European Conferences on Biomedical Optics (ECBO)

Collocated with:

19th International Congress on Photonics in Europe
LASER World of PHOTONICS 2009
Conference on Lasers and Electro-Optics and the European Quantum Electronics Conference (CLEO Europe-EQEC 2009)

14–18 June 2009

ICM—International Congress Centre Munich
Munich, Germany

Advance Registration Deadline: May 4, 2009, 11:59 p.m. EDT (03.59 GMT, next day)

General Chairs
Mary-Ann Mycek, Univ. of Michigan, USA
Wolfgang Drexler, Cardiff Univ., UK

Program Chairs
Christoph K. Hitzenberger, Medical Univ. of Vienna, Austria
Brian W. Pogue, Dartmouth Univ., USA

Sponsored by:
The Optical Society (OSA)
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Cooperating Society:
German Biophotonics Research Program

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About ECBO

Sponsored by OSA and SPIE, the European Conferences on Biomedical Optics (ECBO) bring together scientists, engineers and clinicians who work with optics and photonics to solve problems in medicine and biomedicine.

Advance Registration Deadline: May 4, 2009, 11:59 p.m. EDT (03.59 GMT, next day)

- Advanced Microscopy Techniques
- Clinical and Biomedical Spectroscopy
- Diffuse Optical Imaging
- Molecular Imaging
- Novel Optical Instrumentation for Biomedical Applications
- Optical Coherence Tomography and Coherence Techniques
- Therapeutic Laser Applications and Laser-Tissue Interactions
- Joint Symposium with CLEO Europe-EQEC 2009

Advanced Microscopy Techniques

Conference Chairs:
Paul J. Campagnola, Univ. of Connecticut Health Ctr., USA
Ernst Stelzer, European Molecular Biology Lab, Germany
Gert von Bally, Medical Ctr. Univ. of Münster, Germany

This conference will explore the rapidly developing field of multidimensional microscopy, including confocal microscopy, nonlinear optical microscopies, light sheet based fluorescence microscopy (SPIM, DSLM) and other novel imaging modalities. Consideration will be given to the characteristics of the overall system design, as well as to topics of image formation, image recording, deconvolution in two, three or more dimensions, and digital methods of producing and displaying the resulting reconstruction. Recent innovations in multi-dimensional microscopy have a serious impact on the biological and medical fields. We hope that the broad range of relevant topics presented at this conference will encourage the interaction among instrumentation engineers, computer image analysts, and researchers in the various fields of biomedical and life science application.

Clinical and Biomedical Spectroscopy

Conference Chairs:
Irene Georgakoudi, Tufts Univ., USA
Jürgen Popp, Univ. Jena, Inst. of Photonic Technology, Germany
Katarina Svanberg, Lund Univ. Medical Laser Ctr., Sweden

Spectroscopic methods have become most valuable tools for both clinical diagnostics and biomedical research applied to in vivo tissue monitoring and the investigation on the molecular scale of excised samples. In clinical diagnostics, optical spectroscopy provides detailed structural and functional information on organs, tissues and body liquids. Basic 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 in the early transformation of normal to diseased tissue, such as when malignant tumours are developed.

The conference provides an interdisciplinary platform for physicians, physicists, biologists, chemists and related researchers in order to strengthen an integrated and holistic approach of understanding normal tissue development and the genesis of diseases in order to be able to ultimately develop new, efficient treatment modalities.
Diffuse Optical Imaging

Conference Chairs:
Rinaldo Cubeddu, Politecnico di Milano, Italy
Andreas H. Hielscher, Columbia Univ., USA

The study of diffuse light imaging in tissue is providing new insight into the structural and functional properties of tissues that are not easily accessed by alternative methods. The research and development of systems that use this approach is leading 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, stroke, hemorrhages, brain and muscular oxygenation, peripheral vascular diseases and joint diseases. Integration of diffuse light imaging into existing clinical instrumentation is a key area of development, and combining diffuse light imaging with new contrast agents is also emerging as a major growth area.

Further improvement in these and other application areas relies on continued advancement in the theory of radiation transport through random media, in data analysis and image reconstruction algorithms, and in instrumentation design. This meeting provides a key interdisciplinary forum for engineers, physicists, mathematicians, and 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.

Molecular Imaging

Conference Chairs:
Kai Licha, mivenion GmbH, Germany
Charles Lin, Massachusetts General Hospital, USA

Emerging reporter-gene technologies and probes for fluorescence and bioluminescence in vivo imaging have enabled an unprecedented and highly versatile visualization of many fundamental tissue processes at the cellular and sub-cellular level. Likewise, advances in optical imaging technologies allow for a powerful imaging platform suitable for basic research, clinical translation and drug discovery. This is an emerging field of the imaging sciences that integrates many scientific disciplines from physics and engineering to chemistry and biotechnology and has strong potential applications in pharmacology, molecular biology and medicine. This conference aims to bring together these diverse fields of the imaging sciences and places particular emphasis on the synergies of novel imaging technology and corresponding molecular reporters in facilitating the propagation of molecular imaging to addressing important biomedical problems.

Novel Optical Instrumentation for Biomedical Applications

Conference Chairs:
Christian D. Depeursinge, Ecole Polytechnique Fédérale de Lausanne, Switzerland
Alex Vitkin, Ontario Cancer Inst., Canada

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 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 photoacoustic spectroscopy, use of MRI to constrain optical tomographic reconstructions, PDT sterilization of surgical margins and the emerging role of photodiagnostics in monitoring and guiding therapies in real time (“theragnostics”). 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 discussion forum of interest to instrument designers, sensor builders, basic and applied clinical researchers, and other scientists interested in exploring novel directions in biophotonics.
Optical Coherence Tomography and Coherence Techniques

Conference Chairs:
Peter E. Andersen, Technical Univ. of Denmark, Denmark
Brett Bouma, Harvard Medical School, USA

Optical coherence tomography (OCT) and optical methods based on coherent light interactions with tissue are emerging medical diagnostic imaging techniques which can perform cross-sectional, three-dimensional, functional, real-time visualization of biological microstructure \textit{in situ}.  

This conference provides an interdisciplinary forum for topics in research and development on a physical and theoretical basis of coherent imaging including novel low-coherence interferometry and tomography techniques, extension techniques of OCT such as polarization-sensitive, Doppler, phase contrast, spectroscopic and second harmonic OCT. In addition, this conference will also focus on the development of new light sources, new probes, new detection schemes and new signal processing algorithms for coherent imaging. Applications of coherent optical techniques for morphological as well as functional assessment in different living tissues and phantoms in various medical fields are also covered.

Therapeutic Laser Applications and Laser-Tissue Interactions

Conference Chairs:
Ronald Sroka, Ludwig-Maximilians-Univ. München, Germany
Lothar Lilge, Univ. Health Network, PMH/Ontario Cancer Inst., Canada

Medical laser application is a broad area for research and development with the vision of improving clinical therapeutic procedures or extending into new fields for lasers in medical use. Novel biomedical laser applications are emerging due to the advent of new types of lasers that widen the possible spectrum of laser-tissue interactions (ultrashort-pulsed lasers, fiber lasers, diode lasers, diode pumped solid-state lasers). These lasers, together with advanced targeting techniques, can be used to improve the target-oriented precise application of laser radiation in clinical practice. Laser light applications include the whole range of non-thermal to thermal reactions up to ionization effects either on the macro-scale, e.g. soft tissue smoothing without ablation, or on the micro scale, e.g. selective retina therapy, to the nano-scale for surgery within cells, as well as short-pulsed laser applications to treat soft and hard tissue in patients. In addition, new laser light application techniques as well as innovative medical keyhole techniques such as laser-assisted NOTES (Natural Orifice Transluminal Endoscopic Surgery) are under investigation.

Highly sophisticated targeting strategies including endogenous or applied chromophores as well as conjugation of chromophores or nanoparticles with antibodies pave the way for new treatment modalities. Furthermore, combination therapies such as the synergetic use of photodynamic therapy and immunomodulatory or antiseptics are encouraging new fields for research and clinical studies.

Improved understanding of biological reactions triggered by laser radiation interacting with natural absorbing sites, targeting molecules, photosensitizers or nanoparticles will lead to progress in the creation of minimally invasive clinical laser light applications or assist in elucidating particular immunological responses from the tissue.

Theoretical considerations and modeling of laser light distribution in tissue with subsequent energy transfer and tissue interactions constitute a solid basis for therapy planning in patients, particularly if combined by improved light delivery and monitoring techniques.

This conference will provide an interdisciplinary forum for scientists, engineers, research-oriented medical specialists and medical doctors using laser-assisted treatment modalities to discuss the progress in all these topics. The forum joins presentations from \textit{in vitro} investigations up to clinical studies of new laser light irradiance in the range of $10^3$–$10^{18}$ Wcm$^{-2}$ to lead to actual clinical and medical questions where laser-assisted techniques can play an important role in future.
Meeting Topics to Be Considered

**Advanced Microscopy Techniques**

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

- High resolution optical imaging on the nanometer scale (e.g. PALM, STORM)
- Very fast and efficient imaging of large and complex biological specimens (e.g. SPIM, DSLM)
- Multi-modal spectroscopic analysis in microscopy
- Single molecular microscopy and microanalysis
- Micro-optics and MEMS based optical systems for the biomedical diagnosis
- Novel image contrast enhancement approaches such as SER and other near field surface effects
- Fluorescence Correlation Spectroscopy
- FRET-FLIM modalities
- Multiphoton microscopy, SHG, THG, and CARS microscopies using exogenous and/or endogenous contrast
- Biomedical instrumentation
- Fast image acquisition with time-resolving image acquisition systems

**Clinical and Biomedical Spectroscopy Topics**

Contributed papers are solicited, but not limited, to the following areas, using optical spectroscopy methods, e.g. fluorescence, autofluorescence, linear and nonlinear Raman, NIR, polarization, back-reflectance, and light scattering spectroscopy, and combined approaches (multimodal imaging):

**Biomedical and clinical spectroscopic diagnostics**

- *In vivo* diagnostics (structural and functional spectral imaging of cells, tissues, organs), including endoscopic, noninvasive and minimally invasive methods
- Tissue pathology
- Spectral biomarker analysis
- Spectroscopic micro- and nanosensors
- BioChip technology for Point-of-Care diagnostics
- Diagnostics and tissue engineering

**Investigation of cellular and sub-cellular processes**

- Analysis of cell dynamics by single-molecule techniques
- High spatial resolution microscopy
- Structural analysis of cells and tissue
- Biomarker discovery for spectroscopic techniques

**Diffuse Optical Imaging**

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

- Diffuse optical tomography and spectroscopy
- Image reconstruction algorithms
- Diffuse fluorescence and bioluminescence imaging
- Photoacoustic and optoacoustic imaging
• Novel molecular contrast agents
• Clinical applications
• Physiological studies using photon migration
• Breast cancer imaging and spectroscopy
• Brain imaging of cerebral activation
• Clinical brain imaging of stroke, hemorrhage, oxygenation, etc.
• Muscle physiology
• Phantom studies
• Animal studies
• Advances and optimization in instrumentation
• Hybrid-modality imaging with diffuse light

**Molecular Imaging**

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

• Pre-clinical and clinical applications of molecular imaging
• Small animal imaging
• Chemistry of fluorescent dyes, probes and nano-particles for *in vivo* animal and human imaging
• Applications of molecular targeting and visualization of disease processes and pathways
• Genetically introduced reporters and proteins for fluorescence and bio-luminescence imaging
• Novel instrumentation and algorithms for optical and molecular imaging
• Validation of the quantitative assessment of molecular signatures *in vivo*
• Approaches for multi-modality imaging including MRI, X-ray, ultrasound and radiodiagnostic techniques

**Novel Optical Instrumentation for Biomedical Applications**

Topics for contributions are thus broadly open and include:

• Photoacoustic/optoacoustic imaging and diagnostics
• Photothermal imaging and diagnostics
• Acousto-optic imaging
• Speckle-based techniques
• Holography and micro-holography
• Nanoprobes for imaging and diagnostics
• MRI/optical image fusion
• Ultrasound/optical image fusion
• New approaches for photon discrimination in turbid media
• Near-field imaging in 2-D and 3-D
• Novel endoscopic technologies
• Integration of diagnostic and therapeutic photomedicine
• Hybrid approaches in photomedicine
• Image-guided therapeutics

**Optical Coherence Tomography and Coherence Techniques**

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

• Optical coherence tomography (OCT) technology and systems
• Coherent imaging system, theory and signal processing
• Clinical applications of OCT
• Frequency/Spectral/Fourier domain OCT
• Functional OCT, such as spectroscopic, Doppler, polarization-sensitive and second-harmonic OCT
• Contrast enhancement techniques for OCT
• Novel light sources and MEMS probes for OCT
• Optical coherent techniques for tissue spectroscopy and imaging
• Fourier optics in tissue imaging
• Coherent light microscopy
• Speckle analysis and methods for speckle reduction
• Adaptive coherent optical systems

**Therapeutic Laser Applications and Laser-Tissue Interactions**

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

• Photo-biological and photo-chemical reactions
• Photo-thermal and photo-mechanical tissue reactions
• Modeling of laser-tissue interactions
• Cellular micro- and nano-effects of laser radiation
• Laser-induced microdissection and catapulting of cells
• Tissue ablation and cutting with short and ultra-short laser pulses
• Hard tissue ablation, benign tissue destruction
• Photodynamic therapy (PDT) of tumors, neoplasia and other pathologic conditions
• Antimicrobial PDT, PDT-mediated immunology
• Cellular mechanisms of low-power laser therapy
• Minimally invasive laser surgery
• Laser applications in NOTES
• Progress in therapeutic laser applications
• In vitro, ex vivo, preclinical and clinical studies
• Experiences in clinical laser application
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**Advanced Microscopy Techniques**

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Ernst Stelzer, European Molecular Biology Lab, Germany, **Co-Chair**
Gert von Bally, Medical Ctr., Univ. of Münster, Germany, **Co-Chair**

Kishan Dholakia, Univ. of St. Andrews, UK
Kevin Eliceiri, Lab for Optical and Computational Instrumentation, Univ. of Wisconsin-Madison, USA
Paul French, Imperial College London, UK
Jesper Glückstad, Technical Univ. of Denmark Fotonik, Denmark
Charles Lin, Massachusetts General Hospital, USA
Jerome Mertz, Boston Univ., USA
Vinod Subramaniam, Univ. of Twente, Netherlands
Rainer Uhl, Ludwig Maximillians Univ. Munchen, Germany

**Clinical and Biomedical Spectroscopy**

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Jürgen Popp, Univ. Jena, Inst. of Photonic Technology, Germany, **Co-Chair**
Katarina Svanberg, Lund Univ. Medical Laser Ctr., Sweden, **Co-Chair**

Volker Deckert, ISAS, Germany
Max Diem, Northeastern Univ., USA
Rebekah Drezek, Rice Univ., USA
Elizabeth Hillman, Columbia Univ., USA
Lise Randeberg, Norges Teknisk Naturvitenskapelige Univ., Norway
Paola Taroni, Politecnico di Milano, Italy

**Diffuse Optical Imaging**

*Conference Chairs:*
Rinaldo Cubeddu, Politecnico di Milano, Italy, **Co-Chair**
Andreas H. Hielscher, Columbia Univ., USA, **Co-Chair**

Joseph P. Culver, Washington Univ., USA
Anabela da Silva, CEA/DBTS, France
Jeremy Hebden, Univ. College London, UK
Alwin Kienle, Univ. of Ulm, Germany
Alexander Klose, Columbia Univ., USA
Jens Steinbrink, Charité-Universitätsmedizin, Germany
**Molecular Imaging**

*Conference Chairs:*
Kai Licha, mivenion GmbH, Germany, Co-Chair
Charles Lin, Massachusetts General Hospital, USA, Co-Chair
Samuel Achilefu, Washington Univ., USA
Christoph Bremer, Univ. Münster ULB, Germany
Giannis Zacharakis, FORTH - IESL, Greece
Gang Zheng, Toronto Medical Discovery Tower, Canada

**Novel Optical Instrumentation for Biomedical Applications**

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Alex Vitkin, Ontario Cancer Inst., Canada, Co-Chair
Vadim Backman, Northwestern Univ., USA
Vanderlei Salvador Bagnato, Univ. of San Paolo, Brazil
Daniel Côté, Laval Univ., Canada
Benoit C. Forget, EPSCI, France
Olivier Haeberle, Groupe LabEl - Lab MIPS, France
Steen Madsen, Univ. of Nevada at Las Vegas, USA
Igor Meglinski, Cranfield Univ., UK
Guenther Paltauf, Karl-Franzens-Univ. Graz, Austria
Ton G. Van Leeuwen, Acad. Medisch Centrum, Netherlands
Robert Weersink, Photonics Res. Ontario, Canada
Maurice Whelan, European Commission, Italy

**Optical Coherence Tomography and Coherence Techniques**

*Conference Chairs:*
Peter E. Andersen, Technical Univ. of Denmark, Denmark, Co-Chair
Brett Bouma, Harvard Medical School, USA, Co-Chair
Jennifer Barton, Univ. of Arizona, USA
Johannes de Boer, Free Univ., Netherlands
Stephen A. Boppart, Univ. of Illinois at Urbana-Champaign, USA
Wolfgang Drexler, Cardiff Univ., UK
James Fujimoto, MIT, USA
Gereon Hüttman, Univ. of Luebeck, Germany
Joseph Izatt, Duke Univ., USA
Ton G. van Leeuwen, Univ. of Amsterdam, Netherlands
Rainer Leitgeb, Medical Univ. of Vienna, Austria
Constantinos Pitris, Univ. of Cyprus, Cyprus
Adrian Podoleanu, Univ. of Kent at Canterbury, UK
Andrew Rollins, Case Western Reserve Univ., USA
Theo Lasser, Ecole Polytechnique de Lausanne, Switzerland
Natalia M. Shakova, Inst. of Applied Physics of RAS, Russia
Julia Welzel, General Hospital Augsburg, Germany
Maciej Wojtkowski, Nicolaus Copernicus Univ., Poland
Yoshiaki Yasuno, Univ. of Tsukuba, Japan
Therapeutic Laser Applications and Laser-Tissue Interactions

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Stefan Andersson-Engels, Lunds Tekniska Hogskola, Sweden
Wolfgang Baeumler, Univ. of Regensburg, Germany
Steve Bown, Univ. College London, UK
Ralf Brinkmann, Medizinisches Laserzentrum Lubeck GmbH, Germany
Martin Frenz, Univ. Bern, Switzerland
Christoph Haisch, Tech. Univ. Munich, Germany
Michael Hamblin, Harvard Medical School, USA
Raimund Hibst, Univ. Ulm, Germany
Colin Hopper, Eastman Dental Inst., UK
Duco Jansen, Vanderbilt Univ., USA
Barbara Krammer, Univ. of Salzburg, Austria
Mladen Korbelik, BC Cancer Agency, Canada
Serge Mordon, INSERM - Pavillon Vancostenobel, France
Ethne Nussbaum, Univ. of Toronto, Canada
Dominic Robinson, Erasmus Univ. Medical Ctr., Netherlands
Ricardas Rotomskis, Vilnius Univ. Laser Res. Ctr., Lithuania
Herbert Stepp, Univ. of Munich, Germany
Alfred Vogel, Univ. of Luebeck, Germany
Georges Wagnieres, Ecole Polytechnique Federale de Lausanne, Switzerland
Timothy Zhu, Univ. of Pennsylvania, USA
Exhibit

For information on the exhibit, please visit the LASER World of PHOTONICS 2009 website.

Career Center

LASER World of PHOTONICS will offer a Career Center to attendees, as well as opportunities for free career coaching. For more information, contact Ms. Katrin Hirl (email: katrin.hirl@messe-muenchen.de).
Invited Speakers

**ECBO Plenary Session: Bridging the Ocean of Biomedical Optics**

**SuA1**, New Techniques for Out-of-Focus Background Rejection, Jerome Mertz; Boston Univ., USA.

**SuA2**, The Emerging Era of High-Performance Mesoscopic and Macroscopic Photonic Imaging, Vasilis Ntziachristos; Inst. for Biological and Medical Imaging, Helmholtz Zentrum München, Germany.

**Joint ECBO-CLEO/Europe Session, Hot Topics: Molecules to Metabolism**

**JTuA1**, Dynamics of DNA-Based Molecular Motors Measured with 1-bp Resolution, Thomas T. Perkins; JILA and NIST, Univ. of Colorado at Boulder, USA.

**JTuA2**, Good Shape Photolysis, Valentina Emiliani; Univ. Paris Descartes, France.


**Advanced Microscopy Techniques**

**MC1**, Determination of Fluorescent Protein On-State Emission Rates by Manipulating the Local Density of Photonic States, Christian Blum¹, Yanina Cesa¹, Johanna M. van den Broek¹, Allard P. Mosk¹, Willem L. Vos¹², Vinod Subramaniam⁰; ¹Univ. of Twente, Netherlands, ²FOM, Inst. for Atomic and Molecular Physics, Netherlands.

**MH1**, Light Sheet Based Fluorescence Microscopes (LSFM, SPIM, DSLM) Reduce Phototoxic Effects by Several Orders of Magnitude, Ernst H. K. Stelzer, Philipp J. Keller; European Molecular Biology Lab Heidelberg, Germany.

**TuK1**, 3-D Tracking and Multi-Wavelength Techniques for Digital Holographic Microscopy Based Cell Analysis, Bjoern Kemper, Patrik Langehanenberg, Sebastian Kosmeier, Sabine Przibilla, Angelika Vollmer, Steffi Keitelhut, Gert von Bally; Ctr. for Biomedical Optics and Photonics, Germany.

**Clinical and Biomedical Spectroscopy**

**TuH5**, Multidimensional Fluorescence Imaging, Paul French; Imperial College London, UK.

**WC1**, Order and Structural Dynamics with Second Harmonic Generation Imaging, Francesco Pavone; Univ. of Florence, Italy.

**WK1**, Addressing the Nanoscale by Optical Nano-Antennas, Niek van Hulst; ICFO, Spain.

**ThA1**, Diode Laser Welding of Ocular Tissues: Microscopic Analysis of Induced Collagen Modifications, Roberto Pini, Francesca Rossi, Paolo Matteini, Fulvio Ratto, Luca Menabuoni; Inst. di Fisica Applicata, Consiglio Nazionale delle Ricerche, Italy.

**ThE3**, Translation Applications of Photonics to Breast Cancer, Nimmi Ramanujam; Biomedical Engineering Dept., Duke Univ., USA.
Diffuse Optical Imaging

SuD3, Resting-State Functional Connectivity in Human Brain with Diffuse Optical Tomography, Brian R. White, Abraham Z. Snyder, Alexander L. Cohen, Steven E. Petersen, Marcus E. Raichle, Bradley L. Schlaggar, Joseph P. Culver; Washington Univ. in St. Louis, USA.

MO1, Differentiation of Benign and Malignant Breast Lesions with 3-D Diffuse Optical Tomography, Regine Choe1, Soren D. Konecky1, Alper Corlu1, Kijoon Lee1, Turgut Durduran1, David R. Busch1, Saurav Pathak1, Mark A. Rosen1, Mitchell D. Schnall1, Brian J. Czerniecki1, Julia Tchou1, Simon R. Arridge2, Martin Schweiger2, Mary E. Putt1, Britton Chance1, Arjun G. Yodh1; 1Univ. of Pennsylvania, USA, 2Univ. College London, UK.

TuD1, Structured Illumination and Time Gated Detection for Diffuse Optical Imaging, Cosimo D'Andrea1,2, Andrea Bassi1,2, Gianluca Valentini2, Rinaldo Cubeddu1,2, Simon Arridge3; 1Natl. Lab for Ultrafast and Ultraintense Optical Science, Consiglio Nazionale delle Ricerche, Italy, 2Dept. di Fisica, Politecnico di Milano, Italy, 3Ctr. for Medical Image Computing, Univ. College London, UK.

Molecular Imaging

ME1, High Speed, Automated, Optically Sectioned Fluorescence Lifetime Imaging Multi-Well Plate Reader and Multiplexed FRET Microscope, Clifford Talbot1, James McGinty1, Ewan McGhee1, David Grant1, Sunil Kumar1, Dylan Owen1, Gordon Kennedy1, Ian Munro1, Wei Zhang1, Tom Bunney2, Tony Magee1, Dan Davis1, Matilda Katan1, Chris Dunsby1, Mark Neil1; 1Imperial College London, UK, 2Inst. of Cancer Res., UK.

MK1, Imaging of Fluorescent Protein Activity in Mice with Multispectral Optoacoustic Tomography (MSOT), Nikolaos Doliolanis, Adrian Taruttis, Amir Rozental, Daniel Razansky, Vasilis Ntziachristos; Technische Univ. and Helmholtz Zentrum München, Germany.

Novel Optical Instrumentation for Biomedical Applications

SuC1, Three-Dimensional Speckle Holography of Cellular Motion inside Tissue, David D. Nolte, John Turek; Purdue Univ., USA.

TuB1, Combined Optoacoustic and Ultrasound Imaging, Michael Jaeger1, Lea Siegenthaler1, Michael Kitz1, Martin Frenz1, D. Schoe2, M. Fleron2, J. F. Greisch2, M. C. De Pauw-Gil2, E. De Pauw2, J. Niederhauser1, D. Schweizer2; 1Univ. of Bern, Switzerland, 2Univ. of Liege, Belgium, 3Fukluda Denshi Switzerland AG, Switzerland.

WF1, Development and Analysis of a Polarised Endoscopic Hyperspectral Reflection and Fluorescence Imaging System, Tobias C. Wood, Vincent Sauvage, Kevin R. Koh, Daniel S. Elson; Imperial College London, UK.

Optical Coherence Tomography and Coherence Techniques


SuF3, Imaging the Inner Retina Using Optical Coherence Tomography with Adaptive Optics, Donald T. Miller, Barry Cense, Omer Kocaoglu, Qiang Wang; Indiana Univ., USA.

MB1, Multiple Wavelength Three-Dimensional Optical Coherence Tomography of Human Skin, Aneesh Alex1, Boris Považay1, Bernd Hofer1, Sergei Popov2, Wolfgang Drexler1; 1School of Optometry and Vision Sciences, Cardiff Univ., UK, 2Dept. of Physics, Imperial College London, UK.
ML1, In vivo Imaging of Pancreatic Endocrine Islets, Martin Villiger1, Joan Goulley2, Christophe Pache1, Michael Friedrich1, Anne Grapin-Botton, Paolo Meda2, Rainer A. Leitgeb1, Theo Lasser1; 1Lab d’Optique Biomédicale, Ecole Polytechnique Fédérale de Lausanne, Switzerland, 2Swiss Inst. for Experimental Cancer Res., Ecole Polytechnique Fédérale de Lausanne, Switzerland, 3Dept. of Cell Physiology and Metabolism, Ctr. Medical Universitaire de Geneve, Switzerland.

WA1, High Speed, High Resolution SLO/OCT for Investigating Temporal Changes of Single Cone Photoreceptors in vivo, Michael Pircher, Bernhard Baumann, Harald Sattmann, Erich Götzinger, Christoph K. Hitzenberger; Medical Univ. of Vienna, Austria.

WL1, High-Speed and High-Sensitive Optical Coherence Angiography, Shuichi Makita, Masahiro Yamanari, Yoshiaki Yasuno; Computational Optics Group, Univ. of Tsukuba, Japan.

WL4, Ultrahigh Speed Spectral/Fourier Domain OCT Imaging in Ophthalmology, Benjamin Potsaid1,2, Iwona Gorczynska1,3, Vivek J. Srinivasan1, Yueli Chen1,3, Jonathan Liu1, James Jiang2, Alex Cable2, Jay S. Duker3, James G. Fujimoto1; 1MIT, USA, 2Thorlabs, Inc., USA, 3New England Eye Ctr. and Tufts Medical Ctr., USA.

Therapeutic Laser Applications and Laser-Tissue Interactions

WE1, Mechanisms of Femtosecond Laser Cellular Optoporation, Tobias Jachowski1, Willem Bintig2, Sebastian Eckert1, Judith Baumgart3, Anaclet Ngezahayo2, Alexander Heisterkamp5, Alfred Vogel1; 1Univ. of Lübeck, Germany, 2Inst. of Biophysics, Leibniz Univ., Germany, 3Laser Zentrum Hannover e.V., Germany.

WI1, Dynamics of Laser Induced Transient Micro Bubble Clusters in the Retinal Pigment Epithelium, Andreas Fritz1, Lars Ptaszynski1, Hardo Stoehr2, Ralf Brinkmann1,2; 1Medical Laser Ctr. Luebeck, Germany, 2Univ. of Luebeck, Germany.

ThD1, Photobleaching Reconstruction for Interstitial Photodynamic Therapy Dosimetry, Johan Axelsson1, Johannes Swartling2, Stefan Andersson-Engels3; 1Dept. of Physics, Lund Univ., Sweden, 2SpectraCure AB, Sweden.

ThF1, Modelling of Optical Properties and Temperature Distribution in and Around Gold Nanorods, Florian Rudnitzki, Marco Bever, Katrin Brieger, Ramtin Rahamanzadeh, Gereon Hüttmann; Inst. of Biomedical Optics, Univ. of Luebeck, Germany.

ThH2, OCT-Aided Femtosecond Laser Microsurgery Device, Ole Massow1, Fabian Will2, Holger Lubatschowski1,2; 1Laser Zentrum Hannover e.V., Germany, 2Rowiak GmbH, Germany.
Welcome to Munich!

The European Conferences on Biomedical Optics (ECBO) has emerged as the largest forum in Europe for this research field, and is co-located with the world’s largest laser show. ECBO provides the unique mix of biomedical diagnostics and therapeutics with participation going from basic science through engineering, with biomedical and clinical researchers. Researchers from all continents are represented in the seven conference theme areas within ECBO.

The focus theme of our plenary session is to bridge the ocean in the biomedical optics world, having speakers who have crossed the Atlantic in the pursuit of their chosen biomedical optics research. The Hot Topics session is jointly organized with CLEO/Europe and focuses on the use of optics ranging all the way from single molecule spectroscopy, through imaging and metabolism monitoring.

The ECBO is co-sponsored by The Optical Society (OSA) and SPIE. There is also cooperation in the planning from the German Biophotonics Research Program in the conferences on Advanced Microscopy Techniques and Clinical and Biomedical Spectroscopy. The conference has been coordinated with CLEO/Europe-EQEC to maximize the synergy. ECBO conference attendees are able use their registration badge to attend any of the other scientific meetings that are co-located with us at the ICM.

Christoph K. Hitzenberger, **Program Chair**
Medical Univ. of Vienna, Austria

Brian W. Pogue, **Program Chair**
Dartmouth College, USA

*The organisers of ECBO thank the following sponsors for their generous support.*
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Wolfgang Drexler, Cardiff Univ., UK

Program Chairs
Christoph K. Hitzenberger, Medical Univ. of Vienna, Austria
Brian W. Pogue, Dartmouth College, USA

Advanced Microscopy Techniques
Paul J. Campagnola, Univ. of Connecticut Health Ctr., USA, Co-Chair
Ernst Stelzer, European Molecular Biology Lab, Germany, Co-Chair
Gert von Bally, Medical Ctr., Univ. of Münster, Germany, Co-Chair
Kishan Dholakia, Univ. of St. Andrews, UK
Kevin Eliceiri, Lab for Optical and Computational Instrumentation, Univ. of Wisconsin-Madison, USA
Paul French, Imperial College London, UK
Jesper Glückstad, Technical Univ. of Denmark Fotonik, Denmark
Charles Lin, Massachusetts General Hospital, USA
Jerome Mertz, Boston Univ., USA
Vinod Subramaniam, Univ. of Twente, The Netherlands
Rainer Uhl, Ludwig Maximilians Univ. Munchen, Germany

Clinical and Biomedical Spectroscopy
Irene Georgakoudi, Tufts Univ., USA, Co-Chair
Jürgen Popp, Univ. Jena, Inst. of Photonic Technology, Germany, Co-Chair
Katarina Svanberg, Lund Univ. Medical Laser Ctr., Sweden, Co-Chair
Volker Deckert, ISAS, Germany
Max Diem, Northeastern Univ., USA
Rebekah Drezek, Rice Univ., USA
Elizabeth Hillman, Columbia Univ., USA
Lise Randeberg, Norges Teknisk Naturvitenskapelige Univ., Norway
Paola Taroni, Politecnico di Milano, Italy

Diffuse Optical Imaging
Rinaldo Cubeddu, Politecnico di Milano, Italy, Co-Chair
Andreas H. Hielscher, Columbia Univ., USA, Co-Chair
Joseph P. Culver, Washington Univ., USA
Anabela da Silva, CEA/DBTS, France
Jeremy Hebden, Univ. College London, UK
Alwin Kienle, Univ. of Ulm, Germany
Alexander Klose, Columbia Univ., USA
Jens Steinbrink, Charité-Universitätsmedizin, Germany

Molecular Imaging
Kai Licha, mivenion GmbH, Germany, Co-Chair
Charles Lin, Massachusetts General Hospital, USA, Co-Chair
Samuel Achilefu, Washington Univ., USA
Christoph Bremer, Univ. Münster ULB, Germany
Giannis Zacharakis, FORTH - IESL, Greece
Gang Zheng, Toronto Medical Discovery Tower, Canada

Novel Optical Instrumentation for Biomedical Applications
Christian D. Depeursinge, Ecole Polytechnique Fédérale de Lausanne, Switzerland, Co-Chair
Alex Vitkin, Ontario Cancer Inst., Canada, Co-Chair
Vadim Backman, Northwestern Univ., USA
Vanderlei Salvador Bagnato, Univ. of Sao Paolo, Brazil
Daniel Côté, Laval Univ., Canada
Benoit C. Forget, EPSCI, France
Olivier Haeberle, Groupe LabEl - Lab MIPS, France
Steen Madsen, Univ. of Nevada at Las Vegas, USA
Igor Meglinski, Cranfield Univ., UK
Guenther Paltauf, Karl-Franzens-Univ. Graz, Austria
Ton G. Van Leeuwen, Acad. Medisch Centrum, The Netherlands
Robert Weersink, Photonics Res. Ontario, Canada
Maurice Whelan, European Commission, Italy
Optical Coherence Tomography and Coherence Techniques

Peter E. Andersen, Technical Univ. of Denmark, Denmark, Co-Chair
Brett Bouma, Harvard Medical School, USA, Co-Chair
Jennifer Barton, Univ. of Arizona, USA
Stephen A. Boppart, Univ. of Illinois at Urbana-Champaign, USA
Johannes de Boer, Free Univ., The Netherlands
Wolfgang Drexler, Cardiff Univ., UK
James Fujimoto, MIT, USA
Gereon Hüttman, Univ. of Luebeck, Germany
Joseph Izatt, Duke Univ., USA
Theo Lasser, Ecole Polytechnique Fédérale de Lausanne, Switzerland
Rainer Leitgeb, Medical Univ. of Vienna, Austria
Constantinos Pitsis, Univ. of Cyprus, Cyprus
Adrian Podoleanu, Univ. of Kent at Canterbury, UK
Andrew Rollins, Case Western Reserve Univ., USA
Natalia M. Shakhova, Inst. of Applied Physics of RAS, Russia
Ton G. van Leeuwen, Univ. of Amsterdam, The Netherlands
Julia Welzel, General Hospital Augsburg, Germany
Maciej Wojtkowski, Nicolaus Copernicus Univ., Poland
Yoshiaki Yasuno, Univ. of Tsukuba, Japan

Therapeutic Laser Applications and Laser-Tissue Interactions

Lothar Lilge, Univ. Health Network, PMH/Ontario Cancer Inst., Canada, Co-Chair
Ronald Sroka, Ludwig-Maximilians-Univ. München, Germany, Co-Chair
Stefan Andersson-Engels, Lunds Tekniska Hogskola, Sweden
Wolfgang Baeumler, Univ. of Regensburg, Germany
Steve Bown, Univ. College London, UK
Ralf Brinkmann, Medizinisches Laserzentrum Lubeck GmbH, Germany
Martin Frenz, Univ. Bern, Switzerland
Christoph Haisch, Tech. Univ. Munich, Germany
Michael Hamblin, Harvard Medical School, USA
Raimund Hibst, Univ. Ulm, Germany
Colin Hopper, Eastman Dental Inst., UK
Duco Jansen, Vanderbilt Univ., USA
Barbara Krammer, Univ. of Salzburg, Austria
Mladen Korbelik, BC Cancer Agency, Canada
Serge Mordon, INSERM - Pavillon Vancover, France
Ethne Nussbaum, Univ. of Toronto, Canada
Dominic Robinson, Erasmus Univ. Medical Ctr., The Netherlands
Ricardas Rotomskis, Vilnius Univ. Laser Res. Ctr., Lithuania
Herbert Stepp, Univ. of Munich, Germany
Alfred Vogel, Univ. of Luebeck, Germany
Georges Wagnieres, Ecole Polytechnique Fédérale de Lausanne, Switzerland
Timothy Zhu, Univ. of Pennsylvania, USA
Conference Highlights

ECBO Plenary Session: Bridging the Ocean of Biomedical Optics
Sunday 14 June, 13.00–15.00
Room 5, Ground Floor, Congress Centre

13.00 Opening Remarks, Christoph K. Hitzenberger; Medical Univ. of Vienna, Austria

13.15 New Techniques for Out-of-Focus Background Rejection, Jerome Mertz; Boston Univ., USA

The problem of out-of-focus background is ubiquitous in fluorescence microscopy. The most common strategy to reject out-of-focus background requires the use of beam scanning. Highly successful examples are confocal microscopy and two-photon excited fluorescence microscopy. Nevertheless, out-of-focus background remains a problem with these techniques when imaging deep in thick tissue.

Recently, alternative strategies have been examined that do not require beam scanning. These include structured illumination microscopy, programmable array microscopy, etc., that can be operated as add-ons to standard widefield microscopes.

I will concentrate mostly on our own work to address the problem of out-of-focus background rejection. In particular, I will describe a novel hybrid technique that requires two raw images. The first image is a standard image that contains both in-focus and out-of-focus components. The second is a purposefully “noisy” image that enables an identification of the out-of-focus component, and hence a rejection of background from the first image. Variations on this simple two-shot hybrid imaging scheme are applied to standard widefield microscopy, confocal microscopy, and two-photon excited fluorescence microscopy.

Jerome Mertz received an A.B. in physics from Princeton University in 1984, and a Ph.D. in quantum optics from University of California at Santa Barbara and the University of Paris VI in 1991. Following postdoctoral studies at the University of Konstanz, Germany (Jürgen Mlynek group) and at Cornell University (Watt Webb group), he obtained a lecturer position at the Ecole Supérieure de Physique et de Chimie Industrielle in Paris, where he became a CNRS research director. He is currently an associate professor of biomedical engineering at Boston University. His interests are in the development and applications of novel optical microscopy techniques for biological imaging. He is also author of a textbook entitled “Introduction to Optical Microscopy.”

Vasilis Ntziachristos, M.Sc., Ph.D., is a Professor and Chair for Biological Imaging at the Technische Universität München and the Director of the Institute for Biological and Medical Imaging at the Helmholtz Zentrum München. Prior to this appointment he has been faculty at Harvard University and the Massachusetts General Hospital. He received his Master’s and Doctorate degrees from the bioengineering department of the University of Pennsylvania and the Diploma on Electrical Engineering from the Aristotle University of Thessaloniki, Greece. Professor Ntziachristos serves on several bio-optics and imaging committees and editorial boards, he was named one of the world’s top innovators by the Massachusetts Institute of Technology (MIT) Technology Review in 2004 and he received in 2008 an ERC Advanced Investigator Award. His major research interests involve the development and in vivo application of optical and opto-acoustic methods for probing physiological and molecular events in tissues.

Opening Remarks, Christoph K. Hitzenberger; Medical Univ. of Vienna, Austria

New Techniques for Out-of-Focus Background Rejection, Jerome Mertz; Boston Univ., USA

The Emerging Era of High-Performance Mesoscopic and Macroscopic Photonic Imaging, Vasilis Ntziachristos; Technical Univ. of Munich and the Inst. of Biological and Medical Imaging (IBMI), Germany

With post-genome biology and medicine facing redefined challenges associated with the understanding of dynamic interactions of cellular processes, at different system levels, imaging can play an increasingly important role in dissecting tissue function in vivo. Optical microscopy has been a fundamental tool of biological discovery for more than three centuries. Yet, supported by evolving optical reporters that tag cellular processes and interactions in vivo, new photonic methods are constantly evolving to enhance the ability of longitudinal visualization of cellular mechanisms in unperturbed environments. Of particular interest are technologies that for the first time offer high-resolution imaging beyond the penetration limits of established microscopy methods. This newfound ability comes with exciting possibilities for discovery in established and emerging fields of biology and medicine, including systems biology and functional -omics interrogations in adult biological organisms, small animals and potentially human applications. Promising fluorescence molecular tomography (FMT) and multi-spectral opto-acoustic tomography (MSOT) methods with the ability to image tissue fluorochromes across the mesoscopic and macroscopic regimes are presented. These methods are shown capable to offer a highly versatile platform for basic discovery, drug discovery and pre-clinical and clinical imaging applications. Key characteristics associated with different imaging implementations are described and applications from imaging cancer, inflammation, stem cells and developing adult (non-transparent) zebrafish are showcased. Collectively these methods have the potential to become the method of choice in biological and select medical fields.

Vasilis Ntziachristos, M.Sc., Ph.D., is a Professor and Chair for Biological Imaging at the Technische Universität München and the Institute for Biological and Medical Imaging at the Helmholtz Zentrum München. Prior to this appointment he has been faculty at Harvard University and the Massachusetts General Hospital. He received his Master’s and Doctorate degrees from the bioengineering department of the University of Pennsylvania and the Diploma on Electrical Engineering from the Aristotle University of Thessaloniki, Greece. Professor Ntziachristos serves on several bio-optics and imaging committees and editorial boards, he was named one of the world’s top innovators by the Massachusetts Institute of Technology (MIT) Technology Review in 2004 and he received in 2008 an ERC Advanced Investigator Award. His major research interests involve the development and in vivo application of optical and opto-acoustic methods for probing physiological and molecular events in tissues.
Poster Sessions
Monday 15 June, and Tuesday 16 June, 15.00–16.30
Foyer ICM, Ground Floor, Congress Centre

Each session will represent a different set of posters. See pages 20-23 for the Monday Poster Session abstracts and pages 33-36 for the Tuesday Poster Session abstracts.

In addition to the poster sessions, several poster presenters from selected conferences will give an oral preview of their posters. Poster previews will consist of brief oral presentations accompanied by one slide. See pages 17-18 for information on the posters included in the preview sessions.

Poster Preview Schedule

<table>
<thead>
<tr>
<th>Time</th>
<th>Session</th>
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<tbody>
<tr>
<td>9.30–10.00</td>
<td>Diffuse Optical Imaging Poster Preview, Room B0.R2, Ground Floor, Congress Centre Hall B0</td>
</tr>
<tr>
<td>13.30–15.00</td>
<td>Optical Coherence Tomography and Coherence Techniques Poster Preview, Room 5, Ground Floor, Congress Centre</td>
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</tbody>
</table>

E-Posters
Poster authors were given the opportunity to post their presentations for viewing at “e-poster terminals” throughout the week. The e-poster terminals are located in the ICM near the session rooms.

Joint ECBO-CLEO/Europe Session, Hot Topics: Molecules to Metabolism
Tuesday 16 June, 16.30–18.30
Room 5, Ground Floor, Congress Centre
Presiders: Brian Pogue; Dartmouth College, USA, and Kishan Dholakia; Univ. of St. Andrews, UK

16.30     Dynamics of DNA-Based Molecular Motors Measured with 1-bp Resolution, Thomas T. Perkins; JILA/NIST and Univ. of Colorado at Boulder, USA

17.00     Good Shape Photolysis, Valentina Emiliani; Univ. Paris Descartes, France

17.30     State-of-the-Art and Future of Ultrahigh Speed OCT, Robert Huber; Ludwig-Maximilians-Univ. München, Germany

18.00     Maintaining Health: Optical Spectroscopy for Assessment of Metabolic Tissue Aging, Lothar Lilge; Univ. Health Network, PMH/Ontario Cancer Inst., Canada

Conference Reception
Wednesday 17 June, 19.30–21.00
Königlicher Hirschgarten, Hirschgarten 1, 80639 München

All ECBO registrants are invited to participate in this reception at the Königlicher Hirschgarten in Munich.

Guests of registered attendees may attend by purchasing tickets for €70 before 12.00 on Monday 15 June, at the registration desk.

Directions to Conference Reception from ICM
From the ICM:
Head north 0.3km on Olof-Palme-Straße toward Am Messesee
Continue on An der Point for 0.2km
Slight right to merge onto A94 toward Munich for 5.2km
Continue on Prinzregentenstraße for 0.7km
Turn right at B2R/Richard-Strauss-Straße for 8.7km
Continue to follow B2R
Continue on Georg-Brauchle-Ring (signs for A8/Stuttgart) for 1.8km
Continue on Wintrichring for 1.9km
Slight right at Menzinger Str. for 20m
Turn left to stay on Menzinger Str. for 0.7km
Continue on Notburgastraße for 0.3km
Slight left at Romanplatz for 0.2km
Slight right at Guntherstraße for 0.5km
Turn left at Königbauerstraße for 15m

Königlicher Hirschgarten,
Hirschgarten 1, 80639 München
Telefon: 089-17 25 91
World of Photonics Highlights

Congress Programs

All ECBO registrants have access to the various congress programs co-located within the ICM. These programs include:

- CLEO/Europe-EQEC
- Lasers in Manufacturing (LiM) 2009
- Optical Metrology 2009
- Frontiers in Electronic Imaging, Manufacturing of Optical Components
- Medical Laser Applications

Full program information is available in the congress guide provided to all attendees in their registration packets.

Medical Laser Applications Exhibition
Sunday 14 June–Monday 15 June, 8.30–18.00
Ground Floor, Congress Centre Hall B0

For the first time the trade show has a separate exhibition that focuses on the subject of biophotonics. Research institutes, developers and manufacturers of optical and photonic methods and processes can provide insights into their biophotonic technologies within the scope of a shared stand or on an individual stand. The broad-based areas of application include dental medicine, dermatology and urology, molecular diagnostics, innovative drug delivery technologies, waterway monitoring and drinking water treatment as well as food and animal feed production. To complement this, the Medical Laser Applications conference will provide expert knowledge in a concise manner. Interdisciplinary workshops entitled Visions for future diagnostics round off the extensive fringe program of LASER 2009 World of Photonics in this field.

World of Photonics Opening and Plenary Session
Monday 15 June, 9.30–11.00
Room 1, Ground Floor/1st Floor, Congress Centre

9.30 World of Photonics Congress Opening Session
Welcome

Keynote: European Commissioner Viviane Reding

10.15 Opening Plenary Talk, Progress in Ultrafast Optics, Erich P. Ippen; Massachusetts Inst. of Technology, USA

LASER World of PHOTONICS Trade Fair
Monday 15 June–Thursday 18 June
Munich Trade Fair Centre

Make sure to visit the number 1 laser and photonics trade fair! Market players from all segments of the photonics industry and scientists meet at the number 1 laser and photonics gathering. Its consistent orientation to actual practice is what makes the difference. No other exhibition presents technology in direct combination with industrial applications for various branches of industry and application sectors—in other words, as “light at work.”

Trade Fair Hours

<table>
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<th>Day</th>
<th>Hours</th>
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</thead>
<tbody>
<tr>
<td>Monday 15 June</td>
<td>9.00–17.00</td>
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<td>Tuesday 16 June</td>
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<td>Wednesday 17 June</td>
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<tr>
<td>Thursday 18 June</td>
<td>9.00–16.00</td>
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</tbody>
</table>

LASER World of Photonics Get-Together Reception
Monday 15 June, 17.30–18.30
Foyer, Ground Floor, Congress Center

Join all Congress participants at this reception.

Herbert Walther Award Session
Tuesday 16 June, 12.30–13.30
Room 1, Ground Floor/1st Floor, Congress Centre

Established in 2007, the Herbert Walther Award honors Professor Herbert Walther for the seminal influence of his path-breaking innovations in quantum optics and atomic physics, and for his wide-ranging contributions to the international scientific community. The Award is jointly made by Deutsche Physikalische Gesellschaft (DPG) and The Optical Society (OSA) and recognizes distinguished contributions in quantum optics and atomic physics as well as leadership in the international scientific community.

The first award will be presented to David J. Wineland of the National Institute of Standards and Technology (NIST) Time and Frequency Division, Boulder, Colorado, USA, for his seminal contributions to quantum information physics and metrology, and the development of trapped ion techniques for applications to basic quantum phenomena, plasma physics, and optical clocks.

The award presentation will be followed by an address from Dr. Wineland:

Quantum Control Experiments with Trapped Atomic Ions*

Confined atomic ions manipulated by laser beams provide a useful system in which to study quantum state control and measurement. Quantum control is an essential part of the relatively new field of quantum information processing (QIP), and trapped ions have been employed to demonstrate some of its basic features. Today’s progress in this area owes much to Prof. Herbert Walther’s extensive accomplishments with cavity-QED and trapped ions. This talk will focus on NIST’s work on trapped-ion QIP, with applications to metrology including atomic clocks.

*NIST work supported by IARPA, ONR, and the NIST Quantum Information Program.
General Information

Registration
ICM - Entry Lobby

The Congress registration fee includes entry into all the conferences that are part of the Congress as well as the LASER World of PHOTONICS Trade Fair.

Registration Hours

<table>
<thead>
<tr>
<th>Day</th>
<th>Hours</th>
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</thead>
<tbody>
<tr>
<td>Sunday 14 June</td>
<td>11.00–17.00</td>
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<tr>
<td>Monday 15 June</td>
<td>8.00–17.00</td>
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<tr>
<td>Tuesday 16 June</td>
<td>8.00–17.00</td>
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<tr>
<td>Wednesday 17 June</td>
<td>8.00–17.00</td>
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<tr>
<td>Thursday 18 June</td>
<td>8.00–17.00</td>
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Coffee Breaks
Ground Level Foyer (unless otherwise noted)

<table>
<thead>
<tr>
<th>Day</th>
<th>Times</th>
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<tr>
<td>Sunday 14 June</td>
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<td>Monday 15 June</td>
<td>16.00–16.30</td>
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<td>Tuesday 16 June</td>
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<td>Wednesday 17 June</td>
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<tr>
<td>Thursday 18 June</td>
<td>10.00–10.30 and 16.00–16.30</td>
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</table>

Travel Information

How to Reach the ICM — International Congress Centre München

At Munich Central Station take the underground U2. The journey to the trade fair grounds takes about 17 minutes. Please refer to the Laser 2009 website for more detailed information, http://www.world-of-photonics.net/en/laser/visitors/Travel/Anreise/MVG.

Transportation from Munich City Centre to ICM — International Congress Centre München

The ICM is about 30-45 minutes from downtown Munich.

Free Public Transport

All registered conference attendees are eligible to use all Munich City Transport (MW - urban railway, underground, trams, and buses) and Laser Airport shuttle by presenting a corresponding ticket together with a conference entrance pass. Passes will be provided on-site with registration. For the most current information about all transport options, schedules and prices, please visit: http://www.world-of-photonics.net/en/laser/visitors/Travel/Anreise/MVG.

Wireless Connectivity

Free wireless connectivity will be provided in the Congress Centre from Sunday to Friday for the convenience of the Congress participants.

Proceedings of SPIE

European Conferences on Biomedical Optics (ECBO)

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<table>
<thead>
<tr>
<th>Vol#</th>
<th>Title (Editor)</th>
<th>Prepublication Price</th>
</tr>
</thead>
<tbody>
<tr>
<td>7367</td>
<td>Advanced Microscopy Techniques (P. J. Campagnola / E. H. Stelzer / G. von Bally)</td>
<td>$90</td>
</tr>
<tr>
<td>7368</td>
<td>Clinical and Biomedical Spectroscopy (I. Georgakoudi / J. Popp / K. Svanberg)</td>
<td>$105</td>
</tr>
<tr>
<td>7369</td>
<td>Diffuse Optical Imaging II (R. Cubeddu / A. H. Hielscher)</td>
<td>$90</td>
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<tr>
<td>7370</td>
<td>Molecular Imaging II (K. Licha / C. P. Lin)</td>
<td>$45</td>
</tr>
<tr>
<td>7371</td>
<td>Novel Optical Instrumentation for Biomedical Applications IV (C. D. Depeursinge / A. Vitkin)</td>
<td>$90</td>
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<tr>
<td>7372</td>
<td>Optical Coherence Tomography and Coherence Techniques IV (P. E. Andersen / B. E. Bouma)</td>
<td>$105</td>
</tr>
<tr>
<td>7373</td>
<td>Therapeutic Laser Applications and Laser-Tissue Interactions IV (R. Sroka / L. D. Lilge)</td>
<td>$100</td>
</tr>
</tbody>
</table>
Explanation of Session Codes

The first element of the code designates the day of the week (Sunday=Su, Monday=M, Tuesday=Tu, Wednesday=W, Thursday=Th), unless the session is joint, in which case the day of the week element will be preceded by “J” (JTuA=joint session on Tuesday). The next element indicates the order of the session within the particular day. Each day begins with the letter A and continues alphabetically. The number on the end of the presentation code signals the position of the talk within the session (first, second, third, etc.). For example, a presentation coded MB4 indicates that this paper is being presented on Monday (M) during the second session (B), and is the fourth paper (4) presented in that session.

Agenda of Sessions — Sunday 14 June

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<thead>
<tr>
<th>Time</th>
<th>Room 4a, Ground Floor, Congress Centre</th>
<th>Room 5, Ground Floor, Congress Centre</th>
<th>Room 11, 1st Floor, Congress Centre</th>
<th>Room 12, 1st Floor, Congress Centre</th>
<th>Room 21, 2nd Floor, Congress Centre</th>
<th>Room B0.R2, Ground Floor, Congress Centre Hall B0</th>
</tr>
</thead>
<tbody>
<tr>
<td>11.00–17.00</td>
<td>Registration Open, ICM—Entry Lobby</td>
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<tr>
<td>13.00–15.00</td>
<td>SuA • ECBO Plenary Session: Bridging the Ocean of Biomedical Optics, Room 5, Ground Floor, Congress Centre</td>
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<tr>
<td>15.00–15.30</td>
<td>Coffee Break, Ground Floor, Congress Centre</td>
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<tr>
<td>15.30–17.00</td>
<td>SuB • Endoscopic Applications of OCT</td>
<td>SuC • Advanced Imaging and Spectroscopy I</td>
<td>SuD • Brain Imaging and Spectroscopy I</td>
<td>SuE • Confocal/3-D Microscopy</td>
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<tr>
<td>17.00–17.30</td>
<td>Coffee Break, Ground Floor, Congress Centre</td>
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<tr>
<td>17.30–18.30</td>
<td>SuF • Ophthalmic OCT I (ends at 18.45)</td>
<td>SuG • Advanced Imaging and Spectroscopy II</td>
<td>SuH • Brain Imaging and Spectroscopy II</td>
<td>SuI • Photophysics I</td>
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</tbody>
</table>

Key to Conference Abbreviations

- AMT— Advanced Microscopy Techniques
- CBS— Clinical and Biomedical Spectroscopy
- DOI— Diffuse Optical Imaging
- MI— Molecular Imaging
- NOIBA— Novel Optical Instrumentation for Biomedical Applications
- OCT— Optical Coherence Tomography and Coherence Techniques
- TLA— Therapeutic Laser Applications and Laser-Tissue Interactions
## Agenda of Sessions — Monday 15 June

<table>
<thead>
<tr>
<th>Time</th>
<th>Event</th>
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<td>8.00–17.00</td>
<td>Registration Open, ICM—Entry Lobby</td>
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<tr>
<td>9.00–10.00</td>
<td>MI • Novel Developments towards the Clinics</td>
</tr>
<tr>
<td>9.00–10.00</td>
<td>OCT • Dermatological OCT</td>
</tr>
<tr>
<td>9.00–10.00</td>
<td>AMT • Photophysiology II</td>
</tr>
<tr>
<td>9.00–10.00</td>
<td>DOI • Theoretical Analysis and Modeling I and Poster Preview</td>
</tr>
<tr>
<td>9.00–17.00</td>
<td>LASER World of PHOTONICS Trade Fair, Munich Trade Fair Centre</td>
</tr>
<tr>
<td>9.30–11.00</td>
<td>World of Photonics Opening and Plenary Session, Room 1, Ground Floor/1st Floor, Congress Centre</td>
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<tr>
<td>11.00–13.30</td>
<td>Lunch Break <em>(on your own)</em></td>
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<tr>
<td>13.30–15.00</td>
<td>MI • Techniques for Live Cell Imaging</td>
</tr>
<tr>
<td>13.30–15.00</td>
<td>OCT • Optical Coherence Tomography and Coherence Techniques Poster Preview</td>
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<tr>
<td>15.00–16.30</td>
<td>NOIBA • Tissue and Specimen Imaging I</td>
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<tr>
<td>15.00–16.30</td>
<td>AMT • Optical Sectioning</td>
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<tr>
<td>15.00–16.30</td>
<td>DOI • Theoretical Analysis and Modeling II</td>
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<tr>
<td>16.00–16.30</td>
<td>MJ • Joint MI/DOI/OCT/AMT Poster Session, Foyer ICM, Ground Floor, Congress Centre</td>
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<td>16.00–16.30</td>
<td>Coffee Break, Exhibition Hall</td>
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<tr>
<td>16.30–18.30</td>
<td>MI • New Probes and Contrast Mechanisms for in vivo Imaging</td>
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<tr>
<td>16.30–18.30</td>
<td>OCT • Pre-Clinical and Clinical Apps I</td>
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<tr>
<td>16.30–18.30</td>
<td>NOIBA • Tissue and Specimen Imaging II</td>
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<tr>
<td>16.30–18.30</td>
<td>AMT • NLO I—Applications</td>
</tr>
<tr>
<td>16.30–18.30</td>
<td>DOI • Imaging of Breast and Other Organs</td>
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<tr>
<td>17.30–18.30</td>
<td>LASER World of Photonics Get-Together Reception, Foyer, Ground Floor, Congress Centre</td>
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</tbody>
</table>

### Key to Conference Abbreviations

- **AMT** — Advanced Microscopy Techniques
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### Agenda of Sessions — Tuesday 16 June

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<th>Room 12, 1st Floor, Congress Centre</th>
<th>Room 21, 2nd Floor, Congress Centre</th>
<th>Room B0.R2, Ground Floor, Congress Centre Hall B0</th>
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<tr>
<td>8.00–17.00</td>
<td>Registration Open, <strong>ICM—Entry Lobby</strong></td>
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<tr>
<td>9.00–10.00</td>
<td><strong>OCT</strong> — TuA • Light Sources and OCT Systems</td>
<td><strong>NOIBA</strong> — TuB • Photoacoustic I</td>
<td><strong>AMT</strong> — TuC • NLO II— Methods</td>
<td><strong>DOI</strong> — TuD • Experimental Techniques I</td>
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<td>9.00–17.00</td>
<td><strong>LASER World of PHOTONICS Trade Fair</strong>, Munich Trade Fair Centre</td>
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<td>10.00–10.30</td>
<td><strong>Coffee Break</strong>, Exhibition Hall</td>
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<tr>
<td>10.30–12.30</td>
<td><strong>OCT</strong> — TuE • OCT Signal and Image Processing</td>
<td><strong>NOIBA</strong> — TuF • Photoacoustic II</td>
<td><strong>AMT</strong> — TuG • Localization and High Precision</td>
<td><strong>CBS</strong> — TuH • Ophthalmology/Cardiology</td>
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<tr>
<td>12.30–13.30</td>
<td><strong>Herbert Walther Award Session</strong>, Room 1, Ground Floor/1st Floor, Congress Centre</td>
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<td>13.30–15.00</td>
<td><strong>OCT</strong> — TuI • Functional Imaging</td>
<td><strong>NOIBA</strong> — TuJ • Lab on a Chip</td>
<td><strong>AMT</strong> — TuK • Holographic Methods</td>
<td><strong>DOI</strong> — TuL • Experimental Techniques II</td>
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<td>15.00–16.30</td>
<td><strong>TuM • Joint CBS/TLA/NOIBA Poster Session</strong>, Foyer ICM, Ground Floor, Congress Centre</td>
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<td>16.00–16.30</td>
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<tr>
<td>16.30–18.30</td>
<td><strong>JTuA • Joint ECBO-CLEO/Europe Session, Hot Topics: Molecules to Metabolism</strong>, Room 5, Ground Floor, Congress Centre</td>
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<tr>
<td>9.00–10.00</td>
<td><strong>OCT—</strong> WA • Functional OCT in Ophthalmology</td>
<td><strong>TLA—</strong> WB • Cellular Surgery I</td>
<td><strong>CBS—</strong> WC • Skin Diagnostics I</td>
<td><strong>CBS—</strong> WC • Skin Diagnostics I</td>
<td><strong>CBS—</strong> WC • Skin Diagnostics I</td>
<td><strong>CBS—</strong> WC • Skin Diagnostics I</td>
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<tr>
<td>9.00–17.00</td>
<td><strong>LASER World of PHOTONICS Trade Fair, Munich Trade Fair Centre</strong></td>
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<tr>
<td>10.00–10.30</td>
<td><strong>OCT—</strong> WD • Pre-Clinical and Clinical Apps II</td>
<td><strong>TLA—</strong> WE • Cellular Surgery II</td>
<td><strong>CBS—</strong> WG • Skin Diagnostics II</td>
<td><strong>CBS—</strong> WG • Skin Diagnostics II</td>
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<tr>
<td>10.30–12.30</td>
<td><strong>OCT—</strong> WH • Novel OCT Technology</td>
<td><strong>TLA—</strong> WI • Ophthalmology</td>
<td><strong>CBS—</strong> WK • Biospectroscopy and Point-of-Care Diagnostics I</td>
<td><strong>CBS—</strong> WK • Biospectroscopy and Point-of-Care Diagnostics I</td>
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<td>12.30–14.00</td>
<td><strong>Lunch Break (on your own)</strong></td>
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<tr>
<td>14.00–16.00</td>
<td><strong>OCT—</strong> WL • Ophthalmic OCT II</td>
<td><strong>TLA—</strong> WM • Novel Approaches (ends at 18.15)</td>
<td><strong>CBS—</strong> WN • Biospectroscopy and Point-of-Care Diagnostics II (ends at 18.15)</td>
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<td><strong>OCT—</strong></td>
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<td>19.30–21.00</td>
<td>Conference Reception, Königlicher Hirschgarten, Hirschgarten 1, 80639 München</td>
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<tr>
<td>9.00–10.00</td>
<td>—CBS— ThA • Minimally Invasive Diagnostics I —TLA— ThB • Photodynamic Therapy I</td>
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<tr>
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<td>10.30–12.30</td>
<td>—CBS— ThC • Minimally Invasive Diagnostics II —TLA— ThD • Photodynamic Therapy II</td>
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<td>12.30–14.00</td>
<td>Lunch Break (on your own)</td>
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<tr>
<td>14.00–16.00</td>
<td>—CBS— ThE • Clinical and Preclinical Tissue Characterization I —TLA— ThF • Modeling</td>
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<td>Coffee Break, Exhibition Hall</td>
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<tr>
<td>16.30–18.30</td>
<td>—CBS— ThG • Clinical and Preclinical Tissue Characterization II —TLA— ThH • Clinical Laser Therapy</td>
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New Techniques for Out-of-Focus Background Rejection, Jerome Mertz; Boston Univ., USA. The problem of out-of-focus background is ubiquitous in fluorescence microscopy. The most common strategy to reject out-of-focus background requires the use of beam scanning. Highly successful examples are confocal microscopy and two-photon excited fluorescence microscopy. Nevertheless, out-of-focus background remains a problem with these techniques when imaging deep in thick tissue. Recently, alternative strategies have been examined that do not require beam scanning. These include structured illumination microscopy, programmable array microscopy, etc., that can be operated as add-ons to standard widefield microscopes. I will concentrate mostly on our own work to address the problem of out-of-focus background rejection. In particular, I will describe a novel hybrid technique that requires two raw images. The first image is a standard image that contains both in-focus and out-of-focus components. The second is a purposefully “noisy” image that enables an identification of the out-of-focus component, and hence a rejection of background from the first image. Variations on this simple two-shot hybrid imaging scheme are applied to standard widefield microscopy, endomicroscopy, and two-photon excited fluorescence microscopy.

Jerome Mertz received an A.B. in physics from Princeton University in 1984, and a Ph.D. in quantum optics from University of California at Santa Barbara and the University of Paris VI in 1991. Following postdoctoral studies at the University of Konstanz, Germany (Jürgen Mlynek group) and at Cornell University (Watt Webb group), he obtained a lecturer position at the École Supérieure de Physique et de Chimie Industrielle in Paris, where he became a CNRS research director. He is currently an associate professor of biomedical engineering at Boston University. His interests are in the development and applications of novel optical microscopy techniques for biological imaging. He is also author of a textbook entitled “Introduction to Optical Microscopy.”

The Emerging Era of High-Performance Mesoscopic and Macroscopic Photonic Imaging, Vasilis Ntziachristos; Technical Univ. of Munich and the Inst. of Biological and Medical Imaging (IBMI), Germany. With post-genome biology and medicine facing redefined challenges associated with the understanding of dynamic interactions of cellular processes, at different system levels, imaging can play an increasingly important role in dissecting tissue function in vivo. Optical microscopy has been a fundamental tool of biological discovery for more than three centuries. Yet, supported by evolving optical reporters that tag cellular processes and interactions in vivo, new photonic methods are constantly evolving to enhance the ability of longitudinal visualization of cellular mechanisms in unperturbed environments. Of particular interest are technologies that for the first time offer high-resolution imaging beyond the penetration limits of established microscopy methods. This newfound ability comes with exciting possibilities for discovery in established and emerging fields of biology and medicine, including systems biology and functional –omics interrogations in adult biological organisms, small animals and potentially select human applications. Promising fluorescence molecular tomography (FMT) and multi-spectral opto-acoustic tomography (MSOT) methods with the ability to image tissue fluorochromes across the mesoscopic and macroscopic regimes are presented. These methods are shown capable to offer a highly versatile platform for basic discovery, drug discovery and pre-clinical and clinical imaging applications. Key characteristics associated with different imaging implementations are described and applications from imaging cancer, inflammation, stem cells and developing adult (non-transparent) zebrafish are showcased. Collectively these methods have the potential to become the method of choice in biological and select medical fields.

Vasilis Ntziachristos, M.Sc., Ph.D, is a Professor and Chair for Biological Imaging at the Technische Universität München and the Director of the Institute for Biological and Medical Imaging at the Helmholtz Zentrum München. Prior to this appointment he has been faculty at Harvard University and the Massachusetts General Hospital. He received his Master’s and Doctorate degrees from the bioengineering department of the University of Pennsylvania and the Diploma on Electrical Engineering from the Aristotle University of Thessaloniki, Greece. Professor Ntziachristos serves on several bio-optics and imaging committees and editorial boards, he was named one of the world’s top innovators by the Massachusetts Institute of Technology (MIT) Technology Review in 2004 and he received in 2008 an ERC Advanced Investigator Award. His major research interests involve the development and in vivo application of optical and opto-acoustic methods for probing physiological and molecular events in tissues.
Sunday 14 June

**Room 5, Ground Floor, Congress Centre**

**15.30–17.00**

**SuB • Endoscopic Applications of OCT**

Peter E. Andersen; Technical Univ. of Denmark, Denmark, Presider

**SuB1 • 15.30**

Invited


OCT enables accurate diagnosis of esophageal pathology relevant to Barrett’s esophagus. We have developed and tested in vivo an OCT guided biopsy platform enabling comprehensive microscopy with laser marking of tissue regions for guiding biopsy.

**SuB2 • 16.00**

Novel Design of an OCT Micro-Probe with Distal Interferometer, Tim Bonin, Eva M. Lankenau, Bjørn Martenssen, Geroen Ettmann; Inst. of Biomedical Optics, Univ. of Luebeck, Germany.

We propose a new design for a GRIN-lens interferometer which works at the tip of a small fiber-based endoscopic probe. A distal interferometer avoids artifacts in the OCT signal caused by fiber movements and birefringence.

**Room 11, 1st Floor, Congress Centre**

**15.30–17.00**

**SuC • Advanced Imaging and Spectroscopy I**

Alex Vitkin; Ontario Cancer Inst., Canada, Presider

**SuC1 • 15.30**

Invited

**Three-Dimensional Speckle Holography of Cellular Motion inside Tissue**, David D. Nolte, John Turek, Purdue Univ., USA.

Three-dimensional imaging assays of anti-cancer drugs applied to tissues are performed using motility contrast imaging (MCI), a speckle holographic imaging technique that detects sub-cellular motion as a fully endogenous imaging contrast agent.

**Room 12, 1st Floor, Congress Centre**

**15.30–17.00**

**SuD • Brain Imaging and Spectroscopy I**

Rinaldo Cubeddu; Politecnico di Milano, Italy, Presider

**SuD1 • 15.30**

Concurrent fMRI and Time-Domain NIRS to Study Functional Activation in Human Brain, Evgeniya Krilova1, Alexander Klimov2, Heidrun Wobrütz3, Ruediger Bruehl4, David Baas5, Rainer Macdonald6, Bernd Ittermann7; ‘Free Univ. of Berlin, Germany; ‘Physikalisch-Technische Bundesanstalt, Germany; ‘Harvard Medical School, USA.

We present a setup combining time-domain near-infrared spectroscopy and functional magnetic resonance imaging, the strategy to compare the data of both modalities, and first results obtained on activation processes in an adult human brain.

**SuD2 • 15.45**

Intra- and Extra-Cortical Activation in a Working Memory Task Assessed by Time-Resolved fNIRS, Erika Molteni1, Anna M. Bianchi1, Giuseppe Baelli2, Matteo Caffini2, Davide Contini2, Lorenzo Spinelli3, Alessandro Torricelli2, Sergio Cerutti4, Rinaldo Cubeddu5,6,7; ‘IT Unit, Bioengineering Dept., Politecnico di Milano, Italy.

We developed an intracoronary catheter to facilitate plaque rupture. In the current study, we have developed an intracoronary catheter to facilitate plaque rupture. In the current study, we have evaluated the intra- and extra-cortical vascular response correlated to neural activity within a working memory ‘in-back’ task in a population of healthy volunteers by means of time-resolved near-infrared functional spectroscopy and generalized linear models.

**SuD3 • 16.00**

Resting-State Functional Connectivity in Human Brain with Diffuse Optical Tomography, Brian R. White, Abraham Z. Snyder, Alexander L. Cohen, Steven V. Petersen, Marcus E. Raichle, Bradley L. Schlaggar, Joseph P. Cohen; Washington Univ. in St. Louis, USA.

We evaluated the intra- and extra-cortical vascular response correlated to neural activity within a working memory ‘in-back’ task in a population of healthy volunteers by means of time-resolved near-infrared functional spectroscopy and generalized linear models.

**Room 21, 2nd Floor, Congress Centre**

**15.30–17.00**

**SuE • Confocal/3-D Microscopy**

Paul Campagnola; Univ. of Connecticut Health Ctr., USA, Presider

**SuE1 • 15.30**

Confocal Microscope with Enhanced Lateral Resolution Using Engineered Illumination Pupils, Bosanta R. Boruah1, Gillavati Unni, India.

Lateral resolution of a confocal microscope can be enhanced significantly by using two engineered illumination pupils. This paper describes the proposed resolution enhancement technique and presents simulation and experimental results.

**SuE2 • 15.45**

Focal Modulation for Improved Imaging Depth in Fluorescence Microscopy, Nanyang Chen1, Choe Hwee Wong1, Colin Sheppard2, Gerald Udup1, Martin Wau1; ‘Natl. Univ. of Singapore, Singapore, ‘Inst. of Medical Biology, A*STAR, Singapore, ‘Bioinformatics Inst., A*STAR, Singapore.

We report a novel microscopy system for fluorescence imaging of thick biological tissues. Refraction limited spatial resolution is achieved at an imaging depth greater than 0.5 mm.

**SuE3 • 16.00**

Investigation of Retinal Micro-Structure by Adaptive Optics Scanning Laser Ophthalmoscope with 1-Micrometer Wavelength Probe, Yoshitsuki Yasuno1, Kazuhito Kurokawa2, Shuichi Makita2, Masahiro Miura1, Keisuke Kawanami1, Fumiki Okamoto1, Tetsuro Oshika1, ‘Computational Optics Group, Univ. of Tsukuba, Japan, ‘Computational Optics and Ophthalmology Group, Japan, ‘Dept. of Ophthalmology, Inst. of Clinical Medicine, Univ. of Tsukuba, Japan.

Adaptive optics scanning laser ophthalmoscope with 1-micrometer band probe is presented. The residual wavefront error was less than 0.02 with in vivo human eye. Photoreceptor cones are visualized at the eccentricity up to 10 degrees.
Atherosclerotic Plaque Composition Imaging with Intravascular OCT, Gis van Soest1, Thadé P. M. Goderie2, Nieves Gonzalo1, Sander R. van Noord3, Evelyn Röger1, Patrick W. Serruy2, Anton E W van der Steen3,4; Erasmus Medical Ctr., The Netherlands, 2Interuniversity Cardiology Inst. of the Netherlands, The Netherlands. Atherosclerotic plaque composition may be identified by its optical properties. We derive the optical extinction coefficient from intravascular OCT data, and demonstrate its use for characterization of tissue type in human coronary artery plaques.

Towards the Development of a Light Scattering Based in vivo Flow Cytometer, Cheryy Greiner, Martin Hunter, Irene Georgakoudi; Tufts Univ., USA. We report on the design of a light scattering based in vivo flow cytometer. We demonstrate its capability to differentiate between red and white blood cells using in vitro microfluidics models of blood circulation.

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Optical Tomography by Digital Holographic Microscopy, Nicolas Pavillon, Jonas Könö, Florian Charrue, Christian Depeursinge; École Polytechnique Fédérale de Lausanne, Switzerland. Three-dimensional imaging coupled with quantitative phase signal gives rise to 3-D refractive index reconstruction, leading to interesting perspectives for cell observation. We present results of tomographic measurements, taken in the framework of digital holography.

Combining Near-Infrared Spectroscopy with Electrocencephalography and Repetitive Transcranial Magnetic Stimulation, Tiina Näsitalo1,2, Kalle Kotilahti1, Hanna Makijärvi1, Ilkka Niittyvirta1, Perkka Meriläinen1; Dept. of Biomedical Engineering and Computational Science, Helsinki Univ. of Technology, Finland, 2BioMed Lab, Helsinki Univ. Central Hospital, Finland. We have combined near-infrared spectroscopy with electrocencephalography to record simultaneously hemodynamic responses and evoked potentials, and with transcranial magnetic stimulation (TMS) to investigate hemodynamic responses to repetitive TMS.

Optical Coherence Tomography and Coherence Techniques

Optical Coherence Tomography with Intravascular OCT, Gis van Soest1, Thadé P. M. Goderie2, Nieves Gonzalo1, Sander R. van Noord3, Evelyn Röger1, Patrick W. Serruy2, Anton E W van der Steen3,4; Erasmus Medical Ctr., The Netherlands, 2Interuniversity Cardiology Inst. of the Netherlands, The Netherlands. Atherosclerotic plaque composition may be identified by its optical properties. We derive the optical extinction coefficient from intravascular OCT data, and demonstrate its use for characterization of tissue type in human coronary artery plaques.

High-Seed Polarization Sensitive Optical Frequency Domain Imaging System for Clinical Cardiovascular Imaging, Wang-Yuh Oh, Benjamin J. Valak, Ailin Shikhov, Guillermo J. Tournay, Brett E. Bouma; Massachusetts General Hospital, Harvard Medical School, USA. We have developed a high-speed wavelength-swept light source that supports optical frequency domain imaging (OFDI) with an A-line rate of up to 400 kHz and demonstrate birefringence strength imaging through a 0.8mm diameter intracoronary catheter.

Optical Tomography by Digital Holographic Microscopy, Nicolas Pavillon, Jonas Könö, Florian Charrue, Christian Depeursinge; École Polytechnique Fédérale de Lausanne, Switzerland. Three-dimensional imaging coupled with quantitative phase signal gives rise to 3-D refractive index reconstruction, leading to interesting perspectives for cell observation. We present results of tomographic measurements, taken in the framework of digital holography.

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SuF1 • 17.30
Quantitative Assessment of Retinal Disorders Using Polarization-Sensitive Optical Coherence Tomography, Bernhard Baumgartner1, Michael Pircher1, Erich Götzing2, Harald Sattmann1, Johannes Junghofer1, Christopher Schütz1, Christian Ahlers1, Wolfgang Gützow1, Ursula Schmidt-Erfurkt1, Christoph K. Hitzenberger1; 1Medical Univ. of Vienna, Austria, 2General Hospital and retinal nerve fiber bundles and capillaries.

SuG1 • 17.30
A Novel Multispectral Imaging Method for Molecular Imaging, George Themelis1, Athanasios Sarantopoulos1, Vassilis Ntziachristos1; 1Technical Univ. of Munich and the Inst. of Biological and Medical Imaging (IBMI) and Helmholtz Ctr. Munich, Germany. A new and highly potent method for multispectral imaging that allows simultaneous imaging of 12 application-defined spectral bands using standard color CCD cameras and multiple band pass filters is presented.

SuH1 • 17.30
Corneal and Suprachoroidal Signals During Motor Activation of the Adult Brain from Time-Resolved Near-Infrared Spectroscopy, Heidrun Wabnitz1,2, Alexander Jelzow1, Rainer Uhlig3, Heidrun Wabnitz1, Rainer Macdonald1; 1Physikalisch-Technische Bundesanstalt, Germany, 2Klinik für Neurologie, Charité - Univ.-Medizin Berlin, Germany, 3Klinik für Neurologie, Vivantes Auguste-Viktoria-Klinikum, Germany. In this group studies on motor activation in healthy subjects, time-resolved diffuse reflectance was recorded together with broadband magnetoencephalography and peripheral physiological signals. The temporal patterns of the corresponding responses to stimulation were analyzed.

SuG2 • 17.45
Fiber Bundle Based Fluorescence Tomography System for Human Breast Imaging, Yuating Lin1, Orhan Nacioglu1, Gaulten Gulasen1; 1Ctf. for Functional Onco-Imaging, Univ. of California at Irvine, USA. A PMT single detector unit is built. We demonstrated that fluorescence concentration and lifetime can be well recovered for a small object embedded in a breast-sized phantom when the fiber bundle detectors are utilized.

SuG3 • 18.00
Time-of-Flight Spectroscopy up to 1400 nm for Analysis of Turbid Media, Dmitry Khodygin1, Tomas Svensson1, Erik Alstrwm1, Stefan Anderson-Engels1; Dept. of Physics, Lund Univ., Sweden. A system capable of performing near infrared time-of-flight spectroscopy (TOFS) up to 1400 nm for analysis of turbid materials is described, and first results are reported.

SuG4 • 18.15
Time-Resolved Optical Stratigraphy in Turbid Media, Lorenzo Spinelli1, Antonio Pifferi1,2,3,4, Davide Contini1, Rinaldo Cubeddu1, Lauro Vannozzi1, Thais Geissbuehler1, Thiemo Spielmann2, Aurelie Fromes1,2, Maria Marzetti3,1, Jaro Ricka4, Martin Frenz1,3, Dominik Marti1, Jaro Ricka, Martin Frenz1; 1Univ. of Bern, Switzerland.

SuI3 • 18.00
Monitoring Oxygen Consumption during Cell Contraction by Triplet State Imaging, Matthias Geissbuehler1, Thiemo Spielmann1, Aurélie Fromes1, Maria Marzetti3, Jaro Ricka4, Martin Frenz1; 1Univ. of Bern, Switzerland.

SuI4 • 18.15
Intraoperative Monitoring of the Cerebral Oxygenation during Carotid Endarterectomy Using Time-Resolved Brain Imager, Michal Kacprzak1, Adam Lieber1, Piotr Sadowski1, Roman Maniewski2, Walerian Stackiwicz1, Grzegorz Miadycki1, Andzej Gabrusiewicz2; 1Inst. of Bio-physics in Lodz, Poland, 2Klinik für Neurologie, Charité - Univ.-Medizin Berlin, Germany. Imaging of changes of the oxy- and deoxyhemoglobin in brain cortex was carried out during carotid endarterectomy. Clear differences in oxygenation dynamics were observed.
MA1 • 9.00
Multi-Modality Assisted Photonic Imaging of Cancer, Marta Zielinska1, George Themelis1, Ralf B. Schulz1, Axel Weber2, Markus Schweiger2, Vasili Ntziafristhou1; 1Inst. for Biological and Medical Imaging and Chair for Biological Imaging, Technische Univ. München, Germany, 2Dept. of Nuclear Medicine, G. Klinikum, M. van der Auwera, Inst. f. Technische Univ. München, Germany. In vivo cancer imaging benefits by multimodal approaches visualizing disease at different scales. We describe the application of peri-operative CT, PET together with intra-operative fluorescence cancer imaging, as an approach that can significantly impact surgical-intervention.

MA2 • 9.15
Multiple Fluorescence Contrast Agents to Enhance the Optical Detection of Oral Neoplasia, Kelsey J. Reschke1, Darren Roblyer1, Richard Schwartz1, Michelle Williams2, Ann Gillenwater2, Rebecca Richards-Kortum1; 1Rice Univ., USA, 2M. D. Anderson Cancer Ctr., USA. Three contrast agents that target molecular or morphological characteristics of cancer were topicaly applied to freshly resected oral lesions. Optical contrast was analyzed with imaging and spectroscopy to evaluate distinction of neoplasia from normal tissue.

MA3 • 9.30
3-D Recontruction of Spatially Resolved Fluorescence Data—A Diagnostics Method, Daniela Strat1, Wolfgang L. Strauss1, Alwin Kienle1; 1Inst. für Lasertechnologien in der Medizin und Meßtechnik an der Univ. Ulm, Germany. We propose a cancer diagnostic method using 3-D reconstruction of fluorescently labeled imaging data. The system was tested with analytical simulations. Phantom measurements will be acquired and compared with the simulations.

MA4 • 9.45
Real-Time Intra-Operative Multispectral Fluorescent Imaging Using Attenuation Correction, George Themelis1, Athanasios Sarantopoulos1, Giorgos V. Katsamanis1, Vasili Ntziafristhou1; 1Inst. for Biological and Medical Imaging (IBMI), Technische Univ. München and Helmholtz Ctr. Mannich, Germany, 2Dept. of Surgery, Biological Imaging Ctr. Groningen, Univ. Medical Ctr. Groningen, The Netherlands. We present a multispectral fluorescent imaging system that implements image correction for tissue optical attenuation, developed for intra-operative surgical imaging. Results demonstrate the performance and utility of the technique over standard fluorescent imaging.

MB1 • 9.00
Invited
Multiple Wavelength Three-Dimensional Optical Coherence Tomography of Human Skin, Anseelh Aley1, Boris Pervazay2, Bernd Hofe3, Sergey Popov4, Wolfgang Drexler5; School of Optometry and Vision Sciences, Cardiff Univ., UK, 6Dept. of Physics, Imperial College London, UK. High-speed (100 A-scans/second) three-dimensional optical coherence tomography at 1060nm and 1300nm with 5-10 μm axial and 10-20 μm transverse resolution is demonstrated to investigate the optimum wavelength region for human skin imaging.

MB2 • 9.30
Analysis of Skin Anisotropy Using Polarization-Sensitive Optical Coherence Tomography, Shingo Sakai1, Masahito Yamamori1, Tatsuki Makita1, Noriaki Nakagawa1, Masayuki Matsumoto2, Yoshiaki Yasuno2; 1Kanebo Cosmetics Inc., Japan, 2Computational Optics Group, Univ. of Twente, Netherlands. From 09.30 until 10.00, selected posters will be previewed. Poster previews are brief oral presentations (approximately 3 minutes) of posters to be presented later in the day.

MB3 • 9.45
Optical Coherence Tomography and Attenuation Coherence Imaging of Skin Cancer, Christian Blum1, Yurina Cse1, Johannes M. van der Broek1, Allard P. Marsk1, Willem L. Van1, Vinoth Subramaniam2; 1Univ. of Twente, The Netherlands, 2FOM, Inst. for Atomic and Molecular Physics. The Netherlands, for Fluorescent proteins are placed at precisely defined distances to a metallic mirror, resulting in a change in the emission lifetime that is used to determine the emission rates, quantum yield and emission oscillator strength.

MC1 • 9.00
Invited
Determination of Fluorescent Protein On-State Emission Rates by Manipulating the Local Density of Photonic States, Christian Blum1, Yurina Cse1, Johannes M. van der Broek1, Allard P. Marsk1, Willem L. Van1, Vinoth Subramaniam2; 1Univ. of Twente, The Netherlands, 2FOM, Inst. for Atomic and Molecular Physics. The Netherlands, for Fluorescent proteins are placed at precisely defined distances to a metallic mirror, resulting in a change in the emission lifetime that is used to determine the emission rates, quantum yield and emission oscillator strength.

MC2 • 9.30
Barium Titanate Nanoparticles Used as Second Harmonic Radiation Imaging Probes for Cell Imaging, Chia-Lung Hsiao1,2, Rachel Grange1, Ye Pu1,2, Demetri Psaltis1,2; 1Ecole Polytechnique Federale de Lausanne, Switzerland, 2Caltech, USA. We present a 3-D no-contact time-resolved fluorescent diffuse optical tomography (FDOT) method that relies on near-infrared scattered and fluorescent photons to image the optical properties and distribution of fluorescent probes in small laboratory animals.

MC3 • 9.45
Dose Limited Fluorescence Microscopy of Living Cells, Herbert Schnackenberger1,2, Michael Wagner1, Petra Weber1, Sarah Schickinger1, Thomas Bruns1, Wolfgang L. Strauss1; 1Inst. for Angewandte Forschung, Hochschule Aalen, Germany, 2Inst. für Lasertechnologien in der Medizin und Meßtechnik, Univ. Ulm, Germany. Light dose reveals to play an important role in fluorescence imaging. We study the behavior of photodynamic killing effects of living cells. Therefore, a microscopic test system for cell viability was established, and corresponding methods were adapted to a compatible dose.
ME1 • 13.30 Invited
High Speed, Automated, Optically Sectioned Fluorescence Lifetime Imaging Multi-Well Plate Reader and Multiplexed FRET Microscope, Clifford Talbot1, James McGinity1, Ewan McGhee1, David Grant1, Sandu Kumar1, Dylan Owen1, Gordon Kennedy1, Ian Munroe1, Wei Zhang1, Tom Bunney1, Tony Magee1, Dan Davis1, Mariuka Kata1, Chris Daniels1, Mark Neil1, Paul Fernie1; Imperial College London, UK, Inst. of Cancer Res., UK. We report two new tools for studying cell signalling networks: a high speed automated optically sectioned FLIM multiwell plate reader and a multiplexed microscope that simultaneously reads out two FRET pairs.

ME2 • 14.00
Improving FRET Detection in Living Cells, Ching-Wei Chang, Mei Wu, Sofia O. Menager, Mary-Ann Mycek; Univ. of Michigan, USA. Unambiguous FRET detection in living cells is often challenging. Here we describe how the advantages of fluorescence lifetime sensing with FLIM, fluorophore selection, and critical environmental controls provide better FRET statistics and less non-specific FRET.

ME3 • 14.15
Concepts for Optical High Content Screens of Excitable Primary Isolated Cells for Molecular Imaging, Lars Kaestner, Qinghai Tian, Oliver Müller, Alme Flocke, Karin Hammer, Sandra Ruppenthal, Anke Schulz, Peter Lipp; Saarland Univ., Germany. We demonstrate the deployment of cellular, molecular and technical requirements to utilize primary isolated excitable cells, namely cardiomyocytes for molecular high content screens.

ME4 • 14.30
Improving Precision in Time-Gated FLIM for Low-Light Live-Cell Imaging, Ching-Wei Chang, Mary-Ann Mycek; Univ. of Michigan, USA. Minimizing stress to live-cell systems during imaging is critical. Time-gating optimization and image denoising were employed independently and in combination to significantly improve precision in low-light time-gated FLIM.

ME5 • 14.45
Ultrahigh Speed CMOS Camera-on-a-Chip for Biomedical Applications, Muzer El-Dessouki, M. Jamal Deen, Qyin Fang, Frances Tor; McMaster Univ., Canada. The paper presents the design of an ultrahigh acquisition rate CMOS APS imager that is suitable for fluorescence lifetime imaging and can take 8-frames at a rate of more than a billion frames per second.

MEG • Tissue and Specimen Imaging I
MG1 • 13.30
Quantitative Measurements of Scattering and Absorption by Low Coherence Spectroscopy, Nicole Wubbena1, Dirk F. Faber1, F. J. A. Wenders2, Tor A. G. van Leeuwen2, Maurice C. G. Alders3; Academic Medical Ctr., Dept. of Biomedical Engineering and Physics – Biomedical Photonics, Univ. of Amsterdam, The Netherlands. Scattering and absorption coefficients of various absorbing and scattering media were measured by low coherence spectroscopy (LCS). LCS combines low coherence interferometry with reflection spectroscopy for quantitative, path length resolved measurements of scattering and absorption.

MG2 • 13.45
A Safe, Low-Cost and Portable Instrumentation for Bedside Time-Resolved Picosecond Near Infrared Spectroscopy, Marine Ammourouz1, Wilfried Uhlen1, Thierry Pempequin1, Patrick Bozner1, Luc Marlier1; Lab d’Imagerie et de Neurosciences Cognitives, Univ. de Strasbourg, France, Inst. d’Electronique du Solide et des Systèmes, Univ. de Strasbourg, France. A time-resolved near infrared spectroscopy setup adapted to clinical environment was built, using four picosecond laser diodes and a photon counting device. Tests on phantoms proved its ability to detect deep absorbing and scattering inclusions.

MG3 • 14.00
Detection and Identification of Biological Agents in situ by Optical Micro Resonance Methods, Vladimir Sarabchennikov1, Elina Tverdokhlevskaya1, Gustav Schweiger1, 2Ruhr Univ. Bochum, Germany. Methods and instrumentation based on resonance frequency dependence of dielectric micro resonators on the surrounding medium is being developed as a real-time one-way disposable sensor for a number of parameters of nanoparticles and biological agents.

MG4 • 14.15
Monte Carlo Analysis of Single Fiber Reflectance Spectroscopy, Stephen C. Kanick, H. J. C. M. Sterenborg, Arjen Amelink; Erasmus Academica Medical Ctr., The Netherlands. We adapt a Monte Carlo model to simulate single fiber reflectance measurement of a homogenous turbid medium and describe the relationship among fiber diameter, optical properties and optically sampled tissue volume.

MG5 • 14.30
Laser Ablation Synthesis Route of CdTe Colloidal Quantum Dots for Biological Applications, Diogo B. Almeida, Eugenia Rodriguez1, Ricardo Moreira1, Said Agouram1, Luiz C. Barbosa1, Ernesto Jimenez1, Carlos L. Cesar1, 1UNICAMP, Brazil, 2Univ. de Valencia, Spain. In this work we report a novel technique for obtaining thiol capped CdTe colloidal quantum dots in one step. These nanoparticles are compatible for silica capping indicating their possible use as fluorescent markers.

MG6 • 14.45
Measurement of Speed Distribution of Red Bloods Cells in Microvascular System Using Laser-Doppler Spectrum Decomposition, Stanislaw Wojtkiewicz, Adam Liebert, Anna Zbiec, Roman Maniewski; Inst. of Biocybernetics and Biomedical Engineering, PAS, Poland. Decomposition of laser-Doppler spectrum was applied for estimation of speed distributions of red blood cells during in vivo microcirculation measurements with thermal and occlusion tests.
We discuss techniques for enhancing the sectioning response and for improving illumination uniformity as a programmable source of structured illumination for optically sectioned fluorescence microscopy. Poher1, Gordon T. Kennedy1, Paul M. W. French1, David Massoubre2, Erdan Gu2, Martin D. Dawson2; Vladislav A. Kamensky1, Konstantin V. Anokhin2; 1Inst. of Applied Physics, RAS, Russian Federation, 2Inst. illuminate and image the specimen. Combined with oblique imaging is described. The same high numerical aperture lens is used to both detection. Optical sectioning and less photo toxicity are intrinsic properties.

Our approach provides “digital embryos.” We developed digital scanned laser light sheet fluorescence microscopy and recorded nuclei localization and movement in entire wild-type and mutant zebrafish embryos over the first 24 hours of development. Schmidt, Jochen Wittbrodt, Ernst H. K. Stelzer; European Molecular Biology Lab Heidelberg, Germany.

The Zebrafish Digital Embryo: In toto Reconstruction of Zebrafish Early Embryonic Development with Digital Scanned Laser Light Sheet Microscopy, Philipp J. Keller, Annette D. Schmidt, Jochen Wittbrodt, Ernst H. K. Stelzer; European Molecular Biology Lab Heidelberg, Germany. We developed digital scanned laser light sheet fluorescence microscopy and recorded nuclei localization and movement in entire wild-type and mutant zebrafish embryos over the first 24 hours of development. Our approach provides “digital embryos.”

The Zebrafish Digital Embryo: In toto Reconstruction of Zebrafish Early Embryonic Development with Digital Scanned Laser Light Sheet Microscopy, Philipp J. Keller, Annette D. Schmidt, Jochen Wittbrodt, Ernst H. K. Stelzer; European Molecular Biology Lab Heidelberg, Germany. We developed digital scanned laser light sheet fluorescence microscopy and recorded nuclei localization and movement in entire wild-type and mutant zebrafish embryos over the first 24 hours of development. Our approach provides “digital embryos.”

Light sheets illuminate the specimen and the focal plane of a wide-field fluorescence microscope from the side. Azimuthal arrangements use independent lenses for illumination and detection. Optical sectioning and less photo toxicity are intrinsic properties.

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Molecular Imaging Posters

M1 Imaging of Dying Cells and Collagen in Vulner-
able Aortae Using Bimodal Qdots, Lenneke Prinsen1, Robbert-Jan J. H. Miserens2, Nicole Bitch1, Tilman Hackeng1, Elke Kool1, Dick W. Slag1,2, Chris P. M. Reutelingsperger1, Mart A. M. van Zandvoort1, Maastricht Univ. Medical Ctr., The Netherlands, *Eindhoven Univ. of Technology, The Netherlands. Imaging of vulnerable sites in atherosclerotic plaques in mice was performed. Collagen or dying cells were targeted using bimodal quantum dots. Plaques were visualized by two-photon microscopy and MRS, unfortunately, MRI was not successful due to insufficient labeling.

M2 Fluorescence Transilluminative Imaging of Photosensitizers in Tumor-Bearing Mice in vivo, Marina V. Shirmanova1, Irina V. Balalaeva1, Marina A. Sirekina1, Anna G. Orlou1, Ilya V. Turchin3, Elena V. Zagaynova1, *Nizhny Novgorod State Medical Academy, Russia, Federal Research, *I.N. Lobachevsky State Univ. of Nizhny Novgorod, Russian Federation, *Inst. of Applied Physics of RAS, Russian Federation. In vivo fluorescence imaging of photosensitizing dyes in tumor-bearing mice is shown. We demonstrate the results of in vivo investigation of photophysical and pharmacokinetic behavior of photosensitizers in a tumor-bearing model.

M3 Sensitivity Limits of Biomarker Imaging by Multi-Spectral Optoacoustic Tomography (MSOT), Daniel Razansky, John Baeten, Vasiliu Nicu-Atkinson, *Inst. for Biomedical and Medical Imaging (IBMI), Technical Univ. of Munich and Helmholtz Ctr. Munich, Germany. We investigate detection capacity and physical limits of molecular imaging with optoacoustics by simulating signals originating from absorbing objects in biological media. The results are experimentally validated by acquiring a near-infrared fluorescent molecular agent.

Diffuse Optical Imaging Posters


M5 3-D Light Source Reconstruction with Spatial Filter for Fluorescence/Bioluminescence Dif-
fuse Optical Tomography, Shigeru Okawa, Yukio Yamada Univ. of Electro-Communications, Japan. A 3-D reconstruction of light sources in biological medium with a spatial filter and an update of the forward model is simulated numerically. A reduction of noises based on singular value decomposition is successfully introduced.

M6 Analysis of Light Propagation in Head Models for Probabilistic Registration of NIRS Data, Yo-
suke Tahahashi1, Yonuke Ok1, Datsume Tisaka1,2, Enkito Ikumuro1, Hiroshi Kawaguchi2,2, Ippata Dan1, Eiji Okada1,2, Keio Univ., Japan, *Japan Society for the Promotion of Science, Japan, *Univ. of Tsukuba, Japan, *Natl. Food Res. Inst., Japan, *Natl. Inst. of Radiological Science, Japan. The light propagation in the head model was calculated to estimate the probabilistic distribution of the volume of tissue probed by a source-detector pair. The spatial sensitivity profile is important to estimate the anatomical location.

M7 Phantom Experiments for Validation of Spatial Resolution Improvement of Optical Topogra-
phy for Double-Density Measurements in the Human Brain, Hirokazu Kakuta1, Eiji Watanabe1, Hideori Yokota1, Keiji Ooguri1, Mihoko Kag1, Takashi Ichihara1, Eiji Okada1,2, Keio Univ., Japan, *Tisch Medizin University, *Hirachi Medical Co., Japan. The phantom experiments are performed to compare the spatial resolution of the double-density measurement with that of the single-density arrangement. The double-density measurements effectively improve the spatial resolution of optical topography.

M8 Measurements of Temporal-Spatial Change in Blood Flow and Volume in Exposed Cortex of Guinea Pig Evoked by Auditory Stimulation, Haruka Nakayama1, Satoshi Matsue2, Naotaka Sakashita3, Keisuke Sakaguchi1, Takahiro Katsura1, Kyoko Yamazaki1, Naoki Tanaka1, Hiroki Kawaguchi1, Atsushi Mak1, Eiji Okada1,2, Keio Univ., Japan, *Advanced Res. Lab. Hitachi, Ltd., Japan. The increase in the blood flow and blood volume was observed in the auditory area of guinea pigs whilst the decrease in the flow and volume was observed in the region surrounding the auditory area.

M9 Extraction of Brain-Activation Component from NIRS Signal by Using Independent Com-
ponent Analysis, Wataru Matsumi, Yutaka Niki, Ayano Suzuki, Eiij Okada, Keio Univ., Japan. The brain activation during visual task is measured by using near-infrared spectroscopy (NIRS). The brain signal is effectively extracted from the NIRS signal by independent component analysis.

M10 Numerical Analysis on Propagation of Light in Turbid Media Using Path-Length Assigned Monte-Carlo Simulation, Katsuhito Ito1, Izumi Nishikado1, Toshiki Iwai1, Graduate School for the Creation of New Photonic Industries, Japan, *Inst. of Symbolic Science and Technology, Tokyo Univ. of Agriculture and Technology, Japan. We simulate the propagation of scattered light using a new simulation algorithm and demonstrate path-length distributions of scattered light and the dependence of distributions of scattered points on the path-length of the detected light.

M11 Effect of Size, Location and Contrast of Tumors to Diagnose Brain Tumors in an n-Layered Model, Min-Chen Peng1, Liang-Yu Chen1, Chien-Hung Chen1, Min-Chun Pan1, Dept. of Electronic Engineering, Tunghai Univ., Taiwan, *Dept. of Mechanical Engineering, Natl. Central Univ., Taiwan. For various size, location and contrast of imitated tumors, both numerical computation and experimental validation were conducted to investigate and conclude diagnosis limitation of an NIR DOIsystem.

M12 Noninvasive Optical Sensor for Tissue Spectroscopy and Optical Tomography, Oleksandr Bilyy, Roman Yaremyk, Oksana Zvereva, Fabrizio Marcelli, Matteo Caffini, Rinaldo Cavedda1,2,3, Alessandro Torricelli1,2,4, Dept. of Physics, Politecnico di Milano, Italy, *IFN-CNR, Inst. of Fotonica and Nanotechnology, Sezione di Milano, Italy, *Res. Unit IIT, Politecnico di Milano, Italy. We developed and optimized a multi-channel dual-wavelength time-domain brain oximeter for functional studies in the clinical environment. The system, mounted on a 19” rack, is interfaced with instrumentation for monitoring physiological parameters and for stimuli presentation.


M14 Hybrid Heuristic Time Dependent Solution of the Radiative Transfer Equation for the Slab, Fabrizio Marcelli1, Samuele Del Bianco1, Antonio Pifferi1,2,3, Lorenzo Spinelli1, Alessandro Torricelli1,2, Giovanni Zaccarini1, Univ. Studi di Firenze, Italy, *CNR-Institut. di Fisica App. A “Nello Carrara”, Italy, *Dept. of Fiisica, Politecnico di Milano, Italy, *IFN-CNR, Inst. of Fotonica and Nanotechnology, Sezione di Milano, Italy, *ULTRAS-INFM-CNR, Natl. Lab for Ultrasound and Ultraintense Optical Science, Italy, *Res. Unit IIT, Politecnico di Milano, Italy. A hybrid heuristic time-dependent analytical solution of the radiative transfer equation for the slab geometry is presented. Comparisons with the results of Monte Carlo simulations have shown an excellent behavior of this model.
by the endogenous tissue autofluorescence. We
of the collected data is, in most cases, limited
Improves Reconstruction of Absorptive Per-
turbations in Optical Tomography,
MJ20
reconstructing absorptive perturbations at differ-
importance of anatomical background model in
results show that source dynamic information
migration, especially for the case of heterogenous
Photon Migration in Heterogenous Materials,
MJ25
In diffuse optical imaging, the quality
In OCT, a larger light penetration
explore how histopathology parameters influence
OCT imaging of basal cell carcinomas (BCC)
be brought to bedside.

Monday 15 June

Session continues on pages 22–23.
MJ40  Line-Field Spectral Domain Optical Coherence Tomography with a Common Path Interferometer. Johannes de Boer; Vrije Univ. van Amsterdam, Ireland, Galway, Ireland. We describe a line-field spectral domain optical coherence tomography system which is a combination of a traditional Spectral Domain OCT and a line-field imaging system. With a CCD array, this system enables fast B-Scan imaging.

MJ41  Signal Processing in Swept-Source Optical Coherence Tomography, Sebastien Vergoeyen1, Daniel Lévesque2, Sherif S. Sherif3, Gopi Lamasache1; Industrial Materials Inst., Natl. Res. Council Canada, Canada, 1Univ. of Manitoba, Canada. This paper deals with different processing techniques to sample data in swept-source optical coherence tomography. Especially, non-uniform Fourier transform algorithms are implemented. The optical performances and the computational time of these different techniques are compared.

MJ42  Optical Coherence Phase Microscopy with High NA Objectives Using a Novel Reference Arm Design, Bryan Haslam, Mattiai de Groot, Johannes de Boer; Vrije Univ. van Amsterdam, The Netherlands. High NA objectives make it difficult to perform optical coherence phase microscopy with a common path interferometer. A new reference arm design is presented for use with high NA objectives while maintaining picometer phase stability.

MJ43  Optical Coherence Tomography Combined with the Confocal Method for Interface Investigation in Class V Cavities, Mihai Romina1, Cosmin Sincescu2, Emmanuela Petrecu1, Claudiu Handa1, Roxana O. Rominu1, Marius Enescu1, Michael Hughes1, Adrian Brud1, George Dobres1, Adrian Gh. Podoleanu1; Faculty of Dentistry, “Victor Babes” Univ. of Medicine and Pharmacy Timisoara, Romania, School of Physical Sciences, Applied Optics Group, Univ. of Kent, UK. Standardized class V cavities, prepared in human extracted teeth, were filled with Premise (Kerr) composite. The specimens were thermo cycled. The interfaces were examined by optical coherence tomography method (OCT) combined with the confocal microscopy.

MJ44  Engineered of Extended Foci for Optical Coherence Microscopy, Christophe Pachon, Christophe Villiger, Simon Rutishauser, Rainer A. Leitgeb, Theo Lasser; Ecole Polytechnique Fédérale de Lausanne, Switzerland. Based on a Dubois integral approach, we engineered an extended focal field distribution for Fourier domain optical coherence microscopy. This simulation optimizes beam configurations for high lateral resolution combined with extended depth of field.

MJ45  Active Index Estimation Using Joint Spectral and Time Domain Optical Coherence Tomography, Maciej Szkulnowski, Szymon Tamborksi, Anna Szkulnowska, Andrzej Kawalczyk, Maciej Wójcikowski; Nicolaus Copernicus Univ., Poland. We describe a modification to joint spectral and time domain OCT that allows for determination of phase refractive index of transparent samples.

MJ46  Ocular Overload Investigations by Noninvasive Technology: Fluorescence Optical Coherence Tomography, Corna Marsan1, Fatemeh Negarzoo1, Cosmin Sincescu1, Inkiu Demjan1, Mike Hughes1, Adrian Brud1, George Dobres1, Adrian Gh. Podoleanu1; Dept. of Ophthalmology, Faculty of Dentistry, Univ. of Medicine and Pharmacy, Romania, 1Dept. of Prostheses Technology and Dental Materials, Faculty of Dentistry, Univ. of Medicine and Pharmacy, Romania, 2Applied Optics Group, School of Physical Science, Univ. of Kent at Canterbury, UK. The aim of this study is the early detection and monitoring of ocular inflammation in bruxing patients. En face OCT was used for imaging of several extracted teeth, with normal morphology, from patients with active bruxism.

MJ47  Optical Coherence Tomography as a Potential Monitoring Tool for Oral Lichen Planus, Olajos K. Akgün1, Gordan Mackenzie2, Kim Piper3, Pete Tomlin1, Dan Bader1, Verena Richter1, Thomas Bruns1; 1Foyer ICM, Ground Floor, Congress Centre, 2School of Dentistry, University of London, UK, 3School of Physical Sciences, Applied Optics Group, Univ. of Kent, UK. The point spread function of the living cells on the patterned surfaces, which were covered by the extracellular matrix elements using micro- and nano-contact printing, was measured by the photo-activated localization microscopy.

MJ48  Marginal Adaptation of Ceramic Veneers Investigated with en face Optical Coherence Tomography, Cosmin Sincescu1, Meda L. Negarzoo1, Emmanuela Petrecu1, Mihaita Romina1, Corna Marsan1, Roxana O. Rominu1, Michael Hughes1, Adrian Brud1, George Dobres1, Adrian Gh. Podoleanu1; Faculty of Dentistry, “Victor Babes” Univ. of Medicine and Pharmacy Timisoara, Romania, 1School of Physical Sciences, Applied Optics Group, Univ. of Kent, UK. This study analyzes the marginal adaptation of Empress veneers using en face optical coherence tomography. The results prove the importance of investigation of the marginal adaptation after every veneer bonding.

Advanced Microscopy Techniques Posters

MJ49  A Maximum Likelihood Method for Simultaneous Deconvolution and Fusion of 3-D Microscopy Data, Urs Kreiz, Khaled A. Khayat, Ernst H. K. Stelzer; European Molecular Biology Lab Heidelberg, Germany. We propose a technique based on the Lucy-Richardson deconvolution scheme that is able to fill the frequency space with information from multiple available images, creating an image with improved and more isotropic resolution.

MJ50  A Fast Marker-Based Registration Method for Alignment of TEM Tilt Series, Jo Lee1, Jongmin Lee1, Hyunna Lee1, Yeong Gil Shin1; School of Computer Science and Engineering, Seoul Natl. Univ., Republic of Korea, 2Dept. of Digital Media, Catholic Univ. of Korea, Republic of Korea. This paper presents a fast marker-based registration technique based on the non-gradient Powell’s multidimensional optimization scheme to speed up optimization as only meaningful parameters are considered for aligning uncalibrated projections taken from transmission electron microscopy.

MJ51  Tomographic Screening of 3-Dimensional Cell Cultures, Verena Richter1, Thomas Bruns1, Michael Wagner1, Wolfgang S. L. Strauss2, Herbert Scheucher2, Wolfram Parson2; 1Hochschule Aalen, Inst. Angewandte Forschung, Germany, 2Inst. für Laser-technologien in der Medizin und Meßtechnik an der Univ. Ulm, Germany. A novel tomographic screening reader for 3-dimensional cell cultures is described. The method is based on structured illumination and permits imaging with high axial resolution and 3-D reconstruction of single cells or clusters.

MJ52  Confocal Microscopy for Automatic Texture Analysis of Elastic Fibers in Histologic Preparations, Randall L. Adam, Gaidaine Vieira, Daniela F. Ferna1, Andre A. de Thomaz, Carlos Lens Cesar, Ronaldo Mette; Inst. de Fisica, UNICAMP, Brazil. Automatic texture analysis of elastic fibers in histologic preparations is based on large confocal fluorescence images analyzed by gliding boxes. Texture features are plotted in diagrams, thus localizing exactly architectural disturbances.

MJ53  Reflective Confocal Laser Scanning Microscopy and Nonlinear Microscopy of Cross-Linked Rabbit Cornea, Alexander Krüger1, Marina Hovakimyan1, Diego F. Ramírez2, Oliver Schlösser1, Uros Krzic, Khaled A. Khairy, Randal L. Adam, Gaidaine Vieira, Daniela F. Ferna1, Andre A. de Thomaz, Carlos Lens Cesar, Ronaldo Mette; Inst. de Fisica, UNICAMP, Brazil. We describe a modification to the Lucy-Richardson deconvolution scheme that is able to fill the frequency space with information from multiple available images, creating an image with improved and more isotropic resolution.

MJ54  Temporal Imaging Chamber (TIC) for en face Imaging of Epidermal Absorption in vitro, Carl Simonsson1, Maria B. Ericson1; 1Dept. of Chemistry, Univ. of Gothenburg, Sweden, 2Dept. of Physics, Univ. of Gothenburg, Sweden. We present an online diffusion cell with optical access allowing full time resolved visualization of skin penetration and measurement of percutaneous absorption. The temporal imaging cell (TIC) is adopted for both two-photon and confocal microscopy.

MJ55  Point Spread Function Measured in Human Skin Using Two-Photon Fluorescence Microscopy, Stina Goldbrand1, Carl Simonsson1, Maria Smidt1, Maria B. Ericson1; 1Dept. of Physics, Univ. of Gothenburg, Sweden, 2Dept. of Chemistry, Univ. of Gothenburg, Sweden. The point spread function in skin was measured using two-photon microscopy. The measured values of lateral resolution were close to the calculated value, but there were larger deviations for the resolution in the axial direction.

MJ56  Imaging the Cell Migration on the Patterned Surfaces by Super-Resolution Microscopy, Fan-Ching Chien, Jau-Ye Shiu, Ching Wen Kuo, Peilin Chen; Res. Ctr. for Applied Sciences, Academia Sinica, Taiwan. The dynamic of the focal adhesion complexes of the living cells on the patterned surfaces, which were covered by the extracellular matrix elements using micro- and nano-contact printing, was measured by the photo-activated localization microscopy.
MJ57 Study of 3-D Cell Morphology and Effect on Light Scattering Distribution, Andrew E. Ekpenyong, Junhua Ding, Li V. Yang, Nancy R. Leffler, Jan Q. Lee, R. Scott Brock, Xin H. Hui; ‘East Carolina Univ., USA, ‘Virginia Commonwealth Univ., USA. We acquire and reconstruct the 3-D structures of mouse melanoma cells to study quantitatively morphology changes in response to gene variations. The effect on light scattering distribution is investigated with a FDTD method.

MJ58 Applying Image Restoration to Fluorescence Lifetime Imaging Microscopy (FLIM), Ching-Wei Chang, Mary-Ann Mycek; Univ. of Michigan, USA. We describe a novel approach using 2-D-intensity-deconvolution to improve spatial resolution in wide-field FLIM. The method maintains lifetime accuracy and can restore features within experimentally reasonable intensity ranges.

MJ59 New Integration of Time-Resolved Fluorescence Techniques for Confocal Laser Scanning Microscopes, Uwe Ortmann1, Matthias Weiss2, Ingo H. Stein, Carsten Forthmann, Christian Steinhaus, Moni Walz, Britta Person, Jan Vogelvang, Rainer Erdmann; ‘PicoQuant GmbH, Germany, ‘Physikalisch-Technische Bundesanstalt (PTB), Germany, ‘Asylum Res., USA. A universal data format allows to record fluorescence dynamics with intensity, spectral and spatial information on a single photon basis. This allows e.g. advanced correlation analysis (FLCS, 2DFCS) or combination of confocal and AFM microscope.

MJ60 Development and Assessment of Image Reconstruction Algorithms Using A Low-Cost Bench-Microscope Based on a Linear CMOS Image Sensor, Milton P. Macedo1,2, Carlos M. Correia1; Inst. Superior de Engenharia de Coimbra, Portugal, ‘GEI - Group of Electronics and Instrumentation, Dept. of Physics, Univ. of Coimbra, Portugal. We aim at establishing a bench-microscope based on a linear sensor as a versatile research tool for the development and assessment of image reconstruction algorithms. Preliminary results of overall system resolution and contrast are presented.

MJ61 Three-Dimensional Numerical Simulation of Complex Optical Systems Using the Optical Transfer Function, Rasoul-Amadou Larbeer, Alexander Heisterkamp; Laser Zentrum Hannover e.V., Germany. We developed a numerical simulation for fs-laser scanning microscopy using the optical transfer function. By this it is possible to simulate aberrations, chirp and even more complicated coherent light fields in three dimensions and time.

MJ62 MEMS-Based Confocal Laser Scanning Microscope for in vivo Imaging, Jürgen V. Helfmann, Jörg Schatz, Ingo Gersonde, Gerd Blüg Laser- und Medizin-Technologie GmbH, Berlin, Germany. With a cardinally mounted micromirror a confocal laser scan microscope for in vivo imaging was built. A resolution of 0.6 µm axially and 10 µm laterally allows to image tissue and cells in good quality.

MJ63 Time-Resolved Multi-Dimensional Spectroscopy down to the Single Molecule Level, Peter Kapusta1, Steffen Rüttiger2, Benedikt Krämer3, Volker Buschmann1, Uwe Ortmann1, Marcelle König4, Felix Koberling1, Duran A. Walters3, J. A. Viant5, Andreas Bülter1, Rainer Erdmann2; ‘PicoQuant GmbH, Germany, ‘Physikalisch-Technische Bundesanstalt (PTB), Germany, ‘Asylum Res., USA. A universal data format allows to record fluorescence dynamics with intensity, spectral and spatial information on a single photon basis. This allows e.g. advanced correlation analysis (FLCS, 2DFCS) or combination of confocal and AFM microscope.

MJ64 Diffusion of Single Molecules in Nanochannels, Claudia Debellaglioma, Nicolas F. Y. Durand, Raphaël Goetschmann, Iwan Maerki, Arnaud Bertsch, Philippe Renaud, Theo Lasser; Ecole Polytechnique Fédérale de Lausanne, Switzerland. Fluorescence correlation spectroscopy allows investigating the interaction of charged proteins with charged surfaces of liquid-filled nanochannels. Based on a 2-D multi-component diffusion model the bulk and surface diffusion behavior is quantified.

MJ65 Controlling the Emission of Organic Dyes for High Sensitivity and Super-Resolution Microscopy, Philip Tinnemeld, Thorben Cordes, Ingo H. Stein, Carsten Forthmann, Christian Steinhaus, Monti Wald, Britta Person, Jan Vogelvang, Ludwig-Maximilians-Univ., Germany. Further development of fluorescence microscopy depends on the improvement of fluorescent probes. We show that the emission of ordinary organic dyes can be controlled to increase photostability and to induce long OFF-states for super-resolution microscopy.

MJ66 Optical Tweezers Assisted by a Pulse Laser Beam, Saki Maeda, Tadao Sugihara, Kotaro Minato; Nara Inst. of Science and Technology, Japan. We have developed a new technique that helps trapping and manipulation of micron sized objects by optical tweezers with a coaxially arranged pulse laser beam under hard-to-operate conditions (e.g. barrier structure in cells, adsorption phenomena etc.).

MJ67 Optical Tweezers Force Measurements to Study Parasites Chemotaxis, Andre A. de Thomaz1, Liliana A. Y. Pozzo2, Adriana Fonte3, Diego B. Almeida4, Cecilia V. Stahl5, Jacerin R. Santos-Mallet6, Suzete A. O. Gomes7, Denise Feders8, Diana C. Ayres9, Selma Giguéri, Carlos Lenz Cerq10, Andre A. de Thomaz1; ’UNICAMP, Brazil, ’Depto de Biologia e Radiobiologia, Ctr. de Ciências Biológicas (CCB), Univ. Federal de Pernambuco (UFPE), Brazil, ’Fundacao Oswaldo Cruz, Brazil, ’Univ. Federal Fluminense, Brazil. In this work we use a methodology to study chemotaxis of Leishmania amazonensis and Trypanosoma cruzi in real time using an optical tweezers system. We obtained quantitative results of the parasites' forces.

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**Monday 15 June**

16.00–16.30 Coffee Break, Exhibition Hall
MK1 • 16.30

**Invited**

**Imaging of Fluorescent Protein Activity in Mice with Multiphoton Imaging**

**Nikolaos Delidoniou**, **Adrian Taruttis**, **Amir Rozental**, **Daniel Razansky**, **Vasilis Ntziachristos**;

Technische Univ. and Helmholz Zentrum München, Germany.

This study demonstrates the application of a newly discovered Red-Shifted Fluorescent Protein (RFP) that is exploited in multiphoton optical tomography (MSOT) of tumors in murine models. Analysis and phantom experiments show the great potential of this method to image FPs in murine models.

ML2 • 17.00

**Visualization of 3-D and 4-D Cell Migration Using Three-Dimensional Ultrahigh Resolution Optical Coherence Tomography**

**Sara M. Rey**, **Adrian Harwood**, **Baris Povazay**, **Bernd Hofer**, **Boris Hermann**, **Angelika Unterhuber**, **Wolfgang Drexler**;

School of Biosciences, Cardiff Univ., UK, Biomedical Imaging Group, Dept. of Optometry and Vision Sciences, Cardiff Univ., UK.

Non-invasive imaging of Dictyostelium discoideum cells of approximately 10µm diameter is demonstrated on epoque 2-D surfaces, within 3-D constructs and in time lapse (4-D) using 800nm ultrahigh resolution, high-speed FDOCT.

ML3 • 17.15

**Nonlinear Imaging of Small Dense LDL Using Mean Sies Obtained in Dynamic Light Scattering**

**Vladimir V. Vodeneev**, **Ilya V. Turchin**, **Sergey M. Deyev**;

Russian Federation.

We propose a technique to evaluate the fraction of sLDL in total LDL using mean sizes obtained in a DLS measurement. The feasibility was verified in the experiments using latex particles and LDL samples.

ML4 • 17.30

**Optical Coherence Tomography Imaging Toward Monitoring Complex Radiofrequency Ablation Procedures**

**Christine P. Fleming**, **William J. Hacker**, **Kara J. Quarti**, **Igor R. Efimov**, **Andrew M. Rollin**;

Case Western Reserve Univ., USA, Washington Univ., USA, MetroHealth Medical Ctr. Heart and Vascular Dept., USA.

We present optical coherence tomography imaging toward monitoring complex ablation procedures such as atrial fibrillation, and epicardial ablation.

MM1 • 16.30

**Imaging of Small Dense LDL Using Mean Sies Obtained in Dynamic Light Scattering**

**Sudhansu Chokroverty**, **Cristina Pepe**, **Christian Depeursinge**;

Ecole Polytechnique Fédérale de Lausanne, Switzerland.

We propose a technique to evaluate the fraction of sLDL in total LDL using mean sizes obtained in a DLS measurement. The feasibility was verified in the experiments using latex particles and LDL samples.

MM2 • 16.45

**Development of an Autofluorescence Probe for Brain Cancer: Simulations and Phantom Studies**

**Raja Behbahani**, **Shahnaz Jamali**, **Roland Schering**;

Faculty of Health Sciences, Hokkaido Univ., Japan, Technical Service Section, Denka Seiken Co., Ltd., Japan.

We propose a technique to evaluate the fraction of sLDL in total LDL using mean sizes obtained in a DLS measurement. The feasibility was verified in the experiments using latex particles and LDL samples.

**These concurrent sessions are grouped across two pages. Please review both pages for complete session information.**

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**Room 4a, Ground Floor, Congress Centre**

**Molecular Imaging**

**Room 5, Ground Floor, Congress Centre**

**Optical Coherence Tomography and Coherence Techniques**

**Room 11, 1st Floor, Congress Centre**

**Novel Optical Instrumentation for Biomedical Applications**
Third-Harmonic Generation Microscopy: Image Formation and Application to Embryo Imaging, Nicolas Olivier, Delphine Désbarre, Emmanuel Beaurepaire, École Polytechnique, France. We analyze phase-matching conditions in third-harmonic microscopy as a function of sample structure and focal field distribution. We study epidetection of coherent signals in thick tissue. We present applications to long-term imaging of embryo morphogenesis.

Spectral Imaging in the Brain with Two-Photon Microscopy, Mathieu Ducroix1,2, Laurent Moreaux1,2, Jonathan Bradley3,4, Olivier Grosbël1,2, Serge Charpak1,2,3, Oliver Griesbeck5, Pascale Tiret1,2,3, Serge Charpak1,2,3; 1INSERM U603, France, 2CNRS UPR 9131, France, 3Univ. Paris Descartes, France, 4CNRS UMR 8118, France, 5Max-Planck-Inst. für Neurobiologie, Germany. We describe an efficient method to detect spatial and temporal spectral variations in depth in the brain with microscopic resolution. Performances were tested in various samples from fluorescent standards to olfactory bulb neurons in vivo.

Time- and Spectral-Resolved Multiphoton Imaging of Fresh Bladder Biopsies, Riccardo Cicchi1, Alfonso Crisci1, Gabriella Nesi1, Alessandro Cosci1, Saverio Giancane1, Marco Carini1, Francesco S. Pavone1; 1Univ. of Florence, Italy, 2Univ. of Florence Medical School, Italy. In this work we have combined temporal and spectral-resolved non-linear imaging techniques to perform a morphological and spectroscopic characterization on different kinds of human ex vivo fresh biopsies of bladder, including healthy and cancerous tissue.

Evaluation of Multiple Sclerosis-Like Lesions in vivo with Coherent Anti-Stokes Raman Scattering Microscopy, Erik Bélanger1,2, Sophie Laffray1,2, Steve Bégin1,2, Israël Veilleux1,2, Réal Vallée1,2, Yves Dé Koninck1,2, Daniel Côté1,2; 1CRULRG-Ctr. de Recherche Univ. Laval Robert-Giffard, Canada, 2Ctr. d’Optique, Photonique et Laser, UCLP, Univ. Laval, Canada. An in vivo study of multiple sclerosis is performed with an animal model called experimental autoimmune encephalomyelitis. After surgically exposing the spinal cord, demyelination and morphology are characterized using reflectance microscopy.

Myosin Helical Pitch Angle as a Quantitative Biomarker for Characterization of Cardiac Programming in Fetal Growth Restriction Measured by Polarization Second Harmonic Microscopy, Ivan Amat-Roís1,2, Sotiris Psilodimitrakopoulos1, Eliudza Eizarch1, Inutxe Torre1,2, Bart Wouters1, Fatima Criqui1, Francesc Figueras1, David Arigita1, Pablo Leza-Alvarez1, Eduard Gratacos1; 1Dept. of Maternal-Fetal Medicine, Inst. de Clínic de Ginecología, Obstetrícia i Nefrologia, Hospital Clinic-Inst. d’Investigacions Biomèdiques August Pi i Sunyer, Ctr. for Biomedical Research on Rare Diseases, Spain, 2ICFO-Inst. de Ciències Fotoniques, Spain. Fetal growth restriction (FGR) has recently shown a strong association with cardiac programming which predisposes to cardiovascular mortality in adulthood. Polarization second harmonic microscopy can quantify molecular architecture changes with high sensitivity in cardiac myofibrils.

A Prototype Mammograph for Simultaneous Acquisition of Tomographic and Time-Resolved Data in Slab Geometry, Axel Hagen1, Dirk Groenick1, Meike Stindl1, Michael Wahl1, Herbert Binnig2, Rainer Macdonald1; 1Physikalisch-Technische Bundesanstalt, Germany, 2PicoQuant GmbH, Germany. We have developed a prototype mammograph for simultaneous acquisition of tomographic and time-resolved data at fluorescence and laser wavelengths in slab geometry. System performance was tested by fluorescence and laser photon measurements using breast-like phantoms.

Differentiation of Benign and Malignant Breast Lesions with 3-D Diffuse Optical Tomography, Regine Choé1, Suren D. Koeckel1, Alper Cetin1, Kijoon Lee1, Turgut Durduvan1, David R. Buech1, Saurav Pathak1, Mark A. Rosen1, Mitchell D. Schnall1, Brian J. Czarnecki1, Julia Tewes2, Simon R. Arridge1, Martin Schweiger1, Mary E. Patt1, Britton Chance1, Arjun G. Yodh2; 1Univ. of Pennsylvania, USA, 2Univ. College London, UK. With a novel parallel-plate diffuse optical tomography system, we have differentiated malignant (N=41) and benign (N=10) breast lesion groups based on tumor-to-normal ratios of oxy-, deoxy-hemoglobin concentrations and tissue scattering.

Changes in Microvascular Blood Flow and Endogenous Chromophores during Mammographic- Like Compression of the Human Breast, David R. Buech1, Regine Choé1, Turgut Durduvan1, Mitchell D. Schnall1, Mark A. Rosen1, Arjun G. Yodh2; 1Univ. of Pennsylvania, USA, 2Hospital of the Univ. of Pennsylvania, USA. A pilot study monitoring perturbations of hemoglobin concentration, blood oxygen saturation, and blood flow using diffuse optics showed significant changes during compression. These results may significantly affect use of contrast agents under mammogram-like compression.
**MK • New Probes and Contrast Mechanisms for in vivo Imaging—Continued**

**MK5 • 17.45**

Image Segmentation for Biomedical Applications Based on Alternating Sequential Filtering and Watershed Transformation, Dimitrios S. Gorgas, Dido Yova, Lab of Biomedical Optics and Applied Biophysics, Natl. Technical Univ. of Athens, Greece. The complex problem of biomedical image segmentation is confronted by developing an algorithm based on sequential filtering and watershed transformation, achieving fast and accurate segmentation. This method can provide researchers a valuable and objective tool.

**MK6 • 18.00**

Dual-Modality Molecular Imaging for Small Animals Using Fluorescence and X-Ray Computed Tomography, Yating Lin1, William C. Barber1, Jan S. Ivanček1, Einar Nygard2, Nair Malsak2, Neal E. Hartough3, Thalasi Gandhi4, Werner W. Röck5, Orhan Nalcioglu1, Gultekin Gulsen1; 1Ctr. for Functional Onco-Imaging, Univ. cal Univ. Munich, Germany. Chair for Biological Imaging, Helmholtz-Ctr. Munich and Technische Universität München, Germany, 2St. Michael's Hospital, Canada, 3Charité - Univ. Medicine Berlin, Germany, 4Univ. of California at Irvine, USA, 5DxRay, Inc., USA. We demonstrate the feasibility of using a dual-modality fluorescence tomography and X-Ray CT system for quantitative molecular imaging. The results demonstrated that fluorophore concentration can only be obtained accurately when guided by the X-ray CT.

**ML • Pre-Clinical and Clinical Apps I—Continued**

**ML5 • 17.45**

A Laryngoscope for Office-Based Imaging of Human Vocal Folds Using OCT, Henning Wosnitza1, Nadine Rohreck, Alexander Krüger1, Marcel Reif2, Kathrin Aleksandrova1, Holger Lubatschowski1; 1Laser Zentrum Hannover e.V., Germany; 2Kantonsspital Aarau, Switzerland. We developed a laryngoscope with an integrated OCT beam path for office-based non-contact imaging of human vocal folds. In combination with conventional videolaryngoscopy superficial and subsurface lesions can be detected and quantitatively analysed.

**ML6 • 18.00**

Time-Resolved Blood Flow Measurement in the in vivo Mouse Model by Optical Frequency Domain Imaging, Julia Walther1, Gregor Mueller1, Sven Meding1, Peter Camallii1, Hannen Homan1, Henning Morawietz2, Edmund Koch; 1Clinical Sensoring and Monitoring, Medical Faculty Carl Gustav Carus, Univ. of Technology Dresden, Germany, 2Vascular Endothelium and Microcirculation, Jožef Stefan Inst., Slovenia. In experiments and numerical simulations of pulsed photothermal radiometry, we compare various signal processing methods and their effects on the contrast between cancerous and normal tissue by processing white light and fluorescence endoscopic images.

**ML7 • 18.15**

4-D in vivo Imaging of Subpleural Lung Parenchyma by Swept Source Optical Coherence Tomography, Sven Meisner1, Aneta Tabuchi1, Michael Mertens2, Hannen Homann1, Julia Walther1, Wolfgang Kuebler1; 1Univ. of Technology Dresden, Germany, 2MVTec, Germany. A novel hybrid imaging system for simultaneous X-ray and fluorescence tomography is presented, capitalizing on 3D projection free-space fluorescence tomography and implemented within a micro-CT scanner. Its use is showcased for lesions in brain and lung.

**MM • Tissue and Specimen Imaging II—Continued**

**MM6 • 17.45**

CTM, a Dedicated System to Measure Colour and Translucency of Human Skin, Peter C. F. Borrvall1, Reinbert Graaff2, Bereshard I. Hoenders3; 1SensorTechnology and Consultancy, The Netherlands, 2Dept. of Biomedical Engineering, Univ. Medical CTR. Groningen and Univ. of Groningen, The Netherlands, 3Inst. for Theoretical Physics, Univ. of Groningen, The Netherlands. The Colour and Translucency Monitor applies large and small illumination spots sharing a small detection spot, delivers two reflection spectra. By plotting both reflection spectra against each other, mind-broadening information regarding scattering and absorption arrives.

**MM7 • 18.00**

Enhancement of Cancerous/Normal Tissue Contrast via Combined White Light and Fluorescence Image Processing: Initial Investigation ex vivo, Angelos A. Kalitzeos1, Azhar Zam1, Florian Steidle2, Eckhard G. Hahn1, Martin Raithel1, Alexandre Desphrik2; 1Erlangen Graduate School in Advanced Optical Technologies (SAOT), Friedrich-Alexander Univ. Erlangen-Nuremberg, Germany, 2Univ. Hospital Erlangen, Dept. of Oral and Maxillofacial Surgery, Friedrich-Alexander Univ. Erlangen-Nuremberg, Germany. The Colour and Translucency Monitor applied large and small illumination spots sharing a small detection spot, delivers two reflection spectra. By plotting both reflection spectra against each other, mind-broadening information regarding scattering and absorption arrives.

**MM8 • 18.15**

Comparison of Binning Approaches in Pulsed Photothermal Temperature Profiling, Matija Milan1, Boris Majaron1, Iztok Stefan 1; 1Inst. of Experimental Physics, University of Ljubljana, Slovenia. In experiments and numerical simulations of pulsed photothermal radiometry, we compare various signal binning approaches. Quadratic and uniform binning result in most accurate temperature depth profiles for shallow and deep objects, respectively.
MN • NLO I—Applications—Continued

MN6 • 17.45
Measurement of the Second Order Hyperpolarizability of the Collagen Triple Helix and Application to Second Harmonic Imaging of Natural and Biomimetic Tissues, Ariane Deniset-Besseau, Paulo De Sa Peixoto, Julien Dubosset, Mathias Struppler, Pierre-Louis Tharax, Emmanuel Benichou, Pierre-François Brevel, Geryska Mosser, Marie-Claire Schanne-Klein; ‘Lab d’Optique et Biosciences, École Polytechnique-CNRS-INSELM, France; ‘Lab de Chimie de la Matière Condensée, CNRS-Univ. Paris 6, France; ‘Lab de Spectroscopie Ionique et Moléculaire, CNRS-Univ. Claude Bernard Lyon-I, France; ‘Ctr. de Recherche Cardiovasculaire Interdisciplinaire Lourdes, INSERM U689, France. We performed hyper-Rayleigh scattering experiments to measure the nonlinear optical response of the collagen triple helix to get insight into the physical origin of second harmonic signals observed in natural and biomimetic tissues.

MN7 • 18.00
Extremely Short Femtosecond Laser Pulses for Stem Cell Microscopy, Karsten König, A. Uchugonova, A. Isemann, R. Biickle, W. Watanabe; ‘Saarland Univ., Germany; ‘JenLab GmbH, Germany; ‘Fraunhofer Inst. for Biomedical Technology, Germany; ‘FEMTOLASERS Produktion GmbH, Austria; ‘AIST, Japan. Ultracompact multiphoton sub-20 femtosecond near infrared MHz laser scanning microscopes have been employed for multiphoton imaging of stem cell clusters as well as targeted transfection and optical knock-out of human adult stem cells.

MN8 • 18.15
Three-Dimensional Harmonic Holographic Microscopy Using Nanoparticles as Probes for Cell Imaging, Chia-Lung Hsieh, Rachel Grange, Ye Pu; ‘Ecole Polytechnique Fédérale de Lausanne, Switzerland; ‘Caltech, USA. We demonstrate the three-dimensional imaging capability of harmonic holographic microscopy by using the second harmonic generation from BaTiO3 nanoparticles as the signal. Three-dimensional distributions of the BaTiO3 nanoparticles in biological cells are recorded without scanning.

MO • Imaging of Breast and Other Organs—Continued

MO5 • 17.45
Automatic Segmentation of Tissue Types in Diffuse Optical Tomography of Human Breast Cancer, David R. Busch, Regine Choe, Turgut Durduran, Han Y. Bart, Sauer-Pathal, Mary Pott, Wencheng Guo, Mark A. Rosen, Mitchell D. Schnall, Arjun G. Yodh; ‘Univ. of Pennsylvania, USA; ‘Hospital of the Univ. of Pennsylvania, USA. We describe a framework to extract a signature of malignancy from diffuse optical measurements of a population of cancers, then use this signature to identify and locate additional cancers in another population.

MO6 • 18.00
Frequency-Domain Optical Tomography of Arthritic Joints, Andreas H. Hielscher, Christian D. Kloe, Hyuns K. Kim, Uwe Neitz, Sabine Blaschke, P. A. Zawatski, Gerhard A. Muller, Jürgen Beauthe; ‘Columbia Univ., USA; ‘Charité - Medical Univ., Germany; ‘Georg-August Univ., Germany. We present clinical data obtained with a new frequency-domain imaging system. Three-dimensional optical tomographic images were generated for 107 fingers affected by arthritis. The data was analyzed using classical statistical methods and a machine-learning algorithm.

MO7 • 18.15
Curvature Correction of the Human Arm for Quantitative Assessment of Ischemia and Reactive Hyperemia Using Multi-Spectral Imaging of the Dermal Layers, Jana M. Kainerstorfer, Franck Amyot, Jason Riley, Maimuddin Hassan, Victor Chernomordik, Christoph Hittenberger, Amir Gandjbakhche; ‘Nat. Inst. of Health, USA; ‘Medical Univ. of Vienna, Austria. Arms of healthy volunteers were occluded for 5 min and multi-spectral images were taken every 30 seconds. A novel curvature correction algorithm was introduced and image reconstruction of blood volume and oxygenation was performed.
TuA1 • 9.00
1 µm Semiconductor Light Source with High Power and Broadband for Optical Coherence Tomography, Lisa Tongying Li, Iyuan Jin, Zhenghua Wu, Weiming Zhu, David Eu, InPhenix, Inc., USA. A InGaAs/AlGaAs quantum-well structure was grown to the desired 1-micron wavelength. High power, broadband SDLs and high gain, high Psat SOAs were achieved. Optimal bandwidth and central wavelength tuning with COD of light sources higher than 100nm.

TuB1 • 9.00 • Invited
Combined Optoacoustic and Ultrasound Imaging, Michael Jager, Lea Siegemund, Michael Kitz, Martin Irene, Der Schulz, M. Florian, J. F. Greisch, M. C. De Paauw-Gilis, E. De Paauw, J. Niederhauser, D. Schweizer, University of Liege, Belgium. Paushal Derakhshani Switzerland, Switzerland. A combined ultrasound and optoacoustic imaging technique including a novel image reconstruction algorithm and targeted contrast agents was developed which allows to image both morphological and physiological functions of tissue.

TuC1 • 9.00

TuD1 • 9.00 • Invited
Structured Illumination and Time Gated Detection for Diffuse Optical Imaging, Costin O’D’Arent1, Andrea Basili1, Gianluca Valentini1, Rinaldo Cavedon2, Simon Arigoni1, Nat. Lab. for Ultrafast and Ultraintense Optical Science, Consiglio Nazionale delle Ricerche, Italy, Dept. di Fisica, Politecnico di Milano, Italy, Ctr. for Medical Image Computing, Univ. College London, UK. Diffuse optical imaging based on structured light and time gated detection is presented. Resolution enhancement with spatial frequency and early time-gating is described. Spatial phase detection is proposed as a new method for accurate inclusion localization.

TuA2 • 9.15
Fourier Domain Mode Locked (FDML) Lasers for Polarization Sensitive OCT, Gesa valte. Wolfgang Wieser, Benjamin R. Biedermann, Christoph M. Eigenwillig, Robert Huber, Ludwig-Maximilians-Univ. Munich, Germany. A Fourier Domain mode-locked (FDML) laser for polarization sensitive optical coherence tomography (OCT) is presented. The laser generates an alternating sequence of wavelength sweeps with their polarization states 90° separated on the Poincare sphere.

TuB2 • 9.30
Photoacoustic NO Detection for Asthma Diagnostics, Markus Gerner, Marcus Woff, Hamburg Univ. of Applied Sciences, Germany. A new photoacoustic detection system for nitrogen monoxide based on a pulsed quantum cascade laser is introduced. The demonstrated sensitivity allows an application as diagnostic tool for asthma.

TuC3 • 9.30
Quasi White Light Multiphoton Imaging, Domenico Alfieri1, Marco Arcioni1, David Armstrong2, Francesco S. Pavone1, ‘Lighttech Firenze s.r.l., Italy. ‘Coherent Inc., USA. ‘Dept. of Physics, Univ. of Florence, Italy. We real- ized multiphoton imaging of biological samples by using high power density source generated in photonic crystal fibers. Spectral selectivity of different dyes and high image resolution are demonstrated at hundreds of microns in depth.

TuD2 • 9.30
Tomography of Brain Activation Using a Time-Gated Camera, Antonio Pifferi1,2, Jing Zhou1, Lorenzo Spinelli1, Andrea Basili1, Gianluca Valentini1, Davide Contini1, Alessandro Torricelli1, Rinaldo Cavedon2,1 Nat. Lab. for Ultrafast and Ultraintense Optical Science, Consiglio Nazionale delle Ricerche, Italy, ‘Res. Unit Politecnico di Milano, Italy. ‘Inst. di Fisica, Politecnico di Milano, Italy. ‘Dept. of Robotics, Brain and Cognitive Sciences, Inst. di Fisica, Politecnico di Milano, Italy, ‘Inst. of Fotonica e Nanotecnologia, Consiglio Nazionale delle Ricerche, Italy. We propose a system for 3D tomography using a single pulsed source and a time-gated camera for functional imaging studies. The system was tested against simulations, phantom measurements, and a preliminary in vivo protocol.

TuA3 • 9.30
Ultra-High Speed, High Resolution OCT Imaging System for Biomedical and Material Applications, James Y. Jiang, Peter Koch, Anjil Davis, Scott Barry, Alex Cable, Thurlabs, Inc., USA. An OCT imaging system capable of measuring sample depth profiles at >110,000 A-lines per second with processed image data streamed to computer memory has been developed for biomedical imaging and material metrology applications.

TuB3 • 9.45
Photoacoustic Generation of X-Waves and their Application in a Dual Mode Scanning Acoustic Microscope, Klaus Pauzlar1, Robert Nauster, Sibylle Grot, Peter Burghuber, Guenther Pabst, ‘Dept. of Physics, Karl-Franzens-Univ. Graz, Austria, ‘Dept. of Sensor Technology, Upper Austrian Res., Austria. For developing a dual mode (acoustic and photoacoustic image contrast) acoustic microscope, specially shaped ultrasonic pulses, so called X-waves generated by illuminating a conically shaped transducer (acoustic) with short laser pulses, are investigated.

TuC4 • 9.45
A Comparison between Coherent and Spontaneous Raman Scattering for Biological Imaging, Brandon R. Buchtel, Sarah R. Nichols, Meng Cai, Jennifer F. Ogilvie, Univ. of Michigan, USA. We compare imaging using coherent and spontaneous Raman scattering under biological imaging conditions. We perform spectral domain imaging of polyethylene beads and find comparable signal levels for both methods, presenting calculations to support our measurements.

TuD3 • 9.45
Multichannel Time-Resolved Instrument Optimized for Monitoring of ICG Passage through the Brain by Simultaneous Detection of Fluorescence and Diffuse Reflectance, Adam Liebert1, Michael Kaupczak1, Daniel Milej, Joanna Maczewski, Wojciech Wegli, Katarzyna Fronczewski1, Ewa Mazurek-Zawadzka, Leszek Rózkich, Roman Maniowski1, Inst. of Biophysics and Biomedical Engineering, PAS, Poland, ‘Dept. of Nuclear Medicine, Medical Univ. of Warsaw, Poland, ‘Dept. of Anesthesiology and Intensive Care, Medical Univ. of Warsaw, Poland. Multi- channel time-resolved instrument which allows for detection of fluorescence and reflectance for 8 source-detector pairs is presented. The instrument was tested during in vivo measurements on the head with intravenous administration of ICG in healthy subjects.
TuE • OCT Signal and Image Processing

TuE1 • 10.30
Statistical Model for Segmentation of Retinal Optical Coherence Tomography, Védran Kajić, Boris Povazay, David A. Marshall, Paul L. Rosin, Wolfgang Drexler, Cardiff Univ., UK. A novel statistical model based on texture and shape was applied for intraretinal layer segmentation of tomograms obtained by a commercially available retinal optical coherence tomography (OCT) system.

TuE2 • 10.45
Real Time 3-D Rendering of Optical Coherence Tomography Volumetric Data, Joachim Pohl1, Gereon Hüttmann1, Peter Koch1; 1Inst. für Biomedizinische Optik, Univ. Lübeck, Germany, 2Thorlabs HL AG, Germany. Making use of the new and fast OCT systems, this work will show a near real time scanning and rendering of volumetric OCT data on a Thorlabs Hyperion OCT system with standard consumer PC hardware.

TuE3 • 11.00
Using Nonequispaced Fast Fourier Transformation to Process Optical Coherence Tomography Signals, Dierck Hillmann1, Gereon Hüttmann1, Peter Koch1; 1Thorlabs HL AG, Germany, 2Inst. für Biomedizinische Optik, Univ. zu Lübeck, Germany. Using Nonequispaced Fast Fourier transformations (NFFT) to process Fourier-domain OCT data yields more precise and in many cases faster results than a standard fast Fourier transformation (FFT) on linearly interpolated data points.

TuE4 • 11.15
Advanced Image Processing of Retardation Scans for Polarization-Sensitive Optical Coherence Tomography, Bettina Heiss1, Elisabeth Lessi-Holzinger1, Karin Wiesauer1, Michael Pircher1, Erich Goetzinger1, Bernhard Baumgärt1, Christoph K. Hüttenberger1, David Stifter1; 1RECENDT GmbH, Austria, 2RECENDT Res. Ctr. for Non-Destructive Testing, Austria, 3Ctr. for Biomedical Engineering and Physics, Medical Univ. Innsbruck, Austria. We present a novel model-based algorithm that extends the concept in structured illumination microscopy to acquire nano-meter depth resolution and sub-diffraction-limit lateral resolution. The profiling frame rate is 12 Hz. The topography of 100 nm polymer fibers is obtained.

TuF1 • 10.30
Ultrasound-Transmission Parameter Imaging in a Photoacoustic Image, Jihin Jose1, Rene Willemink2, Steffen Resnik2, Thijis Maaskant2, Johan van Heijst2, Ton Van Leeuwen2; 1Sint Maartenskliniek, 2Universiteit Maastricht, Maastricht, The Netherlands. We present our “hybrid” imaging system, which can image both optical absorption properties and acoustic transmission properties of an object in a two-dimensional slice using a computed tomography photoacoustic imaging.

TuF2 • 10.45
Fiber-Based Detectors for Photoacoustic Imaging, Hubert Gruen1, Thomas Berer1, Robert Nuster1, Gunther Paltouf1, Peter Burgholzer1; 1RECENDT Res. Ctr. for Non-Destructive Testing GmbH, Austria, 2Inst. für Funktionsmedizin, Univ. Vienna, Austria. For photoacoustic imaging so called integrating detectors are used. First images of phantoms and simple structures reconstructed from data collected with fiber-based detectors are presented. The prospects of fiber-based detectors for medical applications are discussed.

TuF3 • 11.00
Multispectral Optical Tomography (MSOT) Scanner for Whole-Body Imaging of Small Animals and Biomarkers, Rui Ma, Vaiai Nitziarchos1, Daniel Razansky1; 1Inst. for Biophysical and Medical Imaging (IBMI), Technical Univ. of Munich and Helmholtz Ctr. Munich, Germany. We present a multispectral optical tomography (MSOT) scanner for whole-body visualization of biomarkers in living animals. Fast 3-D imaging, resolution of below 90μm and other advantageous characteristics are demonstrated in phantom and animal experiments.

TuF4 • 11.15
Optical Characterization of Gold Nanoparticle Optical Contrast Agents Using an Optical Fiber Approach, Striang Manohar, Constantin Ungureanu, Arjen Amelink, Rajapopal Rayavanur, Henriks J. C. Steenbergen, Tom G. C. Van Leeuwen; 1Univ. of Twente, The Netherlands, 2Univ. of Amsterdam, The Netherlands. The absorption and scattering coefficients of gold nanospheres. This method has great potential in characterizing all types of nanoparticle-based optical contrast agents.

TuG1 • 10.30
High-Speed Optical Nano-Profilityometry with Sub-Diffraction-Limit Local Resolution, Chun-Chia Wang1, Chun-Hung Lee2; 1Res. Ctr. for Applied Sciences, Academia Sinica, Taiwan, 2Inst. of Biophotonics, Natl. Yang-Ming Univ., Taiwan. We employ the differential detection concept in structured illumination microscopy to achieve nano-meter depth resolution and sub-diffraction-limit lateral resolution. The profiling frame rate is 12 Hz. The topography of 100 nm polymer fibers is obtained.
Tuesday 16 June

Optical Coherence Tomography and Coherence Techniques

TuE • OCT Signal and Image Processing—Continued

TuE5 • 11.30
Multiple Scattering Effects Measured in Intralipid with (Doppler) Optical Coherence Tomography, Irena Kalkman1, Dirk J. Faber1, Tom G. van Looijen1,2, ‘Dept. of Biomedical Engineering and Physics, Academic Medical Ctr., Univ. of Amsterdam, The Netherlands, 1Dept. of Ophthalmology, Academic Medical Ctr., Univ. of Amsterdam, The Netherlands, 2Biomedical Technology Inst., Univ. of Twente, The Netherlands. Optical coherence tomography attenuation and Doppler flow measurements are performed on Intralipid solutions with varying concentration. The effect of multiple scattering in both attenuation and flow measurements is observed and quantified.

TuE6 • 11.45
AM-FM Techniques in Optical Coherence Tomography, Andreas Kartakoullis, Evgenia Bouzi, Constantinus Piris; Univ. of Cyprus, Cyprus. Ameliorating modulation-frequency properties isolation (AM-FM) analysis is applied to OCT images to extract additional information which is directly related to scatterer size changes. It can detect malignant features which are below the resolution of OCT.

TuF • Photoacoustic II—Continued

TuF5 • 11.30
Photoacoustic Imaging Using a Conical Axicon Detector, Sibylle Gratt, Klaus Passler, Robert Nuster, Guenther Pahulj; Dept. of Physics, Karl-Franzens Univ. Graz, Austria. A conically shaped piezoelectric ultrasound detector is investigated. This so-called axicon-detector achieves a sustained line of focus just depending on the geometrical center. Results of some simulations and experiments are given and discussed.

TuF6 • 11.45
Photoacoustic Microscopy with Large Integrating Optical Anular Detectors, Thomas Berer, Hubert Grun, Christian Hofer, Peter Burgholzer; RECENDT Res. Ctr. for Non-Destructive Testing, Austria. Large optical annular detectors were realized using polymer optical fibers and a Mach-Zehnder interferometer. Photoacoustic measurements were performed and compared to numerical simulations. Furthermore, deconvolution algorithms were applied to reduce artifacts in the images.

TuG • Localization and High Precision—Continued

TuG5 • 11.30
Live Cell Imaging with Surface Plasmon-Mediated Fluorescence Microscopy, Karla Balaban, Viviane Devaux1, Yannick Goulam, Sandrine Lévy-Sémé, Emmanuel Fort; Inst. Langeron, Ecole Superieure de Physique et de Chimie Industrielles ParisTech, France, Ctr. de Photonique Biomédicale and Lab of Photophysics and Nanophotonic, Univ. Paris Sud, France. We present a new imaging technique using surface-plasmon mediated fluorescence which permits enhanced membrane imaging. In addition, we show that, when coupled to lifetime fluorescence imaging, membrane topography can be measured with a nanometric resolution.

TuH • Ophthalmology/Cardiology—Continued

TuH6 • 12.00
Endoscopic Measurements of Free Flap Perfusion in the Head and Neck Region Using Red-Excited Indocyanine Green: Monitoring Fluorescence, Hilmar Schadenberg1, Sven Znare1,2, Herbert Stepp1, Ulrich Harre1, Christian S. Betz1; Laser Res. Lab, LIFE Ctr., Großhadern Medical Campus, Germany, Ludwig Maximuln University, ORL, Germany. To overcome limitations of indocyanine green angiography for detecting early stage flap malperfusion several techniques have been evaluated, including semi-quantitative fluorescence measurements, combination of fluorescence and quasi-whitelight measurements and deconvolution of flap perfusion resistance.

TuH7 • 12.15
Hyperspectral Characterization of Atherosclerotic Plaques, Liv Lyngnes Randles1, Eivind L. P. Larsen1, Astrid Altonen2, Olav A. Haugen1, Lars O. Svanberg1; 1Dept. of Electronics and Telecommunications, Norwegian Univ. of Science and Technology, Norway, 2Dept. of Lab Medicine, Children’s and Women’s Health, Norwegian Univ. of Science and Technology, Norway. It was investigated if hyperspectral imaging is suitable for characterization of atherosclerotic plaques. Analysis of post mortem reflectance and fluorescence images from human aorta samples shows that fatty deposits, collagen and hemoglobin can be classified.
Room 5, Ground Floor, Congress Centre

13.30–15.00
TuL • Functional Imaging
Christoph Hitzenberger; Medical Univ. of Vienna, Austria, Presider

TuL1 • 13.30
Imaging the Embryonic Heart with Optical Coherence Tomography Imaging of Chick Embryos
L. Wilson1,2,3, Joana Castanheira4, Luís Fereira4, Madhusudhana Gargeshu1, Bilal Ataya1, David L. Wilson2, Kersti K. Linask2, Michiko Watanabe2, Andrew M. Rollins1; 1Case Western Reserve Univ., 2INESC Porto - Inst. de Engenharia de Sistemas e Computadores, Porto, Portugal, 3Inst. di Fotonica e Nanotecnologie, Dept. di Fisica, Politecnico di Milano, Italy, 4LioniX BV, The Netherlands.

TuL2 • 13.45
In vivo in situ en face Optical Coherence Tomography Imaging of Chick Embryos
Leitner1,2,3, Joana Castanheira4, Luís Fereira4, Isabel Palmeirim5, Carla C. Rose5, Adrian Gh Podoleanu5; 1Faculty of Science, Univ. of Porto, Portugal, 2INESC Porto - Inst. de Engenharia de Sistemas e Computadores, Porto, Portugal, 3Applied Optics Group, School of Physical Sciences, Univ. of Kent at Canterbury, UK, 4ICTS, School of Health Sciences, Univ. of Minho, Portugal. We present an in vivo in situ en face optical coherence tomography study of chick embryos in several stages of development. Images were acquired at different depths within the sample, allowing access to embryo morphology in depth.

TuL3 • 14.00
Simultaneous Dual-Band Spectral Domain Optical Coherence Tomography Using a Supercontinuum Laser Light Source
Mika Mäder1, Maciej Baranski1, Ingo Neumann2, David L. Wilson2, Kersti K. Linask2, Joana Castanheira4, Luís Fereira4, Andrew M. Rollins1; 1Case Western Reserve Univ., 2INESC Porto - Inst. de Engenharia de Sistemas e Computadores, Porto, Portugal, 3Inst. di Fotonica e Nanotecnologie, Dept. di Fisica, Politecnico di Milano, Italy, 4LioniX BV, The Netherlands.

Room 11, 1st Floor, Congress Centre

13.30–15.00
TuJ • Lab on a Chip
Peter Macko; Nanotechnology and Molecular Imaging Unit, Inst. for Health and Consumer Protection, Italy, Presider

TuJ1 • 13.30
Optically Modulated Rapid Electrokinetic Patternning For Micro and Nano Particles
Aloke Kumar, Stuart J. Williams, Steven T. Werely; Purdue Univ., USA. A novel tool for non-invasive manipulation of micro and nano particles is developed by using optical landscapes in a microfluidic environment where low frequency alternating current (AC) electric fields are present.

TuJ2 • 13.45
Multi-Point, Multi-Wavelength Fluorescence Monitoring of DNA Separation in a Lab-on-a-Chip with Monolithically Integrated Femtosecond-Laser-Written Waveguides
Chaitanya Dongre1, Jasper van Weerd2, Rob van Weel2, Rebeca Martinez-Vazquez1, Roberto Osellame1, Roberta Ramponi1, Giuolo Carra1, Ronald Dekker1, Geert A. J. Besselink1, Hans H. van den Vlekkert4, Hugo J. W. M. Hoekstra1; 1Optical Imaging Systems, MESA+ Inst. for Nanotechnology, 2Eindhoven Univ. of Technology, 3Patterning For Micro and Nano Particles, 4LioniX BV, The Netherlands. The feasibility of using a femtosecond-laser-written waveguide for monitoring DNA separation in a lab-on-a-chip format is presented. The waveguide is written in a silicon-on-insulator wafer and integrated with a planar optical microfluidic device to achieve label-free separation of fluorescently labeled DNA molecules in on-chip microfluidic channels. DNA separation is monitored by integrated waveguide arrays, with simultaneous spatial and wavelength resolution. This is an important step toward point-of-care diagnostics with multiplexed DNA assays.

Room 21, 2nd Floor, Congress Centre

13.30–15.00
TuK • Holographic Methods
Kishan Dholakia; Univ. of St. Andrews, UK, Presider

TuK1 • 13.30
3-D Tracking and Multi-Wavelength Techniques for Digital Holographic Microscopy
Björn Kemper, Patrik Lange-hansenberg, Sebastian Kausmeyer, Sabine Prezibilla, Angelika Vollmer, Steffi Kettlau, Gert von Bally; Ctr. for Biomedical Optics and Photonics, Germany. It is shown that digital holographic microscopy (DHM) permits label-free 3-D tracking of multiple cells without mechanical focus realignment. Furthermore, by using multi-wavelength techniques in DHM, a reduction of amplitude and phase noise is achieved.

TuK2 • 14.00
Digital Holographic Microscope Working in Dark Field Mode to Investigate Objects Smaller than the Optical Resolution
Frank Dubois, Patrick Greffet; Univ. Libre de Bruxelles, Belgium. A dark field digital holographic microscope to detect objects smaller than the optical resolution limit is presented. It combines an improved detection with the digital holography refocusing capability. Experimental demonstrations and applications are discussed.

Room BO.R2, Ground Floor, Congress Centre Hall B0

13.30–15.00
TuL • Experimental Techniques II
Anabela Da Silva; LETI-CEA Recherche Technologique, France, Presider
Jens Steinbrink; Charité-Univ.-Medizin Berlin, Germany, Presider

TuL1 • 13.30
Impact of the Measurement Model Deviations on Fluorescence Diffuse Optical Tomography
Nicos Durot1, Anabela Da Silva2, Jean-Marc Dinrient1, Françoise Peyrin1; 1Electronics and Information Technologies Lab, French Atomic Energy Commission/Micro and Nanotechnology Innovation Ctr., France, 2Inst. Fresnel, France.

TuL2 • 13.45
Mice Lung Disease Follow-up with “Open Air” Fluorescence Diffuse Optical Tomography
Anne Koerig1, Georges Ganon1, Lionel Herri2, Michel Berger1, Jean-Marc Dinrient1, Jérôme Bouté1, Véronique Fassrand1, Jean-Luc Cell1, Philippe Pellet1, Philippe Rice2; 1CEA, LETI, MINATEC, France, 2Inst. Albert Bonniot, France. A fluorescence diffuse optical tomography instrument including a dedicated reconstruction scheme which accounts for the medium optical heterogeneities is presented. It allows non-contact measurements and does not require animal immersion in an optical adaptation liquid.

Tuesday, 16 June 2009

European Conferences on Biomedical Optics (ECBO) • 14–18 June 2009
Tu4 • 14.15 Spectroscopy in Single and Double Layered Weakly Scattering Phantoms Using Frequency Domain Optical Coherence Tomography, Boris Hermann1, Christoph Meyer2, Bernd Hoff3, Boris Povazay4, Wolfgang Drexler2; 1Cardiff Univ., UK, 2Bern Univ. of Applied Sciences, Switzerland. Depth resolved absorption profiles in the wavelength range of 800nm and 140nm bandwidth are demonstrated using spectroscopic frequency domain OCT. Absorption dynamics are presented, which might be useful for the investigation of pharmacokinetics or pharmacodynamics.

Tu4 • 14.15 Opto-fluidic Chip System with Integrated Fluidically Controllable Optics, Manfred Schubert1, Matthias Arras2, Gunter Mayer3, Thomas Henkel4; 1Inst. of Photonic Technology, Germany, 2Friedrich Schiller Univ., Germany. We describe an optofluidic approach for fibre coupling and flexible beam-shaping in the central plane of all-glass microfluidic devices. That way, adaptive, microfluidically controllable lens systems can be realized for beam shaping and light-section creation.

Tu5 • 14.30 Measurement of Microvascular Apparent Pulse Wave Velocity Using DOCT, Marco Bonesi1, Stefano Borga2, John Rodrigo1, Lóránd Kelemen2, Pál Ormos2; 1Inst. di Fisica Applicata Carrara, Consiglio Nazionale delle Ricerche, Italy, 2School of Photonics, Univ. of Muenster, Germany, 3-Ctr. for Biomedical Optics and Functional Imaging, Natl. Univ. of Singapore, Singapore. Optical microassembly platform for constructing reproducible microenvironments for biomedical studies. We describe a model platform for constructing versatile microenvironments by fabricating morphologically complex microstructures and assembling these archetypal building blocks into various configurations using optical traps.

Tu6 • 14.45 See the Brain at Work—Intraoperative Laser Doppler Functional Brain Imaging, Erica J. Magh1, Stephen Matcher2, Univ. of Sheffield, UK. We define microvascular apparent pulse-wave velocity and suggest its relation to the mechanical properties of a blood-microvessel. We suggest how this parameter could be measured using Doppler-OCT and present initial investigations using a silicone-microvessel-phantom.

Tu6 • 14.45 Fluorescence Optical Platform for CRP and PCT Detection, Francesco Baldini1, Ambra Gianfagna2, Cosimo Tronci3, Luca Deiati4, Gianpiero Perrot1; 1Istituto di Fisica Applicata Carrara, Consiglio Nazionale delle Ricerche, Italy, 2Dept. of Biomedical Engineering, Natl. Univ. of Singapore, Singapore, 3Dept. of Electronics and Computer Engineering, Natl. Univ. of Singapore, Singapore. A sandwich assay for C-reactive protein and procollagenin detection was implemented on a fluorescence-based optical platform. A limit of quantification of 13 µg L\(^{-1}\) and 20 µg L\(^{-1}\) was achieved for CRP and PCT, respectively.

Tu7 • 14.45 Application of Color Digital Holographic Microscopy for Analysis of Stained Tissue Sections, Xiaoli Mo1,2, Björn Kemper1, Patrick Langehanenberg1, Angela Kumler1, Jihui Xie3, Hetong Chen4, Felix von Bally1, Pierre Magistretti2, Christian Depeursinge3; 1Ctr. for Biomedical Optics and Functional Imaging, Natl. Univ. of Singapore, Singapore, 2Brain Mind Inst., Ecole Polytechnique Fédérale de Lausanne, Switzerland, 3-Ctr. de Neurosciences Psychiatriques, Univ. of Lausanne, Switzerland. A pseudo-random single photon counting based on the spread spectrum time-resolved optical measurement method combined with single photon counting. It offers faster data acquisition, high time-resolution and has low system cost.

Tu7 • 14.45 A Fast Method for finding Optimal Wave-lengths for Diffuse Optical Tomography, Iain Styles1,2; 1Univ. of Birmingham, UK. We present an algorithm for finding optimal wavelengths for diffuse optical tomography that does not require an exhaustive search of wavelength space. We investigate the effect of increasing the number of wavelengths used in DOT.
TuM1 Time-Delayed Diffuse Optical Spectroscopy: A Differential Absorption Approach, Paola Taronti1,2, Andrea Bazzi1,2, Lorenza Spinelli1, Rinaldo Cableda1,2,3, Antonio Piﬃeri1,2,3, Inst. di Fotonica e Nanotecnologie, Consiglio Nazionale delle Ricerche, Bologna, Italy; Dept. of Physics, Politecnico di Milano, Italy, 2Natl. Lab for Ultrafast and Ultraintense Optical Science, Consiglio Nazionale delle Ricerche, Italy, 3Res. Unit Politecnico di Milano, Italy. A method is presented to estimate spectral changes in the absorption properties of turbid media from time-resolved reflectance/transmittance measurements. Structural information obtained from scattering and extinction of the fluorescence that is linked to state of the ECM.

TuM2 Mueller Matrices Monitoring of Pathological Changed Connective Tissue, V. F. Ungurian, O. Ya. Wenchakul, Bucovinian State Medical Univ., Ukraine. Specific features of the formation of local and statistical polarization structures of laser radiation scattered in phase-inhomogeneous layers of biological tissue (BT) were studied. The analytical correlation of biological object John's matrices with far-field matrix element is researched.

TuM3 Complex Degree of Mutual Polarization of Biological Tissue Layers (BT) were studied. A BT architectonics was suggested. Mueller Matrices Monitoring of Pathological Changed Connective Tissue, V. F. Ungurian, O. Ya. Wenchakul, Bucovinian State Medical Univ., Ukraine. Specific features of the formation of local and statistical polarization structures of laser radiation scattered in phase-inhomogeneous layers of biological tissue (BT) were studied. The analytical correlation of biological object John’s matrices with far-field matrix element is researched.

TuM4 Correlation and Fractal Structure of Jones Matrices of Human Bile Secret, Alexander G. Ushenko1, A. I. Fediv1, Yu. F. Marchuk2, Chernivtsi Natl. Univ., Ukraine; Bucovinian State Medical Univ., Ukraine. The interrelation of anisotropy structure of human bile secret and topological element distribution of John’s matrices is investigated here. The analytical correlation of biological object John’s matrices with far-field matrix element is researched.

TuM5 Determination of the Optical Properties of Anisotropic Turbid Media Using an Integrating Sphere, Marie-Theres Heine, Florian Foschum, René Michels, Alwen Kienle; Inst. für Lasertechnologien in der Medizin und Meßtechnik at the Univ. Ulm, Germany. We studied the angular distribution of the reflected and reflected light from rough turbid biological tissue. Especially the influence of surface roughness on the determination of the optical properties is investigated.

TuM6 Fluorescence Lifetime Concentration Detection in vitro by Background Subtraction, Maria Gartner1, Jürg Mütte2, Thomas Oster1, Petra Schwille3; BIOTECH, Biophysics, Dresden Univ. of Technology, Germany. A novel method for fluorescence lifetime determination of the concentration of the optical properties of turbid media was set up and verified using liquid phantoms. It is investigated if the absorption coefficient of anisotropic turbid media can be accurately obtained.

TuM7 Multifunctional Laser Noninvasive Spectroscopic System for Medical Diagnostics and Some Metrological Provisions for That, Dmitrii A. Ragatkin1, Ludmila G. Lapava1, Elena V. Petrushkova1, Victor V. Sidorenko1, Moscow Regional Center, Russia. ATR prism attached at the distal end enables high-throughput measurement of biomedical samples and the probe has merits of flexibility, durability, and non-toxicity.

TuM8 IR Analysis of CaOx Kidney Calculi, Oleg Borden1, Oksana Drozdchak1, Ivan Frankev Natl. Health Center, Ukraine. The results obtained show a potential for differentiating soft tissues as well as tumors. The results obtained show a potential for differentiating soft tissues as well as tumors.

TuM9 Multispectral Autofluorescence and Reflectance Spectroscopy Posters

TuM10 Multispectral Autofluorescence and Reflectance Spectroscopy for Precise Concentration Detection in vivo by Background Subtraction, Maria Gartner, Jürg Mütte, Thomas Oster, Petra Schwille; Biophysics, Dresden University of Technology, Germany. In vivo studies of single molecule dynamics by means of fluorescence correlation spectroscopy can suffer from high background. Fluorescence lifetime correlation spectroscopy provides a tool to distinguish between signal and unwanted contributions via lifetime separation.

TuM11 Development of a Modified Transillumination Breast Spectroscopy (TIBS) System for Population-Wide Screening, Eleanor J. Walter1,2, Lothar D. Lilge1,2; Univ. Health Network, Canada; Univ. of Toronto, Canada. A transillumination breast spectroscopy system has been modified by reducing the spectral content to facilitate its use in multicentre trials. The reduction did not significantly reduce its ability to predict mammographic density.

TuM12 Flexible ATR Probe for Endoscopic FT-IR Measurement Using Hollow Optical Fiber, Yuji Matsumura, Saiko Kino, Tokohu Univ., Japan. We present infrared spectroscopy systems based on hollow optical-fiber probes are proposed. An ATR prism attached at the distal end enables high-throughput measurement of biomedical samples and the probe has merits of flexibility, durability, and non-toxicity.

TuM13 Fluorescence Lifetime Concentration Detection in vitro by Background Subtraction, Maria Gartner, Jürg Mütte, Thomas Oster, Petra Schwille; Biophysics, Dresden University of Technology, Germany. In vivo studies of single molecule dynamics by means of fluorescence correlation spectroscopy can suffer from high background. Fluorescence lifetime correlation spectroscopy provides a tool to distinguish between signal and unwanted contributions via lifetime separation.

TuM14 Optical Soft Tissue Differentiation by Diffuse Reflectance Spectroscopy, Achaz Zari1, Florian Stolle1, Emekha Oleke, Katja Tangermann-Gerk2, Michael Schmidt1, Werner Adler2, Alexander Dautel1; 1AOT - Graduate School in Advanced Optical Technologies, Friedrich-Alexander-Universitiät Erlangen-Nürnberg, Germany; 2Dept. of Medical Informatics, Biometry and Epidemiology, Friedrich-Alexander-Universitiät Erlangen-Nürnberg, Germany. Laser surgery lacks haptic feedback control. Diffuse reflectance spectroscopy provides a straightforward approach for such feedback. The results obtained show a potential for differentiating soft tissues as guidance for tissue-specific laser surgery.

TuM15 Optical Soft Tissue Differentiation by Diffuse Reflectance Spectroscopy, Achaz Zari, Florian Stolle, Emekha Oleke, Katja Tangermann-Gerk, Michael Schmidt, Werner Adler, Alexander Dautel; 1AOT - Graduate School in Advanced Optical Technologies, Friedrich-Alexander-Universitiät Erlangen-Nürnberg, Germany; 2Dept. of Medical Informatics, Biometry and Epidemiology, Friedrich-Alexander-Universitiät Erlangen-Nürnberg, Germany. Laser surgery lacks haptic feedback control. Diffuse reflectance spectroscopy provides a straightforward approach for such feedback. The results obtained show a potential for differentiating soft tissues as guidance for tissue-specific laser surgery.

TuM16 Multispectral Autofluorescence and Reflectance Spectroscopy for Precise Concentration Detection in vivo by Background Subtraction, Maria Gartner, Jürg Mütte, Thomas Oster, Petra Schwille; Biophysics, Dresden University of Technology, Germany. In vivo studies of single molecule dynamics by means of fluorescence correlation spectroscopy can suffer from high background. Fluorescence lifetime correlation spectroscopy provides a tool to distinguish between signal and unwanted contributions via lifetime separation.

TuM17 Fiberoptics Based Laser System for 2-D Fluorescence Detection and Optical Biopsy, Daia Kazakeshil, Arina Chirlely, Saulius Bagdonas1, Giedri Strekbytė1, Rūdrūnas Kotoškiulis2, Rūdrūnas Gudonis1; 1Dept. of Quantum Electronics and Lasertechnologien in der Medizin und Meßtechnik, Germany; 2Natl. Lab for Ultrafast and Ultraintense Optical Science, Consiglio Nazionale delle Ricerche, Italy. A fiber-optics based laser system for depth probing fluorescence measurements is described. Localization of the PKH67 marked cells was evaluated with the probe needle tip registering fluorescence spectra at various probing depth.

TuM18 Development of a Modified Transillumination Breast Spectroscopy (TIBS) System for Population-Wide Screening, Eleanor J. Walter, Lothar D. Lilge; 1Univ. Health Network, Canada; 2Univ. of Toronto, Canada. A transillumination breast spectroscopy system has been modified by reducing the spectral content to facilitate its use in multicentre trials. The reduction did not significantly reduce its ability to predict mammographic density.

TuM19 Optical Soft Tissue Differentiation by Diffuse Reflectance Spectroscopy, Achaz Zari, Florian Stolle, Emekha Oleke, Katja Tangermann-Gerk, Michael Schmidt, Werner Adler, Alexander Dautel; 1AOT - Graduate School in Advanced Optical Technologies, Friedrich-Alexander-Universitiät Erlangen-Nürnberg, Germany; 2Dept. of Medical Informatics, Biometry and Epidemiology, Friedrich-Alexander-Universitiät Erlangen-Nürnberg, Germany. Laser surgery lacks haptic feedback control. Diffuse reflectance spectroscopy provides a straightforward approach for such feedback. The results obtained show a potential for differentiating soft tissues as guidance for tissue-specific laser surgery.

TuM20 Fiberoptics Based Laser System for 2-D Fluorescence Detection and Optical Biopsy, Daia Kazakeshil, Arina Chirlely, Saulius Bagdonas1, Giedri Strekbytė1, Rūdrūnas Kotoškiulis2, Rūdrūnas Gudonis1; 1Dept. of Quantum Electronics and Lasertechnologien in der Medizin und Meßtechnik, Germany; 2Natl. Lab for Ultrafast and Ultraintense Optical Science, Consiglio Nazionale delle Ricerche, Italy. A fiber-optics based laser system for depth probing fluorescence measurements is described. Localization of the PKH67 marked cells was evaluated with the probe needle tip registering fluorescence spectra at various probing depth.
TuM21  
Differentiation of Human Heart Conduction System by Means of Fluorescence Spectroscopy, Jonas Ventas1, Eduardas Zarasauskas2, Saulius Bagdonas3, Elektra Zurasauskaite2, Ricardas Butomskis2; 1Laser Res. Ctr., Vilnius Univ., Lithuania, 2Medical University of Lodz, Poland, 3Lithuanian Institute of Biomedical Sciences, Lithuania.  

TuM22  
Efficiency of Fluorescence Coupling into Planar Waveguides, Ronja Bämker, Kai Bodensiek, André Selle, Thomas Fricker-Regemann, Jürgen Biehm, Gerd Marowsky; Laser-Lab Göttingen e.V., Germany.  

TuM23  
Optical Detection of Singlet Oxygen Produced by UVA Irradiation of Fatty Acids and Phospholipids, Johannes Regenburger, Tim Maish, Wolfgang Bäumler, Univ. of Regensburg, Germany. We investigated the generation of singlet oxygen by fatty acids and lipids during UVA (355 nm) exposure. We detected and quantified singlet oxygen directly by measuring its NIR luminescence time and spectral resolved.  

TuM24  
Biphasic Functional Signals from the Human Visual Cortex Measured by Time-Resolved Diffusing-Wave Spectroscopy, Jun Li, Markus Nimke, Thomas Gieder, Thomas Elbert; Univ. Konstanz, Germany.  

TuM25  
An Integrated Biophotonic Imaging System for Studying Muscle Physiology, Vishal Saxena, University of Southern California, USA. All optical technique based on near infrared spectroscopy (650-850 nm) and mid infrared imaging (8-12um) is applied as a non-invasive tool to monitor vasculature status of skeletal muscle and physiological changes that occur during exercise.

TuM26  
Changes in Scalp and Cortical Blood Flow during Hyperventilation Measured with Diffusing-Wave Spectroscopy, Ioan Il, Markus Nimke, Thomas Gieder; Univ. of Konstanz, Germany. Changes in scalp and cortical blood flow induced by voluntary hyperventilation are investigated by near-infrared diffusing-wave spectroscopy. Data measured from six subjects show the hemodynamic response during hyperventilation period is not simply monophasic.

TuM27  
Sleep Apnea Termination Decreases Cerebral Blood Flow: A Near-Infrared Spectroscopy Study, Jaakko Virrankoski1,2, Tommi Noponen1, Tapio Salo1, Jouko Tooplis1, Pekka Mäiriäinen1; 1Dept. of Biomedical Engineering and Computational Science, Helsinki Univ. of Technology, Finland, 2Helsinki Univ. Central Hospital, Finland. Near-infrared spectroscopy is used for determining extravascular and cortical haemoglobin concentration changes during apnic events in sleep. Results suggest termination of apnea leads to increase in extracerebral blood flow and decrease in cerebral blood flow.

TuM28  
Development of Technology of Cerebral Oxygenation Measurements by Time-Resolved Spectroscopy, Yuri A. Chiriev; Inst. of Physics NAS Belarus, Belarus. Detailed investigations of cerebral tissues optical properties have been carried out. New technology of cerebral oxygenation measurements based on time resolved registration of backscattered radiation of probing picosecond laser pulse is developed.

TuM29  
Investigation of Arterial Inflow and Venous Capacitance in Human Skin by Use of RGB Images, Izzami Nishidate1, Hayato Kaneko1, Taiko Maeda1, Yohsuke Aizai1, Tsuyoshi Izumi2, Johannes Kuler1; 1Orthopedic Institute, Tottori University, Japan, 2Research Institute of Biomedical Sciences, University of Occupational and Environmental Health, Japan. We investigated the venous capacitance in the human skin were visualized from the increase rate and the change of total blood concentration derived from RGB images during upper limb occlusion at 5mmHg pressure.

TuM30  
Bioplastic Functional Signals from the Human Vascular Cortex Measured by Time-Resolved Diffusing-Wave Spectroscopy, Jun Li, Markus Nimke, Thomas Gieder, Leonie Koban, Johannna Kisler, Thomas Elbert; Univ. Konstanz, Germany. A transiently elicited by steady-state flickering is measured non-invasively by multi-speckle near-infrared diffusing-wave spectroscopy (DWS). The time-resolved DWS signal shows a biphasic feature after onset of stimulation.

TuM31  
Photodynamic Therapy of Precancer and Early Cancer of Vulva, Olga I. Trushina, Elena G. Novikova, Victor Y. Sokolov, E. Filenenko, E. Chukovka, Valery I. Chisson, Georgy N. Vorontsov; P.A. Herzen Moscow Res. Oncology Inst., Russian Federation. PDT was performed in 18 patients with severe dysplasia and in 4 patients with vulva carcinoma in situ. Complete regression of VIN III was achieved in 15 patients, carcinoma in situ in 3 cases.

TuM32  
Endolaryngeal Surgery and Adjuvant Photodynamic Therapy (PDT) in Cases of Viral Associated Recurrent Papillomatisis (VARP) of Larynx, A. Gladyshev1, Larisa Telegena1, Victor Y. Sokolov1, I. Rebotier1, L. Zaraskiene1, Sergey G. Kuzmin1, Georgy N. Vorontsov2; 1P.A. Herzen Moscow Res. Oncology Inst., Russian Federation, 2Organic Intermediates and Dyes Inst., Russian Federation. A method of combined treatment in case of a VARP of larynx has been elaborated. For the period 1995-2008, 36 patients with VARP of larynx were treated with Alasens (5-ALA), Radachlortin, and Photosens.

TuM33  
Therapeutic Effect of Intravitreal Bevacizumab (Avastin) in Combination with Photosens Photodynamic Therapy in the Treatment of Choroidal Neovascularisation, Maria V. Budzitskaya1, I. Garova1, I. Sherogleva1, E. Kazar- ian1, E. Privanikova1, Sergey G. Kuzmin1, Georgy N. Vorontsov2; State Res. Inst. of Eye Disease of RAS, Russian Federation. Fifteen patients with choroidal neovascularisation at 6-month intervals were observed. Our study finds it feasible to use combining PDT (Photosens) with intravitreal bevacizumab as an effective alternative treatment of patients with classic subfoveal choroidal neovascularisation.

TuM34  
Evaluation of the PDT Effect of Foscan and Forpex in the LNCaP Human Prostate Cancer Cell Line, Apasna O. Petri1, Maria Kyrrzou2, Elena Alexandra1, Michael Ballé1, Susanna Gjöf1, Dido T Wong1; 1Lab of Biomedical Optics and Applied Biophysics, School of Electrical and Computer Engineering, Natl. Technical Univ. of Athens, Greece, 2Div. of Pharmaceutical Technology, School of Pharmacy, Natl and Kapodistrian Univ of Athens, Greece, 3Research and Development, Biolitec AG, Germany. Localization, uptake and phototoxicity of Foscan and Forpex in prostate cancer cells (LNCaP) was measured time and spectral resolved. Results show that Foscan presents higher phototoxicity than Forpex under the same experimental conditions.

TuM35  
Optical Detection of Singlet Oxygen Produced by UVA Irradiation of Fatty Acids and Phospholipids, Johannes Regenburger, Tim Maish, Wolfgang Bäumler, Univ. of Regensburg, Germany. We investigated the generation of singlet oxygen by fatty acids and lipids during UVA (355 nm) exposure. We detected and quantified singlet oxygen directly by measuring its NIR luminescence time and spectral resolved.

TuM36  
The Role of Singlet Oxygen and Oxygen Concentration in Photodynamic Inactivation of Bacteria, Tim Maish, Johannes Regenburger, Wolfgang Bäumler, Univ. of Regensburg, Germany. We investigated the generation and decay of singlet oxygen in bacteria like E. coli and E. aerius.

TuM37  
Photodynamic Effect of ALA-Induced Porphyrim and Chlorin e6 on Mycobacterium phlei and Mycobacterium smegmatis, B. Bruce-Michal, U. Gemm, D. Hüttenberger, J. Callum, H.-J. Foth, 1,2Univ. of Kaiserslautern, Germany, 3ApoCare Pharma GmbH, Germany. The present results show cell destruction by photodynamic inactivation using ALA-induced porphyrins and chlorin e6 accumulated in Mycobacterium phlei and Mycobacterium smegmatis, whereas we reached a reduction up to 97% dependent on different oxygen concentrations.

TuM38  
Characterization of a Miniature Integrating Cylinder for Absolute Calibration of Fluence Rate Probes for Interstitial Photodynamic Therapy (PDT), Benjamin Lai1,2, Lothar Ligitz1,2, 3Div. of Medical Biophysics, Univ. of Toronto Canada, 1Ontario Cancer Inst., Univ. Health Network, Canada. An integrating cylinder with a multiplied multiplication factor of 33.5 composed of high-density polyurethane has been developed for absolute calibration of fluence rate probes designed for photodynamic therapy monitoring.

TuM39  
Absolute Calibration of Multi-Sensor Fluorescent Probes for Interstitial Photodynamic Therapy Monitoring, Benjamin Lai1,2, Lothar Ligitz1,2, 3Univ. of Toronto Canada, 1Ontario Cancer Inst., Univ. Health Network, Canada. Fluorescent multi-sensor fiber optic probes for spatially resolved monitoring of Interstitial Photodynamic Therapy were absolutely calibrated using an integrating cylinder. The dynamic response was evaluated and showed linear responsivity in the test range 0.3-10mW/cm2.
TuM40 Light Dosimetry in Collagen Phantoms in Presence of Methylene Blue and Intralipid, Elisa M. Sales1, Naszer A. Dogruistandi1, Mauricio S. Baptista1, Rouangela Dr1,2; Physics Inst., Univ. of Sao Paulo (IFUSP), Brazil, 1Engineering & Social Science Ctr., Univ. of ARC (CECS - UFABC), Brasil, 2Chemistry Inst., Univ. of Sao Paulo (IQUSP), Brazil. In this work we measured the transmission of red laser light through collagen phantoms containing methylene blue and Intralipid. We also analyzed the scattered light distribution and inferred about penetration depth and maximum intensity position.

TuM41 Determination of Tissue Optical Properties Using Double Integrating Sphere System for Advanced Laser Medicine, Kunio Awaaza1,2, Katsumori Itoh1, Norihito Honda1; Osaka Univ., Japan, JST, Japan. Optical property changes should be considered to realize safe laser treatments. This study shows the optical properties of normal and laser treated tissues in visible to near-infrared wavelength range by using double integrating sphere system.

TuM42 Optical Parameters Evaluation Using Optical Coherent Tomography Images, Iulian Ionita1, Univ. of Bucharest, Romania. OCT currently used for in vivo tissue images is a high spatial resolution information source about local optical properties of tissue. From OCT images analyzed we have extracted data about the light attenuation at 1350 nm.

TuM43 The Modeling of the Temperature Field, Formed inside Multilayer Biological Tissue under the Affect of the Laser Emission, Kirill Kalikov1, Faculty of Physics and Mechanics, Dept. of Higher Mathematics, St. Petersburg Polytechnic State Univ., Russian Federation. The model hyperthermy of the biological structure under the effect of laser emission is proposed. One allows to research the influence of temperature field to the electrophysical parameters of the biosystem for case in vivo.

TuM44 Comparison of 980-nm and 1070-nm in Endovenous Laser Treatment (EVL), Nenim Topaloglu1, Ozgur Tabakoglu1; Mehmet Umit Ergenoglu1, Murat Gulsoy2; Biomedical Engineering Inst., Bafgazici Univ., Turkey, Dept. of Cardiovascular Surgery, Yeditepe Univ. Hospital, Turkey. The aim is to investigate effect of different laser modalities on EVLT Human veins were irradiated with 980-nm and 1070-nm lasers at 8 and 10 W. 10 W of 980-nm laser led to better shrinkage.

TuM45 Laser Osteoperforation for Treatment of Inflammatory and Destructive Bone Diseases, Valery A. Privalov1, Igor V. Kriuchek1, Ivan A. Abakumkin1, Igor I. Shumily1, Alexander V. Lopat1; Chelyabinsk State Medical Acad., Russian Federation, Chelyabinsk Municipal Hospital No.1, Russian Federation, Chelyabinsk State Univ., Russian Federation. Clinical trial in 508 osteomembrines, 50 nmseum and 40 osteochondropathy cases proved the efficiency of laser osteoperforation for treatment of inflammatory and destructed bone districts. The method promotes rapid inflammation reduction and stimulates bone repair.

TuM46 Card Microcablekage Investigation after Nd:YAG Laser-Assisted Treatment, Cosmin Balabu1, Carmen Todera1, Laura Filip1, Mirela Calinauc1, Cezmea Demies1, Cosmin Lece1, Aurel Badu1; School of Dentistry, Victor Babu1, Univ. of Medicine and Pharmacy Timisoara, Romania, Dept. of Mechanics and Vibration, Politehnica Univ. of Timisoara, Romania. This in vitro study was conducted in order to assess using optical microscopy the apical sealing in Ned:YAG laser irradiated root canals in comparison with the conventional treatment method.

TuM47 Optical Tweezer and Manipulation of PMMA Beads in Various Conditions, Domnna Kotekifski1, Marzena Makropulu1, Alexandros Senjuntidis1; Natl. Technical Univ. of Athens, Greece. We present experimental results of micro-ablation of trapping PMMA beads, in various media, and results of measurements of the optical trap force of PMMA beads. We determine the shape size of PMMA microparticles using A.F.M.

TuM48 Optically Guided Neuronal Growth, David J. Carruth1, D. J. Stevenson1, M. Mazi1, F. Gunn1; Optically Guided Neuronal Growth, 206-00266 nm Laser Irradiation, Elisa Sputrato, Mersini I. Makropulu1, Kyros Moutsouris1, Costas Bacharis1, Natl. Technical Univ. of Athens, Greece. Ablation experiments of human donor cornea flaps were conducted with the 4th harmonic of an Nd:YAG laser, with various laser pulses. AFM analysis was performed for examination of the ablated cornea morphology and surface roughness.

TuM49 Non-Ablative Processing of Biofibers by Femtosecond IR Laser, Vladimir A. Kharkovnyan1,2, Efato1, Chen-Yuan Dong1; Natl. Taiwan Univ., Taiwan, Yiwee1, Venerus Physic Inst., Armenia. Controllable, non-ablative photo-processing of collagen, cotton and spider silker fibers was achieved by femtosecond Tis laser. Fibers were cut, bend and welded by the infrared laser and simultaneously imaging using SHG and two-photon autofluorescence microscopy.

TuM50 An Experimental Study of Corneal Scattering for the Optimization of Femtosecond Keratoplasty, Donald A. Peyrot1, Florent Aptel2, Carolina Crosetti1, Florent Dalaloin1, Karsten Plattmann1, Michele Savoldelli1, Jean-Marc Legais2; Lab d’Optique Applique2, ESTA – Ecole Polytechnique – CNRS UMR 7639, France, Lab Biotechnologie et Ost, Hôpital Dieu, France. Direct transmittance spectrum of human corneas is studied through a confocal geometry setup. Comparison of the obtained spectrum with the total transmittance spectrum gives the corneal scattering spectrum, and its wavelength dependence is presented.

TuM51 Corneal Transparency Revisited, Karsten Plattmann1, Lab d’Optique Applique1, ESTA – Ecole Polytechnique – CNRS UMR 7639, France. We present a mathematical model and a numerical analysis of the tissue microstructure of the anterior segment of the eye permitting to explain corneal transparency and to predict the light scattering properties of the tissue.

TuM52 Transmission Measurements of Human Crystals, Leonor H. Lundemand1, Line Kehoe1, Christine Herbst1, Michael Larsen1, Glostrup Hospital, Denmark. We present new results of the transmission of visible and near infrared light of the human crystalline lens aged 17-75. Compared to previously published results, we find a larger transmission especially in the near infrared.

TuM53 Atomic Force Microscopy Analysis of Human Corneal Surface after UV (λ=266 nm) Laser Irradiation, Elisa Sputrato, Mersini I. Makropulu1, Kyros Moutsouris1, Costas Bacharis1, Natl. Technical Univ. of Athens, Greece. Ablation experiments of human donor cornea flaps were conducted with the 4th harmonic of an Nd:YAG laser, with various laser pulses. AFM analysis was performed for examination of the ablated cornea morphology and surface roughness.

TuM54 Multispectral Imaging of the Ocular Fundus and Surface Roughness, Carnival, D. J. Stevenson1, D. Mazi1, F. Gunn1; Multispectral Imaging of the Ocular Fundus and Its Wavelength Dependence, Paul V. A. Wensing1, Jan Schouten1, Alexadros A. Serafetinides; Natl. Technical Univ. of Athens, Greece. Ablation experiments of human donor cornea flaps were conducted with the 4th harmonic of an Nd:YAG laser, with various laser pulses. AFM analysis was performed for examination of the ablated cornea morphology and surface roughness.

TuM55 Simultaneous Imaging of Blood Flow and Hemoglobin Concentration Change in Skin Tissue Using NIR Speckle Patterns, Yukihisa Aizu1, Tatuya Hirata1, Takashi Maek1, Izumi Nishidate1, Naomichi Yokoi1, 2Muroan Inst. of Technology, Japan, Tokyo Univ. of Agriculture and Technology, Japan, 3Asahikawa Natl. College of Technology, Japan. We propose a method for imaging simultaneously blood flow and hemoglobin concentration change in skin tissue using speckle patterns at two wavelengths in a near-infrared range. Experimental results demonstrate the usefulness of the method.

TuM56 Light Collection from Fluorescence-Based Biosignals by Holographic Diffactive Optical Elements, Peter Macka1, Maurice Whelan2, Nanotechnology and Molecular Imaging Unit, Inst. for Health and Consumer Protection, European Commission-DG Joint Res. Ctr., Italy. A fluorescence-based biosignals with an integrated holographic diffactive element on its underside is presented. The diffactive element acts as a collector of fluorescence emitted from surface-bound emitters. The performance of the diffusive elements is demonstrated.

TuM57 Infrared Signature Analysis of the Thyroid Tumors, Georgiev G. Gergovski1, Adina-Mariana G. Gergovski1, Marius-Razvan G. Gergovski1, Univ. of Pitesti, Romania, Medical and Pharmaceutical University of Bucharest, Romania. The best defense against cancer is early detection, when tumor dimensions are very small. A medical system operating on five steps is presented. The experimental results for 24 patients with thyroid nodules are described.

TuM58 Light Scattering by Multiple Spheres: Solutions of Maxwell Theory Compared to Radiative Transfer Theory, Florian Voit1, Jan Schäfer1, Alwin Wysocka1, Halina Podbielska2; Inst. of Biomedical Engineering and Instrumentation, Wroclaw Univ. of Technology, Poland. A novel method of bacteria detection using near-infrared light is presented. Theoretical results for multi-sphere models. Non-absorbing dielectric spheres in varying concentrations are used to approximate the structure of biological tissue.

TuM59 Exploiting of Optical Transforms for Bacteria Evaluation in vitro, Igor Buzalewicz1, Katarzyna Wysoczka1, Halina Podbielska2; Inst. of Biomedical Engineering and Instrumentation, Wroclaw Univ. of Technology, Poland. A novel method of bacteria concentration evaluation based on Fourier and wavelet analysis is proposed. The applied algorithm provides spatial and scale invariance, which leads to obtain comparative image processing method of bacteria colonies concentration determination.
**TuM60**
Polarization Metrology of John's Matrices Images of Pathologically Changed Biotissues, Sergey B. Yermolenko, Yuriy A. Usenklo, Alexander J. Dubolazov; Chernivtsi Natl. Univ., Ukraine. The correlation of biotissue architectonics and topological element distribution of John's Matrices is investigated. We researched the correlation of birefringent layers (PIL) of biological tissue (BT) were studied.

**TuM61**
Polarization Selection of Two-Dimensional Phase-Inhomogeneous Pathologically Changed Biotissues Images, Sergey B. Yermolenko, Yuriy A. Usenklo, Alexander J. Dubolazov; Chernivtsi Natl. Univ., Ukraine. Formation of local and statistical polarization structures of laser radiation scattered in phase-inhomogeneous layers (PIL) of biological tissue (BT) were studied. A method of polarization phase reconstruction of BT architectonics was suggested.

**TuM62**
Dynamic Imaging of Blood Microcirculation in the Olfactory Bulb of Rats, Barbara L'Ileurieux, Mawin Bendokhrane, Claire Martin, Hitec Garden, Frederic Pain; Lab Image et Modélisation en Neurobiologie et Cancérologie, CNRS, Univ. Paris XI/UUniv. Paris VII, France. We report the first use of laser speckle contrast imaging to obtain spatiotemporal maps of odor-evoked blood flow changes in the olfactory bulb of anesthetised rats.

**TuM63**
Monitoring of Epithelium Capillary Density, Rajesh V. Kanawade, Gennady Sayko, Alexander Dospekh, Erlangen Graduate School in Advanced Optical Technologies (SOT), Friedrich-Alexander Univ. Erlangen-Nuremberg, Germany. The overall scope of this work is to develop optical fiber probe for real time monitoring and measure physiological changes in the epithelium capillary density and blood oxygenation, which helps to detect shock development.

**TuM64**
Spectropolarimetry in Singular Structure Biotissues Images for Diagnostics of their Pathological Changes, Sergey Yermolenko, Yuriy Usenklo, Alexander Prydyb, Stefan Gamzinski; Chernivtsi Natl. Univ., Ukraine. We theoretically analyzed the formation of the polarization singularities of the biological tissues representations of various morphological structures. We experimentally examined the coordinate distributions of polarization singularities of the physiologically normal and pathologically changed biological tissues.

**TuM65**
Terahertz Radiation May Be Used in Medical Diagnostics, Viacheslav I. Fedorov, V. M. Klementiev1, A. G. Khamoyan1, E. Ya Shevela2, E. R. Chernyshe2; 1Chernivtsi Natl. Univ., Ukraine, 2Univ. of Bucharest, Romania. We theoretically analyzed the formation of the polarization singularities of the physiologically normal and pathologically changed biological tissues. The possibility of using the terahertz laser as a diagnostic instrument was studied. Terahertz exposure can be a diagnostic test of potential insufficiency of red blood cells and lymphocytes at early stages of hematological and immune diseases.

**TuM66**
Light Scattering Properties of Bacteria Nutrient Medium, Oleksandr Bilhy1, Vasyl' Getman', Roman Yaremky1, Yaroslav Ferensenko, Okwama Droshuk1, Ihor Kotsyumba2, Ihor Kushnir1; Leiv Natl. Univ., Ukraine, 'State Scientific Res. Control Inst. of Veterinary Preparations and Food Additives, Ukraine. The results of research of light scattering properties of eight liquid bacteria nutrient media for the bacterial cells of Escherichia coli are described.

**TuM67**
Experimental Determination of Frequency Dependent Acoustic Attenuation for Photoacoustic Imaging, Johannes Bauer-Marschallinger, Francisco Camacho-Gonzalez, Thomas Beier, Robert Grün, Peter Burgholzer; RECENET Res. Otr. Non Destructive Testing, Austria. The knowledge of the frequency dependent acoustic attenuation is important for an improvement of model-based time reversal methods for photoacoustic imaging. Two methods of experimental determination of these coefficients and results are shown.
High-speed, High-resolution SLO/OCT for Investigating Temporal Changes of Single Cone Photoreceptors in Vivo

Michael Picker, Bernhard Baumann, Harold Sattmann, Erich Götzinger, Christoph K. Hitzenberger; Medical Univ. of Vienna, Austria.

In this paper we present our improved transversal scanning OCT system that is capable of retinal imaging with cellular resolution. With this instrument long-term changes of single human cone photoreceptors are observed.

Light-Induced Nanoparticle-Activated Cell-Selection: Successful Stem Cell Purification in a Preclinical Model

Florian Lelloff1, Sebastian Zierer1, Frank Jägerke1, Gerwin Hüttemann1, Andreas Limmre1, Percy Knolle1, Elmar Endl1; Inst. of Molecular Medicine and Experimental Immunology, Univ. Hospital Bonn, Germany, ‘Inst. of Biomedical Optics, Univ. of Luebeck, Germany. Elimination of leukemia cells contaminating bone marrow by light-induced nanoparticle-activated cell-selection resulted in tumor free survival of transplanted mice, which showed unaltered bone marrow reconstitution and development of a functional immune system.

Targeted Optoinjection of Single Gold Nanoparticles into Individual Mammalian Cells

Cvig Moindogd1, David J. Stevenson1, Tom Brown1, Frank Grimm-Moore1, Kishan Dhokia1,1; School of Physics and Astronomy, Univ. of St. Andrews, UK, ‘School of Biology, Univ. of St. Andrews, UK, ‘School of Physics and Astronomy, UK. We present an all optical technique for delivering single 100 nm gold nanoparticles into a specified region of the interior of an individual mammalian cell through a combination of optical tweezing and femtosecond optoinjection.

Laser-Induced Cavitation Around Single Au-Nanoparticles

Michael Kitz, Michael Jaeger, Lea Siegenthaler, Martin Frenz; Univ. of Bern, Switzerland. Vapor bubble generation threshold, bubble lifetime, induced pressure transients and microscopic flash photography images have been determined and captured following irradiation of a single gold nanoparticle with a short ns laser pulse.

The Effect of Single Femtosecond Pulses on Gold Nanoparticles in an Aqueous Environment

Omer P. Kocaoglu1, Qiang Wang1, Weihua Gao1, Ravi S. Jonnal1, Toyohiko Yatagai2, Donald T. Miller1; 1Indiana Univ., USA, ‘2Utsunomiya Univ., Japan.

We present a novel method to obtain optical angiographies in an Aqueous Environment, using a Computational Phase-Shift, Hamo Homann, Julia Walther, Gregor Mueller, Edmund Koch, Dresden Univ. of Technology, Germany. We present a novel method to obtain optical angiographies (OAG) from optical coherence tomography (OCT). A moving reference arm is simulated by introducing a phase-shift at the post-processing stage. The method can be applied bi-directionally.

Investigation of Discriminant Analysis Methods for the Diagnosis of Basal Cell Carcinoma


High-speed, high-resolution SLO/OCT for investigating temporal changes of single cone photoreceptors in vivo.

Light-induced nanoparticle-activated cell-selection: successful stem cell purification in a preclinical model.

Targeted optoinjection of single gold nanoparticles into individual mammalian cells.

Laser-induced cavitation around single Au-nanoparticles.

The effect of single femtosecond pulses on gold nanoparticles in an aqueous environment.

Investigation of discriminant analysis methods for the diagnosis of basal cell carcinoma.
Colorectal Neoplasm Characterization Based on Swept-Source Optical Coherence Tomography, Chih-Wei Lu*, Han-Mo Chiou*, Chiao-Wei Sun1; 1Medical Electronics and Device Technology Ctr., Industrial Technology Res. Inst., Taiwan, 2Dept. of Internal Medicine and Health Management Ctr., Natl. Taiwan Univ. Hospital, Taiwan, 3Biophotonics Interdisciplinary Res. Ctr. and Inst. of Biophotonics, Natl. Yang-Ming Univ., Taiwan. To detect the morphological changes between polyph and tumor can allow early diagnosis of colorectal cancer and simultaneous removal of lesions. The various adenoma/carcinoma in vitro samples are monitored by our swept-source optical coherence tomography system.

3-D Fourier Domain Optical Coherence Tomography of Post Perfusion Fixed Ethanol-Filled Isolated Rabbit Lungs, Sven Meissner*, Lilla Knell*, Edmund Koch1; 1Univ. of Technology Dresden, Germany, Medical Faculty Carl Gustav Carus, Germany. 3-D Fourier domain optical coherence tomography was used to image post-perfusion fixed ethanol filled lungs to acquire realistic alveolar geometry, which is needed to develop numerical models of the lung on an alveolar scale.

Catheter-Based Intraluminal Optical Coherence Tomography to Defining the Delimitation of Different Wall Layers of Porcine Ureters ex vivo, Ulrike L. Mueller-Lisse*, Oliver A. Meissner, Margret Bauer, Christian Stief, Maximilian F. Reiser, Ullrich G. L. Mueller-Lisse, Oliver A. Meissner, Margit Bauer, Ulrike Kuetemeyer1, Willem Binning*, Sebastian Eckert1, Judith Baumgarth1, Anaclet Ngezahayo*, Alexander Heisterkamp1, Alfred Vogel1, Univ. of Lübeck, Germany; 2Inst. of Biophysics, Leibniz Univ., Germany, 3Laser Zentrum Hannover e.V., Germany. We investigated the mechanism of optoporation by series of femtosecond laser pulses combining the patch clamp technique, a pump-probe laser setup and high-speed photography. We revealed the role of long-lasting bubbles for cell perforation.

Mechanisms of Femtosecond Laser Cellular Optoporation, Tobias Jakobski1, Willem Binning*, Sebastian Eckert1, Judith Baumgarth1, Anaclet Ngezahayo*, Alexander Heisterkamp1, Alfred Vogel1; 1Univ. of Lübeck, Germany; 2Inst. of Biophysics, Leibniz Univ., Germany, 3Laser Zentrum Hannover e.V., Germany. We investigated the mechanism of optoporation by series of femtosecond laser pulses combining the patch clamp technique, a pump-probe laser setup and high-speed photography. We revealed the role of long-lasting bubbles for cell perforation.

Repetition Rate Dependent Side Effects of fs Laser Based Cell Transfection, Judith Baumgarth1, Kar Kuemtey*, Willem Binning*, Anaclet Ngezahayo*, Wolfgang Ertmer*, Holger Lubatschowski*, Alexander Heisterkamp1; 1Laser Zentrum Hannover, Germany; 2Inst. of Biophysics, Leibniz Univ. of Hannover, Germany, 3Inst. of Quantum Optics, Leibniz Univ. of Hannover, Germany. Membrane permeation induces stress to cells due to calcium influx and reactive oxygen species formation. These side effects are lower at kHz repetition rate compared to MHz and can completely be suppressed by additional antioxidants.


Novel Optical Instrumentation for Biomedical Applications

Clinical and Biomedical Spectroscopy

Correction of Raman Signals for Tissue Optical Processing, Carpentier2, Ingo Gerwandi1, Stefan Andreu1, Jürgen Hofmann*, Gerd Böling1; 1Lasers- und Medizin-Technologie GmbH, Berlin, Germany, 2Technischen Univ. Berlin, Germany. The influence of optical properties on the resonance Raman signal of carotenoids in skin was determined by phantom measurements. We applied combined Raman and spatially resolved reflectance measurements to correct the Raman signal.

Multispectral Dermoscopy, Dimitris Kapoula- lyvas1, Nicola Buctcut2, Giovanni Ciammocaroc2, Vicenzo di Giorgi*, Andrea Lomiti*, Francesco Savino Povone1; 1European Lab for Non-linear Spectroscopy (LENS), Univ. of Florence, Italy, 2Dept. of Dermatology, Univ. of Florence, Italy. The multispectral dermoscope has been used for imaging skin lesions. Illumination at three different spectral regions and subsequent image processing through a database of spectral characteristics extraction, selection and classification methods was implemented.

Clinical Spectral Diagnosis of Non-Melanoma Skin Cancer: Initial Pilot Study, Narasimhan Rajaram1, Dianne Kovacic*, Michael R. Migden3, Rajaram1, Dianne Kovacic2, Michael R. Migden3, Aneesur Rehman2, Jörn Bullerdiek3,4, Wolfgang Ertmer1, Didier Wolf; Ctr. de Recherche en Automatique de Nancy, France. The detection of blader cancer in endoscopic image sequences can be difficult. The aim of this contribution is to assess the performance of two mosaicing algorithms leading to maps (one unique image) facilitating the diagnosis.
the root canal.

the presence of voids and microleakage within tomography (OCT) prototype which evinced Harry van Lenthe 3, Thilo Gambichler 4, Klaus the concentration of aqueous mixtures of glucose

enna, Austria.

2Dept. of Dentistry, Faculty of Medicine, Univ. of Podoleanu2; 1Univ. of Medicine and Pharmacy of

Kratz2, Antonia Torcasio3, Nils C. Gerhardt 1, G.

1Photonics and Terahertz Technology, Ruhr-Univ.

Room 5, Ground Floor, Congress Centre

Room 11, 1st Floor, Congress Centre

Room 12, 1st Floor, Congress Centre

Room BO.R2, Ground Floor, Congress Centre Hall B0

WD + Pre-Clinical and Clinical Apps II—Continued

WD5 • 11.30

En face Optical Coherence Tomography Investigation of Interface Fiber Posts/Adhesive Cement/Root Canal Wall, Meda L. Nogratiu, Cosmin Sinescu, Mihai Romina, Duhruva Markovic1, Daniela M. Pop1, Michael Hughes2, Adrian Brada2, George Dobre3, Adrian Gh Podolcane1, Faculty of Dentistry, ‘Victor Babes’ Univ. of Medicine and Pharmacy Timisoara, Romania, 3Dept. of Dentistry, Faculty of Medicine, Univ. of Novi Sad, Serbia, 3Applied Optics Group, School of Physical Science, Univ. of Kent, UK. This study analyzes the adaptation and gap width between fiber posts, adhesive luting cement and root canal wall. The results prove the importance of assessing the quality of the interfaces after every luting fiber post.

WD6 • 11.45

Three-Dimensional Bone Imaging: Optical Coherence Tomography versus Micro Computer Tomography. Christoph Kussoy1, Marta Kratz1, Antonio Torcasio2, Nicu C. Gerhardt1, G. Harry van Lenthe1, Thilo Gambichler2, Klaus Hoffmann3, David R. Jones1, Martin R. Hofmann1; 1Photons and Teerahertz Technology, Ruhr-Univ. Bochum, Germany, 3Experimental Orthopaedics and Biomicrosciences, Philips Univ. Marburg, Germany, 2Univ. of Biomechanics and Engineering Design, Katholieke Univ. Leuven, Belgium, 3Dept. of Dermatology and Allergology, St. Josef Hospital, Germany. We apply optical coherence tomography (OCT) on human bone samples in comparison to micro computer tomography (μCT) at the same sample area. Where μCT visualizes only hard tissue, i.e. trabeculae, OCT additionally images marrow cells.

WD7 • 12.00

Investigation of Er:YAG Laser Root Canal Irradiation Using en face OCT, Carmen Todisco, Corinna Balabuc1, Laura Filip1, Mirea Calniceanu1, Adrian Brada2, Michael Hughes2, Adrian Gh Podolcan2; 1Univ. of Medicine and Pharmacy of Timisoara, Romania, Romania; School of Physical Sciences, Univ. of Kent, Canterbury, UK. This pilot study was designed to investigate the quality of endodontic treatment performed with/without Er:YAG laser using en face optical coherence tomography (OCT) prototype which evinced the presence of voids and microleakage within the root canal.

WD8 • 12.15

Glucose-Albunin Mixture Concentration Measurements Using Refractive Low Coherence Interferometry—tFLI, Jens Liebermann1, Boris Paschke2, Mirco Calvist3. Using a refractive low coherence interferometry (tFLI) technique we determined the concentration of aqueous mixtures of glucose and albumin. This is an extension of a second-order dispersion derived from spectral phase of time-domain interferogram.

Wednesday 17 June

Room 11, 1st Floor, Congress Centre

Therapeutic Laser Applications and Laser-Tissue Interactions

WE • Cellular Surgery II—Continued

WE4 • 11.30

Online Dosimetry of Cellular Otopoptosis and Pulsed Laser Surgery of Tissues, Alfred Vogel, Sebastian Eckert, Tobias Jachowski, Xiao Xuqiang, Sebastian Freisank, Norbert Linz; Univ. of Luebeck, Germany. We developed a probe-beam scattering method for dosimetry of cellular otopoptosis in which the size of bubbles perforating the membrane is inferred from the bubble oscillation time. The method works in transmission and reflection mode.

WE5 • 11.45

Variations of Membrane Topography on Living Cells Induced by Laser Light, Jian-Long Xiu1,2, Ping Ya Hui1,2, Xin Lu Xia1,2, Chun-Huang Lee3; 1Inst. of Biophotonics, Natl. Yang-Ming Univ., Taiwan, 2Res. Ctr. for Applied Sciences, Academia Sinica, Taiwan, 3Dept. of Internal Medicine, Natl. Taiwan Univ. Hospital, Taiwan. We observe the variations of membrane topography induced by laser light on the lamellipodia of living cells by using wide-field optical profilometry. We analyze the retraction rate and roughness of membranes affected by laser irradiation.

WE6 • 12.00

Changes in Mitochondrial Membrane Potential upon Pulsed Laser Exposure, Kamaleesh Sethanam1, Benjamin Lu2, Yumi Moriyama3; 39

Lothar Liegel; 3Ontario Cancer Inst., Univ. Health Network, Canada, 4Dept. of Medical Biophysics, Univ. of Toronto, Canada. In this study we demonstrate selective thermal effects of low level laser irradiation and how pulsed laser exposure can cause changes to the mitochondrial membrane potential in vivo.

WE7 • 12.15

Femtosecond Laser Based Enucleation of Porcine Oocytes for Somatic Cell Nuclear Transfer, Kai Kütemeyer1, Andrea Lucas-Hahn2, Björn Petersen1, Petra Hasel1, Erka Lemke1, Heiner Niemann3, Alexander Heisterkamp1, Laser Zentrum Hannover e.V., Germany, 1Inst. für Nutztieregenetik (FLI), Germany. We present a new minimal invasive oocyte enucleation method for somatic cell nuclear transfer. Femtosecond laser irradiation of the metaphase plate resulted in a significant inhibition of early embryonic cleavage while maintaining intact oocyte morphology.

WE8 • 12.15

Spatio-temporal and Coherence Techniques

WE4 • 11.30

Design and Validation of a Bimodal MRI-Optics Endoluminal Probe for Colorectal Cancer Diagnosis, Anoop Jangid1, Raphael Sableng, Hervé Saint-Jalmes2, Olivier Beuf1; Univ. de Lyon, France, 3Univ. Rennes 1, France. Following the bimodal technical innovations put forward in the diagnosis of colorectal cancer, we present a prototype of a high resolution MRI-optics probe along with the first tests carried out and the results obtained.

WE5 • 11.45

Image Restoration for Video Endoscope Systems, Berndschew Chow; Natl. San Yat-Sen Univ., Taiwan. Existing image restoration methods, requiring a referenced image inserted in body, cannot apply to endoscope imaging. We therefore propose a method by estimating polluted MTF for the degraded imaging system to restore blurred images.

WE6 • 12.00

Using Dispersion to Adjust Image Plane in Interferometric Spectrally Encoded Endoscopy, Mikhail Meron, Dvir Yelin, Technion- Israel Inst. of Technology, Israel. New means for adjusting imaging plane in spectrally encoded endoscopy is proposed and demonstrated, using dispersion management at the interferometer reference arm. This approach could become useful in optimizing imaging quality and field of view.

WE7 • 12.15

Femtosecond Laser Based Enucleation of Porcine Oocytes for Somatic Cell Nuclear Transfer, Kai Kütemeyer1, Andrea Lucas-Hahn2, Björn Petersen1, Petra Hasel1, Erka Lemke1, Heiner Niemann3, Alexander Heisterkamp1, Laser Zentrum Hannover e.V., Germany, 1Inst. für Nutztieregenetik (FLI), Germany. We present a new minimal invasive oocyte enucleation method for somatic cell nuclear transfer. Femtosecond laser irradiation of the metaphase plate resulted in a significant inhibition of early embryonic cleavage while maintaining intact oocyte morphology.

WE8 • 12.15

Optical Properties of Bloodstains for Age Determination, Ralph J. Bremmer, Martin J.C. van Gemert, Ton G. van Leeuwen, Maurice C. Aalderen, Biomedical Engineering and Physics, Academic Medical Ctr. Univ. of Amsterdam, The Netherlands. When blood exits the body, its main chromophores, oxy-hemoglobin, oxidizes to met-hemoglobin. We characterized the optical properties of a bloodstain to analyze it with diffuse reflectance spectra for age determination.
Wednesday 17 June

16.00-16.30 Coffee Break, Exhibition Hall

16.00-16.30 Coffee Break, Exhibition Hall

**Room 5, Ground Floor, Congress Centre**

**Optical Coherence Tomography and Coherence Techniques**

**WH • Novel OCT Technology—Continued**

**WI • Ophthalmology—Continued**

**WI • Experimental Techniques III—Continued**

**Room 11, 1st Floor, Congress Centre**

**Therapeutic Laser Applications and Laser-Tissue Interactions**

**WI • Experimental Techniques III—Continued**

**Room 12, 1st Floor, Congress Centre**

**Diffuse Optical Imaging**

**Room BO.R2, Ground Floor, Congress Centre Hall B0**

**Clinical and Biomedical Spectroscopy**

**WI • Biospectroscopy and Point-of-Care Diagnostics I—Continued**

**WI • 15.00**

Evaluation of a Cheap Ultrasonic Stage for Light Source Coherence Function Measurement and Dynamic Focusing, Nikola Kostajnja, Stephen J. Matchett, David Childs, Wiendelt Steenbergen, Richard Hogg, Rod Smallwood; ‘Univ. of Sheffield, UK, ‘Univ. of Twente, The Netherlands. We evaluate the performance of a cheap ultrasonic stage in setups related to optical coherence tomography. The stage was used as a delay line measuring coherence function and in a dynamic focusing arrangement.

**WI • 15.15**

Development of a Diffuse Optical Spectroscopic Imaging System for Intensive Care Medicine. Yo-Wei Liu, Ming-Lung Chiang, Shih-hai Liang, Jie-tai Chu, Chi-Wai Soo; ‘Graduate Inst. of Photonics and Optoelectronics, Natl. Taiwan Univ., Taiwan; ‘China Medical Univ. Hospital Taipei Branch, Taiwan; ‘China Medical Univ. Hospital, Taiwan. Diffuse optical spectroscopic imaging is a technique provides the measurement of changes in oxy- and deoxy-hemoglobin. In experiments, the hemodynamics are observed with laser Doppler measurements from healthy and patients in intensive care unit.

**WI • 15.30**

Multiplexed Diagnostics and Spectroscopic Ruler Applications with Terbium to Quantum Dots FRET, Daniel Geißler, Nathaniel G. Bulte, Hans-Gerd Lohmannsröder, Niko Hildebrand; ‘Physicalische Chemie, Univ. Potsdam, Germany, ‘Lumphone, Inc., USA, ‘Fraunhofer Inst. for Applied Polymer Res., Germany. We present the application of biocompatible semiconductor core/shell quantum dots as multiplexing FRET acceptors together with a commercial terbium complex as donor in a homogeneous immunoassay format for clinical diagnostics and molecular ruler applications.

**WI • 15.45**

A Membrane-Associated FRET Sensor for Detection of Apoptosis, Herbert Schnackenburger, Michael Wagner, Petra Weber, Thomas Bruhn, Heiko Steuer, Brigitte Angres; ‘Hochschule Aalen, ‘NMI, ‘Dresdner Hochschule für Angewandte Wissenschaften, Germany. A membrane associated caspase sensor based on Förster Energy Transfer (FRET) between fluorescent proteins is reported. Upon apoptosis a linker between these proteins is cleaved, and pronounced changes of fluorescence spectra and lifetimes are observed.
Wednesday 17 June

Room 5, Ground Floor, Congress Centre

16.30–18.30
**Optical Coherence Tomography and Coherence Techniques**

**Invited**

**High-Speed and High-Sensitive Optical Coherence Angiography**, Shinichi Makita, Masahiro Yamana, Yoshitaka Yasuno; Computational Optics Group, Univ. of Tskuba, Japan. High-speed and high-sensitive phase-resolved spectral-domain optical coherence tomography has been developed. Two tomograms with a time interval have been acquired with dual beams. High-sensitive Doppler optical coherence angiography of the human eye has been demonstrated.

Room 11, 1st Floor, Congress Centre

16.30–18.15
**Therapeutic Laser Applications and Laser-Tissue Interactions**

**WM 1 • 16.30**

**Dependence of Optoacoustic Transients on Exciting Laser Parameters for Online Monitoring of Retinal Photocoagulation**, Tsvetan Acree,1,2 Kerstin Schlachetzki,3 Erich Götzinger,2 Michael Pircher,2 F. Yanik;1,2 MIT, USA. We demonstrate the capability of full range complex SD-OCT together with an adapted spectrometer design for imaging the whole human anterior eye segment in vivo from the cornea to the posterior surface of the lens.

**WM 2 • 17.00**

**Heartbeat-Induced Axial Eye Motion Artifacts during Optical Coherence Tomography Measurements**, Jay de Kinkelder1,2,3; 1Jeroen Roy de Kinkelder, Jeroen van de Pol,3 Bernhard Baumann, Erich Götzinger, Medical Univ. of Vienna, Austria. We demonstrate the capability of full range complex SD-OCT together with an adapted spectrometer design for imaging the whole human anterior eye segment in vivo from the cornea to the posterior surface of the lens.

Room BO.R2, Ground Floor, Congress Centre Hall B0

16.30–18.15
**Clinical and Biomedical Spectroscopy**

**WN 1 • 16.30**

**The Implementation of an Isotope-Edited Internal Standard for Quantification of Lowest Drug Concentrations Using Surface Enhanced Raman Spectroscopy (SERS) in a Lab on a Chip Device**, Anne Märi,1 Thomas Henkel1, Jürgen Popp1;1 Friedrich-Schiller-Univers. Jena, Germany. An innovative lab on a chip system offers the possibility for reproducible, quantitative online SERS measurements based on the application of isotope labelled internal standards and liquid-liquid segmented flow-based flow-through Raman detection.

**WN 2 • 16.45**

**Spectral Cytopathology: Infrared and Raman Spectroscopy of Individual Human Cells**. Max Diem1, Benjamin Bird1, Christian Mattiäus2, Miloslav Mýdlík2, Jennifer Schubert2, Tatiana Cheremukhin2, Kenta Papamarkakis1. Nora Lauer1;1 Northeastern Univ., USA, 2Tufts Univ. Medical Ctr., USA. Microspectral data of individual cells reveals biochemical and biomedical information, such as cell maturation, state of disease, and exposure to drugs. This contribution explores means of data collection, analysis and medical diagnosis.

**WN 3 • 17.15**

**Two-Dimensional Resonance Raman Signatures for Identification of Cells and Bacteria in Complex Environments**, Jacob Gruver1, Pratima Kunapareddy1,2,3; 1Inst. of Biomedical Optics, Univ. of Luebeck, Germany, 2Medical Univ. of Luebeck, Germany, 3Inst. of Surface Engineering and Thin Films, Germany. We present microfluidic technologies for manipulating and immobilizing the nematode *C. elegans*, which enables rapid studies of neural regeneration using powerful optical techniques including multi-photon microscopy and femtosecond laser nanosurgery.

**WN 4 • 17.30**

**Localization and Identification of Bacteria by Means of Micro-Raman Spectroscopy and Fluorescence Imaging**, Petra Rösch1,2; 1Northeastern Univ., USA, 2Tufts Univ. Medical Ctr., USA. We present microfluidic technologies for manipulating and immobilizing the nematode *C. elegans*, which enables rapid studies of neural regeneration using powerful optical techniques including multi-photon microscopy and femtosecond laser nanosurgery.

**WN 5 • 17.45**

**UTI Diagnosis and Antibigram Using Raman Spectroscopy**, Eridaka Kastanos1, Alexandros Kyriakides2, Katerina Hadjigeorgiou2, Constantinios Pirès3; 1Univ. of Nicosia, Cyprus, 2Univ. of Cyprus, Cyprus. Raman spectroscopy is investigated for performing identification and antibiotic of bacteria common in UTIs. They are classified with over 94% accuracy and sensitivity to ciprofloxacin is also clearly evident by differences in the Raman spectra.
Wednesday 17 June

**Optical Coherence Tomography and Coherence Techniques**

**Room 5, Ground Floor, Congress Centre**

**WL • Ophthalmic OCT II—Continued**

**WL5 • 18.00**

Observation of Doppler Random Signals in Light Backscattered from Sclera Obtained by Joint Spectral and Time Domain OCT, Danuta Bukowska, Anna Szkulmowska, Maciej Szkulmowski, Ireneusz Grukowski, Maciej Wojtkowski, Andrzej Kowalczyk; Inst. of Physics, Nicolaus Copernicus Univ., Poland. Joint STdOCT provides three-dimensional quantitative ocular blood vessels imaging. We also observe random Doppler signals in light backscattered from sclera, which enables reconstructing the blood vessels situated in choroidal and scleral layers.

**WM6 • 17.45**

Characterizing Fluorescence Spectral Features of Cancer, Benign and Normal Tissues through Wavelet Transform and Singular Value Decomposition, Anita Gharekhan1, Ashok Oza1, M. B. Suresh Kumar2, Prasanta K. Panigrahi2, Asima Pradhan2; 1C.U. Shah Science College, India, 2Dept. of Physics, Faculty of Science, The M.S. Univ. of Baroda, India, "Physical Res. Lab, India, "Indian Inst. of Science Education and Res. (IISER), India," Dept. of Physics and Ctr. for Laser Technology, Indian Inst. of Technology, India. Properties of spectral fluctuations and prominent spectral features of fluorescence spectra in visible region using laser as an excitation source of normal, benign and cancer tissues are studied through wavelet transform and principal component analysis.

**WN6 • 17.45**

Bioanalysis on the Nanometer Scale, Volker Deckert, Tanja Deckert-Gaudig, Elena Bailo, Marc Richter; Inst. for Analytical Sciences, Germany. Tip-enhanced Raman scattering (TERS) is used as a label-free analytical tool to investigate bio-materials on the nanometer scale. Examples ranging from single peptides to experiments in cells will be presented.

**WL6 • 18.15**

Active Axial Eye Motion Tracking by Extended Range, Closed Loop OPD-Locked White Light Interferometer for Combined Confocal/en face Optical Coherence Tomography Imaging of the Human Eye Fundus in vivo, Raluca G. Caca1, Mark W. Hathaway2, Adrian Podoleanu1,3, Richard B. Rosen2,3; 1Univ. of Kent, UK, 2Ophthalmic Technologies Inc - OPKO, Canada, 3New York Eye and Ear Infirmary, USA. An interferometric tracking device is used to detect axial eye motion and apply a correction signal to a reference voice coil retroreflector. The device is integrated in an SLO/OCT instrument for imaging the eye fundus.

**19.30–21.00 Conference Reception, Königlicher Hirschgarten, Hirschgarten 1, 80639 München**

**Room 11, 1st Floor, Congress Centre**

**WM • Novel Approaches—Continued**

**WM6 • 17.45**

Characterizing Fluorescence Spectral Features of Cancer, Benign and Normal Tissues through Wavelet Transform and Singular Value Decomposition, Anita Gharekhan1, Ashok Oza1, M. B. Suresh Kumar2, Prasanta K. Panigrahi2, Asima Pradhan2; 1C.U. Shah Science College, India, 2Dept. of Physics, Faculty of Science, The M.S. Univ. of Baroda, India, "Physical Res. Lab, India, "Indian Inst. of Science Education and Res. (IISER), India," Dept. of Physics and Ctr. for Laser Technology, Indian Inst. of Technology, India. Properties of spectral fluctuations and prominent spectral features of fluorescence spectra in visible region using laser as an excitation source of normal, benign and cancer tissues are studied through wavelet transform and principal component analysis.

**WM7 • 18.00**

Multifractal Spectra of Laser Doppler Flowmetry Signals in Healthy and Sleep Apnea Syndrome Subjects, Benjamin Buard1,2, Wojciech Trepczyński1,2, Guillaume Mahé3, François Chateau-Blondeau4, David Rousseau4, Frédéric Gagnadoux5, Pierre Abraham6, Anne Hummel7; 1Groupe ESAIP, France, 2Lab d’Ingénierie des Systèmes Automatiques (LISA), Univ. d’Angers, France, 3Lab de Physiologie et d’Explorations Vasculaires, Ctr. Hospitalier Universitaire d’Angers, France, 4Dept. of Pneumology, Ctr. Hospitalier Universitaire d’Angers, France, 5Dept. of Medicine B, Univ. of Muenster, Germany, 6Ctr. for Biomedical Optics and Photonics, Univ. of Muenster, Germany. To better understand the peripheral cardiovascular system, complexity of laser Doppler flowmetry signals (LDF) is analysed. We show that the sleep apnea syndrome has no or little impact on the multifractal spectra of LDF signals.

**Room B0.R2, Ground Floor, Congress Centre Hall B0**

**WN • Biospectroscopy and Point-of-Care Diagnostics II—Continued**

**WN6 • 17.45**

Bioanalysis on the Nanometer Scale, Volker Deckert, Tanja Deckert-Gaudig, Elena Bailo, Marc Richter; Inst. for Analytical Sciences, Germany. Tip-enhanced Raman scattering (TERS) is used as a label-free analytical tool to investigate bio-materials on the nanometer scale. Examples ranging from single peptides to experiments in cells will be presented.

**WN7 • 18.00**

Microinjection Based 3-Dimensional Imaging of Subcellular Structures with Digital Holographic Microscopy, Christina Rommel1, Sabine Przibilla2, Gert von Bally2, Björn Kemper2, Jurgen Schubackenger2; 1Dept. of Medicine B, Univ. of Muenster, Germany, 2Ctr. for Biomedical Optics and Photonics, Univ. of Muenster, Germany. Imaging of 3-dimensional cellular processes in living cells by digital holography depends on the objects of interest refraction index. Microinjection of glycerol containing buffers enhances the intracellular contrast and allows the imaging of subcellular structures.
9.00–10.00
ThA • Minimally Invasive Diagnostics I
Paul French; Imperial College London, UK, Presider

ThA1 • 9.00
Diode Laser Welding of Ocular Tissues: Microscopic Analysis of Induced Collagen Modifications
Roberto Pini, Francesca Rossi, Paolo Matteini, Fulvio Ratto, Luca Menabuoni; Inst. di Fisica Applicata, Consiglio Nazionale delle Ricerche, Italy. Laser welding of ocular tissues is a new technique used to support or substitute standard suturing. In view of its clinical application, the modifications induced in the collagen matrix were analyzed with various microscopic methods.

ThA2 • 9.30
Incorporation of Single Fiber Reflectance Spectroscopy into Ultrasound-Guided Endoscopy of Mediastinal Lymph Nodes, Stephen C. Kanick, Cor van der Leest, Joachim Aerts, H.J.C.M. Sterenborg, Arjen Amelink; Erasmus Medical Ctr., The Netherlands. We have incorporated a single fiber reflectance spectroscopy device into the ultrasound-guided endoscopy procedure and present preliminary data showing optically quantitated physiological and morphological characteristics extracted from clinical measurements of benign and malignant lymph nodes.

ThA3 • 9.45
Combining Raman Spectroscopy with Multimodal Endoscopic Imaging for in vivo Diagnosis of Gastric Precancer at Gastroscopy, Zhiwei Huang, Seng Khoon Teh, Wei Zhang, Jianhua Ma, Xianbao Shao, Kan Lin, Khek Yu Ho, Ming Teh, Khay Guan Yeoh; Natl. Univ. of Singapore, Singapore. We report an integrated Raman spectroscopy and multimodal endoscopic imaging techniques for in vivo diagnosis and detection of gastric precancer during clinical gastroscopy.

10.00–10.30 Coffee Break, Exhibition Hall
10.30–12.30
ThC • Minimally Invasive Diagnostics II
Paul French; Imperial College London, UK, Presider

ThC1 • 10.30
Wearable Diffuse Reflectance Sensor for Continuous Monitoring of Catecholamine Blood Perfusion, Pavel Zdabaran, Mark Talary, Andreas Caduff, Salamis Monitoring AG, Switzerland. A double-wavelength optical sensor for monitoring of catecholamine blood perfusion is presented. A simulation of partial differential pathways has been used for the optimization of source-detector distance. Hardware implementation and outpatient results are discussed.

ThC2 • 10.45
Investigation of Optimum Wavelengths for Quantitative Spectroscopy, Audrey K. C. Huang, Ian M. Stockford, John A. Crowe, Stephen P. Morgan; Univ. of Nottingham, UK. An evaluation of the optimum choice of wavelengths, when using the ‘modified Lambert-Beer law’ to estimate blood oxygen saturation, that minimises the mean error across a range of oxygen saturation values is presented.

ThC3 • 11.00
Using Pd-Porphyrin Phosphorescence and Photodynamic Oxygen Consumption to Study Oxygen Diffusion in Cells, Mark A. Weston1,2, Michael S. Patterson2,3, McMaster Univ. Canada, 1Janosvics Cancer Ctr., Canada. M2 cells were incubated with Pd-porphyrin and irradiated at 405 nm. The change in Pd-porphyrin phosphorescence intensity, resulting primarily from photodynamic consumption of oxygen, was monitored to estimate the intracellular diffusion coefficient of oxygen.

ThC4 • 11.15
Imaging of Cortical Haemoglobin Concentration with RGB Reflectometry, Andrei Steimer1, Markus Graemer, Brunsilav Eberl, Martina Fuchtmeyer, Georg Roay, Christoph Leitner, Jens Dreier3, Ute Lindauer1, Matthias Kohl-Bareis1, RheinAirCampus, Univ. of Applied Sciences Koblenz, Germany. ‘Neurologische Klinik, Charité – Universitätsmedizin Berlin, Germany, ‘Dept. of Neurosurgery, Technical Univ. Munich, Germany. We demonstrate that a colour RGB-CCD camera can be used to map haemoglobin changes of the exposed cortex following cortical activation of rats and analyse its performance in comparison with narrow bandpass spectroscopy.

ThC5 • 11.30
Using Broadband Spatially Resolved NIRS to Assess Muscle Oxygenation during Altered Running Protocols, Georg Krouskovski1, Maria Velikadze, Andrei Steimer1, Dmitriy Geraskin1, Patrick Neary3, Matthias Kohl-Bareis1, Univ. of Applied Sciences Koblenz, Germany, ‘Univ. of Regina, Canada. We used broad-band NIR to monitor muscle oxygenation during two running paradigms (velocity and modulated step frequency) in healthy volunteers and found a high correlation with spirometry (body energy consumption) and accelerometer (body movement).

ThC6 • 11.45
A Compact Time-Resolved System for NIR Spectroscopy, Rebecca Re1, Davide Contini2, Matteo Caffini, Lorenzo Spinnelli1, Ronaldo Calvedo1, Alessandro Tursielli1, Dept. of Physics, Politecnico di Milano, Italy, ‘IFN-CNR Inst. of Fotonica and Nanotecnology, Sezione di Milano, Italy, ‘Res. Unit IIT, Politecnico di Milano, Italy, ‘ULTRAS-INFM-CNR, Natl. Lab for Ultrafast and Ultraintense Optical Science, Italy. We developed a compact dual-wavelength dual-channel system for time-resolved diffuse NIR spectroscopy that uses a novel approach based on space-multiplexing (instead of time-multiplexing) of wavelengths, to increase the signal-to-noise ratio and avoid cross-talk.

ThC7 • 12.00
Tissue Oxygenation during Exercise Measured with NIRS: A Quality Control Study, Erwin Gere1, Dmitriy Geraskin1, Patrick Neary3, Petra Platen1, Matthias Kohl-Bareis1, Univ. of Applied Sciences Koblenz, RheinAirCampus, Univ. of Applied Sciences Koblenz, Germany, ‘Univ. of Regina, Canada, ‘Ruhr-Univ. Bochum, Germany, ‘German Sport Univ., Germany. We assessed the reproducibility and the influence of the wavelengths of NIRS muscle monitoring when a cycling exercise is repeated at the same or different day and found surprisingly small deviations of 1–2%.

ThC8 • 12.15
Quantitative Analysis of Arterial Tissue with Optical Coherence Tomography, Costas Fluerasu1, Dan P. Popescu1, Xiaoxue Mao, Shoudong Chang, Michael G. Sowa2, Inst. for Microstructural Sciences, Natl. Res. Council of Canada, Canada, ‘Inst. for Biodeagnostics, Natl. Res. Council of Canada, Canada. Tissue morphology, attenuation and texture are analyzed from images acquired by OCT from arterial samples. The data were corrected for the effect of confocal point spread function and were analyzed using the single scattering model.
**ThE1 • 14.00**

**Clinical and Preclinical Tissue Characterization I**

*Katarina Svanberg; Lund Univ., Sweden, Presider*

**Time-Resolved Transmittance Spectroscopy of Breast in vivo up to 1100 nm: Test on 10 Volunteers,** Paolo Taroni, Andrea Basili, Daniela Comelli, Rinaldo Cabalda, Antonio Pifferi; Dept. of Physics, Politecnico di Milano, Italy. Absorption and scattering spectra of breast assessed on volunteers demonstrated feasibility of in vivo spectroscopy up to 1100 nm. The extended characterization of collagen revealed an absorption-peak (1020 nm) of interest to quantify collagen in vivo.

**Spatially Offset Raman Spectroscopy for Breast Tumor Surgical Margin Evaluation,** Matthew D. Keller1,2, Shivam K. Majumder1, Mark C. Kelley1, AnitA Mahadevan-Jansen1,2; Vanderbilt Univ., USA, 3Vanderbilt Univ. Medical Ctr., USA. Spatially offset Raman spectroscopy (SORS) is shown to be effective in detecting Raman spectral signatures of breast tumors under up to 2mm of normal breast tissue, as needed for evaluating margin status following partial mastectomies.

**Translation Applications of Photonics to Breast Cancer,** Nimmi Ramanyam; Biomedical Engineering Dept., Duke Univ., USA. Photonics based tools can provide insights into the metabolic, physiologic and morphological properties of breast tissues. This talk will present customization and translation of optical spectroscopy and spectral imaging techniques to translational applications in breast cancer.

**In vivo Assessment of Microstructural and Functional Alterations in Cervical Neoplasia,** Costas Baldas1,2, George Papoutsoglou1, Costas Loukas2, Yiannis Skiadas2,3, Christos Pappas2,3, Dimitris Haido-Keller1; 1Vanderbilt Univ., USA, 2Raja Raman Ctr. for Advanced Technology, India, 3Vanderbilt Univ. Medical Ctr., USA. Pulsed laser irradiated gold nanoparticles can be used to modify and destroy cells and proteins. In contrast to spherical particles nanorods are not as suitable. The reasons and main issues are clarified in this work.

**Automated Interpretation of Scatter Signatures Aimed at Tissue Morphology Identification,** Pilar B. Garcia-Allende1, Venkat Krishnaswamy2, Kimberley S. Samkoe2, P. Jack Hoopes2,3, Brian W. Pogue2,3, Olga M. Comedi1, Jose M. Lopez-Higuera1; 1Photonics Engineering Group, Univ. of Cantabria, Spain, 2Thayer School of Engineering, Dartmouth College, USA, 3Dept. of Surgery, Dartmouth Medical School, USA. Scattering changes encountered in the raster scanning of normal and tumor pancreatic tissues using microsampling reflectance spectroscopy are pathologically classified (normal, epithelial proliferation, necrosis and fibrosis) in an automated manner.

**Scatter Spectroscopy Imagery for Breast Tumor Margin Delineation,** Venkataramanan Krishnaswamy2, Wendy A. Welie1, Ashley M. Laughery1, Brian W. Pogue2; 1Dartmouth College, USA, 2Dartmouth-Hitchcock Medical Ctr., USA. Change in tissue sub-cellular structures, a hallmark of cancer, presents an intrinsic contrast mechanism for delineating tumor margins. A novel design for a multispectral, dark-field, reflectance scanning confocal imager is presented.

**Fractal Processing of Pathological Changed Muscular Tissue Images,** Y. P. Ungurian, O. Ya. Wanchulak; Bucovian State Medical Univ., Ukraine. It has been shown that for physiologically normal biological tissues polarization properties of scattered radiation possess fractal character. Pathological changes of biotissues architeconics are accompanied with the transformation of polarization selfsimilar structure into statistic one.

**ThE • 14.15**

**ThE2 • 14.15**

**ThE3 • 14.30**

**ThE4 • 15.00**

**ThE5 • 15.15**

**ThE6 • 15.30**

**ThE7 • 15.45**

**ThF1 • 14.00 Invited**

**ThF2 • 14.30**

**ThF3 • 14.45**

**ThF4 • 15.00**

**ThF5 • 15.15**

**ThF6 • 15.30**

**ThF7 • 15.45**

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**14.00–16.00**

**Room 5, Ground Floor, Congress Centre**

**Clinical and Biomedical Spectroscopy**

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**14.00–16.00**

**Room 11, 1st Floor, Congress Centre**

**Therapeutic Laser Applications and Laser-Tissue Interactions**

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**14.00–16.00**

**ThE • Clinical and Preclinical Tissue Characterization I**

*Katarina Svanberg; Lund Univ., Sweden, Presider*
Wavelength TPEF Imaging, Quantitative Biochemical and Morphological Biomarkers of Early Cancer Derived from Multi-ThG8 • 18.15

Surface, Quantitative Assessment of Liver Fibrosis Using Non-Linear Optical Microscope across Liver ThG7 • 18.00

and histopathologic results. characterized using knowledge of molecular autofluorescence signatures to correlate spectroscopic severely needed. Multispectral fluorescence images were collected of human ovary, and tissue was

A n o

Timothy E. Renkoski, Urs Utzinger; Univ. of Arizona, USA. Multispectral Fluorescence Imaging of Ovarian Surface for Oncologic Tissue Characterization, ThG6 • 17.45

Bernd-Claus Weber3, Georges Wagnières 1, Hubert van den Bergh 1; 1Ecole Polytechnique Federale de Lausanne, Switzerland, 2Ctr. Hospitalier Univ. Vaudois, Switzerland, 3Richard Wolf GmbH, Germany. During fluorescence cystoscopy, fluorescence positive sites are not always related to cancer. We developed microcystoscopy to visualize the vessel structure in situ to help discriminating cancerous lesions from inflammations. Results from 48 patients are presented.

ThG4 • 17.15

Characterisation of Positive Sites by Microcystoscopy during Fluorescence Cystoscopy with Hexvis® for the Detection of Early Bladder Carcinoma, Blaise Lavoix*, Dandana Aysun*, Patrice Juchinski*, Bernd Claus Weber*, Georges Wagnières, Hubert van den Bergh; 1Ecole Polytechnique Federale de Lausanne, Switzerland, 2Ctr. Hospitalier Univ. Vaudois, Switzerland, 3Richard Wolf GmbH, Germany. During fluorescence cystoscopy, fluorescence positive sites are not always related to cancer. We developed microcystoscopy to visualize the vessel structure in situ to help discriminating cancerous lesions from inflammations. Results from 48 patients are presented.

ThG5 • 17.30

New Approach in Prostate Gleason Grading Using Fluorescence Microscopic Imaging, Eleni Alex- andrakou, Dido Yova; School of Electrical Engineering, Lab of Biomedical Optics and Applied Biophysics, Natl. Technical Univ. of Athens, Greece. Confocal microscopy imaging was applied using a two external fluorescent probes to assign prostate cancer Gleason grading. Their colocalisation pattern and the corresponding metrics resulted in high accuracy of prostate grading.

ThG6 • 17.45

Multispectral Fluorescence Imaging of Ovarian Surface for Oncologic Tissue Characterization, Timothy E. Renkoski, Urs Utzinger; Univ. of Arizona, USA. An ovarian cancer screening method is severely needed. Multispectral fluorescence images were collected of human ovary, and tissue was characterized using knowledge of molecular autofluorescence signatures to correlate spectroscopic and histopathologic results.

ThG7 • 18.00

Quantitative Assessment of Liver Fibrosis Using Non-Linear Optical Microscope across Liver Surface, Yueting He1, Shunyi Xu1,2, Hanary Vu1,2, Peter So1; 1Singapore-MIT Alliance, Natl. Univ. of Singapore, Singapore, 2Institute of Bioengineering and Nanotechnology, Singapore, 3Bioinformatics Res. Ctr., Nanyang Technological Univ., Singapore, 4Dept. of Physiology, Natl. Univ. of Singapore, Singapore, 5Dept. of Mechanical Engineering, MIT, USA. We developed a quantification system based on non-linear optical microscopy to extract information from liver surface, and successfully staged liver fibrosis stage based on the surface information collected by the non-linear optical microscopy.

ThG8 • 18.15

Quantitative Biochemical and Morphological Biomarkers of Early Cancer Derived from Multi-Wavelength TPEF Imaging, Jonathan Levitt*, Martin Hunter*, Molly McLoughlin-Draud*, Karl Mangner*, Irene Georgakoudi*; 1Tufts Univ., USA, 2Harvard Medical School, Brigham and Women’s Hospital, USA. We present an automated method that relies on analysis of two-photon excited fluorescence images acquired at multiple excitation-emission wavelengths to provide quantitative, biochemical and morphological tissue characteristics of potentially high diagnostic value for cancer detection.

ThG1 • 16.30

Raman and CARS-Based Tissue Analysis, Benjamin Dietzek 1, Christoph Krafft 2, Denis Akinmure 2, Christiane Bielzik 1, Michael Schmitt 1, Ivor Petersen 3, Andreas Stammreich 2, Jürgen Poppe 2; 1Institute of Physical Chemistry, Friedrich-Schiller Univ., Germany, 2Inst. of Photonic Technology, Germany, 3Dept. of Internal Medicine II, Friedrich-Schiller Univ. Germany. We present an experimental evaluation of the information content of the two complimentary techniques spontaneous Raman and CARS microscopy. This first comparison establishes the foundation for further development of the CARS technology for tissue diagnostics.

ThG2 • 16.45

Optical Spectroscopy for Clinical Detection of Pancreatic Cancer, Malavika Chandra, Robert H. Wilson, James Scheiman, Diane Simone, Barbara McKenna, Juliane Pandl, Mary-Ann Mycek 2; 1Univ. of Michigan, USA, 2Univ. of Michigan Medical School, USA. A prototype clinical fluorescence and reflectance spectrometer was developed and employed to detect human pancreatic adenocarcinoma. For the first time, quantitative pancreatic tissue models and chemometric algorithms were applied to successfully distinguish among tissue types.

ThG3 • 17.00

In vivo Spectral Imaging of Different Cell Types by Two-Photon Excited Autofluorescence in the Small Intestine, Regina B. Orzekowksky-Schroeder, Geren Hüttmann, Norbert Koop, Alfred Vogel, Antje Klinger, Markus Blasenohl, Andreas Gevert; 1Inst. of Biomedical Optics, Univ. of Luebeck, Germany, 2Inst. of Anatomy, Univ. of Luebeck, Germany. Spectrally resolved two-photon excited autofluorescence imaging is used to distinguish different cell types and functional areas during dynamic processes in the living gut. Complementing the morphological information, this will give new insights into immunological processes.

ThG4 • 17.15

Characterisation of Positive Sites by Microcystoscopy during Fluorescence Cystoscopy with Hexvis® for the Detection of Early Bladder Carcinoma, Blaise Lavoix*, Dandana Aysun*, Patrice Juchinski*, Bernd Claus Weber*, Georges Wagnières, Hubert van den Bergh; 1Ecole Polytechnique Federale de Lausanne, Switzerland, 2Ctr. Hospitalier Univ. Vaudois, Switzerland, 3Richard Wolf GmbH, Germany. During fluorescence cystoscopy, fluorescence positive sites are not always related to cancer. We developed microcystoscopy to visualize the vessel structure in situ to help discriminating cancerous lesions from inflammations. Results from 48 patients are presented.

ThG5 • 17.30

New Approach in Prostate Gleason Grading Using Fluorescence Microscopic Imaging, Eleni Alexandrakou, Dido Yova; School of Electrical Engineering, Lab of Biomedical Optics and Applied Biophysics, Natl. Technical Univ. of Athens, Greece. Confocal microscopy imaging was applied using two external fluorescent probes to assign prostate cancer Gleason grading. Their colocalisation pattern and the corresponding metrics resulted in high accuracy of prostate grading.

ThG6 • 17.45

Multispectral Fluorescence Imaging of Ovarian Surface for Oncologic Tissue Characterization, Timothy E. Renkoski, Urs Utzinger; Univ. of Arizona, USA. An ovarian cancer screening method is severely needed. Multispectral fluorescence images were collected of human ovary, and tissue was characterized using knowledge of molecular autofluorescence signatures to correlate spectroscopic and histopathologic results.

ThG7 • 18.00

Quantitative Assessment of Liver Fibrosis Using Non-Linear Optical Microscope across Liver Surface, Yueting He1, Shunyi Xu1,2,3, Hanary Vu1,4, Peter So1; 1Singapore-MIT Alliance, Natl. Univ. of Singapore, Singapore, 2Institute of Bioengineering and Nanotechnology, Singapore, 3Bioinformatics Res. Ctr., Nanyang Technological Univ., Singapore, 4Dept. of Physiology, Natl. Univ. of Singapore, Singapore, 5Dept. of Mechanical Engineering, MIT, USA. We developed a quantification system based on non-linear optical microscopy to extract information from liver surface, and successfully staged liver fibrosis stage based on the surface information collected by the non-linear optical microscopy.

ThG8 • 18.15

Quantitative Biochemical and Morphological Biomarkers of Early Cancer Derived from Multi-Wavelength TPEF Imaging, Jonathan Levitt*, Martin Hunter*, Molly McLoughlin-Draud*, Karl Mangner*, Irene Georgakoudi*; 1Tufts Univ., USA, 2Harvard Medical School, Brigham and Women’s Hospital, USA. We present an automated method that relies on analysis of two-photon excited fluorescence images acquired at multiple excitation-emission wavelengths to provide quantitative, biochemical and morphological tissue characteristics of potentially high diagnostic value for cancer detection.
European Conferences on Biomedical Optics (ECBO) UPDATE SHEET

Withdrawals:
SuE1 TuL6 WM4 WN8
MJ50 TuM40 WN3 ThG7

Presider Update:
Dominic Robinson; Erasmus Univ. Medical Ctr., Netherlands and Herbert Stepp; Univ. of Munich, Germany will preside over session ThB, Photodynamic Therapy I.

Presenter Changes:
ME1, High Speed, Automated, Optically Sectioned Fluorescence Lifetime Imaging Multi-Well Plate Reader and Multiplexed FRET Microscope, will be presented by Paul French; Imperial College London, UK.

MJ4, Simultaneous Reconstructing Fluorescent Yield and Lifetime from Measured Time-Resolved Transmittance of a Small-Animal-Stimulating Phantom, will be presented by Patrick Poulet; Inst. de Physique Biologique, Univ. Louis Pasteur Strasbourg, France.

MK1 has an updated title and presenter: Imaging of Fluorescent Protein Activity in Small Animals with Multispectral Optoacoustic Tomography (MSOT) will be presented by Daniel Razansky; Technische Univ. and Helmholz Zentrum München, Germany.

TuG3, Super-Resolved Position and Orientation of Fluorescent Dipoles, will be presented by Stefan Geissbühler; Ecole Polytechnique Fédérale de Lausanne, Switzerland.

Presentation Updates:
The following poster preview has been added to session MD, Theoretical Analysis and Modeling I and will be presented by Haruka Nakayama at 10:00 a.m.–10:03 a.m.: Measurements of Temporal-Spatial Change in Blood Flow and Volume in Exposed Cortex of Guinea Pig Evoked by Auditory Stimulation, Haruka Nakayama1, Satoshi Matsuo2, Naotaka Sakashita1, Koichiro Sakaguchi1, Takushige Katsura2, Kyoko Yamazaki1, Naoki Tanaka1, Hideo Kawaguchi2, Atsushi Maki2, Eiji Okada1; 1Keio Univ., Japan, 2Advanced Res. Lab, Hitachi, Ltd., Japan.

The author block for MM7, Enhancement of Cancerous/Normal Tissue Contrast via Combined White Light and Fluorescence Image Processing: Initial Investigation ex vivo, should read as follows: Angelos A. Kalitzeos1, Azhar Zami1, Florian Stelze1, Eckhard G. Hahn1, Martin Raithel3, Alexandre Douplik1; 1Erlangen Graduate School in Advanced Optical Technologies (SAOT), Friedrich-Alexander Univ. Erlangen-Nuremberg, Germany, 2Univ. Hospital Erlangen, Dept. of Oral and Maxillofacial Surgery, Friedrich-Alexander Univ. of Erlangen-Nuremberg, Germany, 3Univ. Hospital Erlangen, Dept. of Medicine I, Friedrich-Alexander Univ. Erlangen-Nuremberg, Germany.

The title for WC3 should read as follows: Comparison of Discriminant Analysis Methods for Detecting Cancer and Precancer Using Elastic Scattering Spectroscopy (ESS).

The title and abstract for WK1 should read as follows: Addressing the Nanoscale by Optical Nano-Antennas, Niek van Hulst; ICFO, Spain. Resonant optical nano-antennas provide optical fields localized on 10-50 nm. We will show the application on both nanoscale imaging and directed emission of photons.

The author block for ThG5, New Approach in Prostate Gleason Grading Using Fluorescence Microscopic Imaging, should read as follows: Eleni Alexandratou, Dido Yova, Dimitris Gorpas; School of Electrical Engineering, Lab of Biomedical Optics and Applied Biophysics, Natl. Technical Univ. of Athens, Greece.