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OPTICS**
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European Conferences on
BIOMEDICAL OPTICS 2019

CALL FOR PAPERS

Submit abstracts by 16 January 2019

23–27 June 2019
ICM—International Congress Center
Munich, Germany

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The use of optical techniques and tools in biomedical imaging and diagnostics has been in continuous expansion for several decades. The research being produced in this field requires presentation and review at major conferences, and specifically it is important to allow co-location with large technology exhibits. The European Conferences on Biomedical Optics (ECBO) have become the largest such event in Europe for researchers, scientists, engineers and clinicians who are developing applications of optical science and photonic technologies to problems in biomedical science and medicine.

This meeting provides a forum to span the gap between basic research and instrumentation engineering, all the way to clinical translation research and mature clinical trials. The common theme of the conferences is that they all are employing optics as a tool or solution in biology, medicine or clinical work. This meeting is biennial and jointly sponsored by the Optical Society and SPIE and will be co-located with Laser Munich 2019-World of Photonics, as well as numerous other society meetings organized by WLT, EOS, OSA, CLEO-Europe, IEEE/LEOS, and EPS.

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Paola Taroni, Politecnico di
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Topics

- **Advances in Microscopic Imaging**
- **Diffuse Optical Spectroscopy and Imaging**
- **Novel Biophotonics Techniques and Applications**
- **Optical Coherence Imaging Techniques and Imaging in Scattering Media**
- **Opto-Acoustic Methods and Applications in Biophotonics**
- **Preclinical and Clinical Optical Diagnostics**
- **Translation of Lasers and Biophotonics Technologies and Procedures: Toward the Clinic**

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Preclinical and Clinical Optical Diagnostics (EB100)

Conference Chairs: **J. Quincy Brown**, Tulane Univ. (USA); **Ton G. van Leeuwen**, Academisch UMC (Netherlands)

Program Committee: **Caroline Boudoux**, Ecole Polytechnique de Montréal (Canada); **Daniel Cote**, Univ. Laval (Canada); **Kishan Dholakia**, Univ. of St. Andrews (United Kingdom); **Daniel S. Elson**, Imperial College London (United Kingdom); **Sylvain Gioux**, Univ. de Strasbourg (France); **Jonathan T. C. Liu**, Univ. of Washington (USA); **Quan Liu**, Nanyang Technological Univ. (Singapore); **Narasimhan Rajaram**, Univ. of Arkansas (USA); **Lise Lyngsnes Randeberg**, Norwegian Univ. of Science and Technology (Norway); **Daniel Razansky**, Helmholtz Zentrum München GmbH (Germany); **Darren M. Roblyer**, Boston Univ. (USA); **Göran Salerud**, Linköping Univ. (Sweden); **Janis Spigulis**, Univ. of Latvia (Latvia); **Henricus J. C. M. Sterenberg**, Academisch Medisch Centrum (Netherlands); **James W. Tunnell**, The Univ. of Texas at Austin (USA); **Siavash Yazdanfar**, Corning Research and Development Corp. (USA)

Spectroscopic and imaging methods have become valuable tools for both pre-clinical and clinical applications, ranging from in vivo tissue monitoring to the investigation of excised samples on the molecular scale. In clinical diagnostics, optical spectroscopy and imaging provides detailed structural and functional information on organs, tissues and body liquids. Basic pre-clinical biomedical applications include the detailed investigation of tissues and cells down to the level of single molecules, helping to understand the principles of cellular and sub-cellular processes that contribute to the early transformation of normal to diseased tissue, such as when malignant tumours are developed.

This conference provides an interdisciplinary platform to promote interaction between physicians, physicists, engineers, biologists, chemists and related researchers, in order to strengthen an integrated and holistic understanding of normal tissue development and the genesis of diseases, with the ultimate goal of using this understanding to develop and new, more efficient diagnostic and treatment modalities for translation.

Contributed papers are solicited on, but not limited to, all areas of development and pre-clinical or clinical application of optical spectroscopy and imaging, including steady-state and time-resolved fluorescence, autofluorescence, linear and nonlinear microscopies, linear and nonlinear Raman, NIR, polarization, laser speckle, back-reflectance, light scattering spectroscopy, and combined approaches (multimodal imaging):

A. Biomedical and clinical applications

- in vivo diagnostics and physiological monitoring (structural and functional spectral imaging of cells, tissues, organs), including endoscopic, noninvasive and minimally invasive methods
- tissue pathology and tissue characterization, including digital pathology
- spectral biomarker analysis
- spectroscopic micro- and nanosensors
- biochip technology for point-of-care diagnostics
- guidance and monitoring of therapies
- diagnostic and tissue engineering.

B. Investigation of cellular and sub-cellular processes

- analysis of cell dynamics by single-molecule techniques
- structural analysis of cells and tissues on the nano-to-microscale
- biomarker discovery for spectroscopic techniques.

Diffuse Optical Spectroscopy and Imaging (EB101)

Conference Chairs: **Hamid Dehghani**, The Univ. of Birmingham (United Kingdom); **Heidrun Wabnitz**, Physikalisch-Technische Bundesanstalt (Germany)

Program Committee: **Regine Choe**, Univ. of Rochester (USA); **Davide Contini**, Politecnico di Milano (Italy); **Jean-Marc Dinten**, MINATEC (France); **Turgut Durduran**, ICFO - Institut de Ciències Fotòniques (Spain); **Adam T. Eggebrecht**, Washington Univ. School of Medicine in St. Louis (USA); **Dirk Grosenick**, Physikalisch-Technische Bundesanstalt (Germany); **Yoko Hoshi M.D.**, Hamamatsu Univ. School of Medicine (Japan); **Shudong Jiang**, Thayer School of Engineering at Dartmouth (USA); **Jana M. Kainerstorfer**, Carnegie Mellon Univ. (USA); **Adam Liebert**, Institute of Biocybernetics and Biomedical Engineering (Poland); **Eiji Okada**, Keio Univ. (Japan); **Felix Scholkmann**, UniversitätsSpital Zürich (Switzerland); **Ilias Tachtsidis**, Univ. College London (United Kingdom)

The study of diffuse optical spectroscopy and imaging in tissue continues to provide new insight into the structural and functional properties of tissues that are not easily assessed by alternative methods. The research and development of systems that exploit this approach has led to clinical prototype systems that are used in basic science and medical research.

Scientific applications range from the study of cerebral physiology to cancer patho-physiology in both animals and humans. Medical applications being explored encompass detection and diagnosis of breast cancer, brain cancer, cognitive neuroscience, stroke, hemorrhages, brain and muscular oxygenation, peripheral vascular diseases and joint diseases as well as establishing novel methods in drug discovery and tracking. Integration of diffuse light imaging into existing clinical instrumentation is a key area of development. Combining diffuse light systems with new contrast agents or other imaging modalities are also emerging as major growth areas. Further improvement in these and other applications rely on continued advancement in the theory of radiation transport in random media, in data analysis and image reconstruction, and in instrumentation design.

This meeting provides a key interdisciplinary forum for engineers, physicists, mathematicians, biomedical scientists and physicians to report on recent results, improvements and new approaches and applications for using diffusing light to characterize the structural and functional properties of tissue.

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

- diffuse optical tomography and spectroscopy
- diffuse fluorescence and bioluminescence imaging
- novel molecular contrast agents
- hybrid-modality imaging with diffuse light
- modeling of light propagation in tissue
- image reconstruction algorithms
- novel instrumentation
- direct clinical applications for the prognosis and screening of cancer
- breast imaging and spectroscopy
- physiology of cerebral haemodynamics
- muscle physiology
- tissue oxygenation monitoring
- pre-clinical animal studies.

Novel Biophotonics Techniques and Applications (EB102)

Conference Chairs: **Arjen Amelink**, Netherlands Organization for Applied Scientific Research TNO (Netherlands); **Seemantini K. Nadkarni**, Wellman Ctr. for Photomedicine (USA)

Program Committee: **Dirk J. Faber**, Academisch Medisch Ctr. (Netherlands); **DongKyun Kang**, College of Optical Sciences, The Univ. of Arizona (USA); **Venkataramanan Krishnaswamy**, Thayer School of Engineering at Dartmouth (USA); **Linbo Liu**, Nanyang Technological Univ. (Singapore); **Igor V. Meglinski**, Univ. of Otago (New Zealand); **Guenther Paltauf**, Karl-Franzens-Univ. Graz (Austria); **Gijs van Soest**, Erasmus MC (Netherlands); **Dvir Yelin**, Technion-Israel Institute of Technology (Israel)

Aside from the well-recognized avenues of biomedical optics for diagnostics, therapeutics and analytics/microscopy, a number of novel and highly promising approaches are under development. These new techniques often rely on new contrast mechanisms, or the confluence of two or more diverse fields, drawing on their complementarity in order to overcome the inherent complexity and heterogeneity of biological tissues. Examples include novel holographic, polarimetric, or speckle-based approaches, the use of MRI or ultrasound to constrain optical tomographic reconstructions, the use of optics to assess tissue biomechanics, wavefront engineering, and the emerging role of photodiagnosics in monitoring and guiding therapies ("theranostics"). These hybrid approaches are driven by task-specific requirements of a particular application. Moreover, a number of new ideas are being investigated based on new methodologies, physical basis, instrument development, integration techniques and data analysis. This conference will present a highly interdisciplinary forum of interest to instrument designers, sensor builders, basic and applied clinical researchers, and other scientists interested in exploring novel directions in biophotonics.

Topics for contributions are thus broadly open and include:

- photothermal imaging and diagnostics
- speckle-based techniques
- polarized light diagnostics
- holography and micro-holography
- optics for tissue biomechanical assessment
- nanoprobes for imaging and diagnostics
- adaptive optics and wavefront engineering
- optical clearance methodologies
- MRI/ultrasound/optical image fusion
- new approaches for photon gating / discrimination in turbid media
- novel endoscopic technologies, including MEMS-enabled techniques
- integration of diagnostic and therapeutic photomedicine
- hybrid approaches in photomedicine.

*This conference will include a workshop on **Advances in Scattering Tomographies**, Workshop Chair: Jeroen Kalkman, TU Delft, Netherlands*

Advances in Microscopic Imaging (EB103)

Conference Chairs: **Emmanuel Beaurepaire**, Ecole Polytechnique (France); **Francesco Saverio Pavone**, LENS - Lab. Europeo di Spettroscopia Non-Lineari (Italy); **Peter T. C. So**, Massachusetts Institute of Technology (USA)

Program Committee: **Paul J. Campagnola**, Univ. of Wisconsin-Madison (USA); **Laurent Cognet**, Lab. Matériaux Optiques, Photonique et Systèmes (France); **Vincent R. Daria**, The Australian National Univ. (Australia); **Valentina Emiliani**, Lab. de neurophysiologie et nouvelles microscopies (France); **Paul M. W. French**, Imperial College London (United Kingdom); **Irene Georgakoudi**, Tufts Univ. (USA); **Rainer Heintzmann**, Institut für Photonische Technologien e.V. (Germany); **Jan Huisken**, Max-Planck-Institut für molekulare Zellbiologie und Genetik (Germany); **U. Valentin Nägerl**, Univ. de Bordeaux (France); **Jerome Mertz**, Boston Univ. (USA); **Nozomi Nishimura**, Cornell Univ. (USA); **Dan Oron**, Weizmann Institute of Science (Israel); **Shy Shoham**, Technion-Israel Institute of Technology (Israel); **Vinod Subramaniam**, Univ. Twente (Netherlands); **Ivo Vanzetta**, Aix-Marseille Univ. (France); **Alipasha Vaziri**, Rockefeller Univ. (USA)

This conference will explore the rapidly developing field of microscopic imaging and applications, with approaches including multidimensional microscopy, light-sheet-based approaches, super-resolution microscopies, multiphoton imaging, and photomanipulation. Consideration will be given to the characteristics of the overall system design, as well as to contrast, image formation, image recording, and digital methods of producing and displaying the resulting reconstruction. Recent innovations in multi-dimensional microscopy have an important impact on the biological and medical fields ranging from cellular and developmental biology to neurosciences. We hope that the broad range of relevant topics presented at this conference will encourage the interaction among physicists, optical engineers, computer image analysts, and biologists.

Papers are invited on all areas of development and application of novel optical microscopies including, but not limited to, the following and related areas:

- super-resolved optical imaging (e.g. PALM/STORM, SIM, STED)
- fast volumetric imaging approaches (e.g. SPIM, DSLM, ultramicroscopy)
- multiphoton microscopy, SHG, THG, CARS, SRS, FWM imaging
- adaptive optics, spatial and temporal control of the excitation
- single molecule microscopy and microanalysis
- phase-, holographic-, absorption-, polarization-based microscopy
- spectroscopic analysis in microscopy
- image contrast enhancement approaches such as near field surface effects
- FRET, FLIM, fluorescence correlation spectroscopy
- applications to cell biology, developmental biology, animal models
- in-vivo tissue microscopy
- optogenetics; instrumentation, reagents and applications
- new contrast agents and reporters of tissue structure and function
- ultra-microscopy / light sheet imaging of optically cleared brain
- fast volumetric imaging approaches for neuro-microscopy
- hybrid and multimodality approaches to neuroimaging
- functional microscopy.

*This conference will include a workshop on **Quantitative Phase Imaging**, Workshop Chair: Gabriel Popescu, Univ. of Illinois at Urbana-Champaign, USA*

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Opto-Acoustic Methods and Applications in Biophotonics (EB104)

Conference Chairs: **Vasilis Ntziachristos**, Helmholtz Zentrum München GmbH (Germany); **Roger Zemp**, Univ. of Alberta (Canada)

Program Committee: **Emmanuel Bossy**, Lab. Interdisciplinaire de Physique (France); **Ben T. Cox**, Univ. College London (United Kingdom); **Stanislav Y. Emelianov**, Georgia Tech Research Institute (USA); **Jan Grimm**, Memorial Sloan-Kettering Cancer Ctr. (USA); **Fabian Kiessling**, Uniklinik RWTH Aachen (Germany); **Chulhong Kim**, Pohang Univ. of Science and Technology (Korea, Republic of); **Michael C. Kolios**, Ryerson Univ. (Canada); **Srirang Manohar**, Univ. Twente (Netherlands); **Alexander A. Oraevsky**, TomoWave Labs, Inc. (USA); **Guenther Paltauf**, Karl-Franzens-Univ. Graz (Austria); **Amir Rosenthal**, Technion-Israel Institute of Technology (Israel); **Lihong V. Wang**, Caltech (USA); **Vladimir P. Zharov**, Univ. of Arkansas for Medical Sciences (USA)

Optoacoustic (photoacoustic) imaging has grown significantly to a powerful optical imaging platform suitable for basic research, clinical translation, and drug discovery. Advances in system design, laser and ultrasound detection technology, and reconstruction and data processing algorithms now offer the ability to visualize a large range of anatomical, functional and molecular bio-markers based on optical contrast, thus enabling exciting biological and clinical applications in basic discovery, early diagnostics and therapy monitoring.

A strength of the optoacoustic methodology is its versatility, manifest in the numerous distinct imaging concepts employed in it: multispectral imaging, nonlinear imaging, real-time imaging, tomography, microscopy, mesoscopy, macroscope, endoscopy, etc. Further, label-free imaging of functional parameters of vasculature including hemoglobin oxygenation, tissue metabolism and water and lipid contrast can be combined with the detection of exogenous molecular agents to provide more complete views of pathologies at scales ranging from microns to several centimeters. Additionally, the ability to detect nanoparticle contrast agents by means of their optical absorption enables unique in vivo visualization.

This emerging field of the imaging sciences integrates many scientific disciplines from physics and engineering to chemistry and mathematics, through to biotechnology and preclinical/clinical biomedicine. It is the aim of this conference to bring together these disciplines, with particular emphasis on development and adaption of optoacoustic technology to enable novel biological and clinical applications. All areas in optoacoustic sensing and imaging are welcomed, from hardware and algorithmic developments, to novel concepts, applications and contrast generation mechanisms, including photo-absorbing agents and nanoparticles.

Areas of interest consider, but are not limited to, progress in the following topics in optoacoustics:

- imaging and tomography
- optoacoustic microscopy
- multi-spectral approaches
- theory and image reconstruction algorithms
- small animal imaging and beyond
- genetic reporters and cell-labeling for optoacoustic imaging
- novel agents and nanoparticles
- novel detection technologies
- novel illumination technologies
- nonlinear optoacoustics
- Doppler phenomena
- multi-modality imaging.

Optical Coherence Imaging Techniques and Imaging in Scattering Media (EB105)

Conference Chairs: **Maciej Wojtkowski**, Polish Academy of Sciences (Poland); **Stephen A. Boppart**, Univ. of Illinois at Urbana-Champaign (USA); **Wang-Yuhl Oh**, KAIST (Korea, Republic of)

Program Committee: **Seok-Hyun Yun**, Wellman Ctr. for Photomedicine (USA); **Peter E. Andersen**, DTU Fotonik (Denmark); **Sylvain Gigan**, Institut Langevin (France); **Adrian G. Podoleanu**, Univ. of Kent (United Kingdom); **Michael Pircher**, Medizinische Univ. Wien (Austria); **James G. Fujimoto**, Massachusetts Institute of Technology (USA); **Robert A. Huber**, Univ. zu Lübeck (Germany); **David D. Sampson**, The Univ. of Western Australia (Australia); **Wonshik Choi**, Korea Univ. (Korea, Republic of); **Yoshiaki Yasuno**, Univ. of Tsukuba (Japan); **Johannes F. de Boer**, Vrije Univ. Amsterdam (Netherlands); **Benjamin J. Vakoc**, Wellman Ctr. for Photomedicine (USA); **Marinko V. Sarunic**, Simon Fraser Univ. (Canada); **Robert J. Zawadzki**, Univ. of California, Davis (USA); **Vivek J. Srinivasan**, Univ. of California, Davis (USA); **Rainer A. Leitgeb**, Medizinische Univ. Wien (Austria)

This conference broadly examines imaging in biological tissues based on coherent light and its interactions with turbid scattering media. The conference provides an interdisciplinary forum for topics in research and development on a physical and theoretical basis of coherent imaging including optical coherence tomography/microscopy (OCT and OCM), adaptive optics in ophthalmoscopy, nonlinear coherence imaging, photothermal and magnetomotive imaging, and imaging with advanced wavefront control. In addition, this conference will focus on the development of new light sources, probes, detection schemes, and signal processing algorithms for coherent imaging. Applications of coherent optical techniques for morphological as well as functional assessment in vivo in various medical fields will also be covered.

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

- OCT and OCM - technology, systems and applications
- imaging using advanced spatio-temporal light modulation
- coherent imaging systems, theory and signal processing
- artificial intelligence and machine/deep learning algorithms for coherent imaging
- contrast enhancement techniques for coherence imaging
- novel light sources and MEMS probes for coherence imaging
- optical coherence techniques for tissue spectroscopy and imaging
- coherent light and holographic microscopy
- optical coherence elastography
- speckle analysis and methods for speckle reduction
- adaptive coherent optical systems
- multi-modal optical coherence imaging platforms.

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Translation of Lasers and Biophotonics Technologies and Procedures: Toward the Clinic (EB106)

Conference Chairs: **Lothar D. Lilge**, Princess Margaret Hospital (Canada); **Carsten M. Philipp**, Evangelische Elisabeth Klinik (Germany)

Program Committee: **Christian Stephan Betz**, Klinikum der Univ. München (Germany); **Ralf Brinkmann**, Univ. zu Lübeck (Germany); **Santiago Camacho Lopez**, Ctr. de Investigación Científica y de Educación Superior de Ensenada B.C. (Mexico); **Matthias Domke**, FH Vorarlberg (Austria); **Martin Frenz**, Univ. Bern (Switzerland); **Mikhail Y. Kirillin**, Institute of Applied Physics (Russian Federation); **Igor Meglinski**, Univ. of Oulu (Finland); **Serge R. Mordon**, INSERM (France); **Carsten M. Philipp**, Elisabeth Klinik (Germany); **Angelika C. Rueck**, Univ. Ulm (Germany); **David D. Sampson**, The Univ. of Western Australia (Australia); **Herbert Stepp**, Univ. Hospital Munich (Germany); **Valery V. Tuchin**, Saratov State Univ. (Russian Federation); **Alfred Vogel**, Univ. zu Lübeck (Germany); **Georges Wagnières**, Ecole Polytechnique Fédérale de Lausanne (Switzerland)

This conference focuses on the research undertaken to translate basic biophotonics science towards clinical applications and aims to provide an interdisciplinary forum for scientists, engineers, technicians, and medical doctors. The laser tissue interactions employed in these studies range from linear interactions as in photobiomodulation, photodynamic and other photochemical therapies, and non-linear interactions ranging from photothermal, via photo ablative to interactions evoking opto-electronic breakdown thus covering irradiances or fluence rates from 10⁻³ – 10¹⁸ Wcm⁻² in all hard and soft tissues from brain surgery to ophthalmology. Researched medical applications can be on the micro scale (as for example in the eye) to the macro scale (photothermal in situ ablation of tumours) to systemic effects involving the immune system.

The conference is looking for late-stage in vivo preclinical studies and early-stage clinical applications.

The biophotonic applications can be of a diagnostic or a therapeutic nature, and also include photonics based image guided therapies, whereby the therapies themselves do not need to be laser or photonics based.

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

- Translational light and laser therapy
- Minimally invasive laser surgery
- Photodynamic therapy (PDT) of tumours, neoplasia, dysplasia
- Antimicrobial PDT, PDT mediated immunology
- Photo-biological and photo-chemical reactions
- Photo-thermal and photo-mechanical tissue reactions
- Modelling of laser or light interactions with tissue
- Cellular micro- and nano-effects of laser radiation
- Tissue ablation and cutting with short and ultra-short laser pulse
- Translational light and laser diagnostics
- Fluorescence guided surgery
- Intraoperative tumour margin detection
- Fluorescence or other spectroscopic/image based diagnostics
- Biophotonics and immune response.



TECHNICAL PROGRAMME

Available March 2019

The comprehensive Advance Technical Programme for this symposium will list conferences, paper titles, and authors in order of presentation; an outline of all planned special events; and hotel and registration information. See www.spie.org/ecbo

Registration

Available Online March 2019

All participants, including invited speakers, contributed speakers, session chairs, co-chairs, and committee members, must pay a registration fee.

Fee information for conferences, a registration form, and general information will be available on the SPIE website in March 2019.

Hotel Reservations

Hotel Booking information is available online at the Laser World of Photonics 2019 website.

Visa Information

Attendees from certain countries may not require a visa to enter Germany. For more details, please visit the website of the German Foreign Office, which will list the point of information within your country.

Letters of Invitation

FOR CONFERENCE CHAIRS, TECHNICAL COMMITTEE MEMBERS, AND AUTHORS: If you are listed as an author on a paper, or as a participant in the programme, and you require an Official Invitation Letter for visa application purposes, please look for the instructions published at the European Biomedical Optics website www.spie.org/ecbo following the European Biomedical Optics 2019 acceptance notifications on 18 March 2019.

NOTE: We recommend that you secure your travel visa before registering for the conference as cancellations after the preregistration cutoff may result in a cancellation fee.

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