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.

Important dates

Abstracts Submission Deadline	26 August 2020
Acceptance Notification Sent to Contact Author	2 November 2020
Manuscripts Due (Conferences OE506, and OE801-OE803 Only)	20 January 2021
Manuscripts Due (All Conferences EXCEPT OE506, and OE801-OE803)	16 February 2021

Submission agreement

Presenting authors, including keynote, invited, oral, and poster presenters, agree to the following conditions by submitting an abstract:

- Register and pay the author registration fee
- Attend the meeting
- Present at the scheduled time
- Publish their manuscript in the SPIE Digital Library
  6-page manuscript minimum for LASE and OPTO; 4-page minimum for BiOS; 20-page maximum
- Obtain funding for registration fees, travel, and accommodations, independent of SPIE, through their sponsoring organizations
- 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.
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Contact information

For questions about submitting an abstract, or the meeting, contact the Conference Program Coordinator.

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 2021 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)

3D PRINTING

SPIE 3D Printing 2021 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

TRACK CHAIR:

Henry Helvajian
The Aerospace Corp. (USA)

BRAIN

SPIE Brain 2021 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 CHAIR:

Elizabeth Hillman
Columbia Univ. (USA)

COVID-19 RESEARCH

The COVID-19 application track highlights papers from Photonics West that illustrate the creativity and breadth of the optics and photonics community's response to the COVID-19 pandemic.

- Photonic Therapeutics and Diagnostics
- Clinical Technologies and Systems
- Tissue Optics, Laser-Tissue Interaction, and Tissue Engineering
- Biomedical Spectroscopy, Microscopy, and Imaging
- Nano/Biophotonics
- 3D Printing and Rapid Prototyping

TRACK CHAIRS:

Tianhong Dai
Wellman Ctr. for Photomedicine, Massachusetts General Hospital, Harvard Univ. (USA)

Brian J. F. Wong
Beckman Laser Institute and Medical Clinic (USA)

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LASE

SPIE LASE has developed into the main forum and meeting place not only for laser science and laser scientists, but also for novel laser applications and laser process engineers. Topics include laser manufacturing, laser materials processing, micro-nano packaging, fiber, diode, solid state lasers, laser resonators, ultrafast, semiconductor lasers and LEDs, and 3D fabrication technologies.

OPTO

SPIE OPTO addresses the most current developments and research in a broad range of optoelectronic technologies and their integration into a variety of industrial and commercial applications. Topics to be covered include optoelectronic materials and devices, photonic integration, nanotechnologies, MEMS/MOEMS, advanced quantum and optoelectronic applications, semiconductor lasers, light-emitting devices, packaging, displays, holography, optical networks, and communications.

Application tracks offer more visibility

When submitting an abstract, add an application track to get your presentation listed in one of these special sections of the program. Each track lists presentations together online and in the conference program so that participants can easily locate presentations in their area of interest.

- Translational Research
- Brain
- 3D Printing
- COVID-19 Research

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