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*

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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 *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 *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 phototmedicine
- 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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Technical Program Committee

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Advanced Microscopy Techniques

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Gert von Bally, *Medical Ctr., Univ. of Münster, Germany ,* ***Co-Chair***

Kishan Dholakia, *Univ. of St. Andrews, UK*
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Jerome Mertz, *Boston Univ., USA*
Vinod Subramaniam, *Univ. of Twente, Netherlands*
Rainer Uhl, *Ludwig Maximillians Univ. Munchen, Germany*

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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*

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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. Shakhova, *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

Conference Chairs:
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Lothar Lilge, *Univ. Health Network, PMH/Ontario Cancer Inst., Canada,* ***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 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.*

JTuA3, State-of-the-Art and Future of Ultrahigh Speed OCT, *Robert Huber; Ludwig-Maximilians-Univ. München, Germany.*

JTuA4, Maintaining Health; Optical Spectroscopy for Assessment of Metabolic Tissue Aging, *Lothar Lilge; Univ. Health Network, PMH/Ontario Cancer Inst., Canada.*

Advanced Microscopy Techniques

MC1, Determination of Fluorescent Protein On-State Emission Rates by Manipulating the Local Density of Photonic States, *Christian Blum[1], Yanina Cesa[1], Johanna M. van den Broek[1], Allard P. Mosk[1], Willem L. Vos[1,2], Vinod Subramaniam[1]; [1]Univ. of Twente, Netherlands, [2]FOM, 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 Ketelhut, 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 Choe[1], Soren D. Konecky[1], Alper Corlu[1], Kijoon Lee[1], Turgut Durduran[1], David R. Busch[1], Saurav Pathak[1], Mark A. Rosen[1], Mitchell D. Schnall[1], Brian J. Czerniecki[1], Julia Tchou[1], Simon R. Arridge[2], Martin Schweiger[2], Mary E. Putt[1], Britton Chance[1], Arjun G. Yodh[1]; [1]Univ. of Pennsylvania, USA, [2]Univ. College London, UK.*

TuD1, Structured Illumination and Time Gated Detection for Diffuse Optical Imaging, *Cosimo D'Andrea[1,2], Andrea Bassi[1,2], Gianluca Valentini[2], Rinaldo Cubeddu[1,2], Simon Arridge[3]; [1]Natl. Lab for Ultrafast and Ultraintense Optical Science, Consiglio Nazionale delle Ricerche, Italy, [2]Dept. di Fisica, Politecnico di Milano, Italy, [3]Ctr. 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 Talbot[1], James McGinty[1], Ewan McGhee[1], David Grant[1], Sunil Kumar[1], Dylan Owen[1], Gordon Kennedy[1], Ian Munro[1], Wei Zhang[2], Tom Bunney[2], Tony Magee[1], Dan Davis[1], Matilda Katan[2], Chris Dunsby[1], Mark Neil[1]; [1]Imperial College London, UK, [2]Inst. of Cancer Res., UK.*

MK1, Imaging of Fluorescent Protein Activity in Mice with Multispectral Optoacoustic Tomography (MSOT), *Nikolaos Deliolanis, Adrian Taruttis, Amir Rozental, Daniel Razansky, Vasilis Ntziachristos; Technische Univ. and Helmholz 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 Jaeger[1], Lea Siegenthaler[1], Michael Kitz[1], Martin Frenz[1], D. Schol[2], M. Fleron[2], J. F. Greisch[2], M. C. De Pauw-Gil[2], E. De Pauw[2], J. Niederhauser[3], D. Schweizer[3]; [1]Univ. of Bern, Switzerland, [2]Univ. of Liege, Belgium, [3]Fukluda 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

SuB1, Optical Frequency Domain Imaging System with Laser Marking for Guiding Esophageal Surveillance Biopsy, *Melissa J. Suter, Priyanka A. Jillella, Benjamin J. Vakoc, Norman S. Nishioka, Brett E. Bouma, Guillermo J. Tearney; Harvard Medical School and Wellman Ctr. for Photomedicine, USA.*

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 Alex[1], Boris Považay[1], Bernd Hofer[1], Sergei Popov[2], Wolfgang Drexler[1]; [1]School of Optometry and Vision Sciences, Cardiff Univ., UK, [2]Dept. of Physics, Imperial College London, UK.*

ML1, *In vivo* Imaging of Pancreatic Endocrine Islets, *Martin Villiger[1], Joan Goulley[2], Christophe Pache[1], Michael Friedrich[1], Anne Grapin-Bott[2], Paolo Meda[3], Rainer A. Leitgeb[1], Theo Lasser[1]; [1]Lab d'Optique Biomédicale, Ecole Polytechnique Fédérale de Lausanne, Switzerland, [2]Swiss Inst. for Experimental Cancer Res., Ecole Polytechnique Fédérale de Lausanne, Switzerland, [3]Dept. 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 Potsaid[1,2], Iwona Gorczynska[1,3], Vivek J. Srinivasan[1], Yueli Chen[1,3], Jonathan Liu[1], James Jiang[2], Alex Cable[2], Jay S. Duker[3], James G. Fujimoto[1]; [1]MIT, USA, [2]Thorlabs, Inc., USA, [3]New England Eye Ctr. and Tufts Medical Ctr., USA.*

Therapeutic Laser Applications and Laser-Tissue Interactions

WE1, Mechanisms of Femtosecond Laser Cellular Optoporation, *Tobias Jachowski[1], Willem Bintig[2], Sebastian Eckert[1], Judith Baumgart[3], Anaclet Ngezahayo[2], Alexander Heisterkamp[3], Alfred Vogel[1]; [1]Univ. of Lübeck, Germany, [2]Inst. of Biophysics, Leibniz Univ., Germany, [3]Laser Zentrum Hannover e.V., Germany.*

WI1, Dynamics of Laser Induced Transient Micro Bubble Clusters in the Retinal Pigment Epithelium, *Andreas Fritz[1], Lars Ptaszynski[1], Hardo Stoehr[2], Ralf Brinkmann[1,2]; [1]Medical Laser Ctr. Luebeck, Germany, [2]Univ. of Luebeck, Germany.*

ThD1, Photobleaching Reconstruction for Interstitial Photodynamic Therapy Dosimetry, *Johan Axelsson[1], Johannes Swartling[2], Stefan Andersson-Engels[1]; [1]Dept. of Physics, Lund Univ., Sweden, [2]SpectraCure AB, Sweden.*

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

ThH2, OCT-Aided Femtosecond Laser Microsurgery Device, *Ole Massow[1], Fabian Will[2], Holger Lubatschowski[1,2]; [1]Laser Zentrum Hannover e.V., Germany, [2]Rowiak GmbH, Germany.*

European Conferences on Biomedical Optics (ECBO)

14–18 June 2009

ICM—International Congress Centre Munich

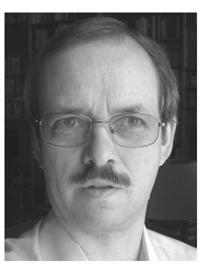
Munich, Germany

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

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Optical Coherence Tomography and Coherence Techniques

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Therapeutic Laser Applications and Laser-Tissue Interactions

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Alfred Vogel, *Univ. of Luebeck, Germany*
Georges Wagnieres, *Ecole Polytechnique Fédérale de Lausanne, Switzerland*
Timothy Zhu, *Univ. of Pennsylvania, USA*

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, 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 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."

14.00 

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 Univestitat 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.

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

Diffuse Optical Imaging Poster Preview, *Room B0.R2, Ground Floor, Congress Centre Hall B0* Monday 15 June	9.30–10.00
Optical Coherence Tomography and Coherence Techniques Poster Preview, *Room 5, Ground Floor, Congress Centre* Monday 15 June	13.30–15.00

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
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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

Monday 15 June	9.00–17.00
Tuesday 16 June	9.00–17.00
Wednesday 17 June	9.00–17.00
Thursday 18 June	9.00–16.00

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 Congres as well as the LASER World of PHOTONICS Trade Fair.

Registration Hours

Sunday 14 June	11.00–17.00
Monday 15 June	8.00–17.00
Tuesday 16 June	8.00–17.00
Wednesday 17 June	8.00–17.00
Thursday 18 June	8.00–17.00

Coffee Breaks

Ground Level Foyer (unless otherwise noted)

Sunday 14 June *(Ground Floor, Congress Centre)*	15.00–15.30 and 17.00–17.30
Monday 15 June	16.00–16.30
Tuesday 16 June	10.00–10.30 and 16.00–16.30
Wednesday 17 June	10.00–10.30 and 16.00–16.30
Thursday 18 June	10.00–10.30 and 16.00–16.30

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

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

Explanation of Session Codes

TuB4

Day of the Week
Su = Sunday
M = Monday
Tu = Tuesday
W = Wednesday
Th = Thursday

Session Designation
(alphabetically)

Number
(presentation order within the session)

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

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

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

	Room 4a, Ground Floor, Congress Centre	Room 5, Ground Floor, Congress Centre	Room 11, 1st Floor, Congress Centre	Room 12, 1st Floor, Congress Centre	Room 21, 2nd Floor, Congress Centre	Room B0.R2, Ground Floor, Congress Centre Hall B0
8.00–17.00	**Registration Open,** *ICM—Entry Lobby*					
9.00–10.00	—MI— **MA • Novel Developments towards the Clinics**	—OCT— **MB • Dermatological OCT**			—AMT— **MC • Photophysics II**	—DOI— **MD • Theoretical Analysis and Modeling I and Poster Preview**
9.00–17.00	**LASER World of PHOTONICS Trade Fair,** *Munich Trade Fair Centre*					
9.30–11.00	**World of Photonics Opening and Plenary Session,** *Room 1, Ground Floor/1st Floor, Congress Centre*					
11.00–13.30	**Lunch Break** *(on your own)*					
13.30–15.00	—MI— **ME • Techniques for Live Cell Imaging**	—OCT— **MF • Optical Coherence Tomography and Coherence Techniques Poster Preview**	—NOIBA— **MG • Tissue and Specimen Imaging I**		—AMT— **MH • Optical Sectioning**	—DOI— **MI • Theoretical Analysis and Modeling II**
15.00–16.30	**MJ • Joint MI/DOI/OCT/AMT Poster Session,** *Foyer ICM, Ground Floor, Congress Centre*					
16.00–16.30	**Coffee Break,** *Exhibition Hall*					
16.30–18.30	—MI— **MK • New Probes and Contrast Mechanisms for *in vivo* Imaging**	—OCT— **ML • Pre-Clinical and Clinical Apps I**	—NOIBA— **MM • Tissue and Specimen Imaging II**		—AMT— **MN • NLO I—Applications**	—DOI— **MO • Imaging of Breast and Other Organs**
17.30–18.30	**LASER World of Photonics Get-Together Reception,** *Foyer, Ground Floor, Congress Centre*					

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 — Tuesday 16 June

	Room 4a, Ground Floor, Congress Centre	Room 5, Ground Floor, Congress Centre	Room 11, 1st Floor, Congress Centre	Room 12, 1st Floor, Congress Centre	Room 21, 2nd Floor, Congress Centre	Room B0.R2, Ground Floor, Congress Centre Hall B0
8.00–17.00	**Registration Open,** *ICM—Entry Lobby*					
9.00–10.00		—OCT— **TuA • Light Sources and OCT Systems**	—NOIBA— **TuB • Photoacoustic I**		—AMT— **TuC • NLO II—Methods**	—DOI— **TuD • Experimental Techniques I**
9.00–17.00	**LASER World of PHOTONICS Trade Fair,** *Munich Trade Fair Centre*					
10.00–10.30	**Coffee Break,** *Exhibition Hall*					
10.30–12.30		—OCT— **TuE • OCT Signal and Image Processing**	—NOIBA— **TuF • Photoacoustic II**		—AMT— **TuG • Localization and High Precision**	—CBS— **TuH • Opthalmology/ Cardiology**
12.30–13.30	**Herbert Walther Award Session,** *Room 1, Ground Floor/1st Floor, Congress Centre*					
13.30–15.00		—OCT— **TuI • Functional Imaging**	—NOIBA— **TuJ • Lab on a Chip**		—AMT— **TuK • Holographic Methods**	—DOI— **TuL • Experimental Techniques II**
15.00–16.30	**TuM • Joint CBS/TLA/NOIBA Poster Session,** *Foyer ICM, Ground Floor, Congress Centre*					
16.00–16.30	**Coffee Break,** *Exhibition Hall*					
16.30–18.30	**JTuA • Joint ECBO-CLEO/Europe Session, Hot Topics: Molecules to Metabolism,** *Room 5, Ground Floor, Congress Centre*					

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 — Wednesday 17 June

	Room 4a, Ground Floor, Congress Centre	Room 5, Ground Floor, Congress Centre	Room 11, 1st Floor, Congress Centre	Room 12, 1st Floor, Congress Centre	Room 21, 2nd Floor, Congress Centre	Room B0.R2, Ground Floor, Congress Centre Hall B0
8.00–17.00	**Registration Open,** *ICM—Entry Lobby*					
9.00–10.00		—OCT— **WA • Functional OCT in Ophthalmology**	—TLA— **WB • Cellular Surgery I**			—CBS— **WC • Skin Diagnostics I**
9.00–17.00	**LASER World of PHOTONICS Trade Fair,** *Munich Trade Fair Centre*					
10.00–10.30	**Coffee Break,** *Exhibition Hall*					
10.30–12.30		—OCT— **WD • Pre-Clinical and Clinical Apps II**	—TLA— **WE • Cellular Surgery II**	—NOIBA— **WF • Endoscopic Techniques** (ends at 12.15)		—CBS— **WG • Skin Diagnostics II**
12.30–14.00	**Lunch Break** *(on your own)*					
14.00–16.00		—OCT— **WH • Novel OCT Technology**	—TLA— **WI • Opthalmology**	—DOI— **WJ • Experimental Techniques III**		—CBS— **WK • Biospectroscopy and Point-of-Care Diagnostics I**
16.00–16.30	**Coffee Break,** *Exhibition Hall*					
16.30–18.30		—OCT— **WL • Ophthalmic OCT II**	—TLA— **WM • Novel Approaches** (ends at 18.15)			—CBS— **WN • Biospectroscopy and Point-of-Care Diagnostics II** (ends at 18.15)
19.30–21.00	**Conference Reception,** *Königlicher Hirschgarten, Hirschgarten 1, 80639 München*					

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

Agenda of Sessions — Thursday 18 June

	Room 4a, Ground Floor, Congress Centre	Room 5, Ground Floor, Congress Centre	Room 11, 1st Floor, Congress Centre	Room 12, 1st Floor, Congress Centre	Room 21, 2nd Floor, Congress Centre	Room B0.R2, Ground Floor, Congress Centre Hall B0
8.00–17.00	**Registration Open,** *ICM—Entry Lobby*					
9.00–10.00		—CBS— **ThA • Minimally Invasive Diagnostics I**	—TLA— **ThB • Photodynamic Therapy I**			
9.00–16.00	**LASER World of PHOTONICS Trade Fair,** *Munich Trade Fair Centre*					
10.00–10.30	**Coffee Break,** *Exhibition Hall*					
10.30–12.30		—CBS— **ThC • Minimally Invasive Diagnostics II**	—TLA— **ThD • Photodynamic Therapy II**			
12.30–14.00	**Lunch Break** *(on your own)*					
14.00–16.00		—CBS— **ThE • Clinical and Preclinical Tissue Characterization I**	—TLA— **ThF • Modeling**			
16.00–16.30	**Coffee Break,** *Exhibition Hall*					
16.30–18.30		—CBS— **ThG • Clinical and Preclinical Tissue Characterization II**	—TLA— **ThH • Clinical Laser Therapy**			

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

ECBO Plenary Session

13.00–15.00
SuA • ECBO Plenary Session: Bridging the Ocean of Biomedical Optics
Christoph K. Hitzenberger; Medical Univ. of Vienna, Austria, Presider

SuA1 • 13.15 Invited

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 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."

SuA2 • 14.00 Invited

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 Univestitat 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.

15.00–15.30 Coffee Break, *Ground Floor, Congress Centre*

Room 5, Ground Floor, Congress Centre

Optical Coherence Tomography and Coherence Techniques

15.30–17.00
SuB • Endoscopic Applications of OCT
Peter E. Andersen; Technical Univ. of Denmark, Denmark, Presider

SuB1 • 15.30 Invited
Optical Frequency Domain Imaging System with Laser Marking for Guiding Esophageal Surveillance Biopsy, *Melissa J. Suter, Priyanka A. Jillella, Benjamin J. Vakoc, Norman S. Nishioka, Brett E. Bouma, Guillermo J. Tearney; Harvard Medical School and Wellman Ctr. for Photomedicine, USA.* 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, Björn Martensen, Gereon Hüttmann; 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

Novel Optical Instrumentation for Biomedical Applications

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.

SuC2 • 16.00
Intracoronary Laser Speckle Imaging for the Evaluation of Atherosclerotic Plaque, *Seemantini K. Nadkarni, Gary J. Tearney; Wellman Ctr. for Photomedicine, Massachusetts General Hospital, Harvard Medical School, USA.* Acute coronary syndromes are frequently preceded by coronary plaque rupture. In the current study, we have developed an intracoronary catheter to facilitate the detection of unstable plaques *in vivo* using laser speckle imaging (LSI).

Room 12, 1st Floor, Congress Centre

Diffuse Optical Imaging

15.30–17.00
SuD • Brain Imaging and Spectroscopy I
Rinaldo Cubeddu; Politecnio di Milano, Italy, Presider

SuD1 • 15.30
Concurrent fMRI and Time-Domain NIRS to Study Functional Activation in Human Brain, *Evgeniya Kirilina[1,2], Alexander Jelzow[2], Heidrun Wabnitz[2], Ruediger Bruehl[2], David Boas[3], Rainer Macdonald[2], Bernd Ittermann[2]; [1]Free Univ. of Berlin, Germany, [2]Physikalisch-Technische Bundesanstalt, Germany, [3]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 Molteni[1], Anna M. Bianchi[1], Giuseppe Baselli[1], Matteo Caffini[2], Davide Contini[2], Lorenzo Spinelli[3], Alessandro Torricelli[2,4], Sergio Cerutti[1], Rinaldo Cubeddu[2,3,4,5]; [1]IIT Unit, Bioengineering Dept., Politecnico di Milano, Italy, [2] Dept. di Fisica, Politecnico di Milano, Italy, [3]IFN-CNR Inst. di Fotonica e Nanotecnologie, Sezione di Milano, Italy, [4]Res. Unit IIT, Politecnico di Milano, Italy, [5]ULTRAS-INFM-CNR, Natl. Lab for Ultrafast and Ultraintense Optical Science, Italy.* We evaluated the intra- and extra-cortical vascular response correlated to neural activity within a working memory "n-back" task in a population of healthy volunteers by means of time-resolved near-infrared functional spectroscopy and generalized linear models.

SuD3 • 16.00 Invited
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.* Mapping resting-state networks allows insight into the brain's functional architecture. Herein, we develop techniques for spatially mapping functional connectivity with DOT (fc-DOT). Simultaneous imaging over the motor and visual cortices yielded robust correlation maps.

Room 21, 2nd Floor, Congress Centre

Advanced Microscopy Techniques

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 Pupil, *Bosanta R. Boruah; Gauhati Univ., 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, *Nanguang Chen[1], Chee Howe Wong[1], Colin Sheppard[1], Gerald Udolph[2], Martin Wasser[3]; [1]Natl. Univ. of Singapore, Singapore, [2]Inst. of Medical Biology, A*STAR, Singapore, [3]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, *Yoshiaki Yasuno[1,2], Kazuhiro Kurokawa[1,2], Shuichi Makita[1,2], Masahiro Miura[2,3], Keisuke Kawana[2,4], Fumiki Okamoto[2,4], Tetsuro Oshika[2,4]; [1]Computational Optics Group, Univ. of Tsukuba, Japan, [2]Computational Optics and Ophthalmology Group, Japan, [3]Tokyo Medical Univ., Japan, [4]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.

Room 5, Ground Floor, Congress Centre

Optical Coherence Tomography and Coherence Techniques

SuB • Endoscopic Applications of OCT—Continued

SuB3 • 16.15
Atherosclerotic Plaque Composition Imaging with Intravascular OCT, *Gijs van Soest[1], Thadé P. M. Goderie[1], Nieves Gonzalo[1], Sander R. van Noorden[1], Evelyn Regar[1], Patrick W. Serruys[1], Anton F. W. van der Steen[1,2]; [1]Erasmus Medical Ctr., The Netherlands, [2]Interuniversity Cardiology Inst. of the 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.

SuB4 • 16.30
High-Seed Plarization Sensitive Optical Frequency Domain Imaging System for Clinical Cardiovascular Imaging, *Wang-Yuhl Oh, Benjamin J. Vakoc, Milen Shishkov, Guillermo J. Tearney, 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.

SuB5 • 16.45
OCT Guided Laser Hyperthermia with Plasmonic Gold Nanoparticles, *Marina A. Sirotkina[1], Marina Vadimovna Shirmanova[1,2], Pavel Dmitrievich Agrba[3], Vladislav Antonievich Kamensky[3], Victor Andreevich Nadtochenko[4], Nikolay Nikolaevich Denisov[4], Elena Vadimovna Zagaynova[1]; [1]Nizhny Novgorod State Medical Acad., Russian Federation, [2]N.I. Lobachevsky State Univ. of Nizhny Novgorod, Russian Federation, [3]Inst. of Applied Physics, RAS, Russian Federation, [4]N.N. Semenov Inst. of Chemical Physics, RAS, Russian Federation.* OCT study of accumulation of gold nanobranches into cervical carcinoma for controlled laser hyperthermia was performed. At the time of maximum accumulation hyperthermia of tumor was undertaken. Nanoparticles were shown to be effective for hyperthermia.

Room 11, 1st Floor, Congress Centre

Novel Optical Instrumentation for Biomedical Applications

SuC • Advanced Imaging and Spectroscopy I—Continued

SuC3 • 16.15
Optical Tomography by Digital Holographic Microscopy, *Nicolas Pavillon, Jonas Kühn, Florian Charrière, Christian Depeursinge; Ecole 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.

SuC4 • 16.30
Towards the Development of a Light Scattering Based *in vivo* Flow Cytometer, *Cherry 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.

SuC5 • 16.45
Turbid Polarimetry for Tissue Characterization, *Michael F. G. Wood[1], Nirmalya Ghosh[1], Eduardo H. Moriyama[1], Marika A. Wallenburg[1], Shu-Hong Li[2], Richard D. Weisel[2], Brian C. Wilson[1], Ren-Ke Li[2], Alex Vitkin[1]; [1]Ontario Cancer Inst., Canada, [2]Toronto General Res. Inst., Canada.* We have developed a novel turbid polarimetry platform for characterization of biological tissues. Currently, we are exploring the use of this platform for characterizion of the extracellular matrix and potential use in monitoring regenerative treatments.

Room 12, 1st Floor, Congress Centre

Diffuse Optical Imaging

SuD • Brain Imaging and Spectroscopy I—Continued

SuD4 • 16.30
Combining Near-Infrared Spectroscopy with Electroencephalography and Repetitive Transcranial Magnetic Stimulation, *Tiina Näsi[1,2], Kalle Kotilahti[1,2], Hanna Mäki[1,2], Ilkka Nissilä[1], Pekka Meriläinen[1]; [1]Dept. of Biomedical Engineering and Computational Science, Helsinki Univ. of Technology, Finland, [2]BioMag Lab, Helsinki Univ. Central Hospital, Finland.* We have combined near-infrared spectroscopy with electroencephalography to record simultaneously hemodynamic responses and evoked potentials, and with transcranial magnetic stimulation (TMS) to investigate hemodynamic responses to repetitive TMS.

SuD5 • 16.45
Bedside Monitoring of Cerebral Perfusion by Time-Domain Near-Infrared Reflectometry, *Oliver Steinkellner[1], Heidrun Wabnitz[1], Rainer Macdonald[1], Clemens Gruber[2], Jens Steinbrink[3], Peter Brunecker[3], Jochen B. Fiebach[3], Hellmuth Obrig[2]; [1]Physikalisch-Technische Bundesanstalt, Germany, [2]Klinik für Neurologie, Charité-Univ.-Medizin Berlin, Germany, [3]Ctr. for Stroke Res. Berlin, Charité-Univ.-Medizin Berlin, Germany.* We describe an ongoing study on perfusion monitoring using indocyanine green as contrast agent. Measurements on cerebral perfusion in ischemic stroke and carotid artery stenosis are presented and compared to established imaging techniques.

Room 21, 2nd Floor, Congress Centre

Advanced Microscopy Techniques

SuE • Confocal/3-D Microscopy—Continued

SuE4 • 16.15
Fluorescence Lifetime Imaging Through a Confocal Microendoscope, *Gordon T. Kennedy[1], Alexander J. Thompson[1], Daniel S. Elson[1], Mark A. A. Neil[1], Gordon W. Stamp[1], Bertrand Viellerobe[2], François Lacombe[2], Christopher Dunsby[1], Paul M. W. French[1]; [1]Imperial College London, UK, [2]Mauna Kea Technologies, France.* We describe a fluorescence lifetime imaging endomicroscope employing a fibre bundle probe and time correlated single photon counting. Preliminary images of stained samples, labelled cells exhibiting Förster resonant energy transfer and tissue autofluorescence are presented.

SuE5 • 16.30
Tracking Three-Dimensional Motion of Liposomes Containing Gold Nanoparticles in Living Cells, *Feng-Ching Tsai[1], Lin-Ai Tai[2], Yu-Jing Wang[2], Jian-Long Xiao[1,3], Chung-Shi Yang[2], Chau-Hwang Lee[1,3]; [1]Res. Ctr. for Applied Sciences, Academia Sinica, Taiwan, [2]Ctr. for Nanomedicine Res., Natl. Health Res. Inst., Taiwan, [3]Inst. of Biophotonics, Natl. Yang-Ming Univ., Taiwan.* By using wide-field optical profilometry, we observe the intracellular translocation processes of liposomes coated with fibroblast growth factors and containing gold nanoparticles in fibroblasts. We analyze the motor-driven and diffusion-like motions of the liposomes.

SuE6 • 16.45
Position-Referenced Microscopy: Regions of Interest Localization and Subpixel Image Comparison by Means of Pseudo-Random Patterns Embedded in Cell Culture Boxes, *July Galeano[1], Patrick Sandoz[1], Emilie Gaiffe[2], Jean-Luc Prétet[2], Christiane Mougin[2]; [1]Dept. d'Optique PM Duffieux, Univ. de Franche-Comté, France, [2]Lab de Biologie Cellulaire et Moléculaire, Univ. de Franche-Comté, France.* Pseudo-random patterns integrated in cell culture boxes are used to monitor the observation position in optical microscopy and to superimpose biological images with a sub-pixel resolution to allow a site-by-site analysis.

17.00–17.30 Coffee Break, *Ground Floor, Congress Centre*

Room 5, Ground Floor, Congress Centre

Optical Coherence Tomography and Coherence Techniques

17.30–18.45
SuF • Ophthalmic OCT I
James Fujimoto; MIT, USA, Presider

SuF1 • 17.30
Quantitative Assessment of Retinal Disorders Using Polarization-Sensitive Optical Coherence Tomography, *Bernhard Baumann[1], Michael Pircher[1], Erich Götzinger[1], Harald Sattmann[1], Johannes Jungwirth[1], Christopher Schütze[2], Christian Ahlers[2], Wolfgang Geitzenauer[2], Ursula Schmidt-Erfurth[2], Christoph K. Hitzenberger[1]; [1]Medical Univ. of Vienna, Austria, [2]General Hospital and Medical Univ. of Vienna, Austria.* We present the unique ability of polarization-sensitive optical coherence tomography to assess retinal disorders in a quantitative way. Areas of atrophic zones and volumes of subretinal fluids were evaluated.

SuF2 • 17.45
Dynamic Retinal Optical Coherence Microscopy without Adaptive Optics, *Rainer A. Leitgeb, Tilman Schmoll, Christoph Kolbitsch; Medical Univ. Vienna, Austria.* Applying ultra-high speed FDOCT without adaptive optics we reveal dynamic microstructural changes of the human retina *in vivo* such as micro-perfusion dynamics of full retinal volumes and the dynamics of individual photoreceptors.

SuF3 • 18.00 Invited
Imaging the Inner Retina Using Optical Coherence Tomography with Adaptive Optics, *Donald T. Miller, Barry Cense, Omer Kocaoglu, Qiang Wang; Indiana Univ., USA.* Ultrahigh resolution OCT combined with adaptive optics provides unprecedented 3-D resolution for imaging the cellular retina *in vivo*. Here we investigate the utility of this instrument for imaging individual retinal nerve fiber bundles and capillaries.

SuF4• 18.30
Pulse Coherent Dynamic Angiography, *Tilman Schmoll, Christoph Kolbitsch, Rainer A. Leitgeb; Medical Univ. Vienna, Austria.* We reconstruct phase coherent quantitative perfusion maps in 4-D using synchronous detection of Doppler-FDOCT data and heartbeat using a pulse-oximeter. Recombination of tomograms according to heart-beat cycle yields full volumes for each cycle instant.

Room 11, 1st Floor, Congress Centre

Novel Optical Instrumentation for Biomedical Applications

17.30–18.30
SuG • Advanced Imaging and Spectroscopy II
Christian Depeursinge; Ecole Polytechnique Fédérale de Lausanne, Switzerland, Presider

SuG1 • 17.30
A Novel Multispectral Imaging Method for Molecular Imaging, *George Themelis, Athanasios Sarantopoulos, Vasilis Ntziachristos; Technical 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.

SuG2 • 17.45
Fiber Bundle Based Fluorescence Tomography System for Human Breast Imaging, *Yuting Lin, Orhan Nacioglu, Gultekin Gulsen; Ctr. 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 Khoptyar, Tomas Svensson, Erik Alerstam, Stefan Andersson-Engels; 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 Spinelli[1], Antonio Pifferi[1,2,3,4], Davide Contini[2], Rinaldo Cubeddu[1,2,3,4], Alessandro Torricelli[2,4]; [1]Inst. di Fotonica e Nanotecnologie, Sezione di Milano, Italy, [2] Dept. di Fisica , Politecnico di Milano, Italy, [3]ULTRAS-INFM-CNR, Natl. Lab for Ultrafast and Ultraintense Optical Science, Italy, [4]Res. Unit IIT, Politecnico di Milano, Italy.* A novel tomographic approach for photon discrimination in turbid media using a single source-detector distance and exploiting temporal information is presented and validated by numerical simulations and *in vivo* measurements.

Room 12, 1st Floor, Congress Centre

Diffuse Optical Imaging

17.30–18.30
SuH • Brain Imaging and Spectroscopy II
Rinaldo Cubeddu; Politecnico di Milano, Italy, Presider

SuH1 • 17.30
Cortical and Superficial Signals During Motor Activation of the Adult Brain from Time-Resolved Near-Infrared Spectroscopy, *Heidrun Wabnitz[1], Tilmann H. Sander[1], Alexander Jelzow[1], Frank Peters[1], Frederik Geisler[2], Michaela Wachs[2], Stefanie Leistner[2], Bruno-Marcel Mackert[3], Lutz Trahms[1], Rainer Macdonald[1]; [1]Physikalisch-Technische Bundesanstalt, Germany, [2]Klinik für Neurologie, Charité - Univ.-Medizin Berlin, Germany, [3]Klinik für Neurologie, Vivantes Auguste-Viktoria-Klinikum, Germany.* In two 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.

SuH2 • 17.45
Validation of a Linear Ansatz for Decomposition of Time-Resolved *in vivo* Fluorescence from an ICG Bolus in the Adult Human Head, *Alexander Jelzow[1], Heidrun Wabnitz[1], Rainer Macdonald[1], Hellmuth Obrig[2], Jens Steinbrink[2]; [1]Physikalisch-Technische Bundesanstalt, Germany, [2]Neurologische Klinik, Charité - Univ.-Medizin Berlin, Germany.* We investigated the validity of a linear ansatz to decompose intra- and extracerebral indocyanine green boli based on *in vivo* time-resolved fluorescence measurements. Results of corresponding Monte-Carlo simulations and phantom experiments are presented.

SuH3 • 18.00
Non-Invasive Measurement of Cerebral Autoregulation and Oxygen Metabolism at the Intensive Care Unit, *Turgut Durduran[1,2], Joel H. Greenberg[3], John A. Detre[3], Arjun G. Yodh[4]; [1]Univ. of Pennsylvania, USA, [2]ICFO-The Inst. of Photonic Sciences, Spain, [3]Dept. of Neurology, Univ. of Pennsylvania, USA, [4]Dept. of Physics and Astronomy, Univ. of Pennsylvania, USA.* Hybrid diffuse optical and correlation spectroscopies enable non-invasive measurement of cerebral autoregulation and oxygen-metabolism at the bed-side. Clinical experience including extensive validation is described for intensive care monitoring of adults and neonates.

SuH4 • 18.15
Intraoperative Monitoring of the Cerebral Oxygenation during Carotid Endarterectomy Using Time-Resolved Brain Imager, *Michal Kacprzak[1], Adam Liebert[1], Piotr Sawosz[1], Roman Maniewski[1,2], Walerian Staszkiewicz[2], Grzegorz Madycki[2], Andrzej Gabrusiewicz[2]; [1]Inst. of Biocybernetics and Biomedical Engineering, Poland, [2]Ctr. for Postgraduate Medical Education, Poland.* Imaging of changes of the oxy- and deoxyhemoglobin in brain cortex was carried out during carotid endarterectomy. Clear differences in oxygenation dynamics on ipsi- and contralateral hemispheres during carotid artery clamping was observed.

Room 21, 2nd Floor, Congress Centre

Advanced Microscopy Techniques

17.30–18.30
SuI • Photophysics I
Rainer Uhl; Ludwig Maximillians Univ. Munchen, Germany, Presider

SuI1 • 17.30
Photoswitching Microscopy with Standard Fluorophores, *Sebastian van de Linde, Anindita Mukherje, Steve Wolter, Mark Schüttpelz, Britta Seefeldt, Robert Kasper, Mik Heilemann, Markus Sauer; Bielefeld Univ., Germany.* We introduce a general approach for super-resolution fluorescence microscopy with molecular-scale optical resolution exploiting the photophysics of standard organic fluorophores such as rhodamine and oxazine derivatives in aqueous solutions.

SuI2 • 17.45
Photo-Manipulation of Fluorescent Probes in Living Cells Using a Kilobeam Array Scanner, *Peter Lipp[1], Ken Bell[2], Lars Kaestner[1]; [1]Molecular Cell Biology, Saarland Univ., Germany, [2]VisiTech Int. Ltd., UK.* We designed a kilobeam array scanner with variable pinholes and a build-in light-path for easy photomanipulation allowing fast, multi-region photoactivation. This enabled a functional investigation of mitochondrial dynamics in living cells.

SuI3 • 18.00
Monitoring Oxygen Consumption during Cell Contraction by Triplet State Imaging, *Matthias Geissbuehler[1], Thiemo Spielmann[2], Aurélie Formey[1], Iwan Maerki[1], Boris Hinz[1], Kai Johnsson[1], Dimitri Van de Ville[1], Theo Lasser[1]; [1]Ecole Polytechnique Fédérale de Lausanne, Switzerland, [2]Kungliga Tekniska Högskolan, Sweden.* We present an imaging contrast based on triplet state lifetime extracted from a series of images taken with modulated excitation schemes. This technique is validated by visualizing oxygen consumption during contraction of smooth muscle cells.

SuI4 • 18.15
Multiphoton Excited Luminescent Blinking, Bleaching and "Switching on" Properties of Gold Nanoparticles, *Michael Ruosch, Dominik Marti, Jaro Ricka, Martin Frenz; Univ. of Bern, Switzerland.* We found that single gold nanoparticles exhibit multiphoton excited luminescent blinking, bleaching and can be photo activated by high intensity laser irradiation. The observed blinking is attributed to a change of the particle morphology.

Room 4a, Ground Floor, Congress Centre

Molecular Imaging

9.00–10.00
MA • Novel Developments towards the Clinics
Kai Licha; mivenion GmbH, Germany, Presider

MA1 • 9.00
Multi-Modality Assisted Photonic Imaging of Cancer, *Marta Zientkowska[1], George Themelis[1], Ralf B. Schulz[1], Axel Weber[2], Markus Schwaiger[2], Vasilis Ntziachristos[1]; [1]Inst. for Biological and Medical Imaging and Chair for Biological Imaging, Technische Univ. München, Germany, [2]Dept. of Nuclear Medicine, Klinikum Rechts der Isar, Technische Univ. München, Germany. In vivo* cancer imaging benefits by multimodal approaches visualizing disease at different scales. We describe the application of pre-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. Rosbach[1], Darren Roblyer[1], Richard Schwarz[1], Michelle Williams[2], Ann Gillenwater[2], Rebecca Richards-Kortum[1]; [1]Rice Univ., USA, [2]M. D. Anderson Cancer Ctr., USA.* Three contrast agents that target molecular or morphological characteristics of cancer were topically 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 Reconstruction of Spatially Resolved Fluorescence Data—A Diagnostics Method, *Daniela Strat, Wolfgang S. L. Strauss, Alwin Kienle; Inst. für Lasertechnologien in der Medizin und Meßtechnik an der Univ. Ulm, Germany.* We propose a cancer diagnostics method using 3-D reconstruction of fluorescence based optical 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 Fluorescence Imaging Using Attenuation Correction, *George Themelis[1], Athanasios Sarantopoulos[1], Gooitzen M. van Dam[2], Vasilis Ntziachristos[1]; [1]Inst. for Biological and Medical Imaging (IBMI), Technische Univ. München and Helmholtz Ctr. Munich, Germany, [2]Dept. of Surgery, BioOptical Imaging Ctr. Groningen, Univ. Medical Ctr. Groningen, The Netherlands.* We present a multispectral fluorescence 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 fluorescence imaging.

Room 5, Ground Floor, Congress Centre

Optical Coherence Tomography and Coherence Techniques

9.00–10.00
MB • Dermatological OCT
Gereon Hüttmann; Univ. of Luebeck, Inst. of Biomedical Optics, Germany, Presider

MB1 • 9.00 Invited
Multiple Wavelength Three-Dimensional Optical Coherence Tomography of Human Skin, *Aneesh Alex[1], Boris Považay[1], Bernd Hofer[1], Sergei Popov[2], Wolfgang Drexler[1]; [1]School of Optometry and Vision Sciences, Cardiff Univ., UK, [2]Dept. of Physics, Imperial College London, UK.* High speed (47,000 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 Sakai[1], Masahiro Yamanari[2], Shuichi Makita[2], Noriaki Nakagawa[1], Masayuki Matsumoto[1], Yoshiaki Yasuno[2]; [1]Kanebo Cosmetics Inc., Japan, [2]Computational Optics Group, Univ. of Tsukuba, Japan.* Anisotropic changes in the dermal birefringence of excised pig skin by stretching were analyzed using high-speed polarization-sensitive swept-source optical coherence tomography. Stretched skin indicated the depth-dependent anisotropic change in dermal collagen structure.

MB3 • 9.45
Optical Coherence Tomography to Aid Development of Skin Cancer Chemopreventive Agents, *Jennifer Barton, Scott Kaser, Clara Curiel, Steven Stratton, David Alberts; Univ. of Arizona, USA.* Eighty patients were imaged with optical coherence tomography before and after treatment with perillyl alcohol. Semi-automated analysis of epidermal thickness and attenuation was performed. OCT enables non-destructive measurement with variability no greater than histology.

Room 21, 2nd Floor, Congress Centre

Advanced Microscopy Techniques

9.00–10.00
MC • Photophysics II
Ernst Stelzer; European Molecular Biology Lab, Germany, Presider

MC1 • 9.00 Invited
Determination of Fluorescent Protein On-State Emission Rates by Manipulating the Local Density of Photonic States, *Christian Blum[1], Yanina Cesa[1], Johanna M. van den Broek[1], Allard P. Mosk[1], Willem L. Vos[1,2], Vinod Subramaniam[1]; [1]Univ. of Twente, The Netherlands, [2]FOM, Inst. for Atomic and Molecular Physics, The Netherlands.* 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 Hsieh[1,2], Rachel Grange[1], Ye Pu[1,2], Demetri Psaltis[1,2]; [1]Ecole Polytechnique Fédérale de Lausanne, Switzerland, [2]Caltech, USA.* We use $BaTiO_3$ nanoparticles as biomarkers for cell imaging by detecting the second harmonic generation signal. These nanoparticles were stabilized in colloidal suspension and also covalently conjugated to the IgG antibodies for specific labeling.

MC3 • 9.45
Dose Limited Fluorescence Microscopy of Living Cells, *Herbert Schneckenburger[1,2], Michael Wagner[1], Petra Weber[1], Sarah Schickinger[1], Thomas Bruns[1], Wolfgang S. L. Strauss[2]; [1]Inst. für Angewandte Forschung, Hochschule Aalen, Germany, [2]Inst. für Lasertechnologien in der Medizin und Meßtechnik, Univ. Ulm, Germany.* Light dose reveals to play an important role in fluorescence and Raman microscopy of living cells. Therefore, a microscopic test system for cell viability was established, and corresponding methods were adapted to a compatible dose.

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

Diffuse Optical Imaging

9.00–10.00
MD • Theoretical Analysis and Modeling I and Poster Preview
Alwin Kienle; Univ. of Ulm, Germany, Presider

MD1 • 9.00
Reconstruction of Fluorophore Distribution for Fluorescence Diffuse Tomography Based on Hybrid Model, *Iliya I. Fiks, Mikhail Kirillin, Ekaterina Sergeeva, Mikhail Kleshnin, Ilya Turchin; Inst. of Applied Physics, RAS, Russian Federation.* Novel reconstruction method for fluorescent diffuse tomography based on advanced radiative transfer equation solution approximation and Monte Carlo simulation will be described.

MD2 • 9.15
3-D Modeling for Solving Forward Model of No-Contact Fluorescence Diffuse Optical Tomography Method, *Farouk Nouizi[1], Renee Chabrier[1], Murielle Torregrossa[2], Patrick Poulet[1]; [1]Lab d'Imagerie et de Neurosciences Cognitives, Univ. de Strasbourg, France, [2]Lab des Sciences de l'Image, de l'Informatique et de la Télédétection, Universite de Strasbourg, France.* We present a new 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.

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.

The following posters will be previewed:
MJ5
MJ6
MJ7
MJ9
MJ10
MJ14
MJ15
MJ16
MJ17
MJ20

See pages 20–21 for titles, authors and abstracts.

Monday 15 June

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

11.00–13.30 Lunch Break *(on your own)*

Room 4a, Ground Floor, Congress Centre	Room 5, Ground Floor, Congress Centre	Room 11, 1st Floor, Congress Centre
Molecular Imaging	Optical Coherence Tomography and Coherence Techniques	Novel Optical Instrumentation for Biomedical Applications

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

Monday 15 June

13.30–15.00
ME • Techniques for Live Cell Imaging
Giannis Zacharakis; Foundation for Res. and Technology Hellas (FORTH), Greece, Presider

ME1 • 13.30 Invited
High Speed, Automated, Optically Sectioned Fluorescence Lifetime Imaging Multi-Well Plate Reader and Multiplexed FRET Microscope, *Clifford Talbot[1], James McGinty[1], Ewan McGhee[1], David Grant[1], Sunil Kumar[1], Dylan Owen[1], Gordon Kennedy[1], Ian Munro[1], Wei Zhang[2], Tom Bunney[2], Tony Magee[1], Dan Davis[1], Matilda Katan[2], Chris Dunsby[1], Mark Neil[1], Paul French[1]; [1]Imperial College London, UK, [2]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 D. Merajver, 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, Aline Flocke, Karin Hammer, Sandra Ruppenthal, Anke Scholz, 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, *Munir El-Desouki, M. Jamal Deen, Qiyin Fang, Frances Tse; 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.

13.30–15.00
MF • Optical Coherence Tomography and Coherence Techniques Poster Preview
Peter E. Andersen; Risoe Natl. Lab, Denmark, Presider

This session consists entirely of poster previews. Poster previews are brief oral presentations (approximately 4 minutes) of posters to be presented later in the day.

The following posters will be previewed:
MJ25
MJ27
MJ28
MJ31
MJ35
MJ36
MJ37
MJ39
MJ40
MJ41
MJ42
MJ44
MJ47

See pages 21–22 for titles, authors and abstracts.

13.30–15.00
MG • Tissue and Specimen Imaging I
Christian Depeursinge; Ecole Polytechnique Fédérale de Lausanne, Switzerland, Presider

MG1 • 13.30
Quantitative Measurements of Scattering and Absorption by Low Coherence Spectroscopy, *Nienke Bosschaart, Dirk J. Faber, Jelmer J. A. Weda, Ton A. G. van Leeuwen, Maurice C. G. Aalders; 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 Amouroux[1], Wilfried Uhring[2], Thierry Pebayle[1], Patrick Poulet[1], Luc Marlier[1]; [1]Lab d'Imagerie et de Neurosciences Cognitives, Univ. de Strasbourg, France, [2]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 Saetchnikov[1], Elina Tcherniavskaia[1], Gustav Schweiger[2]; [1]Belarusian State Univ., Belarus, [2]Ruhr 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 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[1], Eugenio Rodriguez[1], Ricardo Moreira[1], Said Agouram[2], Luiz C. Barbosa[1], Ernesto Jimenez[2], Carlos L. Cesar[1]; [1]UNICAMP, Brazil, [2]Univ. 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 Zbieć, 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.

Room 21, 2nd Floor, Congress Centre

Advanced Microscopy Techniques

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

Diffuse Optical Imaging

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

13.30–15.00
MH • Optical Sectioning
Gert von Bally; Westfaelische Wilhelms Univ. Munster, Germany, Presider

MH1 • 13.30 Invited

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.* 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.

MH2 • 14.00

The Zebrafish Digital Embryo: *In toto* Reconstruction of Zebrafish Early Embryonic Development with Digital Scanned Laser Light Sheet Fluorescence 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."

MH3 • 14.15

Optically Sectioned Imaging by Oblique Plane Microscopy, *Chris Dunsby; Imperial College London, UK.* An optically sectioning microscopy technique based on oblique selective plane illumination combined with oblique imaging is described. The same high numerical aperture lens is used to both illuminate and image the specimen.

MH4 • 14.30

Fiber-Optic Based Ultramicroscopy for Biological Tissue Study, *Andrey N. Morozov[1], Ilya V. Turchin[1], Vladislav A. Kamensky[1], Konstantin V. Anokhin[2]; [1]Inst. of Applied Physics, RAS, Russian Federation, [2]Inst. of Normal Physiology, RAMS, Russian Federation.* We developed fiber-optic based ultramicroscopy setup to provide cellular level resolution 3-D images of large specimens. Two-sided laser sheet illumination combined with fluorescence confocal microscopy and optical tissue clearing procedure allows single neuron resolution imaging.

MH5 • 14.45

Optical Sectioning Microscopy Using Line-Element Micro-LED Arrays, *Mark A. A. Neil[1], Vincent Poher[1], Gordon T. Kennedy[1], Paul M. W. French[1], David Massoubre[2], Erdan Gu[2], Martin D. Dawson[2]; [1]Imperial College London, UK, [2]Inst. of Photonics, UK.* We describe a GaN LED line microarray device as a programmable source of structured illumination for optically sectioned fluorescence microscopy. We discuss techniques for enhancing the sectioning response and for improving illumination uniformity and efficiency.

13.30–15.00
MI • Theoretical Analysis and Modeling II
Alwin Kienle; Univ. of Ulm, Germany, Presider

MI1 • 13.30

Implementation of a Block-Structured Grid for Fast and Accurate Modeling of Fluorescence Light Propagation in Arbitrary Shaped Tissue, *Alexander D. Klose, Ludguier D. Montejo, Hyun K. Kim, Xuejun Gu, Andreas H. Hielscher; Columbia Univ., USA.* We developed a method for generating block-structured grids that can be used with the fluorescence equation of radiative transfer in the frequency domain. Light propagation in arbitrarily shaped tissue can be modeled with high accuracy.

MI2 • 13.45

A Multilevel and Multigrid Optical Tomography Based on Radiative Transfer Equation, *Hao Gao, Hongkai Zhao; Univ. of California at Irvine, USA.* Based on a multigrid forward solver of radiative transfer equation for optical imaging, an efficient multilevel simultaneous reconstruction of absorption and scattering coefficients is presented.

MI3 • 14.00

Light Diffusion in N-Layered Turbid Media, *Andre Liemert, Alwin Kienle; Inst. für Lasertechnologien in der Medizin und Meßtechnik, Germany.* Light propagation in N-layered turbid media is studied in the steady-state, frequency, and time domains. Solutions of the diffusion equation are derived and compared to Monte Carlo simulations. In addition, the inverse problem is outlined.

MI4 • 14.15

Rapid Convergence to the Inverse Solution Regularized with Lorentzian Distributed Function for NIR DOT, *Min-Cheng Pan[1], Min-Chun Pan[2]; [1]Dept. of Electronic Engineering, Tungnan Univ., Taiwan, [2]Dept. of Mechanical Engineering, Natl. Central Univ., Taiwan.* A promising method achieving rapid convergence for image reconstruction is introduced for the continuous-wave NIR-DOT. An approach employs a constraint based on Lorentzian distributed function incorporated into Tikhonov regularization, thereby rapidly converging a stable solution.

MI5 • 14.30

Hybrid Theoretical Approach for Modeling the Whole-Space Distribution of Scattered Light, *Ekaterina A. Sergeeva, Mikhail Yu. Kirillin; Inst. of Applied Physics of the RAS, Russian Federation.* Analytical model of radiation in scattering medium is developed that describes distribution of scattered photons at arbitrary distance from the source. The validity of the model is confirmed by comparing with Monte Carlo simulations.

MI6 • 14.45

Nonlinear Color Segmentation of Optical Diffusion Tomograms Reconstructed by the Photon Average Trajectory Method, *Alexander B. Konovalov, Vitaly V. Vlasov, Dmitry V. Mogilenskikh, Igor V. Pavlov; Russian Federal Nuclear Ctr. - Zababakhin Inst. of Applied Physics, Russian Federation.* This paper proposes an approach to segment the diffusion tomograms reconstructed by the photon average trajectory method. The approach is based on the generation of nonlinear functions of correspondence between image intensity and color space.

15.00–16.30
MJ • Joint MI/DOI/OCT/AMT Poster Session

Molecular Imaging Posters

MJ1

Imaging of Dying Cells and Collagen in Vulnerable Plaques Using Bimodal Qdots, *Lenneke Prinzen[1], Robbert-Jan J. H. Miserus[1], Nicole Bitsch[1], Tilman Hackeng[1], Eline Kooi[1], Dick W. Slaaf[1,2], Chris P. M. Reutelingsperger[1], Marc A. M. van Zandvoort[1]; [1]Maastricht Univ. Medical Ctr., The Netherlands, [2]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-laser-scanning-microscopy; unfortunately, MRI was not successful due to insufficient labeling.

MJ2

Fluorescence Transilluminative Imaging of Photosensitizers in Tumor-Bearing Mice *in vivo*, *Marina V. Shirmanova[1,2], Irina V. Balalaeva[2], Marina A. Sirotkina[1], Anna G. Orlova[3], Ilya V. Turchin[3], Elena V. Zagaynova[1]; [1]Nizhny Novgorod State Medical Acad., Russian Federation, [2]N.I. Lobachevsky State Univ. of Nizhny Novgorod, Russian Federation, [3]Inst. of Applied Physics of RAS, Russian Federation. In vivo* fluorescence imaging of photosensitive dyes in tumor-bearing mice is shown. We demonstrate the results of noninvasive investigation of photosensitizers pharmacokinetics by fluorescence imaging setup in transilluminative configuration.

MJ3

Sensitivity Limits of Biomarker Imaging by Multi-Spectral Optoacoustic Tomography (MSOT), *Daniel Razansky, John Baeten, Vasilis Ntziachristos; Inst. for Biological 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 visualizing a near-infrared fluorescent molecular agent.

Diffuse Optical Imaging Posters

MJ4

Simultaneous Reconstructing Fluorescent Yield and Lifetime from Measured Time-Resolved Transmittance of a Small-Animal-Stimulating Phantom, *Feng Gao[1], Patrick Poulet[2], Yukio Yamada[3]; [1]Tianjin Univ., China, [2]Inst. de Physique Biologique, Univ. Louis Pasteur Strasbourg, France, [3]Univ. of Electro-Communications, Japan.* A full three-dimensional, featured-data algorithm for time-domain fluorescence diffuse optical tomography is presented and experimentally validated by use of a multi-channel time-correlation single photon counting system and a normalized Born formulation.

MJ5

3-D Light Source Reconstruction with Spatial Filter for Fluorescence/Bioluminescence Diffuse Optical Tomography, *Shinpei 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.

MJ6

Analysis of Light Propagation in Head Models for Probabilistic Registration of NIRS Data, *Yosuke Takahashi[1], Yosuke Oki[1], Daisuke Tsuzuki[2,3,4], Enkhtur Lkhamsuren[3], Hiroshi Kawaguchi[5], Ippeita Dan[4], Eiji Okada[1]; [1]Keio Univ., Japan, [2]Japan Society for the Promotion of Science, Japan, [3]Univ. of Tsukuba, Japan, [4]Natl. Food Res. Inst., Japan, [5]Natl. Inst. of Radiological Science, Japan.* The light propagation in the head models 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.

MJ7

Phantom Experiments for Validation of Spatial Resolution Improvement of Optical Topography for Double-Density Measurement, *Hirokazu Kakuta[1], Eiju Watanabe[2], Hidenori Yokota[2], Keiji Oguro[2], Mikihiro Kaga[3], Takashi Ishizuka[3], Eiji Okada[1]; [1]Keio Univ., Japan, [2]Jichi Medical Univ., Japan, [3]Hitachi 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.

MJ8

Measurements of Temporal-Spatial Change in Blood Flow and Volume in Exposed Cortex of Guinea Pig Evoked by Auditory Stimulation, *Haruka Nakayama[1], Satoshi Matsuo[1], Naotaka Sakashita[1], Koichiro Sakaguchi[1], Takushige Katsura[2], Kyoko Yamazaki[2], Naoki Tanaka[2], Hideo Kawaguchi[2], Atsushi Maki[2], Eiji Okada[1]; [1]Keio Univ., Japan, [2]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.

MJ9

Extraction of Brain-Activation Component from NIRS Signal by Using Independent Component Analysis, *Wataru Matsui, Yutaka Niki, Ayano Suzuki, Eiji Okada; Keio Univ., Japan.* The brain activation during visual task is measured by the multi-distance probe configuration of near-infrared spectroscopy (NIRS). The brain signal is effectively extracted from the NIRS signal by independent component analysis.

MJ10

Numerical Analysis on Propagation of Light in Turbid Media Using Path-Length Assigned Monte-Carlo Simulation, *Katsuhito Ishii[1], Izumi Nishidate[2], Toshiaki Iwai[2]; [1]Graduate School for the Creation of New Photonics Industries, Japan, [2]Inst. of Symbiotic 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 scattering points on the path-length of the detected light.

MJ11

Effect of Size, Location and Contrast of Tumors to Diagnosis Limitation of NIR DOI System, *Min-Cheng Pan[1], Liang-Yu Chen[2], Chien-Hung Chen[2], Min-Chun Pan[2]; [1]Dept. of Electronic Engineering, Tungnan Univ., Taiwan, [2]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-DOI system.

MJ12

Noninvasive Optical Sensor for Tissue Spectroscopic, *Oleksandr Bilyy, Roman Yaremyk, Oksana Drobchak; Lviv Natl. Univ., Ukraine.* A soft- and hardware realization of optoelectronic intellectual sensor for biomedical noninvasive studies on the base of light analysis reflected from living tissues is described.

MJ13

Noninvasive Determination of the Optical Properties of Brain Using a Neural Network, *Marion C. Jäger, Florian Foschum, André Liemert, Alwin Kienle; Inst. für Lasertechnologien in der Medizin und Meßtechnik, Germany.* Light propagation in an n-layered model of the brain is investigated using solutions of the diffusion theory and Monte Carlo simulations. A neural network is applied to study the inverse problem.

MJ14

Hybrid Heuristic Time Dependent Solution of the Radiative Transfer Equation for the Slab, *Fabrizio Martelli[1], Samuele Del Bianco[1,2], Antonio Pifferi[3,4,5,6], Lorenzo Spinelli[4], Alessandro Torricelli[3,6], Giovanni Zaccanti[1]; [1]Univ. degli Studi di Firenze, Italy, [2]CNR-Inst. di Fisica Applicata "Nello Carrara", Italy, [3]Dept. di Fisica, Politecnico di Milano, Italy, [4]IFN-CNR, Inst. di Fotonica e Nanotecnologie, Sezione di Milano, Italy, [5]ULTRAS-INFM-CNR, Natl. Lab for Ultrafast and Ultraintense Optical Science, Italy, [6]Res. Unit IIT, Politecnico di Milano, Italy.* A hybrid heuristic time dependent analytical solution of the radiative transfer equation for the slab is derived. Comparisons with the results of Monte Carlo simulations have shown an excellent behavior of this model.

MJ15

Nonlinear Fitting Procedure for Accurate Time-Resolved Measurements in Diffusive Media, *Lorenzo Spinelli[1], Fabrizio Martelli[2], Alessandro Torricelli[3,4], Antonio Pifferi[1,3,4,5], Giovanni Zaccanti[2]; [1]Inst. di Fotonica e Nanotecnologie, Sezione di Milano, Italy, [2]Dept. di Fisica, Univ. degli Studi di Firenze, Italy, [3]Dept. di Fisica, Politecnico di Milano, Italy, [4]Res. Unit IIT - Politecnico di Milano, Italy, [5]ULTRAS-INFM-CNR, Natl. Lab for Ultrafast and Ultraintense Optical Science, Italy.* We studied nonlinear fitting procedure for accurate time-resolved measurements in diffusive media by both analytical and numerical (Monte Carlo) simulations, to quantify the effect of counts, temporal sampling, analytical model, background and instrument response function.

MJ16

A Multichannel Time-Domain Brain Oximeter for Clinical Studies, *Davide Contini[1,2], Lorenzo Spinelli[3], Matteo Caffini[1], Rinaldo Cubeddu[1,2,3,4], Alessandro Torricelli[1,4]; [1]Dept. di Fisica, Politecnico di Milano, Italy, [2]ULTRAS-INFM-CNR, Natl. Lab for Ultrafast and Ultraintense Optical Science, Italy, [3]IFN-CNR, Inst. di Fotonica e Nanotecnologie, Sezione di Milano, Italy, [4]Res. Unit IIT, Politecnico di Milano, Italy.* We developed and optimized a multichannel 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.

MJ17

Instrumentation and Methodology for an Optical Monitoring of Cerebral Perfusion at the Bedside, *Oliver Steinkellner[1], Heidrun Wabnitz[1], Alexander Jelzow[1], Rainer Macdonald[1], Clemens Gruber[2], Jens Steinbrink[3], Hellmuth Obrig[2]; [1]Physikalisch-Technische Bundesanstalt, Germany, [2]Klinik für Neurologie, Charité-Univ.-Medizin Berlin, Germany, [3]Ctr. for Stroke Res. Berlin, Charité-Univ.-Medizin Berlin, Germany.* A time-domain near-infrared reflectometer with technical approval for clinical studies is presented. Optimization of measuring technique and signal analysis pertaining to reliability, rapid-applicability and artifact suppression is demonstrated by means of *in vivo* data.

MJ18

Time-Resolved Measurement of the Scattered Light with a Standard CCD Camera, *Katarzyna Neveu-Zarychta, Dominique Ettori, Leila Azzizi, Eric Tinet, Sigrid Avrillier, Jean-Michel Tualle; Laboartoire de Physique de Lasers, Univ. Paris 13, France.* We will present results obtained with a standard CCD camera for time-resolved measurement of the light scattered by a turbid medium. Potential applications will be considered and discussed.

MJ • Joint MI/DOI/OCT/AMT Poster Session—Continued

MJ19

Accurate Anatomical Background Model Improves Reconstruction of Absorptive Perturbations in Optical Tomography, *Juha K. P. Heiskala[1,2], Ilkka T. Nissilä[3]; [1]Dept. of Computer Science, Univ. College London, UK, [2]BioMag Lab, Helsinki Univ. Central Hospital, Finland, [3]Dept. of Biomedical Engineering and Computational Science, Helsinki Univ. of Technology, Finland.* Importance of anatomical background model in reconstructing absorptive perturbations at different depths in the neonatal head was assessed using Monte Carlo simulations. Results suggest that information of optical background can improve reconstructions, even when approximate.

MJ20

Upconverting Nanocrystals for Biomedical Imaging, *Can T. Xu[1], Johan Axelsson[1], Haichun Liu[1], Gabriel Somesfalean[1], Zhiguo Zhang[2], Stefan Andersson-Engels[1]; [1]Dept. of Physics, Lund Univ., Sweden, [2]Dept. of Physics, Harbin Inst. of Technology, China.* In diffuse optical imaging, the quality of the collected data is, in most cases, limited by the endogenous tissue autofluorescence. We report a biocompatible method for autofluorescence insensitive imaging in turbid media.

MJ21

Angular Domain Imaging (ADI) of Turbid Media Using Enhanced Micro-Tunnel Filter Arrays, *Fartash Vasefi[1,2], Benny S. L. Hung[1], Bozena Kaminska[1], Glenn H. Chapman[1], Jeffrey J. L. Carson[2,3]; [1]Simon Fraser Univ., Canada, [2]Lawson Health Res. Inst., Canada, [3]Univ. of Western Ontario, Canada.* We performed trans-illumination ADI imaging through turbid media using a micro-tunnel array fabricated with internal reflection-trapping surface features. The new tunnel design was more efficient at accepting informative non-scattered light compared to previous designs.

MJ22

Effect of Source Decay in Bioluminescence Tomography: A Phantom Study, *Han Yan, Mehmet Burcin Unlu, Orhan Nalcioglu, Gultekin Gulsen; Univ. of California at Irvine, USA.* Bioluminescence tomography reconstruction results with source decay information are presented. The results show that source dynamic information is pivotal for accurate reconstruction when the decay half-life is comparable to the duration of the data acquisition.

MJ23

GPU-Based Monte Carlo Simulations of Photon Migration in Heterogenous Materials, *Erik Alerstam, Tomas Svensson, Stefan Andersson-Engels; Lund Univ., Sweden.* We describe fast GPU-based Monte Carlo simulations of photon migration, especially for the case of heterogenous materials. Implications for interpretation of average optical properties are discussed.

MJ24

Video-Rate Near-Infrared Tomography Using Spectral Analysis for Hemodynamic Imaging, *Min-Chun Pan[1], Venkataramanan Krishnaswamy[2], Subhadra Srinivasan[2], Brian W. Pogue[2]; [1]Dept. of Mechanical Engineering, Natl. Central Univ., Taiwan, [2]Thayer School of Engineering, Dartmouth College, USA.* Using extracted spectral features is proposed to reconstruct video-rate optical-properties images. Compared with reconstruction through time-sequence data, results via spectral features are exempt from noise affection and differentiate hemodynamic conditions in a single heart-beat cycle.

Optical Coherence Tomography and Coherence Techniques Posters

MJ25

OCT Imaging with High Lateral Resolution Using a Dynamically Focusing Multi-Lens System, *Khaled Aljasem, Andreas Seifert, Hans Zappe; IMTEK, Univ. of Freiburg, Germany.* A tunable OCT system capable of providing a high lateral resolution better than 10μm along an axial scan depth of 6mm is introduced. The tunability is realized by a pneumatically actuated liquid-filled membrane lens.

MJ26

Non-Destructive Detection of Defects in Artificial Skin Tissue by Optical Coherence Tomography, *Ulrich Marx[1], Robert Schmitt[1], Andrea Heymer[2], Michaela Kaufmann[2]; [1]Fraunhofer Inst. for Production Technology IPT, Germany, [2]Fraunhofer Inst. for Interfacial Engineering and Biotechnology IGB, Germany.* The application of optical coherence tomography in tissue engineering facilities offers great potential for non-invasive inline quality control. A study, comparing OCT tomograms and histologies of skin equivalents for defect detection, shows a well-defined analogy.

MJ27

Novel Polarization-Sensitive Spectral Domain Optical Coherence Tomography Using Single Camera Spectrometer, *Cheol Song, DaeGab Gweon; KAIST, Republic of Korea.* We propose novel spectral domain polarization sensitive optical coherence tomography with single camera spectrometer composed of a custom-made grating and a multi-line CCD camera. Two polarization beams are imaged on different line of CCD camera.

MJ28

Which Histological Characteristics of Basal Cell Carcinomas Influence the Quality of Optical Coherence Tomography Imaging? *Mette Mogensen[1], Lars Thrane[2], Thomas M. Joergensen[2], Birgit M. Nürnberg[3], Gregor B. E. Jemec[1]; [1]Dept. of Dermatology, Roskilde Hospital, Univ. of Copenhagen, Denmark, [2]DTU Fotonik, Dept. of Photonics Engineering, Technical Univ. of Denmark, Denmark, [3]Dept. of Pathology, Roskilde Hospital, Univ. of Copenhagen, Denmark.* We explore how histopathology parameters influence OCT imaging of basal cell carcinomas (BCC) and address whether such parameters correlate with the quality of the recorded OCT images. Our results indicate that inflammation impairs OCT imaging.

MJ29

Comparative Study between Ultrasonography and Optical Coherence Tomography in Interventional Cardiology, *Félix Fanjul-Vélez[1], José María de la Torre-Hernández[2], Noé Ortega-Quijano[1], José Javier Zueco-Gil[2], José Luis Arce-Diego[1]; [1]Applied Optical Techniques Group, TEISA Dept., Univ. of Cantabria, Spain, [2]Interventional Cardiology Dept., Marqués de Valdecilla Univ. Hospital, Spain.* In this work, IVUS and OCT are applied to perform preliminary imaging of arteries with stents for cardiological applications. The results enable to compare the performance of both techniques and their potential for clinical purposes.

MJ30

Optical Coherence Tomography for Imaging of Scaffolds and Micro-Flows Monitoring, *Marco Bonesi[1], Boris Veksler[2], Elisey Kobzev[3], Igor Meglinski[2]; [1]Univ. of Sheffield, UK, [2]Cranfield Univ., UK, [3]Univ. of Oxford, UK.* We applied optical coherence tomography (OCT) for imaging of the scaffold structures. Doppler OCT has been used to monitor the micro-flows within the scaffolds and complex geometry vessels.

MJ31

Time and Spectral Domain All-Fiber Optical Coherence Tomography Systems with Variable Dispersion Compensators, *Sairam Iyer, Norman Lippok, Stéphane Coen, Frédérique Vanholsbeeck; Univ. of Auckland, New Zealand.* Variable dispersion compensators are used to build time (TD-OCT) and spectral (SD-OCT) domain all-fiber optical coherence tomography systems. Their abilities are demonstrated in biological tissues with the TD-OCT system reaching a significant sensitivity of 86-dB.

MJ32

Imaging of Cytoplasm Shuttle Flow in *Physarum Polycephalum* by Doppler Optical Coherence Tomography, *Alexander V. Bykov[1,2], Alexander V. Priezzhev[2], Janne Lauri[1], Risto Myllylä[1]; [1]Univ. of Oulu, Finland, [2]M.V. Lomonosov Moscow State Univ., Russian Federation.* DOCT technique was applied to imaging the oscillatory dynamics of protoplasm in the strands of slime mold Physarum. Radial contractions of the gel-like stand walls and the velocity distributions in the sol-like endoplasm are imaged.

MJ33

Quantitative Comparison of Light Penetration Depths at 1300 nm and 1600 nm for OCT Systems, *Vitali M. Kodach[1], Jeroen Kalkman[1], Dirk J. Faber[1], Ton G. van Leeuwen[1,2]; [1]Academic Medical Ctr., The Netherlands, [2]Univ. of Twente, The Netherlands.* In OCT, a larger light penetration depth can be achieved with longer wavelengths. We compared theoretically and experimentally 1300 nm and 1600 nm. We showed when the use of the 1600 nm is beneficial.

MJ34

***Ex vivo* Study of Diagnostic Accuracy of Optical Coherence Tomography in Urothelial Cell Carcinoma,** *Daniel M. de Bruin[1], Lida Dam[1], Evelyne C. C. Cauberg[2], Jean Jmch de la Rosette[2], Theo M. de Rijeke[2], Ton G. van Leeuwen[1], Dirk J. Faber[1]; [1]Biomedical Engineering and Physics, Academic Medical Ctr., Univ. of Amsterdam, The Netherlands, [2]Urology Dept., Academic Medical Ctr., Univ. of Amsterdam, The Netherlands.* We used attenuation coefficients measured by OCT to discriminate between different grades of bladder cancer. The differences between grade 1 and 3 and between grade 2 and 3 are found significant.

MJ35

Visualising Internal Biological Structure with Full Field Swept Source Optical Coherence Tomography—Viability and Limitations, *James R. Fergusson, Boris Povazay, Wolfgang Drexler; Biomedical Imaging Group, Dept. of Optometry and Vision Sciences, Cardiff Univ., UK.* Full field swept source optical coherence tomography of biological samples is presented with 8.5μm axial and 4μm transverse resolution, 307,200 A-lines/s accomplishing 65dB SNR with 48.8pW of optical power per pixel.

MJ36

Quantitative Volume Angiograms of Human Retinal Blood Flow Using Histogram-Based Filtering, *Christoph Kolbitsch, Tilman Schmoll, Rainer A. Leitgeb; Medical Univ. Vienna, Austria.* We present a method to generate quantitative retinal angiography maps from Doppler-FDOCT volume scans. Histograms of the Doppler tomograms are used to differentiate between pixels containing information about blood flow and pixels representing static tissue.

MJ37

Blood Flow Measurement in the *in vivo* Mouse Model by the Combination of Doppler OCT and the Signal Power Decrease in Spectral Domain OCT, *Julia Walther[1], Gregor Mueller[2], Henning Morawietz[2], Edmund Koch[1]; [1]Clinical Sensoring and Monitoring, Medical Faculty Carl Gustav Carus, Univ. of Technology Dresden, Germany, [2]Vascular Endothelium and Microcirculation, Medical Faculty Carl Gustav Carus, Univ. of Technology Dresden, Germany.* A combination of the established Doppler OCT and the numerically simulated signal damping due to obliquely moved scatterers is used to measure the blood flow velocities in the *in vivo* mouse model.

MJ38

Endoscopic Low Coherence Interferometry in Upper Airways, *Yves Delacrétaz[1], Daniel Boss[1], Florian Lang[2], Christian Depeursinge[1]; [1]Ecole Polytechnique Fédérale de Lausanne, Switzerland, [2]Ctr. Hospitalier Univ. Vaudois, Switzerland.* We introduce endoscopic low coherence interferometry to obtain topology of upper airways through commonly used rigid endoscopes. Our device is fully compatible with procedures used in day-to-day examinations and can potentially be brought to bedside.

Session continues on pages 22–23.

MJ • Joint MI/DOI/OCT/AMT Poster Session—Continued

MJ39

Resonant Doppler Imaging with Common Path OCT, *Edmund Koch, Daniel Hammer, Siqian Wang, Maximiliano Cuevas, Julia Walther; Univ. of Technology Dresden, Germany.* A system for resonant-Doppler imaging using a small size, piezoelectric actor for reference length modulation is described. As this element is easily incorporated into the scanner-head the advantages of common path OCT can be used.

MJ40

Line-Field Spectral Domain Optical Coherence Tomography Using a 2-D Camera, *Jingyu Wang[1], Christopher J. Dainty[2], Adrian Podoleanu[1]; [1]Univ. of Kent, UK, [2]Natl. Univ. of 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 Vergnole[1], Daniel Lévesque[1], Sherif S. Sherif[2], Guy Lamouche[1]; [1]Industrial Materials Inst., Natl. Res. Council Canada, Canada, [2]Univ. of Manitoba, Canada.* This paper deals with different processing techniques to resample 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 Novel Reference Arm Design, *Bryan Haslam, Mattijs 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 Rominu[1], Cosmin Sinescu[1], Emanuela Petrescu[1], Claudiu Haiduc[1], Roxana O. Rominu[1], Marius Enescu[1], Michael Hughes[2], Adrian Bradu[2], George Dobre[2], Adrian Gh. Podoleanu[2]; [1]Faculty of Dentistry, "Victor Babeş" Univ. of Medicine and Pharmacy Timişoara, Romania, [2]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

Engineering of Extended Focii for Optical Coherence Microscopy, *Christophe Pache, Martin Villiger, Simon Rutishauser, Rainer A. Leitgeb, Theo Lasser; Ecole Polytechnique Fédérale de Lausanne, Switzerland.* Based on a Debye 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

Refractive Index Estimation Using Joint Spectral and Time Domain Optical Coherence Tomography, *Maciej Szkulmowski, Szymon Tamborski, Anna Szkulmowska, Andrzej Kowalczyk, Maciej Wojtkowski; 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

Occlusal Overload Investigations by Noninvasive Technology: Fluorescence Optical Coherence Tomography, *Corina Marcauteanu[1], Meda Negruţiu[2], Cosmin Sinescu[2], Enikö Demjan[1], Mike Hughes[3], Adrian Bradu[3], George Dobre[3], Adrian Gh. Podoleanu[3]; [1]Dept. of Occlusion, Faculty of Dentistry, Univ. of Medicine and Pharmacy, Romania, [2]Dept. of Prostheses Technology and Dental Materials, Faculty of Dentistry, Univ. of Medicine and Pharmacy, Romania, [3]Applied Optics Group, School of Physical Science, Univ. of Kent at Canterbury, UK.* The aim of this study is the early detection and monitoring of occlusal overload in bruxing patients. *En face* FOCT was used for imaging of several extracted tooth, with normal morphology, from patients with active bruxism.

MJ47

Optical Coherence Tomography as a Potential Monitoring Tool for Oral Lichen Planus, *Oluyori K. Adegun[1], Gordon Mackenzie[2], Kim Piper[3], Pete Tomlins[4], Dan Bader[5], Farida Fortune[1]; [1]Clinical and Diagnostic Oral Sciences, Queen Mary Univ. of London, UK, [2]Michelson Diagnsotics Ltd., Kent, UK, [3]Dept. of Oral Pathology, Royal London Hospital, UK, [4]Natl. Physics Lab, UK, [5]School of Engineering and Materials Science, Queen Mary Univ. of London, UK.* Oral lichen planus (OLP) has the potential for malignant transformation; therefore patients require regular follow-up. Existing follow-up procedures require subjective clinical examination and biopsy. Optical coherence tomography can provide an alternative for monitoring histopathological changes in OLP.

MJ48

Marginal Adaptation of Ceramic Veneers Investigated with *en face* Optical Coherence Tomography, *Cosmin Sinescu[1], Meda L. Negrutiu[1], Emanuela Petrescu[1], Mihai Rominu[1], Corina Marcauteanu[2], Roxana O. Rominu[1], Michael Hughes[3], Adrian Bradu[3], George Dobre[3], Adrian Gh. Podoleanu[3]; [1]Faculty of Dentistry, "Victor Babeş" Univ. of Medicine and Pharmacy Timişoara, Romania, [2]Dept. of Occlusion, "Victor Babeş" Univ. of Medicine and Pharmacy Timişoara, Romania, [3]School of Physical Sciences, Applied Optics Group, Univ. of Kent, UK.* This study analyzes the quality of marginal adaptation and gap width 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, *Uros Krzic, Khaled A. Khairy, Ernst H. K. Stelzer; European Molecular Biology Lab Heidelberg, Germany.* We propose a technique based on the Lucy-Richardson deconvolution scheme that effectively fills 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, *Ho Lee[1], Jeongjin Lee[2], Hyunna Lee[1], Yeong Gil Shin[1]; [1]School of Computer Science and Engineering, Seoul Natl. Univ., Republic of Korea, [2]Dept. 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 microscope.

MJ51

Tomographic Screening of 3-Dimensional Cell Cultures, *Verena Richter[1], Thomas Bruns[1], Michael Wagner[1], Wolfgang S. L. Strauss[2], Herbert Schneckenburger[1]; [1]Hochschule Aalen, Inst. für Angewandte Forschung, Germany, [2]Inst. für Lasertechnologien 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, *Randal L. Adam, Gislaine Vieira, Daniela P. Ferro, Andre A. de Thomaz, Carlos Lenz Cesar, Konradin Metze; 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 Krüger[1], Marina Hovakimyan[2], Diego F. Ramirez[1], Oliver Stachs[2], Rudolf F. Guthoff[2], Alexander Heisterkamp[1]; [1]Laser Zentrum Hannover e.V., Germany, [2]Universitätsaugenklinik, Germany.* Cross-linked rabbit corneae were imaged with reflective confocal laser scanning and nonlinear microscopy. Forward versus backward second harmonic signals differ substantially but show no signature of treatment. NAD(P)H-autofluorescence and reflection of keratocytes are strongly changed.

MJ54

Temporal Imaging Chamber (TIC) for *en face* Imaging of Epidermal Absorption *in vitro*, *Carl Simonsson[1], Maria Smedh[2], Charlotte Jonsson[1], Marica B. Ericson[2]; [1]Dept. of Chemistry, Univ. of Gothenburg, Sweden, [2]Dept. of Physics, Univ. of Gothenburg, Sweden.* We present an online diffusion cell with optical access allowing for 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 Guldbrand[1], Carl Simonsson[2], Maria Smedh[1], Marica B. Ericson[1]; [1]Dept. of Physics, Univ. of Gothenburg, Sweden, [2]Dept. 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, Chiung 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.

MJ • Joint MI/DOI/OCT/AMT Poster Session—Continued

MJ57

Study of 3-D Cell Morphology and Effect on Light Scattering Distribution, *Andrew E. Ekpenyong[1], Junhua Ding[1], Li V. Yang[1], Nancy R. Leffler[1], Jun Q. Lu[1], R. Scott Brock[2], Xin H. Hu[1]; [1]East Carolina Univ., USA, [2]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 Ortmann[1], Matthias Weiss[2], Ben Kraemer[1], Volker Buschmann[1], Marcelle Koenig[1], Felix Koberling[1], Jedrzej Szymanski[2], Nina Malchus[2], Rainer Erdmann[1]; [1]PicoQuant GmbH, Germany, [2]German Cancer Res. Ctr., Bioquant Ctr., Germany.* Time-resolved FRET measurements using a special laser scanning microscope are presented. The results allow one to distinguish between different FRET efficiencies and variations in the amount of completely to incompletely labelled FRET molecules inside living cells.

MJ60

Development and Assessment of Image Reconstruction Algorithms Using A Low-Cost Bench-Microscope Based on a Linear CMOS Image Sensor, *Milton P. Macedo[1,2], Carlos M. Correia[2]; [1]Inst. Superior de Engenharia de Coimbra, Portugal, [2]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, *Raoul-Amadeus Lorbeer, 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, Rijk Schütz, Ingo Gersonde, Gerd Illing; Laser- und Medizin-Technologie GmbH, Berlin, Germany.* With a cardanically 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 Kapusta[1], Steffen Rüttinger[2], Benedikt Krämer[1], Volker Buschmann[1], Uwe Ortmann[1], Marcelle König[1], Felix Koberling[1], Deron A. Walters[3], J. A. Viani[3], Andreas Bülter[1], Rainer Erdmann[1]; [1]PicoQuant GmbH, Germany, [2]Physikalisch-Technische Bundesanstalt (PTB), Germany, [3]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, 2fFCS) or combination of confocal and AFM microscope.

MJ64

Diffusion of Single Molecules in Nanochannels, *Claudio Dellagiacoma, 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 Tinnefeld, Thorben Cordes, Ingo H. Stein, Carsten Forthmann, Christian Steinhauer, Moni Walz, Britta Person, Jan Vogelsang; 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 Sugiura, 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 Thomaz[1], Liliana Y. Pozzo[1], Adriana Fontes[2], Diogo B. Almeida[1], Cecilia V. Stahl[3], Jacenir R. Santos-Mallet[3], Suzete A. O. Gomes[3], Denise Feder[4], Diana C. Ayres[1], Selma Giorgio[1], Carlos Lenz Cesar[1], Andre A. de Thomaz[1]; [1]UNICAMP, Brazil, [2]Depto de Biofísica e Radiobiologia, Ctr. de Ciências Biológicas (CCB), Univ. Federal de Pernambuco (UFPE), Brazil, [3]Fundacao Oswaldo Cruz, Brazil, [4]Univ. Federal Fluminense, Brazil.* In this work we use a methodology to study chemotaxis of *Leishmania amazonensis* and *Trypanossoma cruzi* in real time using an optical tweezers system. We obtained quantitative results of the parasites forces.

16.00–16.30 Coffee Break, *Exhibition Hall*

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

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

16.30–18.30
MK • New Probes and Contrast Mechanisms for *in vivo* Imaging
Charles Lin; Wellman Labs of Photomedicine, Massachusetts General Hospital, USA, Presider

MK1 • 16.30 Invited
Imaging of Fluorescent Protein Activity in Mice with Multispectral Optoacoustic Tomography (MSOT), *Nikolaos Deliolanis, Adrian Taruttis, Amir Rozental, Daniel Razansky, Vasilis Ntziachristos; Technische Univ. and Helmholz Zentrum München, Germany.* The use of the newly discovered Red-Shifted Fluorescent Proteins is exploited in multispectral optoacoustic tomography (MSOT). Analysis and phantom experiments show the great potential of this method to image FPs in murine models.

MK2 • 17.00
***In vivo* Multispectral Fluorescence Tomography with Red Fluorescent Proteins,** *Nikolaos Deliolanis[1,2], Thomas Wurdinger[3], Bakhos Tannous[3], Vasilis Ntziachristos[1]; [1]Technische Univ. and Helmholz Zentrum München, Germany, [2]Ctr. for Molecular Imaging Res., Massachusetts General Hospital and Harvard Medical School, USA, [3]Neuroscience Ctr., Massachusetts General Hospital and Harvard Medical School, USA.* We exploit the use of the new red fluorescent proteins in multispectral fluorescence tomography. We demonstrate the high potential of the method by imaging mouse tumor models in deep tissue.

MK3 • 17.15
NAOMI: Minimal Detectable Dose of Nanoparticle Contrast Agents in OCT, *Dirk J. Faber[1], Daniel M. de Bruin[1], Ton G. van Leeuwen[1,2]; [1]Dept. of Biomedical Engineering and Physics, Academic Medical Ctr. Amsterdam, The Netherlands, [2]Univ. of Twente, The Netherlands.* Quantitative determination of the minimal detectable dose of nanoparticle contrast agents is paramount for toxicity studies. We present our approach based on controllable multilayered ultrathin optical phantoms.

MK4 • 17.30
Conjugated Quantum Dots for *in vivo* Targeting and Whole-Body Imaging of Small Animal Tumors, *Irina V. Balalaeva[1,2], Tatyana A. Zdobnova[2,3], Anna A. Brilkina[1,2], Marina V. Shirmanova[1], Irina M. Krutova[1], Oleg A. Stremovsky[3], Elena N. Lebedenko[3], Vladimir V. Vodeneev[1], Ilya V. Turchin[2], Sergey M. Deyev[3]; [1]Nizhny Novgorod State Univ., Russian Federation, [2]Inst. of Applied Physics of RAS, Russian Federation, [3]Inst. of Bioorganic Chemistry of RAS, Russian Federation.* We have obtained quantum dots linked to anti-HER2/neu 4D5 scFv antibody to label HER2/neu-overexpressing cells of tumors. Functional properties of conjugates have been confirmed *in vitro* and *in vivo*, using fluorescence transilluminative imaging setup.

16.30–18.30
ML • Pre-Clinical and Clinical Apps I
Jennifer Barton; Univ. of Arizona, USA, Presider

ML1 • 16.30 Invited
***In vivo* Imaging of Pancreatic Endocrine Islets,** *Martin Villiger[1], Joan Goulley[2], Christophe Pache[1], Michael Friedrich[1], Anne Grapin-Bott[2], Paolo Meda[3], Rainer A. Leitgeb[1], Theo Lasser[1]; [1]Lab d'Optique Biomédicale, Ecole Polytechnique Fédérale de Lausanne, Switzerland, [2]Swiss Inst. for Experimental Cancer Res., Ecole Polytechnique Fédérale de Lausanne, Switzerland, [3]Dept. of Cell Physiology and Metabolism, Ctr. Medical Universitaire de Geneve, Switzerland.* We use a fast scanning extended focus optical coherence microscope that circumvents the compromise between lateral resolution and depth of field to measure endocrine islets *in situ* and *in vivo* in the mouse.

ML2 • 17.00
Visualization of 3-D and 4-D Cell Migration Using Three-Dimensional Ultrahigh Resolution Optical Coherence Tomography, *Sara M. Rey[1,2], Adrian Harwood[1], Boris Povazay[2], Bernd Hofer[2], Boris Hermann[2], Angelika Unterhuber[2], Wolfgang Drexler[2]; [1]School of Biosciences, Cardiff Univ., UK, [2]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 opaque 2-D surfaces, within 3-D constructs and in time lapse (4-D) using 800nm ultrahigh resolution, high-speed FDOCT.

ML3 • 17.15
Rapid Skin Profiling with Non-Contact Full-Field Optical Coherence Tomography: Study of Patients with Diabetes Mellitus Type I, *Pavel Zakharov[1], Mark Talary[1], Isabel Kolm[2], Andreas Caduff[1]; [1]Solianis Monitoring AG, Switzerland, [2]Dept. of Dermatology, Univ. Hospital Zürich, Switzerland.* The skin of diabetic patients has been characterized in a non-contact way with the novel full-field optical coherence tomography microscope followed by an automatic morphology quantification procedure. Results have demonstrated high correlation with reference method.

ML4 • 17.30
Optical Coherence Tomography Imaging Toward Monitoring Complex Radiofrequency Ablation Procedures, *Christine P. Fleming[1], William J. Hucker[2], Kara J. Quan[3], Igor R. Efimov[2], Andrew M. Rollins[1]; [1]Case Western Reserve Univ., USA, [2]Washington Univ., USA, [3]MetroHealth Medical Ctr. Heart and Vascular Dept., USA.* Catheter ablation using radiofrequency energy is a clinical procedure to treat cardiac arrhythmias. We present optical coherence tomography imaging toward monitoring complex ablation procedures such as atrial fibrillation, and epicardial ablation.

16.30–18.30
MM• Tissue and Specimen Imaging II
Christian Depeursinge; Ecole Polytechnique Fédérale de Lausanne, Switzerland, Presider

MM1 • 16.30
Fraction Estimation of Small Dense LDL Using Mean Sizes Obtained in Dynamic Light Scattering, *Suchin Trirongjitmoah[1], Toshihiro Sakurai[2], Kazuya Iinaga[3], Hitoshi Chiba[2], Koichi Shimizu[1]; [1]Graduate School of Information Science and Technology, Hokkaido Univ., Japan, [2]Faculty of Health Sciences, Hokkaido Univ., Japan, [3]Technical Service Section, Denka Seiken Co., Ltd., Japan.* We propose a technique to evaluate the fraction of sdLDL 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 Autofluorescent Probe for Brain Cancer: Simulations and Phantom Studies, *Barbara Leh, Yves Charon, Marie-Alix Duval, Florence Jean, Françoise Lefebvre, Laurent Menard, Rainer Siebert; IMNC, UMR 8165, France.* Autofluorescence spectroscopy from brain tissue may help to discriminate cancerous from healthy tissue. The characteristics of our probe are studied on phantoms and confronted to Monte Carlo simulations. Geometrical origins of fluorescent light are evaluated.

MM3 • 17.00
Non-Linear Grating-Based Angular Filter for Ballistic Transillumination, *Paulino Vacas-Jacques[1], Vladimir P. Ryabukho[2], Marija Strojnik[1], Valery V. Tuchin[2], Gonzalo Paez[1]; [1]Ctr. de Investigaciones en Optica, Mexico, [2]Saratov State Univ., Russian Federation.* Laser radiation incident on a grazing diffraction grating followed by a slit conform the system. We validate the angular amplification experimentally. Values range from 10-15X. Similarly beam-size reduction values provide an efficient ~100X filtering scheme.

MM4 • 17.15
Sensing of Gas Inside Tissue for Optical Diagnostics of Human Sinus Cavities, *Tomas Svensson[1], Märta Lewander[1], Zuguang Guan[1], Sven Lindberg[2], Roger Siemund[3], Katarina Svanberg[4], Sune Svanberg[1]; [1]Lund Univ., Sweden, [2]Dept of Oto-Rhino-Laryngology, Lund Univ. Hospital, Sweden, [3]Dept. of Diagnostic Radiology, Lund Univ. Hospital, Sweden, [4]Dept. of Oncology, Lund Univ. Hospital, Sweden.* Laser-based sensing of oxygen and water vapour has been used for optical characterisation of sinus cavities in patients undergoing evaluation for sinus-related problems. Co-registered CT images allow investigation of the diagnostic potential.

MM5 • 17.30
Broadband 3-D Digital Holography of Scattered Objects, *Dmitry V. Shabanov, Grigory V. Gelikoniov, Valentin M. Gelikonov; Inst. of Applied Physics, RAS, Russian Federation.* 3-D wideband digital holography method based on tunable light source has been demonstrated. Fast reconstruction method of 3-D images of scattered objects has been developed. 3-D images of test objects are demonstrated.

Sessions continue on page 26.

Room 21, 2nd Floor, Congress Centre

Advanced Microscopy Techniques

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

Diffuse Optical Imaging

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

16.30–18.30
MN • NLO I—Applications
Jesper Glückstad; Technical Univ. of Denmark, Denmark, Presider

MN1 • 16.30
Third-Harmonic Generation Microscopy: Image Formation and Application to Embryo Imaging, *Nicolas Olivier, Delphine Débarre, Emmanuel Beaurepaire; Ecole 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.

MN2 • 16.45
Spectral Imaging in the Brain with Two-Photon Microscopy, *Mathieu Ducros[1,2,3], Laurent Moreaux[1,2,3], Jonathan Bradley[3,4], Pascale Tiret[1,2,3], Oliver Griesbeck[5], Serge Charpak[1,2,3]; [1]INSERM U603, France, [2]CNRS UMR 8154, France, [3]Univ. Paris Descartes, France, [4]CNRS UMR 8118, France, [5]Max-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*.

MN3 • 17.00
Time- and Spectral-Resolved Multiphoton Imaging of Fresh Bladder Biopsies, *Riccardo Cicchi[1], Alfonso Crisci[2], Gabriella Nesi[1], Alessandro Cosci[1], Saverio Giancane[1], Marco Carini[1], Francesco S. Pavone[1]; [1]Univ. of Florence, Italy, [2]Univ. of Florence Medical School, Italy.* In this work we have combined time- 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.

MN4 • 17.15
Evaluation of Multiple Sclerosis-Like Lesions *in vivo* with Coherent Anti-Stokes Raman Scattering Microscopy, *Erik Bélanger[1,2], Sophie Laffray[1,2], Steve Bégin[1,2], Israël Veilleux[1,2], Réal Vallée[1,2], Yves De Koninck[1,2], Daniel Côté[1,2]; [1]CRULRG-Ctr. de Recherche Univ. Laval Robert-Giffard, Canada, [2]Ctr. d'Optique, Photonique et Laser (COPL), 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 *in vivo* CARS and reflectance microscopy.

MN5 • 17.30
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-Roldan[1,2], Sotiris Psilodimitrakopoulos[2], Elisenda Eixarch[1], Iratxe Torre[1], Bart Wotjas[1], Fatima Crispi[1], Francesc Figueras[1], David Artigas[2], Pablo Loza-Alvarez[2], Eduard Gratacos[1]; [1]Dept. of Maternal-Fetal Medicine, Inst. Clínic de Ginecologia, Obstetrícia i Neonatologia, Hospital Clinic-Inst. d'Investigacions Biomèdiques August Pi i Sunyer, Ctr. for Biomedical Network Res. on Rare Diseases, Spain, [2]ICFO-Inst. de Ciencies 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.

16.30–18.30
MO • Imaging of Breast and Other Organs
Andreas H. Hielscher; Columbia Univ., USA, Presider

MO1 • 16.30 Invited
Differentiation of Benign and Malignant Breast Lesions with 3-D Diffuse Optical Tomography, *Regine Choe[1], Soren D. Konecky[1], Alper Corlu[1], Kijoon Lee[1], Turgut Durduran[1], David R. Busch[1], Saurav Pathak[1], Mark A. Rosen[1], Mitchell D. Schnall[1], Brian J. Czerniecki[1], Julia Tchou[1], Simon R. Arridge[2], Martin Schweiger[2], Mary E. Putt[1], Britton Chance[1], Arjun G. Yodh[1]; [1]Univ. of Pennsylvania, USA, [2]Univ. 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-, total-hemoglobin concentrations and tissue scattering.

MO2 • 17.00
Time-Domain Fluorescence Imaging of Breast Cancer, *Dirk Grosenick[1], Axel Hagen[1], Rainer Macdonald[1], Herbert Rinneberg[1], Alexander Pöllinger[2], Susen Burock[3], Peter M. Schlag[3]; [1]Physikalisch-Technische Bundesanstalt, Germany, [2]Dept. of Radiology, Charité - Univ. Medicine Berlin, Germany, [3]Comprehensive Cancer Ctr., Charité - Univ. Medicine Berlin, Germany.* We have performed a feasibility study on time-domain fluorescence mammography using ICG as contrast agent. Our optical mammograms display the local enrichment of the dye in carcinomas at high contrast.

MO3 • 17.15
Changes in Microvascular Blood Flow and Endogenous Chromophores during Mammographic-Like Compression of the Human Breast, *David R. Busch[1], Regine Choe[1], Turgut Durduran[1], Mitchell D. Schnall[2], Mark A. Rosen[2], Arjun G. Yodh[1]; [1]Univ. of Pennsylvania, USA, [2]Hospital 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.

MO4 • 17.30
A Prototype Mammograph for Simultaneous Acquisition of Tomographic and Time-Resolved Data in Slab Geometry, *Axel Hagen[1], Dirk Grosenick[1], Meike Stindt[1], Michael Wahl[2], Herbert Rinneberg[1], Rainer Macdonald[1]; [1]Physikalisch-Technische Bundesanstalt, Germany, [2]PicoQuant 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.

Sessions continue on page 27.

17.30–18.30 LASER World of Photonics Get-Together Reception, *Foyer, Ground Floor, Congress Centre*

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

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

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, *Dimitris S. Gorpas, 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, *Yuting Lin[1], William C. Barber[2], Jan S. Iwanczk[2], Einar Nygard[2], Nail Malakov[2], Neal E. Hartsough[2], Thulasi Gandhi[2], Werner W. Roeck[1], Orhan Nalcioglu[1], Gultekin Gulsen[1]; [1]Ctr. for Functional Onco-Imaging, Univ. of California at Irvine, USA, [2]DxRay, 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.

MK7 • 18.15

Hybrid Fluorescence Tomography/X-Ray Tomography Improves Reconstruction Quality, *Ralf B. Schulz, Angelique Ale, Athanasios Sarantopoulos, Markus Freyer, Eric Soehngen, Marta Zientkowska, Vasilis Ntziachristos; Inst. for Biological and Medical Imaging and Chair for Biological Imaging, Helmholtz-Ctr. Munich and Technical Univ. Munich, Germany.* A novel hybrid imaging system for simultaneous X-ray and fluorescence tomography is presented, capitalizing on 360°-projection free-space fluorescence tomography and implemented within a micro-CT scanner. Its use is showcased for lesions in brain and lung.

ML • Pre-Clinical and Clinical Apps I—Continued

ML5 • 17.45

A Laryngoscope for Office-Based Imaging of Human Vocal Folds Using OCT, *Henning Wisweh[1], Nadine Rohrbeck[1], Alexander Krüger[1], Marcel Kraft[2], Kathrin Aleksandrov[1], Holger Lubatschowski[1]; [1]Laser Zentrum Hannover e.V., Germany, [2]Kantonsspital 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 Walther[1], Gregor Mueller[2], Sven Meißner[1], Peter Cimalla[1], Hanno Homann[1], Henning Morawietz[2], Edmund Koch[1]; [1]Clinical Sensoring and Monitoring, Medical Faculty Carl Gustav Carus, Univ. of Technology Dresden, Germany, [2]Vascular Endothelium and Microcirculation, Medical Faculty Carl Gustav Carus, Univ. of Technology Dresden, Germany.* Phase-resolved Doppler-OFDI with a read-out rate of 20 kHz has been used to quantify pulsatile blood flow within a vasodynamic measurement in the murine saphenous artery *in vivo* with an initial diameter of 260 µm.

ML7 • 18.15

4-D *in vivo* Imaging of Subpleural Lung Parenchyma by Swept Source Optical Coherence Tomography, *Sven Meissner[1], Arata Tabuchi[2], Michael Mertens[3,4], Hanno Homann[1], Julia Walther[1], Wolfgang M. Kuebler[2,3], Edmund Koch[1]; [1]Univ. of Technology Dresden, Germany, [2]St. Michael's Hospital, Canada, [3]Charité - Univ.smedizin Berlin, Germany, [4]Freie Univ. Berlin, Germany.* Swept-Source OCT was used for *in vivo* 3-D imaging of alveolar volume change in the inspiratory phase in ventilated mice. We demonstrate a temporally resolved 3-D imaging of subpleural alveoli.

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. Borsboom[1], Reindert Graaff[2], Bernhard J. Hoenders[3]; [1]SensorTechnology and Consultancy, The Netherlands, [2]Dept. of Biomedical Engineering, Univ. Medical Ctr. Groningen and Univ. of Groningen, The Netherlands, [3]Inst. 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. Kalitzeos[1], Azhar Zam[1], Florian Stelzle[2], Eckhard G. Hahn[3], Martin Raithel[3], Alexandre Douplik[3]; [1]Erlangen Graduate School in Advanced Optical Technologies (SAOT), Friedrich-Alexander Univ. Erlangen-Nuremberg, Germany, [2]Univ. Hospital Erlangen, Dept. of Oral and Maxillofacial Surgery, Friedrich-Alexander Univ. of Erlangen-Nuremberg, Germany, [3]Univ. Hospital Erlangen, Dept. of Medicine I, Friedrich-Alexander Univ. Erlangen-Nuremberg, Germany.* The scope of this work is to enhance the contrast between cancerous and normal tissue by processing white light and fluorescence endoscopic images.

MM8 • 18.15

Comparison of Binning Approaches in Pulsed Photothermal Temperature Profiling, *Matija Milanič, Boris Majaron; Jožef Stefan Inst., 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.

Room 21, 2nd Floor, Congress Centre

Advanced Microscopy Techniques

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

Diffuse Optical Imaging

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

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[1], Paulo De Sa Peixoto[2], Julien Duboisset[3], Mathias Strupler[1], Pierre-Louis Tharaux[4], Emmanuel Benichou[3], Pierre-François Brevet[3], Gervaise Mosser[2], Marie-Claire Schanne-Klein[1]; [1]Lab d'Optique et Biosciences, Ecole Polytechnique-CNRS-INSERM, France, [2]Lab de Chimie de la Matière Condensée, CNRS-Univ. Paris 6, France, [3]Lab de Spectroscopie Ionique et Moléculaire, CNRS-Univ. Claude Bernard Lyon I, France, [4]Ctr. de Recherche Cardiovasculaire Inserm Lariboisière, 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[1,2], A. Uchugonova[1,3], A. Isemann[4], R. Bückle[2], W. Watanabe[5]; [1]Saarland Univ., Germany, [2]JenLab GmbH, Germany, [3]Fraunhofer Inst. for Biomedical Technology, Germany, [4]FEMTOLASERS Produktions GmbH, Austria, [5]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[1,2], Rachel Grange[1], Ye Pu[1,2], Demetri Psaltis[1,2]; [1]Ecole Polytechnique Fédérale de Lausanne, Switzerland, [2]Caltech, USA.* We demonstrate the three-dimensional imaging capability of harmonic holographic microscopy by using the second harmonic generation from $BaTiO_3$ nanoparticles as the signal. Three-dimensional distributions of the $BaTiO_3$ 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[1], Regine Choe[1], Turgut Durduran[1], Han Y. Ban[1], Saurav Pathak[1], Mary Putt[1], Wensheng Guo[1], Mark A. Rosen[2], Mitchell D. Schnall[2], Arjun G. Yodh[1]; [1]Univ. of Pennsylvania, USA, [2]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[1], Christian D. Klose[1], Hyun K. Kim[1], Uwe Netz[2], Sabine Blaschke[3], P. A. Zwakae[3], Gerhard A. Müller[3], Jürgen Beuthan[2]; [1]Columbia Univ., USA, [2]Charité - Medical Univ., Germany, [3]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[1], Franck Amyot[1], Jason Riley[1], Moinuddin Hassan[1], Victor Chernomordik[1], Christoph Hitzenberger[2], Amir Gandjbakhche[1]; [1]Natl. Inst. of Health, USA, [2]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.

Room 5, Ground Floor, Congress Centre

Optical Coherence Tomography and Coherence Techniques

9.00–10.00
TuA • Light Sources and OCT Systems
Maciej Wojtkowski; Inst. of Physics, N. Copernicus Univ., Poland, Presider

TuA1 • 9.00
1 µm Semiconductor Light Source with High Power and Broadband for Optical Coherence Tomography, *Lisa Tongning Li, Jinyan 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 SLDs and high gain, high Psat SOAs were achieved. Optimal bandwidth and central wavelength tuning with COD of light sources higher than 100mW.

TuA2 • 9.15
Fourier Domain Mode Locked (FDML) Lasers for Polarization Sensitive OCT, *Gesa Palte, Wolfgang Wieser, Benjamin R. Biedermann, Christoph M. Eigenwillig, Robert Huber; Ludwig-Maximilians-Univ. München, 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.

TuA3 • 9.30
Ultra-High Speed, High Resolution OCT Imaging System for Biomedical and Material Applications, *James Y. Jiang, Peter Koch, Anjul Davis, Scott Barry, Alex Cable; Thorlabs, 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.

TuA4 • 9.45
Wavelength Swept ASE Source, *Christoph M. Eigenwillig, Benjamin R. Biedermann, Wolfgang Wieser, Robert Huber; Lehrstuhl für BioMolekulare Optik, Ludwig-Maximilians-Univ. München, Germany.* We present a novel wavelength swept light source for optical coherence tomography (OCT). Arbitrary sweep rates up to 2x170kHz are achieved by phase-shifted control of two optical bandpass-filters to compensate light propagation effects.

Room 11, 1st Floor, Congress Centre

Novel Optical Instrumentation for Biomedical Applications

9.00–10.00
TuB • Photoacoustic I
Guenther Paltauf; Karl-Franzens-Univ. Graz, Austria, Presider

TuB1 • 9.00 Invited
Combined Optoacoustic and Ultrasound Imaging, *Michael Jaeger[1], Lea Siegenthaler[1], Michael Kitz[1], Martin Frenz[1], D. Schol[2], M. Fleron[2], J. F. Greisch[2], M. C. De Pauw-Gil[2], E. De Pauw[2], J. Niederhauser[3], D. Schweizer[3]; [1]Univ. of Bern, Switzerland, [2]Univ. of Liege, Belgium, [3]Fukluda Denshi Switzerland AG, 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.

TuB2 • 9.30
Photoacoustic NO Detection for Asthma Diagnostics, *Markus Germer, Marcus Wolff; 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.

TuB3 • 9.45
Photoacoustic Generation of X-Waves and their Application in a Dual Mode Scanning Acoustic Microscope, *Klaus Passler[1], Robert Nuster[1], Sibylle Gratt[1], Peter Burgholzer[2], Guenther Paltauf[1]; [1]Dept. of Physics, Karl-Franzens-Univ. Graz, Austria, [2]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 (axicon) with short laser pulses, are investigated.

Room 21, 2nd Floor, Congress Centre

Advanced Microscopy Techniques

9.00–10.00
TuC • NLO II—Methods
Charles Lin; Wellman Labs of Photomedicine, Massachusetts General Hospital, USA, Presider

TuC1 • 9.00
Contrast Enhancement in Second Harmonic Imaging: Discriminating between Muscle and Collagen, *Sotiris Psilodimitrakopoulos[1], Ivan Amat-Roldan[1,2], Iratxe Torre[2], Eduard Gratacos[2], David Artigas[3], Pablo Loza-Alvarez[1]; [1]ICFO-The Inst. of Photonic Sciences, Spain, [2]Dept. of Maternal-Fetal Medicine, Inst. Clínic de Ginecologia, Obstetrícia i Neonatologia, Spain, [3]Univ. Politècnica de Catalunya, Spain.* We use polarization second harmonic generation imaging to gain contrast and to discriminate with pixel resolution, in the same image, different SHG source architectures on an *ex vivo* mammalian tissue.

TuC2 • 9.15
***In vivo* Multiplexed Two-Photon Imaging with Shaped Broadband Pulses,** *Rajesh S. Pillai[1], Caroline Boudoux[1,2], Guillaume Labroille[1], Nicolas Olivier[1], Israel Veilleux[1], Emmanuel Farge[3], Manuel Joffre[1], Emmanuel Beaurepaire[1]; [1]Ecole Polytechnique, France, [2]École Polytechnique de Montréal, Canada, [3]Inst. Curie, France.* We report simultaneous selective imaging of two different fluorescent species in a biological specimen using spectral phase shaping of a single broadband laser beam, with short pixel dwell time and high resolution (0.8 NA).

TuC3 • 9.30
Quasi White Light Multiphoton Imaging, *Claudio de Mauro[1], Domenico Alfieri[1], Marco Arrigoni[2], David Armstrong[2], Francesco S. Pavone[3]; [1]Light4tech Firenze s.r.l., Italy, [2]Coherent Inc., USA, [3]Dept. of Physics, Univ. of Florence, Italy.* We realized 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.

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

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

Diffuse Optical Imaging

9.00–10.00
TuD • Experimental Techniques I
Anabela Da Silva; LETI-CEA Recherche Technologique, France, Presider
Jens Steinbrink; Charité-Univ.-Medizin Berlin, Germany, Presider

TuD1 • 9.00 Invited
Structured Illumination and Time Gated Detection for Diffuse Optical Imaging, *Cosimo D'Andrea[1,2], Andrea Bassi[1,2], Gianluca Valentini[2], Rinaldo Cubeddu[1,2], Simon Arridge[3]; [1]Natl. Lab for Ultrafast and Ultraintense Optical Science, Consiglio Nazionale delle Ricerche, Italy, [2]Dept. di Fisica, Politecnico di Milano, Italy, [3]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.

TuD2 • 9.30
Tomography of Brain Activation Using a Time-Gated Camera, *Antonio Pifferi[1,2,3], Qing Zhao[4], Lorenzo Spinelli[5], Andrea Bassi[1,3], Gianluca Valentini[1,3], Davide Contini[3], Alessandro Torricelli[2,3], Rinaldo Cubeddu[1,2,3]; [1]Natl. Lab for Ultrafast and Ultraintense Optical Science, Consiglio Nazionale delle Ricerche, Italy, [2]Res. Unit Politecnico di Milano, Inst. Italiano di Tecnologia, Italy, [3]Dept. di Fisica, Politecnico di Milano, Italy, [4]Dept. of Robotics, Brain and Cognitive Sciences, Inst. Italiano di Tecnologia, Italy, [5]Inst. di Fotonica e Nanotecnologie, 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.

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 Liebert[1], Michal Kacprzak[1], Daniel Milej[1], Joanna Maczewska[2], Wojciech Weigl[3], Katarzyna Fronczewska[2], Ewa Mayzner-Zawadzka[3], Leszek Królicki[2], Roman Maniewski[1]; [1]Inst. of Biocybernetics and Biomedical Engineering, PAS, Poland, [2]Dept. of Nuclear Medicine, Medical Univ. of Warsaw, Poland, [3]Dept. of Anesthesiology and Intensive Care, Medical Univ. of Warsaw, Poland.* Multichannel 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.

10.00–10.30 Coffee Break, *Exhibition Hall*

Room 5, Ground Floor, Congress Centre

Optical Coherence Tomography and Coherence Techniques

10.30–12.30
TuE • OCT Signal and Image Processing
Adrian Podoleanu; Univ. of Kent at Canterbury, UK, Presider

TuE1 • 10.30
Statistical Model for Segmentation of Retinal Optical Coherence Tomography, *Vedran 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 commercial 800nm retinal optical coherence tomography (OCT) system.

TuE2 • 10.45
Real Time 3-D Rendering of Optical Coherence Tomography Volumetric Data, *Joachim Probst[1], Gereon Hüttmann[1], Peter Koch[2]; [1]Inst. für Biomedizinische Optik, Univ. Lübeck, Germany, [2]Thorlabs 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 Hillmann[1], Gereon Hüttmann[2], Peter Koch[1]; [1]Thorlabs HL AG, Germany, [2]Inst. 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 Heise[1], Elisabeth Leiss-Holzinger[2], Karin Wiesauer[2], Michael Pircher[3], Erich Goetzinger[3], Bernhard Baumann[3], Christoph K. Hitzenberger[3], David Stifter[4]; [1]RECENDT GmbH, Austria, [2]RECENDT- Res. Ctr. for Non-Destructive Testing, Austria, [3]Ctr. for Biomedical Engineering and Physics, Medical Univ. Vienna, Austria, [4]ZONA-Ctr. for Surface and Nanoanalytics, Johannes Kepler Univ., Austria.* We present directional filtering and coherence-enhancing diffusion for image enhancement as well as two-dimensional quadrature demodulation of single fringe patterns in retardation images, which were acquired with polarization-sensitive optical coherence tomography.

Room 11, 1st Floor, Congress Centre

Novel Optical Instrumentation for Biomedical Applications

10.30–12.30
TuF • Photoacoustic II
Ton van Leeuwen; Acad. Medisch Centrum, The Netherlands, Presider

TuF1 • 10.30
Ultrasound-Transmission Parameter Imaging in a Photoacoustic Imager, *Jithin Jose[1], Rene Willemink[1], Steffen Resink[1], Thijs Maalderink[1], Johan van Hespen[1], Ton Van Leeuwen[1,2], Srirang Manohar[1]; [1]Univ. of Twente, The Netherlands, [2]Univ. of Amsterdam, The Netherlands.* We present a “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 imager.

TuF2 • 10.45
Fiber-Based Detectors for Photoacoustic Imaging, *Hubert Grün[1], Thomas Berer[1], Robert Nuster[2], Günther Paltauf[2], Peter Burgholzer[1]; [1]RECENDT Res. Ctr. for Non Destructive Testing GmbH, Austria, [2]Karl-Franzens-Univ., 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 Optoacoustic Tomography (MSOT) Scanner for Whole-Body Imaging of Small Animals and Biomarkers, *Rui Ma, Vasilis Ntziachristos, Daniel Razansky; Inst. for Biological and Medical Imaging (IBMI), Technical Univ. of Munich and Helmholtz Ctr. Munich, Germany.* We present a multispectral optoacoustic tomography (MSOT) scanner for whole-body visualization of biomarkers in living animals. Fast 3-D imaging, resolution of below 50μm and other advantageous characteristics are demonstrated in phantom and animal experiments.

TuF4 • 11.15
Optical Characterization of Gold Nanoparticle Optoacoustic Contrast Agents Using an Optical Fiber Approach, *Srirang Manohar[1], Constantin Ungureanu[1], Arjen Amelink[2], Rajagopal Rayavarapu[1], Henricus J. C. Sterenborg[2], Ton G. C. Van Leeuwen[3]; [1]Univ. of Twente, The Netherlands, [2]Erasmus Medical Ctr., The Netherlands, [3]Academic Medical Ctr., Univ. of Amsterdam, The Netherlands.* We describe the use of differential pathlength spectroscopy for accurate estimation of the optical absorption and scattering coefficients of gold nanospheres. This method has great potential in characterizing all types of nanoparticle-based optoacoustic contrast agents.

Room 21, 2nd Floor, Congress Centre

Advanced Microscopy Techniques

10.30–12.30
TuG • Localization and High Precision
Jerome Mertz; Boston Univ., USA, Presider

TuG1 • 10.30
High-Speed Optical Nano-Profilometry with Sub-Diffraction-Limit Lateral Resolution, *Chun-Chieh Wang[1], Chau-Hwang Lee[1,2]; [1]Res. Ctr. for Applied Sciences, Academia Sinica, Taiwan, [2]Inst. of Biophotonics, Natl. Yang-Ming Univ., Taiwan.* We employ the differential detection concept in structured illumination microscopy to achieve nanometer depth resolution and sub-diffraction-limit lateral resolution. The profiling frame rate is 12 Hz. The topography of 100-nm polymer fibers is obtained.

TuG2 • 10.45
High-Resolution Fluorescence Microscopy Using Three-Dimensional Structured Illumination, *Pedro F. Gardeazabal Rodriguez, Pierre Blandin, Ivan Maksimovic, Eduardo Sepulveda, Eleonora Muro, Benoit Dubertret, Vincent Loriette; Lab Photons et Matière, UPR 5, CNRS, Ecole Supérieure de Physique et Chimie Industrielles de la ville de Paris, France.* We developed a high-resolution microscope based on 3-D structured illumination generated with two SLM. This setup enables both lateral resolution improvement by a factor two and axial localization of point like objects with nanometric precision.

TuG3 • 11.00
Super-Resolved Position and Orientation of Fluorescent Dipoles, *Francois Aguet, Stefan Geissbühler, Iwan Märki, Theo Lasser, Michael Unser; Ecole Polytechnique Fédérale de Lausanne, Switzerland.* We introduce an efficient, image formation model-based algorithm that extends super-resolution fluorescence localization to include orientation estimation, and report experimental accuracies of 5 nanometers for position estimation and 2 degrees for dipole orientation estimation.

TuG4 • 11.15
Three-Dimensional Localization of Fluorescent Emitters at the Nano-Scale, *Iwan Maerki, Stefan Geissbühler, François Aguet, Alberto Bilenca, Theo Lasser; Ecole Polythechnique Fédérale de Lausanne, Switzerland.* We demonstrate nanometer-level localization accuracy of a single fluorescent emitter in three dimensions. Our super-resolution microscopy technique is based on spectral self-interference for axial localization and two-dimensional diffraction pattern analysis for lateral localization.

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

Clinical and Biomedical Spectroscopy

10.30–12.30
TuH • Opthalmology/Cardiology
Paola Taroni; Dept. of Physics, Politecnico di Milano, Italy, Presider

TuH1 • 10.30
Clinical Results of Fluorescence Lifetime Imaging in Ophthalmology, *Dietrich Schweitzer[1], Sylvio Quick[1], Matthias Klemm[2], Martin Hammer[1], Susanne Jentsch[1], Jens Dawczynski[1]; [1]Experimental Ophthalmology, Univ. of Jena, Germany, [2]Inst. of Biomedical Engineering and Informatics, Technical Univ. Ilmenau, Germany.* A laser scanner ophthalmoscope was developed for fluorescence lifetime measurements at the human retina. Local and global alterations in lifetimes were found between healthy subjects and patients suffering from age-related macular degeneration or vessel occlusion.

TuH2 • 10.45
Multimodal Multiphoton Imaging of Intact Eye Tissues, *Nicolas Olivier[1], Florent Aptel[2], Ariane Deniset-Besseau[1], Jean-Marc Legeais[2], Karsten Plamann[3], Marie-Claire Schanne-Klein[1], Emmanuel Beaurepaire[1]; [1]Ecole Polytechnique, France, [2]Univ. Paris V, France, [3]Lab d'Optique Appliquée, ENSTA, Ecole Polytechnique, CNRS, France.* We evaluate three combined modalities of multiphoton microscopy, second-harmonic generation (SHG), third-harmonic generation (THG), and two-photon-excited fluorescence (2PEF) for imaging the anterior segment of intact eye tissue.

TuH3 • 11.00
Method for Simultaneous Detection of Functionality and Tomography, *Dietrich Schweitzer[1], Matthias Klemm[2], Martin Hammer[1], Susanne Jentsch[1], Frank Schweitzer[3]; [1]Experimental Ophthalmology, Univ. of Jena, Germany, [2]Inst. of Biomedical Engineering and Informatics Technical Univ. Ilmenau, Germany, [3]Thueringenklinik GmbH, Germany.* The appearance time of fluorescence originating from different ocular layers will be determined by an extended model function for approximation of time-resolved autofluorescence. The geometrical distance can be calculated, including light velocity and refractive index.

TuH4 • 11.15
Spectroscopic Imaging of the Retinal Vessels Using a New Dual-Wavelength, *Seyed Hossein Rasta[1,2], A. Manivannan[2], Peter F. Sharp[2]; [1]Tabriz Univ. of Medical Sciences, Islamic Republic of Iran, [2]Univ. of Aberdeen, UK.* To investigate the feasibility of assessing vessel blood oxygenation in the human retina using a dual-spectral confocal scanning laser ophthalmoscope. The relative oxygen levels of retinal artery and vein were determined using a new dual-wavelength.

Sessions continue on page 30.

Room 5, Ground Floor, Congress Centre

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, *Jeroen Kalkman[1], Dirk J. Faber[1,2], Ton G. van Leeuwen[1,3]; [1]Dept. of Biomedical Engineering and Physics, Academic Medical Ctr., Univ. of Amsterdam, The Netherlands, [2]Dept. of Ophthalmology, Academic Medical Ctr., Univ. of Amsterdam, The Netherlands, [3]Biomedical 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 Bousi, Constantinos Pitris; Univ. of Cyprus, Cyprus.* Amplitude modulation-frequency modulation (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.

TuE7 • 12.00
Nanoparticles for Contrasting OCT Images of Skin, *Mikhail Yu Kirillin[1], Pavel Agrba[1], Vladislav Kamensky[1], Marina Shirmanova[2], Marina Sirotkina[2], Elena Zagaynova[2]; [1]Inst. of Applied Physics RAS, Russian Federation, [2]Nizhny Novgorod State Medical Acad., Russian Federation.* Contrasting of skin forming elements in OCT images after application of silica/gold nanoshells or titanium dioxide nanoparticles in solution is discussed. The study is performed both by Monte Carlo simulations and *in vivo* on animals.

TuE8 • 12.15
Spectroscopic Studies of Flowing Particles Using Fourier Domain OCT, *Szymon Tamborski, Maciej Szkulmowski, Ireneusz Grulkowski, Michalina Gora, Andrzej Kowalczyk, Maciej Wojtkowski; Inst. of Physics, Nicolaus Copernicus Univ., Poland.* In this contribution the method of examining spectroscopic properties of flowing media is presented. It enables simultaneous investigation of flow velocity as well as extinction coefficients from the same measurement.

Room 11, 1st Floor, Congress Centre

Novel Optical Instrumentation for Biomedical Applications

TuF • Photoacoustic II—Continued

TuF5 • 11.30
Photoacoustic Imaging Using a Conical Axicon Detector, *Sibylle Gratt, Klaus Passler, Robert Nuster, Guenther Paltauf; 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 geometry of the detector. Results of some simulations and experiments are given and discussed.

TuF6 • 11.45
Photoacoustic Microscopy with Large Integrating Optical Annular Detectors, *Thomas Berer, Hubert Grün, 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.

TuF7 • 12.00
Fiber Optic Interferometric Ultrasonic Sensors for Biomedical Imaging, *Daniel Gallego, Victor Collado, Horacio Lamela; Univ. Carlos III de Madrid, Spain.* Interferometric optical fiber sensors for optoacoustic biomedical imaging within the frequency range of 1-5 MHz are presented. We compare optoacoustic generated signals detected by the optical fiber sensor with PZT wideband sensor with good agreement.

TuF8 • 12.15
Quantitative Optoacoustic Imaging Using a Model-Based Approach, *Amir Rosenthal, Daniel Razansky, Vasilis Ntziachristos; Inst. for Biological and Medical Imaging (IBMI), Technical Univ. of Munich and Helmholtz Ctr. Munich, Germany.* We propose a fast model-based optoacoustic inversion method capable of artifact-free quantified reconstruction of optical absorption in turbid tissues and compare its performance to commonly used backprojection inversion algorithms using simulations and experiments in tissue-mimicking phantoms.

Room 21, 2nd Floor, Congress Centre

Advanced Microscopy Techniques

TuG • Localization and High Precision—Continued

TuG5 • 11.30
Live Cell Imaging with Surface Plasmon-Mediated Fluorescence Microscopy, *Karla Balaa[1], Viviane Devauges[2], Yannick Goulam[1], Sandrine Lévêque-Fort[2], Emmanuel Fort[1]; [1]Inst. Langevin, Ecole Superieure de Physique et de Chimie Industrielles ParisTech, France, [2]Ctr. de Photonique Biomedicale and Lab de Photophysique Moléculaire, 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.

TuG6 • 11.45
FRET Detection for Neurobiological Applications Using a Total Internal Reflection Fluorescence Lifetime Imaging Microscope, *Viviane Devauges[1,2,3], Pierre Blandin[1,2,3], Jack-Christophe Cossec[4], Sandrine Lécart[3], Catherine Marquer[4], Marie-Claude Potier[4], Frédéric Druon[2,3], Patrick Georges[2,3], Sandrine Lévêque-Fort[1,3]; [1]Lab de Photophysique Moléculaire, Univ. Paris Sud, France, [2]Lab Charles Fabry, l'Inst. d'Optique, Univ. Paris Sud, France, [3]Ctr. de Photonique Biomédicale, Univ. Paris Sud, France, [4]Lab de Biologie des Interactions Neurones/Glie, France.* We present the development of a time resolved TIRF microscope illuminated by a supercontinuum laser source. It permits to perform wide-field fluorescence lifetime imaging of neurobiological processes at the plasma membrane with subwavelength axial resolution.

TuG7 • 12.00
Label-Free Observation of Asymmetric Growth of Cancer-Cell Filopodia in a Culture Chip, *Tsi-Hsuan Hsu[1], Meng-Hua Yen[2], Wei-Yu Liao[3], Ji-Yen Cheng[2,4], Chau-Hwang Lee[1,2,5]; [1]Inst. of Biophotonics, Natl. Yang-Ming Univ., Taiwan, [2]Res. Ctr. for Applied Sciences, Academia Sinica, Taiwan, [3]Dept. of Internal Medicine, Natl. Taiwan Univ. Hospital, Taiwan, [4]Dept. of Mechanical and Mechantronic Engineering, Natl. Taiwan Ocean Univ., Taiwan, [5]Graduate Inst. of Clinical Medicine, Natl. Taiwan Univ., Taiwan.* We use super-resolution bright-field optical microscopy to observe the filopodium of lung cancer cells in a culture chip. We verify that asymmetric protrusions of filopodia indicate the direction of concentration gradients of growth factors.

TuG8 • 12.15
Ultra-Fast Imaging of Colloidal Nanostructures with Diffraction-Unlimited Microscopy, *Volker Westphal, Marcel A. Lauterbach, Chaitanya Ullal, Stefan W. Hell; Max-Planck-Inst. for Biophysical Chemistry, Germany.* Diffraction-unlimited imaging is one of the emerging fields in microscopy. Compared with other super-resolution techniques, STED microscopy allows complete image acquisition at much higher frame-rates (~200fps), with is explored here to visualize colloidal crystal-formation.

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

Clinical and Biomedical Spectroscopy

TuH • Opthalmology/Cardiology—Continued

TuH5 • 11.30 Invited
Multidimensional Fluorescence Imaging, *Paul French; Imperial College London, UK.* Multidimensional fluorescence imaging (MDFI), including rapid fluorescence lifetime imaging (FLIM), is being developed for label-free medical microscopy and endoscopy, HCA with automated optically sectioned FLIM and FRET in a multiwell plate reader and optical projection tomography.

TuH6 • 12.00
Endoscopic Measurements of Free Flap Perfusion in the Head and Neck Region Using Red-Excited Indocyanine Green: Monitoring Fluorescence, *Hilmar Schachenmayr[1], Sven Zhorzel[2], Herbert Stepp[1], Ulrich Harréus[2], Christian S. Betz[2]; [1]Laser Res. Lab, LIFE Ctr., Großhadern Medical Campus, Germany, [2]Ludwig Maximilian Univ., 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, combining of fluorescence and quasi-whitelight measurements and deconvolution of flap perfusion resistance.

TuH7 • 12.15
Hyperspectral Characterization of Atherosclerotic Plaques, *Lise Lyngsnes Randeberg[1], Eivind L. P. Larsen[1], Astrid Aksnes[1], Olav A. Haugen[2], Lars O. Svaasand[1]; [1]Dept. of Electronics and Telecommunications, Norwegian Univ. of Science and Technology, Norway, [2]Dept. of Lab Medicine, Children's and Womens 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.

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

Room 5, Ground Floor, Congress Centre

Optical Coherence Tomography and Coherence Techniques

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

TuI1 • 13.30
Imaging the Embryonic Heart with Optical Coherence Tomography, *Michael W. Jenkins[1], Madhusudhana Gargesha[1], Bilal Ataya[1], David L. Wilson[1], Kersti K. Linask[2], Michiko Watanabe[1], Andrew M. Rollins[1]; [1]Case Western Reserve Univ., USA, [2]Univ. South Florida, USA.* Development of an ultrahigh-speed gated OCT system incorporated into an environmental chamber allows us to investigate embryonic heart development under physiologic conditions. Here we present initial studies where stressors have been applied to the heart.

TuI2 • 13.45
***In vivo in situ en face* Optical Coherence Tomography Imaging of Chick Embryos,** *Michael Leitner[1,2,3], Joana Castanheira[4], Luís Fereira[4], Isabel Palmeirim[4], Carla C. Rosa[1,2], Adrian Gh Podoleanu[3]; [1]Faculty of Science, Univ. of Porto, Portugal, [2]INESC Porto - Inst. de Engenharia de Sistemas e Computadores-Porto, Portugal, [3]Applied Optics Group, School of Physical Sciences, Univ. of Kent at Canterbury, UK, [4]ICVS, 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.

TuI3 • 14.00
Simultaneous Dual-Band Spectral Domain Optical Coherence Tomography Using a Supercontinuum Laser Light Source, *Peter Cimalla, Mirko Mehner, Maximiliano Cuevas, Julia Walther, Edmund Koch; Clinical Sensoring and Monitoring, Faculty of Medicine Carl Gustav Carus, Dresden Univ. of Technology, Germany.* Spectral domain optical coherence tomography is performed simultaneously at 800 nm and 1250 nm central wavelength with axial resolutions better than 4.5 µm and 7 µm, respectively, using a supercontinuum laser and a fiber-coupled setup.

Room 11, 1st Floor, Congress Centre

Novel Optical Instrumentation for Biomedical Applications

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 Patterning For Micro and Nano Particles, *Aloke Kumar, Stuart J. Williams, Steven T. Wereley; 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 Dongre[1], Jasper van Weerd[2], Rob van Weeghel[2], Rebeca Martinez Vazquez[3], Roberto Osellame[3], Roberta Ramponi[3], Giulio Cerullo[3], Ronald Dekker[4], Geert A. J. Besselink[4], Hans H. van den Vlekkert[4], Hugo J. W. M. Hoekstra[1], Markus Pollnau[1]; [1]Integrated Optical MicroSystems (IOMS), MESA+ Inst. for Nanotechnology, Univ. of Twente, The Netherlands, [2]Zebra Bioscience BV, The Netherlands, [3]Inst. di Fotonica e Nanotecnologie del CNR, Dept. di Fisica, Politecnico di Milano, Italy, [4]LioniX BV, The Netherlands.* Electrophoretic separation of fluorescently labeled DNA molecules in on-chip microfluidic channels was 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.

TuJ3 • 14.00
Optical Tweezers and Integrated Waveguide System for Cell Selection and Transport in Polymer Microfluidic Devices, *Duoaud F. Shah, Luc G. Charron, Lothar Lilge; Princess Margaret Hospital, Univ. of Toronto, Canada.* A laser-based optical system for cell selection and passive transportation inside a polymer microfluidic device is presented. Optical tweezers and integrated waveguides are used to select and transport multiple cells in a network of channels.

Room 21, 2nd Floor, Congress Centre

Advanced Microscopy Techniques

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

TuK1 • 13.30 Invited
3-D Tracking and Multi-Wavelength Techniques for Digital Holographic Microscopy Based Cell Analysis, *Björn Kemper, Patrik Langehanenberg, Sebastian Kosmeier, Sabine Przibilla, Angelika Vollmer, Steffi Ketelhut, 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 Grosfils; 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 B0.R2, Ground Floor, Congress Centre Hall B0

Diffuse Optical Imaging

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, *Nicolas Ducros[1], Anabela Da Silva[2], Jean-Marc Dinten[1], Françoise Peyrin[3]; [1]Electronics and Information Technologies Lab, French Atomic Energy Commission/Micro and Nanotechnology Innovation Ctr., France, [2]Inst. Fresnel, France, [3]Ctr. de Recherche et d'Applications en Traitement de l'Image et du Signal, France.* Within the diffusion approximation, we recently shown that the classical measurable quantity models can lead to significant deviations. Here, the impact of these deviations on the reconstruction quality is evaluated.

TuL2 • 13.45
Mice Lung Disease Follow-up with "Open-Air" Fluorescence Diffuse Optical Tomography, *Anne Koenig[1], Georges Gonon[1], Lionel Hervé[1], Michel Berger[1], Jean-Marc Dinten[1], Jérôme Boutet[1], Véronique Josserand[2], Jean-Luc Coll[2], Philippe Peltié[1], Philippe Rizo[1]; [1] CEA, LETI, MINATEC, France, [2]Inst. 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.

TuL3 • 14.00
Effects of a Finite Spectral Bandwidth Light Source in Time-Resolved Diffuse Spectroscopy, *Andrea Farina, Andrea Bassi, Paola Taroni, Daniela Comelli, Lorenzo Spinelli, Rinaldo Cubeddu, Antonio Pifferi; Dept. di Fisica, Politecnico di Milano, Italy.* We discuss the spectral distortions occurring when time-resolved diffuse spectroscopy is performed illuminating with a spectrally wide source. Theoretical and experimental investigations are given and a data analysis method to overcome the distortions is proposed.

Sessions continue on page 32.

Room 5, Ground Floor, Congress Centre

Optical Coherence Tomography and Coherence Techniques

TuI • Functional Imaging—Continued

TuI4 • 14.15
Spectroscopy in Single and Double Layered Weakly Scattering Phantoms Using Frequency Domain Optical Coherence Tomography, *Boris Hermann[1], Christoph Meier[1,2], Bernd Hofer[1], Boris Povazay[1], Wolfgang Drexler[1]; [1]Cardiff Univ., UK, [2]Bern 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.

TuI5 • 14.30
Measurement of Microvascular Apparent Pulse Wave Velocity Using DOCT, *Marco Bonesi, Stephen Matcher; 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.

TuI6 • 14.45
See the Brain at Work—Intraoperative Laser Doppler Functional Brain Imaging, *Erica J. Martin-Williams[1], Andreas Raabe[2], Dimitri Van De Ville[3], Marcel Leutenegger[4], Andrea Szelenyi[5], Elke Hattingen[5], Rudiger Gerlach[5], Volker Seifert[5], Christoph Hauger[6], Antonio Lopez[1], Rainer Leitgeb[1], Michael Unser[3], Theo Lasser[1]; [1]Lab of Biomedical Optics, Inst. of Micotechnique, STI, Ecole Polytechnique Fédérale de Lausanne, Switzerland, [2]Klinik und Polyklinik fur Neurochirurgie, Switzerland, [3]Biomedical Imaging Group, IMT, Ecole Polytechnique Fédérale de Lausanne, Switzerland, [4]Max Plank Inst., Germany, [5]Johann Wolfgang Goethe Univ., Germany, [6]Carl Zeiss Meditec, Germany.* During open brain surgery we acquire perfusion images non-invasively using laser Doppler imaging. The regions of brain activity show a distinct signal in response to stimulation providing intraoperative functional brain maps of remarkably strong contrast.

Room 11, 1st Floor, Congress Centre

Novel Optical Instrumentation for Biomedical Applications

TuJ • Lab on a Chip—Continued

TuJ4 • 14.15
Optofluidic Chip System with Integrated Fluidically Controllable Optics, *Manfred Schubert[1], Matthias Arras[2], Günter Mayer[1], Thomas Henkel[1]; [1]Inst. of Photonic Technology, Germany, [2]Friedrich 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.

TuJ5 • 14.30
Optical Microassembly Platform for Constructing Reconfigurable Microenvironments for Biomedical Studies, *Darwin Z. Palima[1], Peter John Rodrigo[1], Lóránd Kelemen[2], Pál Ormos[2], Jesper Glückstad[1]; [1]DTU Fotonik, Technical Univ. of Denmark, Denmark, [2]Inst. of Biophysics, Biological Res. Ctr., HAS, Hungary.* User-reconfigurable microenvironments can aid in understanding cellular development processes. We demonstrate a model platform for constructing versatile microenvironments by fabricating morphologically complex microstructures and assembling these archetypal building blocks into various configurations using optical traps.

TuJ6 • 14.45
Fluorescence Optical Platform for CRP and PCT Detection, *Francesco Baldini[1], Ambra Giannetti[1], Cosimo Trono[1], Luca Bolzoni[2], Giampiero Porro[2]; [1]Inst. di Fisica Appicata Carrara, Consiglio Nazionale delle Ricerche, Italy, [2]Datamed S.r.L., Italy.* A sandwich assay for C-reactive protein and procalcitonin 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.

Room 21, 2nd Floor, Congress Centre

Advanced Microscopy Techniques

TuK • Holographic Methods—Continued

TuK3 • 14.15
Digital Holographic Microscopy at Fundamental and Second Harmonic Wavelengths, *Etienne Shaffer, Christian Depeursinge; Ecole Polytechnique Fédérale de Lausanne, Switzerland.* We report on multi-functional second harmonic generation digital holographic microscopy, and present its application to determination of (1) 3-D-position and (2) nature of nanoparticles (here polystyrene microspheres and barium titanate nanoparticles).

TuK4 • 14.30
Monitoring the Dynamics of Cell with Digital Holographic Microscopy, *Pierre Marquet[1,2], Pascal Jourdain[2], Benjamin Rappaz[2], Daniel Boss[2], Christian Depeursinge[3], Pierre Magistretti[2]; [1]Ctr. de Neurosciences Psychiatriques, Univ. of Lausanne, Switzerland, [2]Brain Mind Inst., Ecole Polytechnique Fédérale de Lausanne, Switzerland, [3]Lab d'Optique Appliquée, Ecole Polytechnique Fédérale de Lausanne, Switzerland.* Digital holographic microscopy, by providing a quantitative phase signal, has permitted to investigate cellular membrane nano-fluctuations of red blood cells as well as to non-invasively monitor an optical signature of the electrical activity of cells.

TuK5 • 14.45
Application of Color Digital Holographic Microscopy for Analysis of Stained Tissue Sections, *Xiaoli Mo[1,2], Björn Kemper[1], Patrik Langehanenberg[1], Angelika Vollmer[1], Jinghui Xie[2], Gert von Bally[1]; [1]Ctr. for Biomedical Optics and Photonics, Univ. of Muenster, Germany, [2]School of Information Science and Technology, Beijing Inst. of Technology, China.* Color digital holographic microscopy offers subsequent multi-focus true color imaging with simultaneous quantitative phase contrast analysis. Investigations on color digital holography have been performed by applying a transmission microscope experimental setup to stained tissue sections.

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

Diffuse Optical Imaging

TuL • Experimental Techniques II—Continued

TuL4 • 14.15
Pseudo-Random Single Photon Counting: The Principle, Simulation, and Experimental Results, *Qiang Zhang, Nanguang Chen; Div. of Bioengineering, Natl. Univ. of Singapore, Singapore.* We report a new time-resolved optical measurement method 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.

TuL5 • 14.30
Source Stabilization for High Quality Time-Domain Diffuse Optical Tomography, *Weirong Mo[1], Nanguang Chen[1,2]; [1]Div. of Bioengineering, Natl. Univ. of Singapore, Singapore, [2]Dept. of Electronic and Computer Engineering, Natl. Univ. of Singapore, Singapore.* The image quality has been greatly improved in our fast time-domain diffuse optical tomography by applying an instantaneous feedback control on the Mach-Zehnder interferometric modulator to stabilize the modulation depth of the light source.

TuL6 • 14.45
A Fast Method for finding Optimal Wavelengths for Diffuse Optical Tomography, *Iain Styles; Univ. 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.

Joint CBS/TLA/NOIBA Poster Session

15.00–16.30
TuM • Joint CBS/TLA/NOIBA Poster Session

Clinical and Biomedical Spectroscopy Posters

TuM1
Time-Resolved Diffuse Optical Spectroscopy: A Differential Absorption Approach, *Paola Taroni[1,2], Andrea Bassi[2,3], Lorenzo Spinelli[1], Rinaldo Cubeddu[2,3,4], Antonio Pifferi[2,3,4]; [1]Inst. di Fotonica e Nanotecnologie, Consiglio Nazionale delle Ricerche, Italy, [2]Dept. di Fisica, Politecnico di Milano, Italy, [3]Natl. Lab for Ultrafast and Ultraintense Optical Science, Consiglio Nazionale delle Ricerche, Italy, [4]Res. Unit Politecnico di Milano, Inst. Italiano di Tecnologia, Italy.* A method is presented to estimate spectral changes in the absorption properties of turbid media from time-resolved reflectance/transmittance measurements. It was derived directly from the microscopic Beer-Lambert law, and tested against simulations and phantom measurements.

TuM2
Exploration of Native Contrast Mechanisms of the Extracellular Matrix, *Urs Utzinger; Univ. of Arizona, USA.* Native optical properties of the extracellular matrix give raise to scattering, frequency doubling and fluorescence emission. Structural information obtained from scattering and extent of cross linking from fluorescence are linked to state of the ECM.

TuM3
Mueller Matrixes Monitoring of Pathological Changed Connective Tissue, *V. P. Ungurian, O. Ya. Wanchuliak; 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. A method of polarization phase reconstruction of BT architectonics was suggested.

TuM4
Correlation and Fractal Structure of Jones Matrices of Human Bile Secret, *Alexander G. Ushenko[1], A. I. Fediv[2], Yu F. Marchuk[2]; [1]Chernivtsi Natl. Univ., Ukraine, [2]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
Complex Degree of Mutual Polarization of Bile—Secret Coherent Images During the Diagnostics of Their Physiological State, *Alexander G. Ushenko[1], A. I. Fediv[2], Yu F. Marchuk[2]; [1]Chernivtsi Natl. Univ., Ukraine, [2]Bucovinian State Medical Univ., Ukraine.* The set of diagnostical criteria (skewness and kurtosis of two-dimensional distributions of complex degree of mutual polarization) has been found for the diagnostics of the chronic acalculous cholecystitis and diabetes mellitus type II.

TuM6
Singular Structure of Polarization Images of Bile Secret in Diagnostics of Human Physiological State, *Alexander G. Ushenko[1], A. I. Fediv[2], Yu F. Marchuk[2]; [1]Chernivtsi Natl. Univ., Ukraine, [2]Bucovinian State Medical Univ., Ukraine.* We theoretically and experimentally examined the coordinate distributions of a single and doubly degenerated polarization singularities of the physiologically normal and pathologically changed bile secrets.

TuM7
Angular Remission and Reflection from Rough Turbid Biological Media, *Florian Foschum, René Michels, Alwin Kienle; Inst. für Lasertechnologien in der Medizin und Meßtechnik an der Univ. Ulm, Germany.* We studied the angular distribution of remitted and reflected light from rough turbid biological tissue. Especially the influence of surface roughness on the determination of the optical properties is investigated.

TuM8
Determination of the Optical Properties of Anisotropic Turbid Media Using an Integrating Sphere, *Marie-Theres Heine, Florian Foschum, Alwin Kienle; Inst. für Lasertechnologien in der Medizin und Meßtechnik, Germany.* An integrating sphere system for determination of the optical properties of turbid media was setup and verified using liquid phantoms. It is investigated if the absorption coefficient of anisotropic turbid media can be accurately obtained.

TuM9
Fluorescence Lifetime Correlation Spectroscopy for Precise Concentration Detection *in vivo* by Background Subtraction, *Maria Gärtner[1,2], Jörg Mütze[1], Thomas Ohrt[1,3], Petra Schwille[1]; [1]BIOTEC, Biophysics, Dresden Univ. of Technology, Germany, [2]Medical Faculty Carl Gustav Carus, Dresden Univ. of Technology, Germany, [3]Dept. of Cellular Biochemistry, Max Planck Inst. for Biophysical Chemistry, 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.

TuM10
Darkfield Scattering Spectroscopic Microscopy Evaluation Using Polystyrene Beads, *Michael Schmitz, René Michels, Alwin Kienle; Inst. für Lasertechnologien in der Medizin und Meßtechnik, Germany.* Diameters of single polystyrene beads were determined within 10 nm accuracy by comparing Mie theory oscillations and wavelength resolved measurements realized with an axicon supported reflected darkfield microscope.

TuM11
Flexible ATR Probe for Endoscopic FT-IR Measurement Using Hollow Optical Fiber, *Yuji Matsuura, Saiko Kino; Tohoku Univ., Japan.* Remote 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.

TuM12
Multifunctional Laser Noninvasive Spectroscopic System for Medical Diagnostics and Some Metrological Provisions for That, *Dmitrii A. Rogatkin[1], Ludmila G. Lapaeva[1], Elena N. Petritskaya[1], Victor V. Sidorov[2]; [1]Moscow Regional Res. and Clinical Inst. "MONIKI", Russian Federation, [2]SPE "LAZMA" Ltd., Russian Federation.* This report describes a new laser noninvasive diagnostic system for medicine, which combines laser Doppler flowmetry, fluorescent diagnostics and reflectance oximetry technique in single equipment. Problems of metrological providings for that are discussed as well.

TuM13
IR Analysis of CaOx Kidney Calculi, *Oleg Bordun, Oksana Drobchak; Ivan Franko Natl. Univ. of Lviv, Ukraine.* IR-absorption spectra of the following samples were studied: urea, CaOx and urea mixture, CaOx, dried urine samples in spectral range 1000-8000 cm^{-1}. The possibility of using IR-spectroscopy for early diagnostic of nephrolithiathis is presented.

TuM14
Development of a Modified Transillumination Breast Spectroscopy (TiBS) System for Population-Wide Screening, *Eleanor J. Walter[1,2], Lothar D. Lilge[1,2]; [1]Univ. Health Network, Canada, [2]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.

TuM15
Optical Soft Tissue Differentiation by Diffuse Reflectance Spectroscopy, *Azhar Zam[1], Florian Stelzle[2], Emeka Nkenke[2], Katja Tangermann-Gerk[3], Michael Schmidt[3], Werner Adler[4], Alexandre Douplik[1]; [1]SAOT – Graduate School in Advanced Optical Technologies, Friedrich-Alexander Univ. of Erlangen-Nuremberg, Germany, [2]Dept. of Oral and Maxillofacial Surgery, Friedrich-Alexander Univ. of Erlangen-Nuremberg, Germany, [3]Blz - Bavarian Laser Ctr., Germany, [4]Dept. of Medical Informatics, Biometry and Epidemiology, Friedrich-Alexander Univ. of Erlangen-Nuremberg, 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
Interaction of Sunscreen TiO_2 Nanoparticles with Skin and UV Light: Penetration, Protection, Phototoxicity, *Alexey Popov[1,2], Jürgen Lademann[3], Alexander Priezzhev[4], Risto Myllylä[1]; [1]Optoelectronics and Measurement Techniques Lab, Univ. of Oulu, Finland, [2]Intl. Laser Ctr., M.V. Lomonosov Moscow State Univ., Russian Federation, [3]Ctr. of Experimental and Applied Cutaneous Physiology, Humboldt Univ. Berlin, Germany, [4]Physics Dept., M.V. Lomonosov Moscow State Univ., Russian Federation.* We show experimentally or theoretically that: 1) TiO_2 nanoparticles do not penetrate into epidermis; 2) the best protectors against erythema are 62-nm particles; 3) porcine skin *in vitro* produces more radicals than TiO_2 nanoparticles.

TuM17
Multispectral Autofluorescence and Reflectance Diagnosis of Non-Melanoma Cutaneous Tumors, *Ekaterina G. Borisova[1], Daniela Dogandjiiska[1], Irina Bliznakova[1], Latchezar Avramov[1], Elmira Petkova[2], Petranka Troyanova[2]; [1]Inst. of Electronics, Bulgarian Acad. of Sciences, Bulgaria, [2]Natl. Oncological Ctr., Bulgaria.* Multispectral fluorescence using 365-440 nm excitation and broad-band 400-760 nm reflectance of non-melanoma cutaneous tumors are detected and evaluated. Major spectral features are addressed and diagnostic discrimination algorithms based on lesions' emission properties are proposed.

TuM18
5-ALA/PpIX Fluorescence Detection of Gastrointestinal Neoplasia, *Ekaterina G. Borisova[1], Irina A. Bliznakova[1], Latchezar A. Avramov[1], Borislav Vladimirov[2]; [1]Inst. of Electronics, Bulgarian Acad. of Sciences, Bulgaria, [2]Univ. Hospital "Queen Giovanna", Bulgaria.* Endogenous and exogenous fluorescence spectra using 405 nm excitation are used to develop simple but effective algorithm, based on dimensionless ratio of the signals at 560 and 635 nm, for differentiation of normal/abnormal gastrointestinal tissues.

TuM19
Fiber-Optics Based Laser System for 2-D Fluorescence Detection and Optical Biopsy, *Dalia Kaškelytė[1], Arūnas Čiburys[1], Saulius Bagdonas[1], Giedrė Streckytė[1], Ričardas Rotomskis[1,2], Roaldas Gadonas[1]; [1]Dept. of Quantum Electronics and Laser Res. Ctr., Vilnius Univ., Lithuania, [2]Lab of Biomedical Physics, Inst. of Oncology, Vilnius Univ., Lithuania.* 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.

TuM20
Development of Laser Fluorescent Method of Detecting the Structural Molecular Modifications of Erythrocyte Membranes, *Nikolai Nemkovich, Andrey Sobchuk, Julia Kruchenok, Ryhor Kurylo; B.I.Stepanov Inst. of Physics, Natl. Acad. of Sciences of Belarus, Belarus.* We have investigated changes of human erythrocyte membranes under the action of interference light fields with different periods of spatial modulation. The modifications of erythrocyte membranes were detected by means of laser fluorescent probe method.

Session continues on pages 34–36.

TuM • Joint CBS/TLA/NOIBA Poster Session—Continued

TuM21
Differentiation of Human Heart Conduction System by Means of Fluorescence Spectroscopy, *Jonas Venius[1,2], Edvardas Žurauskas[3], Saulius Bagdonas[1], Eleonora Žurauskienė[1], Ricardas Rotomskis[1,2]; [1]Laser Res. Ctr., Vilnius Univ., Lithuania, [2]Inst. of Oncology, Vilnius Univ., Lithuania, [3]Medical Faculty, Vilnius Univ., Lithuania.* Fluorescence spectroscopy was used to study the differences between the human heart tissues *ex vivo*. Characteristic excitation and emission wavelengths were defined and the ability of differentiation of conduction system from surrounding tissues was demonstrated.

TuM22
Efficiency of Fluorescence Coupling into Planar Waveguides, *Ronja Bäumner, Kai Bodensiek, André Selle, Thomas Fricke-Begemann, Jürgen Ihlemann, Gerd Marowsky; Laser-Lab Göttingen e.V., Germany.* Using planar waveguides as optical biosensors, a large part of the excited fluorescence is coupled back into the waveguide. We present a fundamental investigation of the fluorescence-collection-efficiency into the waveguide by theoretical and experimental means.

TuM23
Discrimination of Microorganisms and Cells in Tissue Engineering by Raman Spectroscopy, *Steffen Koch[1], Marieke Dreiling[1], Matthias Gutekunst[1], Carsten Bolwien[2], Hagen Thielecke[3], Heike Mertsching[1]; [1]Fraunhofer Inst. for Interfacial Engineering and Biotechnology IGB, Germany, [2]Fraunhofer Inst. for Physical Measurement Techniques IPM, Germany, [3]Fraunhofer Inst. for Biomedical Engineering IBMT, Germany.* Sterility testing and cellular characterization is essential for the production process of transplants in tissue engineering. Discrimination of microorganisms and cells and cellular characterization are essential tasks solvable by micro-Raman spectroscopy.

TuM24
A Method for Determining Nutritional Facts with Raman Spectroscopy, *Christos Moustakas, Constantinos Pitris; Univ. of Cyprus, Cyprus.* Raman spectroscopy was investigated for measurement of the nutritional properties of food products. It can estimate several nutritional parameters, such as calories, fat, protein, carbohydrates, sugars, and fiber, with an error of 2.9% to 6.7%.

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 (8-12μm) is applied as a non-invasive tool to monitor vascular 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, *Jun Li, Markus Ninck, Thomas Gisler; 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 Virtanen[1,2], Tommi Noponen[3], Tapani Salmi[4], Jussi Toppila[4], Pekka Meriläinen[1]; [1]Dept. of Biomedical Engineering and Computational Science, Helsinki Univ. of Technology, Finland, [2]Helsinki Univ. Central Hospital, Finland, [3]Turku PET Ctr., Turku Univ. Hospital, Finland, [4]Dept. of Clinical Neurophysiology, Helsinki Univ. Central Hospital, Finland.* Near-infrared spectroscopy is used for determining extracerebral and cortical haemoglobin concentration changes during apneic 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. Chivel; 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, *Izumi Nishidate[1], Hayato Kaneko[1], Takaaki Maeda[2], Yoshihisa Aizu[2], Tetsuya Yuasa[3], Kyuichi Niizeki[3]; [1]Tokyo Univ. of Agriculture and Technology, Japan, [2]Muroran Inst. of Technology, Japan, [3]Yamagata Univ., Japan.* The arterial inflow and 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 50mmHg pressure.

TuM30
Biphasic Functional Signals from the Human Visual Cortex Measured by Time-Resolved Diffusing-Wave Spectroscopy, *Jun Li, Markus Ninck, Thomas Gisler, Leonie Koban, Johanna Kissler, Thomas Elbert; Univ. Konstanz, Germany.* Visual activity 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.

Therapeutic Laser Applications and Laser-Tissue Interactions Posters

TuM31
Photodynamic Therapy of Precancer and Early Cancer of Vulva, *Olga I. Trushina, Elena G. Novikova, Victor V. Sokolov, E. Filonenko, E. Chulcova, Valery I. Chissov, Georgy N. Vorozhtsov; P.A. Hertzen 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 Case of Virus-Associated Recurrent Papillomatosis (VARP) of Larynx, *A. Gladyshev[1], Larisa Telegina[1], Victor V. Sokolov[1], I. Reshetov[1], L. Zavalishina[1], Sergey G. Kuzmin[2], Georgy N. Vorozhtsov[2]; [1]P.A. Hertzen Moscow Res. Oncology Inst., Russian Federation, [2]Organic 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), Radachlorin, and Photosens.

TuM33
Therapeutic Effect of Intravitreal Bevacizumab (Avastin) in Combination with Photosens Photodynamic Therapy in the Treatment of Choroidal Neovascularisation, *Maria V. Budzinskaya, I. Gurova, I. Schegoleva, E. Kazarian, E. Privivkova, Sergey G. Kuzmin, Georgy N. Vorozhtsov; 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 Fospeg® in the LNCaP Human Prostate Cancer Cell Line, *Aspasia G. Petri[1], Maria Kyriazi[1], Eleni Alexandratou[1], Michael Rallis[2], Susanna Grafe[3], Dido Yova[1]; [1]Lab of Biomedical Optics and Applied Biophysics, School of Electrical and Computer Engineering, Natl. Technical Univ. of Athens, Greece, [2]Div. of Pharmaceutical Technology, School of Pharmacy, Natl. and Kapodistrian Univ. of Athens, Greece, [3]Res. and Development, Biolitec AG, Germany.* Localization, uptake and phototoxicity of a new *m*-THPC liposomal formulation (Fospeg®) were evaluated in LNCaP cells through confocal microscopy and MTT. Results show that Fospeg® presents higher phototoxicity than Foscan® under the same experimental conditions.

TuM35
Optical Detection of Singlet Oxygen Produced by UVA Irradiation of Fatty Acids and Phospholipids, *Johannes Regensburger, Tim Maisch, 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 Maisch, Johannes Regensburger, Wolfgang Bäumler; Univ. of Regensburg, Germany.* We investigated the facilities to optimize photodynamic inactivation of bacteria, which is a new approach to kill especially multi-resistant bacteria. We measured the generation and decay of singlet oxygen in bacteria like *S. aureus* and *E. coli*.

TuM37
Photodynamic Effect of ALA-Induced Porphyrins and Chlorin e6 on *Mycobacterium phlei* and *Mycobacterium smegmatis*, *R. Bruce-Micah[1], Ute Gamm[1], D. Hüttenberger[2], J. Cullum[1], H.-J. Foth[1]; [1]Univ. of Kaiserslautern, Germany, [2]Apocare 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 (IPDT), *Benjamin Lai[1,2], George Netchev[2], Emma Henderson[1,2], Lothar Lilge[1,2]; [1]Dept. of Medical Biophysics, Univ. of Toronto, Canada, [2]Ontario Cancer Inst., Univ. Health Network, Canada.* An integrating cylinder with a measured 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 Lai[1,2], Lothar Lilge[1]; [1]Univ. of Toronto, Canada, [2]Ontario 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.

TuM • Joint CBS/TLA/NOIBA Poster Session—Continued

TuM40

Light Dosimetry in Collagen Phantoms in Presence of Methylene Blue and Intralipid, *Elisa M. Sales[1], Nasser A. Daghastanli[2], Maurício S. Baptista[3], Rosangela Itri[1]; [1]Physics Inst., Univ. of Sao Paulo (IFUSP), Brazil, [2]Engineering & Social Science Ctr., Univ. of ABC (CECS – UFABC), Brazil, [3]Chemistry Inst., Univ. of Sao Paulo (IQUSP), Brazil.* In this work we measured the transmittance 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 Awazu[1,2], Katsunori Ishii[1], Norihiro Honda[1]; [1]Osaka Univ., Japan, [2]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 Ionita; 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 Kulikov; Faculty of Physics and Mechanics, Dept. of Higher Mathematics, St. Petersburg Polytechnical 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 (EVLT), *Nermin Topaloglu[1], Ozgur Tabakoglu[1], Mehmet Umit Ergenoglu[2], Murat Gulsoy[1]; [1]Biomedical Engineering Inst., Bogazici Univ., Turkey, [2]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, *Valeriy A. Privalov[1], Igor V. Krochek[2], Ivan A. Abushkin[1], Igor I. Shumilin[1], Alexander V. Lappa[3]; [1]Chelyabinsk State Medical Acad., Russian Federation, [2]Chelyabinsk Municipal Hospital No.1, Russian Federation, [3]Chelyabinsk State Univ., Russian Federation.* Clinical trial in 508 osteomyelitis, 50 nonunion and 40 osteochondropathy cases proved the efficiency of laser osteoperforation for treatment of inflammatory and destructive bone diseases. The method promotes rapid inflammation reduction and stimulates bone reparation.

TuM46

Root Canal Microleakage Investigation after Nd:YAG Laser-Assisted Treatment, *Cosmin Balabuc[1], Carmen Todea[1], Laura Filip[1], Mircea Calniceanu[1], Camelia Demian[2], Cosmin Locovei[2], Aurel Raduta[2]; [1]School of Dentistry, "Victor Babeş" Univ. of Medicine and Pharmacy Timişoara, Romania, [2]Dept. of Mechanics and Vibration, Politehnica Univ. of Timişoara, Romania.* This *in vitro* study was conducted in order to assess using optical microscopy the apical sealing in Nd:YAG laser irradiated root canals in comparison with the conventional treatment method.

TuM47

Optical Tweezers and Manipulation of PMMA Beads in Various Conditions, *Domna Kotsifaki, Mersini Makropoulou, Alexandros Serafetinides; 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. Carnegie, D. J. Stevenson, M. Mazilu, F. Gunn-Moore, K. Dholakia; Univ. of St. Andrews, UK.* We present a study on the development of a viable mechanism for optically guided neuronal growth with the aid of a mathematical model, and detail the use of a spatial light modulator to control growth.

TuM49

Non-Ablative Processing of Biofibers by Femtosecond IR Laser, *Vladimir A. Hovhannisyan[1,2], Wen Lo[1], Chen-Yuan Dong[1]; [1]Natl. Taiwan Univ., Taiwan, [2]Yerevan Physics Inst., Armenia.* Controllable, non-ablative photo-processing of collagen, cotton and spider silk fibers was achieved by femtosecond Ti:Sa laser. Fibers were cut, bended and welded by the infrared laser and simultaneously imaged using SHG and two-photon auotofluorescence microscopy.

TuM50

An Experimental Study of Corneal Scattering for the Optimization of Femtosecond Keratoplasty, *Donald A. Peyrot[1], Florent Aptel[2], Caroline Crotti[1], Florent Deloison[1], Karsten Plamann[1], Michèle Savoldelli[2], Jean-Marc Legeais[2]; [1]Lab d'Optique Appliquée, ENSTA – Ecole Polytechnique – CNRS UMR 7639, France, [2]Lab Biotechnologie et Oeil, Hôtel-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 Plamann; Lab d'Optique Appliquée, ENSTA – Ecole Polytechnique – CNRS UMR 7639, France.* We present a mathematical model and a numerical analysis of the tissular 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 Crystalline Lenses, *Jesper H. Lundeman, Line Kessel, Kristine Herbst, Michael Larsen; Glostrup Hospital, Denmark.* We present new results of the transmission of visible and near infrared light of the human crystalline lenses 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 Cornea Surface after UV (λ=266 nm) Laser Irradiation, *Ellas Spyratou, Mersini I. Makropoulou, Kyros Moutsouris, Costas Bacharis, Alexandros 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.

Novel Optical Instrumentation for Biomedical Applications Posters

TuM54

Multispectral Imaging of the Ocular Fundus Using LED Illumination, *Nick Everdell[1], Iain Styles[2], Ela Claridge[2], Jeremy Hebden[1], Antonio Calcagni[2], Jon Gibson[3]; [1]Univ. College London, UK, [2]Univ. of Birmingham, UK, [3]Aston Univ., UK.* We present an imaging system based on LED illumination for obtaining multispectral optical images of the human ocular fundus. Initial images suggest that the system is an order of magnitude faster than comparable filter-based systems.

TuM55

Simultaneous Imaging of Blood Flow and Hemoglobin Concentration Change in Skin Tissue Using NIR Speckle Patterns, *Yoshihisa Aizu[1], Tatsuya Hirata[1], Takaaki Maeda[1], Izumi Nishidate[2], Naomichi Yokoi[3]; [1]Muroran Inst. of Technology, Japan, [2]Tokyo Univ. of Agriculture and Technology, Japan, [3]Asahikawa 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 Biochips by Holographic Diffractive Optical Elements, *Peter Macko, Maurice Whelan; Nanotechnology and Molecular Imaging Unit, Inst. for Health and Consumer Protection, European Commission–DG Joint Res. Ctr., Italy.* A fluorescence-based biochip with an integrated holographic diffractive element on its underside is presented. The diffractive element acts as a collector of fluorescence emitted from surface-bound emitters. The performance of the diffractive elements is demonstrated.

TuM57

Infrared Signature Analysis of the Thyroid Tumors, *Gheorghe V. Gavriloaia[1], Adina-Mariana G. Ghemigian[2], Mariuca-Roxana G. Gavriloaia[2]; [1]Univ. of Pitesti, Romania, [2]Medical and Pharmaceutical Univ. 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 Voit, Jan Schäfer, Alwin Kienle; Inst. für Lasertechnologien in der Medizin und Meßtechnik, Germany.* A comparison of simulation results between analytical solutions of Maxwell theory and radiative transfer theory is given 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 Buzalewicz, Katarzyna Wysocka, Halina Podbielska; Inst. of Biomedical Engineering and Instrumentation, Wroclaw Univ. of Technology, Poland.* A novel method of bacteria concentration evaluation based on Fourier and Mellin spectra investigation is proposed. The applied algorithm provides spatial and scale invariance, which leads to obtain comparative image processing method of bacteria colonies concentration determination.

Session continues on page 36.

Joint CBS/TLA/NOIBA Poster Session

TuM • Joint CBS/TLA/NOIBA Poster Session—Continued

TuM60
Polarization Selection of Two-Dimensional Phase-Inhomogeneous Pathologically Changed Biotissues Images, *Sergey B. Yermolenko, Yurij A. Ushenko, Vadim I. Istratyy, Pavlo V. Ivashko; 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.

TuM61
Polarization Metrology of John's Matrices Images of Pathologically Changed Biotissues, *Sergey B. Yermolenko, Yurij A. Ushenko, Alexander I. Dubolazov; Chernivtsi Natl. Univ., Ukraine.* The interrelation of orientation, anisotropy structure of biotissue architectonics and topological element distribution of John's Matrices is investigated. We researched the correlation of bioobject John's Matrices with matrix element indices measured in Fraunhofer's diffraction.

TuM62
Dynamic Imaging of Blood Microcirculation in the Olfactory Bulb of Rats, *Barbara L'Heureux, Mounir Bendahmane, Claire Martin, Hirac Gurden, Frederic Pain; Lab Imagerie et Modélisation en Neurobiologie et Cancérologie, CNRS, Univ. Paris XI/Univ. 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, Gennadiy Sayko, Alexandre Douplik; Erlangen Graduate School in Advanced Optical Technologies (SAOT), 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 vessel/capillary density and blood oxygenation, which helps to detect shock development.

TuM64
Spectropolarymetry in Singular Structure Biotissues Images for Diagnostics of their Pathological Changes, *Sergey Yermolenko[1], Yurij Ushenko[1], Alexander Prydiy[1], Stepan Guminetski[1], Ion Gruia[2]; [1]Chernivtsi Natl. Univ., Ukraine, [2]Univ. of Bucharest, Romania.* 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[1], V. M. Klementiev[1], A. G. Khamoyan[1], E. Ya Shevela[2], E. R. Chernykh[2]; [1]Inst. of Laser Physics, Siberian Branch of RAS, Russian Federation, [2]Inst. of Clinical Immunology, Siberian Branch of the Russian Acad. of Medical Science, Russian Federation.* 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 Bilyy[1], Vasyl' Getman[1], Roman Yaremyk[1], Yaroslav Ferensovich[1], Oksana Drobchak[1], Ihor Kotsyumbas[2], Ihor Kushnir[2]; [1]Lviv Natl. Univ., Ukraine, [2]State Scientific-Res. Control Inst. of Veterinary Preparations and Fodder 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 Berer, Hubert Grün, Peter Burgholzer; RECENDT Res. Ctr. 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.

16.00–16.30 Coffee Break, *Exhibition Hall*

Room 5, Ground Floor, Congress Centre

Joint ECBO-CLEO/Europe Session

16.30–18.30
JTuA • Joint ECBO-CLEO/Europe Session, Hot Topics: Molecules to Metabolism

Brian Pogue; Dartmouth College, USA, Presider
Kishan Dholakia; Univ. of St. Andrews, UK, Presider

JTuA1 • 16.30 Invited
Dynamics of DNA-Based Molecular Motors Measured with 1-bp Resolution, *Thomas T. Perkins; JILA/NIST and Univ. of Colorado at Boulder, USA.* Traditionally, biological optical-trapping experiments have resolved motions >1 nm. Yet, important biological motion occurs over even smaller distances. In particular, DNA-based molecular motors take steps as small as 0.34 nm [1 base pair (bp)]. I will review key technical advances necessary for measuring 1-bp steps, and highlight recent biological results.

JTuA2 • 17.00 Invited
Good Shape Photolysis, *Valentina Emiliani; Univ. Paris Descartes, France.* We present a new method to generated single and two-photon (2P) patterned photoactivation based on the combination of a spatial light modulator to control lateral light distribution and (in 2PE) a dispersive optical setup for temporal focusing to control and localize the illumination pattern in the axial direction. The system is applied for the sptiotemporal control of glutamate release in brain slices..

JTuA3 • 17.30 Invited
State-of-the-Art and Future of Ultrahigh Speed OCT, *Robert Huber; Ludwig-Maximilians-Univ. München, Germany.* The current status of ultrahigh speed OCT systems is reviewed and the usefulness of higher imaging speeds is discussed. Advantages and disadvantages of spectral OCT vs. swept source OCT systems for various applications are analyzed to provide a prognosis for future developments.

JTuA4 • 18.00 Invited
Maintaining Health: Optical Spectroscopy for Assessment of Metabolic Tissue Aging, *Lothar Lilge; Univ. Health Network, PMH/Ontario Cancer Inst., Canada.* Results of an optical spectroscopy study investigating healthy breasts in premenopausal women (25-45) demonstrated the ability to determine individualized rate of change in the tissue optical properties over a 3-year period with measurements performed at a 3-month interval. While the population average optical density decreased over time with a change similar to mammographic x-ray density, for the individual optical changes varied widely, with a small subgroup of women even showing an increase over the observation period.

Room 5, Ground Floor, Congress Centre

Optical Coherence Tomography and Coherence Techniques

9.00–10.00
WA • Functional OCT in Ophthalmology
Ton van Leeuwen; Acad. Medisch Centrum, The Netherlands, Presider

WA1 • 9.00 Invited
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.* 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.

WA2 • 9.30
Measuring Retinal Polarization Properties at the Micron Level *in vivo*, *Barry Cense[1,2], Omer P. Kocaoglu[1], Qiang Wang[1], Weihua Gao[1], Ravi S. Jonnal[1], Toyohiko Yatagai[2], Donald T. Miller[1]; [1]Indiana Univ., USA, [2]Utsunomiya Univ., Japan.* A polarization-sensitive OCT system was integrated with a sample arm containing adaptive optics. AO offers three distinct advantages for PS-OCT measurements: an increased signal-to-noise ratio, a higher lateral resolution and a smaller speckle size.

WA3 • 9.45
Optical Angiography from Optical Coherence Tomograhy Using a Computational Phase-Shift, *Hanno 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.

Room 11, 1st Floor, Congress Centre

Therapeutic Laser Applications and Laser-Tissue Interactions

9.00–10.00
WB • Cellular Surgery I
Lothar Lilge; Ontario Cancer Inst., Canada, Presider
Alfred Vogel; Univ. of Luebeck, Germany, Presider

WB1 • 9.00
"Light-Induced Nanoparticle-Activated Cell-Selection": Successful Stem Cell Purification in a Preclinical Model, *Florian Levold[1], Sebastian Ziewer[1], Frank Jüngerkes[1], Gereon Hüttmann[2], Andreas Limmer[1], Percy Knolle[1], Elmar Endl[1]; [1]Inst. of Molecular Medicine and Experimental Immunology, Univ. Hospital Bonn, Germany, [2]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.

WB2 • 9.15
Targeted Optoinjection of Single Gold Nanoparticles into Individual Mammalian Cells, *Craig McDougall[1], David J. Stevenson[1], Tom Brown[1], Frank Gunn-Moore[2], Kishan Dholakia[2,3]; [1]School of Physics and Astronomy, Univ. of St. Andrews, UK, [2]School of Biology, Univ. of St. Andrews, UK, [3]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.

WB3 • 9.30
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.

WB4 • 9.45
The Effect of Single Femtosecond Pulses on Gold Nanoparticles in an Aqueous Environment, *Omri Warshavski, Limor Minai, Dvir Yelin; Technion-Israel Inst. of Technology, Israel.* We present the observation of size reduction of gold nanoparticle followed by a series of high power single femtosecond pulses near the particles' resonance frequency. The effect was observed by spectral measurements and electron microscopy.

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

Clinical and Biomedical Spectroscopy

9.00–10.00
WC • Skin Diagnostics I
Lise L. Randeberg; Dept. of Electronics and Telecommunications, Norwegian Univ. of Science and Technology, Norway, Presider

WC1 • 9.00 Invited
Order and Structural Dynamics with Second Harmonic Generation Imaging, *Francesco Pavone; Univ. of Florence, Italy.* We will present a few examples where the use of second harmonic generation imaging is able to furnish information about the order of structures and the structural dynamics of molecoles up to the atomic scale.

WC2 • 9.30
***In vivo* Mutiphoton Tomography of Human Skin,** *Karsten Koenig[1,2], Rainer Bückle[1], Martin Weinigel[1], V. Katsoulidou[1], Karsten Koenig[3], Peter Elsner[3], Martin Kaatz[3]; [1]Jenlab GmbH, Germany, [2]Saarland Univ., Germany, [3]Univ. Jena, Germany.* High-resolution clinical multiphoton tomography of human skin has been performed for skin cancer detection and to study skin aging and the diffusion behaviour of suncreen nanoparticles.

WC3 • 9.45
Investigation of Discriminant Analysis Methods for the Diagnosis of Basal Cell Carcinoma, *Yan Jiao[1], Waseem Jerjes[2], Tahwinder Upile[2], C. A. Mosse[3], Martin Austwick[3], Stephen G. Bown[3], Colin Hopper[2]; [1]Natl. Medical Laser Ctr., Div. of Surgery and Interventional Science, Univ. College London Medical School, UK, [2]Dept. of Oral and Maxillofacial Surgery, Univ. College London Hospitals, UK, [3]Natl. Medical Laser Ctr., London, Div. of Surgery and Interventional Science, Univ. College London Medical School, UK.* Linear discriminant analysis and support vector machine were compared for correlating elastic scattering spectroscopy data with histopathology for the non-invasive, immediate, operator independent discrimination between normal skin and basal cell carcinomas. Both are effective.

10.00–10.30 Coffee Break, *Exhibition Hall*

Room 5, Ground Floor, Congress Centre

Optical Coherence Tomography and Coherence Techniques

10.30–12.30
WD • Pre-Clinical and Clinical Apps II
Yoshiaki Yasuno; Inst. of Applied Physics, Univ. of Tsukuba, Japan, Presider

WD1 • 10.30
Colorectal Neoplasm Characterization Based on Swept-Source Optical Coherence Tomography, *Chih-Wei Lu[1], Han-Mo Chiu[2], Chia-Wei Sun[3]; [1]Medical Electronics and Device Technology Ctr., Industrial Technology Res. Inst., Taiwan, [2]Dept. of Internal Medicine and Health Management Ctr., Natl. Taiwan Univ. Hospital, Taiwan, [3]Biophotonics Interdisciplinary Res. Ctr. and Inst. of Biophotonics, Natl. Yang-Ming Univ., Taiwan.* To detect the morphological changes between polyp 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.

WD2 • 10.45
3-D Fourier Domain Optical Coherence Tomography of Post Perfusion Fixated Ethanol-Filled Isolated Rabbit Lungs, *Sven Meissner[1], Lilla Knels[2], Edmund Koch[1]; [1]Univ. of Technology Dresden, Germany, [2]Medical Faculty Carl Gustav Carus, Germany.* 3-D Fourier domain optical coherence Tomography was used to image post-perfusion-fixated ethanol filled lungs to acquire realistic alveolar geometry, which is needed to develop numerical models of the lung on an alveolar scale.

WD3 • 11.00
Catheter-Based Intraluminal Optical Coherence Tomography (OCT) and Endoluminal Ultrasound in the Delineation of Different Wall Layers of Porcine Ureters *ex vivo*, *Ulrike L. Mueller-Lisse, Oliver A. Meissner, Margit Bauer, Christian Stief, Maximilian F. Reiser, Ullrich G. Mueller-Lisse; Univ. of Munich, Germany.* Catheter-guided optical coherence tomography (OCT) is a new means of intraluminal microstructural imaging, (spatial resolution of 10-20 µm). We compared distinction of tissue layers of porcine ureters *ex vivo* between OCT and endoluminal ultrasound (ELUS).

WD4 • 11.15
Optical Coherence Tomography in a Beating Heart Setup, *Guy Lamouche[1], Marc L. Dufour[1], Mark Hewko[2], Lori Gregorash[2], Bo Xiang[2], Gauthier Bruno[1], Sébastien Vergnole[1], Michael Smith[2], Christian Padioleau[1], Christian Degranpré[1], Charles-Etienne Bisaillon[1], Jean-Pierre Monchalin[1], Michael G. Sowa[2]; [1]Industrial Materials Inst., Natl. Res. Council Canada, Canada, [2]Inst. for Biodiagnostics - Natl. Res. Council Canada, Canada.* Optical coherence tomography (OCT) is performed in a beating heart setup. An excised porcine heart is suspended and allowed to beat naturally while being perfused. This is a great asset for intravascular OCT development.

Room 11, 1st Floor, Congress Centre

Therapeutic Laser Applications and Laser-Tissue Interactions

10.30–12.30
WE • Cellular Surgery II
Ralf Brinkmann; Univ. of Luebeck, Germany, Presider
Wolfgang Bäumler; Univ. of Regensburg, Germany, Presider

WE1 • 10.30 Invited
Mechanisms of Femtosecond Laser Cellular Optoporation, *Tobias Jachowski[1], Willem Bintig[2], Sebastian Eckert[1], Judith Baumgart[3], Anaclet Ngezahayo[2], Alexander Heisterkamp[3], Alfred Vogel[1]; [1]Univ. of Lübeck, Germany, [2]Inst. of Biophysics, Leibniz Univ., Germany, [3]Laser 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.

WE2 • 11.00
Repetition Rate Dependent Side Effects of fs Laser Based Cell Transfection, *Judith Baumgart[1], Kai Kuetemeyer[1], Willem Bintig[2], Anaclet Ngezahayo[2], Wolfgang Ertmer[3], Holger Lubatschowski[1], Alexander Heisterkamp[1]; [1]Laser Zentrum Hannover, Germany, [2]Inst. of Biophysics, Leibniz Univ. of Hannover, Germany, [3]Inst. of Quantum Optics, Leibniz Univ. of Hannover, Germany.* Membrane perforation 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.

WE3 • 11.15
Nanoparticle Mediated Laser Cell Perforation, *Markus Schomaker[1], Judith Baumgart[1], Anaclet Ngezahayo[2], Jörn Bullerdiek[3,4], Ingo Nolte[3], Hugo Murua Escobar[3,4], Holger Lubatschowski[1], Alexander Heisterkamp[1]; [1]Laser Zentrum Hannover e.V., Germany, [2]Inst. of Biophysics, Leibniz Univ., Germany, [3]Univ. of Veterinary Medicine Hanover, Germany, [4]Ctr. for Human Genetics, Univ. of Bremen, Germany.* We present our results for nanoparticle mediated laser poration as an alternative transfection technique. As a fundamental part to perforate the cell membrane the interactions of gold nanoparticles and living cells were studied.

Room 12, 1st Floor, Congress Centre

Novel Optical Instrumentation for Biomedical Applications

10.30–12.15
WF • Endoscopic Techniques
Melissa J. Suter; Harvard Medical School and Wellman Ctr. for Photomedicine, USA, Presider

WF1 • 10.30 Invited
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.* A hyperspectral fluorescence and polarisation resolved imaging system incorporating a rigid endoscope has been developed for tissue characterisation. Mueller matrices have been recorded for two commercial endoscopes to allow correction of their complex polarisation properties.

WF2 • 11.00
Multiple Channel Spectrally Encoded Endoscopy, *Avraham Abramov, Dvir Yelin; Dept. of Biomedical Engineering, Technion-Israel Inst. of Technology, Israel.* A new method for conducting speckle-free spectrally encoded endoscopy through separate illumination and imaging channels is presented. This approach may open new opportunities for color and fluorescence imaging through miniature endoscopic probes.

WF3 • 11.15
Comparative Study of Image Registration Techniques for Bladder Video-Endoscopy, *Achraf Ben Hamadou, Charles Soussen, Walter Blondel, Christian Daul, Didier Wolf; Ctr. de Recherche en Automatique de Nancy, France.* The detection of bladder cancer in endoscopic image sequences can be difficult. The aim of this contribution is to asses the performance of two mosaicing algorithms leading to maps (one unique image) facilitating the diagnosis.

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

Clinical and Biomedical Spectroscopy

10.30–12.30
WG • Skin Diagnostics II
Lise L. Randeberg; Dept. of Electronics and Telecommunications, Norwegian Univ. of Science and Technology, Norway, Presider

WG1 • 10.30
Correction of Raman Signals for Tissue Optical Properties, *Carina Reble[1,2], Ingo Gersonde[1], Stefan Andree[1], Jürgen Helfmann[1], Gerd Illing[1]; [1]Laser- und Medizin-Technologie GmbH, Berlin, Germany, [2]Technischen 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.

WG2 • 10.45
Multispectral Dermoscope, *Dimitrios Kapsokalyvas[1], Nicola Bruscino[2], Giovanni Cannarozzo[2], Vicenzo di Giorgi[2], Torello Lotti[2], Francesco Saverio Pavone[1]; [1]European Lab for Non-linear Spectroscopy (LENS), Univ. of Florence, Italy, [2]Dept. 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 can provide information on the localization of melanin, hemoglobin and scattering structures in the skin.

WG3 • 11.00
Clinical Spectral Diagnosis of Non-Melanoma Skin Cancer: Initial Pilot Study, *Narasimhan Rajaram[1], Dianne Kovacic[2], Michael R. Migden[3], Jason S. Reichenberg[2], Tri H. Nguyen[3], James W. Tunnell[1]; [1]Univ. of Texas at Austin, USA, [2]Univ. of Texas Medical Branch, USA, [3]Univ. of Texas M.D. Anderson Cancer Ctr., USA.* We report the results of a pilot clinical study using a combined diffuse reflectance/intrinsic fluorescence system on 37 patients with non-melanoma skin cancer and suggest a novel approach to analyze and spectrally diagnose skin lesions.

WG4 • 11.15
Spatially Resolved Bimodal Spectroscopy for Classification/Evaluation of Mouse Skin Inflammatory and Pre-Cancerous Stages, *Gilberto Díaz-Ayil, Marine Amouroux, Fabien Clanché, Yves Granjon, Walter C. P. M. Blondel; Nancy-Univ., France.* Spatially resolved autofluorescence and diffuse reflectance bimodal spectroscopy was used *in vivo* to discriminate various stages of skin precancer in a UV-irradiated mouse model. Various spectral characteristics extraction, selection and classification methods were implemented.

Room 5, Ground Floor, Congress Centre

Optical Coherence Tomography and Coherence Techniques

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. Negrutiu[1], Cosmin Sinescu[1], Mihai Rominu[1], Dubravka Markovic[2], Daniela M. Pop[1], Michael Hughes[3], Adrian Bradu[3], George Dobre[3], Adrian Gh Podoleanu[3]; [1]Faculty of Dentistry, "Victor Babeş" Univ. of Medicine and Pharmacy Timişoara, Romania, [2]Dept. of Dentistry, Faculty of Medicine, Univ. of Novi Sad, Serbia, [3]Applied 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 Kasseck[1], Marita Kratz[2], Antonia Torcasio[3], Nils C. Gerhardt[1], G. Harry van Lenthe[3], Thilo Gambichler[4], Klaus Hoffmann[4], David B. Jones[2], Martin R. Hofmann[1]; [1]Photonics and Terahertz Technology, Ruhr-Univ. Bochum, Germany, [2]Experimental Orthopaedics and Biomechanics, Philipps Univ. Marburg, Germany, [3]Div. of Biomechanics and Engineering Design, Katholieke Univ. Leuven, Belgium, [4]Dept. 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 Todea[1], Cosmin Balabuc[1], Laura Filip[1], Mircea Calniceanu[1], Adrian Bradu[2], Michael Hughes[2], Adrian Gh. Podoleanu[2]; [1]Univ. of Medicine and Pharmacy of Timisoara, Romania, Romania, [2]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-Albumin Mixture Concentration Measurements Using Refractive Low Coherence Interferometry—rLCI, *Jens Liebermann[1,2], Branislav Grajciar[2], Adolf F. Fercher[2]; [1]Ilmenau Technical Univ., Germany, [2]Medical Univ. of Vienna, Austria.* Using a refractive low coherence interferometry (rLCI) technique we determined the concentration of aqueous mixtures of glucose and albumin. The method is based on second-order dispersion derived from spectral phase of time-domain interferogram.

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 Optoporation and Pulsed Laser Surgery of Tissues, *Alfred Vogel, Sebastian Eckert, Tobias Jachowski, Xiao Xuan Liang, Sebastian Freidank, Norbert Linz; Univ. of Luebeck, Germany.* We developed a probe-beam scattering method for dosimetry of cellular optoporation 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 Xiao[1,2], Ping-Yu Hsu[1], Wei-Yu Liao[3], Chau-Hwang Lee[1,2]; [1]Inst. of Biophotonics, Natl. Yang-Ming Univ., Taiwan, [2]Res. Ctr. for Applied Sciences, Academia Sinica, Taiwan, [3]Dept. 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, *Kumudesh Sritharan[1,2], Benjamin Lai[1,2], Yumi Moriyama[1,2], Lothar Lilge[1,2]; [1]Ontario Cancer Inst., Univ. Health Network, Canada, [2]Dept. 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 vitro.*

WE7 • 12.15
Femtosecond Laser Based Enucleation of Porcine Oocytes for Somatic Cell Nuclear Transfer, *Kai Kütemeyer[1], Andrea Lucas-Hahn[2], Björn Petersen[2], Petra Hassel[2], Erika Lemme[2], Heiner Niemann[2], Alexander Heisterkamp[1]; [1]Laser Zentrum Hannover e.V., Germany, [2]Inst. für Nutztiergenetik (FLI), Germany.* We present a new minimally 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.

Room 12, 1st Floor, Congress Centre

Novel Optical Instrumentation for Biomedical Applications

WF • Endoscopic Techniques—Continued

WF4 • 11.30
Design and Validation of a Bimodal MRI-Optics Endoluminal Probe for Colorectal Cancer Diagnosis, *Anoop Ramgolam[1], Raphaël Sablong[1], Hervé Saint-Jalmes[2], Olivier Beuf[1]; [1]Univ. de Lyon, France, [2]Univ. 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.

WF5 • 11.45
Image Restoration for Video Endoscope Systems, *Benshung Chow; Natl. Sun 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.

WF6 • 12.00
Using Dispersion to Adjust Image Plane in Interferometric Spectrally Encoded Endoscopy, *Michal Merman, 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.

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

Clinical and Biomedical Spectroscopy

WG • Skin Diagnostics II—Continued

WG5 • 11.30
Spectroscopy and Finite Element Modeling for the Age Determination of Bruises, *Barbara Stam, Ton G. van Leeuwen, Maurice C. G. Aalders; Academic Medical Ctr. Amsterdam, The Netherlands.* Although accurate age determination of bruises is important for diagnosing child abuse, currently no suitable technique is available. Combining spatial information from spectroscopic measurements with finite element modeling may lead to an accurate age determination.

WG6 • 11.45
Reference Values of Skin Autofluorescence in Caucasian Healthy Subjects, *Marten Koetsier[1], H. L. Lutgers[2], C. de Jonge[3], A. M. van Roon[2], T. P. Links[2], A. J. Smit[2], Reindert Graaff[1]; [1]Dept. of Biomedical Engineering, Univ. Medical Ctr. Groningen and Univ. of Groningen, The Netherlands, [2]Dept. of Medicine, Univ. Medical Ctr. Groningen and Univ. of Groningen, Groningen, The Netherlands, [3]DiagnOptics Technologies B.V., The Netherlands.* Skin autofluorescence is a valuable marker in diabetes mellitus and other diseases with increased cardiovascular risk. The current study provides reference values for healthy Caucasian control subjects and shows the relation with subject age.

WG7 • 12.00
Spatially Resolved Reflectance Used to Deduce Absorption and Reduced Scattering Coefficients, *Stefan Andree, Jürgen Helfmann, Ingo Gersonde, Gerd Illing; Laser- und Medizin-Technologie GmbH, Berlin, Germany.* Presentation of a variable spectral spatially resolved reflectance set-up. A lookup table of Monte-Carlo simulations was used to infer absorption and reduced scattering coefficients of measured spectra. Evaluation was effected using phantoms.

WG8 • 12.15
Optical Properties of Bloodstains for Age Determination, *Rolf H. Bremmer, Martin J. C. van Gemert, Ton G. van Leeuwen, Maurice C. Aalders; Biomedical Engineering and Physics, Academic Medical Ctr., Univ. of Amsterdam, The Netherlands.* When blood exits the body, its main chromophore, oxy-hemoglobin, oxidizes to methemoglobin. We characterized the optical properties of a bloodstain to analyze it with diffuse reflectance spectra for age determination.

12.30–14.00 Lunch Break *(on your own)*

Room 5, Ground Floor, Congress Centre

Optical Coherence Tomography and Coherence Techniques

14.00–16.00
WH • Novel OCT Technology
Rainer A. Leitgeb; Medical Univ. Vienna, Austria, Presider

WH1 • 14.00
Comparison of Sensitivity for High Speed Fourier Domain OCT Systems, *Daniel Szlag, Ireneusz Grulkowski, Michalina Gora, Karol Karnowski, Andrzej Kowalczyk, Maciej Wojtkowski; Nicolaus Copernicus Univ., Poland.* The performance of Spectral OCT systems employing CCD/CMOS detectors and swept source OCT system is compared. The sensitivity values are demonstrated as functions of light intensity in reference arm. Contributions of noise sources are determined.

WH2 • 14.15
Multi-Band Ultrahigh Resolution Full-Field Optical Coherence Tomography, *Delphine Sacchet, Julien Moreau, Patrick Georges, Arnaud Dubois; Lab Charles Fabry de l'Inst. d'Optique, Univ. Paris-Sud, France.* Multi-band ultrahigh-resolution full-field optical coherence tomography, achieving a detection sensitivity of 90 dB and a micrometer-scale resolution in the three directions, is demonstrated using several detectors or a spectrally adjustable illumination source.

WH3 • 14.30
Efficiency and Contrast Enhancement in Full-Field OCT Using Non-Ideal Polarization Behavior, *Norman N. L. Lippok, Frédérique Vanholsbeeck, Poul Nielsen; Univ. of Auckland, New Zealand.* We present how to improve efficiency and dynamic range for interferometric systems by taking advantage of the finite extinction ratio of a polarizing beam splitter. The technique has been demonstrated on a full-field OCT system.

WH4 • 14.45
High Resolution Simultaneous Dual-Band Spectral Domain Optical Coherence Tomography, *Stefan Kray, Felix Spöler, Michael Först, Heinrich Kurz; Inst. of Semiconductor Electronics, RWTH Aachen Univ., Germany.* We present a fiber-based spectral-domain optical coherence tomography system, measuring simultaneously at 740nm and 1230nm central wavelengths. Real-time imaging is demonstrated with outstanding spectroscopic contrast and axial resolutions <3µm and <5µm, respectively.

Room 11, 1st Floor, Congress Centre

Therapeutic Laser Applications and Laser-Tissue Interactions

14.00–16.00
WI • Opthalmology
Martin Frenz; Univ. of Bern, Switzerland, Presider

WI1 • 14.00 Invited
Dynamics of Laser Induced Transient Micro Bubble Clusters in the Retinal Pigment Epithelium, *Andreas Fritz[1], Lars Ptaszynski[1], Hardo Stoehr[2], Ralf Brinkmann[1,2]; [1]Medical Laser Ctr. Luebeck, Germany, [2]Univ. of Luebeck, Germany.* The dynamics of microbubbles gernerated by µs and ns laser pulses around clustered microabsorbers were investigated by optical interferometry and high speed photography in order to optimize the irradiation parameters for selective retina therapy (SRT).

WI2 • 14.30
Time Resolved Detection of Tissue Denaturation during Retinal Photocoagulation, *Kerstin Schlott[1], Jens Langejürgen[2], Marco Bever[1], Reginald Birngruber[1,2], Ralf Brinkmann[1,2]; [1]Medical Laser Ctr. Luebeck, Germany, [2]Inst. of Biomedical Optics, Univ. of Luebeck, Germany.* In order to analyse retinal photocoagulation, the change of optical and biomechanical tissue properties is measured time resolved by optical transmission of the laser light and by optoacoustics and compared to final lesion sizes.

WI3 • 14.45
Optical Coherence Tomography Controlled Femtosecond Laser Pulse Treatment of Tractional Retinal Detachment, *Anja Hansen[1], Holger Lubatschowski[1], Ronald R. Krueger[2]; [1]Laser Zentrum Hannover e.V., Germany, [2]Cole Eye Inst., Cleveland Clinic Foundation, USA.* We present an optical system that allows for precisely delivering femtosecond laser pulses for a photodisruption process in the posterior segment of open-sky eyes with optical coherence tomography control of the focal depth.

Room 12, 1st Floor, Congress Centre

Diffuse Optical Imaging

14.00–16.00
WJ • Experimental Techniques III
Anabela Da Silva; LETI-CEA Recherche Technologique, France, Presider
Jens Steinbrink; Charité-Univ.-Medizin Berlin, Germany, Presider

WJ1 • 14.00
Advantages of Fluorescence over Diffuse Reflectance Measurements Tested in Phantom Experiments with Dynamic Inflow of ICG, *Daniel Milej, Michał Kacprzak, Adam Liebert, Roman Maniewski; Inst. of Biocybernetics and Biomedical Engineering, Poland.* Time-resolved measurements of diffuse reflectance and fluorescence were carried out on phantom with dynamic inflow of indocyanine green at different depths. Preliminary results show better sensitivity of fluorescence signals to the inflow of the dye.

WJ2 • 14.15
Influence of SNR on Statistical Analysis of Spatial Extent of Brain Activation Measured by Multi-Spectral Imaging, *Naotaka Sakashita[1], Koichiro Sakaguchi[1], Satoshi Matsuo[1], Haruka Nakayama[1], Takushige Katsura[2], Kyoko Yamazaki[2], Naoki Tanaka[2], Hideo Kawaguchi[2], Atsushi Maki[2], Eiji Okada[1]; [1]Keio Univ., Japan, [2]Advanced Res. Lab, Hitachi, Ltd., Japan.* The relationship between the spatial extent of the brain activation estimated by statistical analysis and the SNR of the concentration changes is investigated. The spatial extent decreases with a decrease in the SNR.

WJ3 • 14.30
Angle-Resolved Ellipsometric Data for Selective Imaging in Scattering Media, *Claude Amra, Jacques Sorrentini, Laurent Arnaud, Myriam Zerrad, Philippe Tchamitchian, Anabela Da Silva, Gaelle Georges, Carole Deumie; Inst. Fresnel, Aix-Marseille Univ., France.* Angle-resolved ellipsometric data are recorded on light scattering and provide a real-time process for selective imaging in scattering media such as biological tissues. Surface and bulk effects are separated for a selective screening inside tissues.

WJ4 • 14.45
Optical Tissue Characterisation: Goodness of Estimation, *Laurent Guyon, Anne Planat-Chrétien, Jean-Marc Dinten; Electronics and Information Technology Lab of the French Atomic Energy Commission (CEA LETI), France.* Statistical functions help judging optical parameters estimation at different experimental conditions. We show that X^R_2 function is a powerful tool for judging goodness of fit and finding fitting interval, providing enough photons are acquired.

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

Clinical and Biomedical Spectroscopy

14.00–16.00
WK • Biospectroscopy and Point-of-Care Diagnostics I
Roberto Pini; Inst. di Fisica Applicata, Italy, Presider

WK1 • 14.00 Invited
Title to Be Announced, *Niek van Hulst; ICFO, Spain.* Abstract not available.

WK2 • 14.30
Diagnostic Biochip System Using SPRI—Critical Influence of Substrate Preparation, *Jolanda Spadavecchia[1], Julien Moreau[1], Michael Canva[1], Maria Grazia Manera[2], Andrej Savchenko[3], Roberto Rella[2]; [1]Lab Charles Fabry, Inst. d'Optique, Univ. Paris Sud, CNRS, France, [2]Inst. per la Microelettronica e Microsistemi-CNR-Unit of Lecce, Univ. Campus via Monteroni, Italy, [3]Inst. of Semiconductor Physics, NAS, Ukraine.* We demonstrate here the critical influence of thin gold film preparation on the surface chemistry binding efficiency in SPRI biochips systems. Significant variation of DNA-DNA hybridization signal is observed within a family of annealed samples.

WK3 • 14.45
Label-Free Optical Detection of Biomolecules by Molecular Interferometric Imaging, *Ming Zhao, Xuefeng Wang, David D. Nolte; Purdue Univ., USA.* We present molecular interferometric imaging (MI2) as a label-free optical detection platform for molecular recognition that has sensitivity close to single molecule detection using shearing interferometric microscopy.

Room 5, Ground Floor, Congress Centre

Optical Coherence Tomography and Coherence Techniques

WH • Novel OCT Technology—Continued

WH5 • 15.00
Evaluation of a Cheap Ultrasonic Stage for Light Source Coherence Function Measurement and Dynamic Focusing, *Nikola Krstajic[1], Stephen J. Matcher[1], David Childs[1], Wiendelt Steenbergen[2], Richard Hogg[1], Rod Smallwood[1]; [1]Univ. of Sheffield, UK, [2]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.

WH6 • 15.15
Demonstrating Magnetic Optical Coherence Elastography (M-OCE) in Tissue Phantoms, *Alex Grimwood[1], Leo Garcia[2], Jeff Bamber[2], Quentin Pankhurst[1], Jon Holmes[3]; [1]Royal Inst. of Great Britain, UK, [2]Inst. of Cancer Res., UK, [3]Michelson Diagnostics, Ltd., UK.* The authors convey proof of principle for magnetic optical coherence elastography (M-OCE). By combining data from finite element modeling (FEM) and tissue phantoms, we demonstrate the potential of this unique non-contact elastographic technique.

WH7 • 15.30
Gabor Domain Optical Coherence Microscopy, *Jannick P. Rolland[1], Panomsak Meemon[2], Supraja Murali[2], Kye-Sung Lee[2], Kelvin P. Thompson[3]; [1]Inst. of Optics, Univ. of Rochester, USA, [2]CREOL, The College of Optics and Photonics, Univ. of Central Florida, USA, [3]Optical Res. Associates, USA.* We propose a developing technology called Gabor domain optical coherence microscopy (GD-OCM) with the design, fabrication and testing of an invariant ~2μm lateral resolution dynamic-focusing probe in a 2mm cubic sample.

WH8 • 15.45
Coherence-Domain Holography for Real-Time Imaging Applications Using a Photorefractive Polymer Device as Recording Medium, *Michael Salvador[1], Jacek Prauzner[1], Sebastian Köber[1], Klaus Meerholz[1], Kwan Jeong[2], David D. Nolte[3]; [1] Dept. of Chemistry, Univ. of Cologne, Germany, [2] Dept. of Physics and Chemistry, Korea Military Acad., Republic of Korea, [3] Dept. of Physics, Purdue Univ., USA.* Using coherence-gated holography image bearing ballistic light can be captured in real-time without computed tomography. We demonstrate depth-resolved imaging of rat tumor spheroids using a highly sensitive photorefractive polymer composite as recording medium.

Room 11, 1st Floor, Congress Centre

Therapeutic Laser Applications and Laser-Tissue Interactions

WI • Opthalmology—Continued

WI4 • 15.00
Optical Real-atime Dosimetry for Selective Retina Therapy (SRT), *Ralf Brinkmann[1], Andreas Fritz[2], Lars Ptaszynski[2], Mark Saeger[3], Hardo Stoehr[1], Johann Roider[3], Reginald Birngruber[1]; [1]Univ. of Luebeck, Germany, [2]Medical Laser Ctr. Luebeck, Germany, [3]Univ. Clinics Schleswig-Holstein, Germany.* Selective retina therapy (SRT) is a new method to treat selectively the RPE by intracellular microvaporization. Since these effects are invisible, we present two optical techniques to monitor bubble nucleation for online dosimetry control.

WI5 • 15.15
Femtosecond-Lentotomy Treatment: Six-Month Follow-up of *in vivo* Treated Rabbit Lenses, *Silvia Schumacher[1], Michael Fromm[1], Uwe Oberheide[2], Patricia Bock[3], Ilka Imbschweiler[3], Heike Hoffmann[1], Andreas Beinecke[3], Georg Gerten[2], Alfred Wegener[4], Holger Lubatschowski[1]; [1]Laser Zentrum Hannover e.V., Germany, [2]Laserforum e.V., Germany, [3]Dept. of Pathology, Univ. of Veterinary Medicine, Germany, [4]Dept. of Ophthalmology, Univ. of Bonn, Germany.* Our aim was to evaluate the changes of the crystalline lens and retina of living rabbit eyes due to a fs-lentotomy treatment using OCT, Scheimpflug imaging and histological sections up to six months postoperatively.

WI6 • 15.30
Photobleaching of a Human Donor Lens Using an 800 nm Femtosecond Laser, *Line Kessel[1], Lars Eskildsen[1,2], Mike van der Poel[2], Michael Larsen[1]; [1]Dept. of Ophthalmology, Glostrup Hospital, Univ. of Copenhagen, Denmark, [2]DTU-Fotonik, Dept. of Photonics Engineering, Technical Univ. of Denmark, Denmark.* Photobleaching of a human donor lens was demonstrated using a femtosecond laser emitting light at 800 nm. Pulse duration was 2-300 femtoseconds and pulse energy was 0.1 μJ.

WI7 • 15.45
Wavelength Optimization in Femtosecond Laser Corneal Surgery: Experimental Results on Tissue, *Caroline Crotti[1], Florent Deloison[1], Donald A. Peyrot[1], Michèle Savoldelli[2], Jean Marc Legeais[2], Frédéric Roger[3], Karsten Plamann[1]; [1]Lab d'Optique Appliquée, Ecole Natl. Supérieure de Techniques Avances, Ecole Polytechnique, Ctr. Natl. de la Recherche UMR, France, [2]Lab Biotechnologie et Oeil, France, [3]Unité de Mécanique, Ecole Natl.e Supérieure de Techniques Avances, France.* Experimental cuts have been performed at wavelengths around 1600 nm and have been compared to those already done at 800 nm and 1000 nm. Comparisons of penetration depth and incision quality are presented.

Room 12, 1st Floor, Congress Centre

Diffuse Optical Imaging

WJ • Experimental Techniques III—Continued

WJ5 • 15.00
Evaluation of Spatial Resolution of Near-Infrared Topography by a Digital Head Phantom, *Eiji Okada[1], Naoya Kiryu[1], Hirokazu Kakuta[1], Hiroshi Kawaguchi[2]; [1]Dept. of Electronics and Electrical Engineering, Keio Univ., Japan, [2]Natl. Inst. of Radiological Science, Japan.* The spatial resolution of near-infrared topography is evaluated by a digital head phantom. The topographic images are obtained from the data measured by two probe arrangements and are calculated by two imaging algorithms.

WJ6 • 15.15
Development of a Diffuse Optical Spectroscopic Imaging System for Intensive Care Medicine, *Yo-Wei Lin[1], Ming-Lung Chuang[2], Shinn-Jye Liang[3], Jui-che Tsai[1], Chih-Wei Lu[4], Chia-Wei Sun[5]; [1]Graduate Inst. of Photonics and Optoelectronics, Natl. Taiwan Univ., Taiwan, [2]China Medical Univ. Hospital Taipei Branch, Taiwan, [3]China Medical Univ. Hospital, Taiwan, [4]Medical Electronics and Device Technology Ctr., Industrial Technology Res. Inst., Taiwan, [5]Biophotonics Interdisciplinary Res. Ctr. and Inst. of Biophotonics, Natl. Yang-Ming Univ., 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 *in vivo* measurements form healthy and patients in intensive care unit.

WJ7 • 15.30
A New Deconvolution Technique for Time-Domain Signals in Diffuse Optical Tomography without *a priori* Information, *Geoffroy Bodi, Yves Bérubé-Lauzière; Univ. de Sherbrooke, Canada.* We present a new method for deconvoluting time domain signals for use in diffuse optical tomography. As an advantage, our method does not use *a priori* information about the signal.

WJ8 • 15.45
Measurements of Cerebral Blood Flow and Blood Oxygenation with Diffuse Optics in Patients after Severe Brain Injury, *Meeri N. Kim[1], Turgut Durduran[1], Suzanne Frangos[1], Brian L. Edlow[1], Erin M. Buckley[1], Heather Moss[1], Chao Zhou[1], Guoqiang Yu[1,2], Regine Choe[1], Eileen Maloney-Wilensky[1], Ronald L. Wolf[1], John H. Woo[1], M. Sean Grady[1], Joel H. Greenberg[1], Joshua Levine[1], John A. Detre[1], W. Andrew Kofke[1], Arjun G. Yodh[1]; [1]Univ. of Pennsylvania, USA, [2]Univ. of Kentucky, USA.* In order to explore its feasibility as a bedside monitor, a hybrid diffuse optical device was used to monitor severely head injured patients with diffuse correlation and near-infrared spectroscopies.

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

Clinical and Biomedical Spectroscopy

WK • Biospectroscopy and Point-of-Care Diagnostics I—Continued

WK4 • 15.00
Optical Biosensor for Point-of-Care Cardiac Marker Detection, *Henrik S. Sørensen[1], Søren T. Jepsen[1], Peter R. Hansen[2], Niels B. Larsen[1], Peter E. Andersen[1], Darryl J. Bornhop[3]; [1]Technical Univ. of Denmark, Denmark, [2]Gentofte Univ. Hospital, Denmark, [3]Vanderbilt Univ., USA.* Back scattering interferometry has been used to monitor biochemical reactions in very dilute samples. This has been done label-free and in free-solution in picoliter sample volumes. Results on cardiac markers for point-of-care applications are presented.

WK5 • 15.15
Dynamic Detection on Specific Proinflammatory Cytokine following Spinal Cord Injury Using Fluorescence Anisotropy and Fluorescence Cross-Correlation Spectroscopy, *Chia-Yan Wu, Chung-Shi Yang, Lu-Wei Lo; Div. of Medical Engineering Res., Natl. Health Res. Inst., Taiwan.* In cerebral ischemia, TNFα plays the critical roles in immunomodulatory and proinflammatory in neuroinflammation. The optical biosensing platforms were designed for analysis on pro-Inflammatory cytokines following injury using fluorescence anisotropy decays and fluorescence cross-correlation spectroscopy.

WK6 • 15.30
Multiplexed Diagnostics and Spectroscopic Ruler Applications with Terbium to Quantum Dots FRET, *Daniel Geißler[1], Nathaniel G. Butlin[2], Hans-Gerd Löhmannsröben[1], Niko Hildebrandt[3]; [1]Physikalische Chemie, Univ. Potsdam, Germany, [2]Lumiphore, Inc., USA, [3]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.

WK7 • 15.45
A Membrane-Associated FRET Sensor for Detection of Apoptosis, *Herbert Schneckenburger[1], Michael Wagner[1], Petra Weber[1], Thomas Bruns[1], Heiko Steuer[2], Brigitte Angres[2]; [1]Hochschule Aalen, Inst. für Angewandte Forschung, Germany, [2]NMI Nuturwissenschaftliches und Medizinisches Inst., Univ. Tübingen, 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.

16.00–16.30 Coffee Break, *Exhibition Hall*

Room 5, Ground Floor, Congress Centre

Optical Coherence Tomography and Coherence Techniques

16.30–18.30
WL • Ophthalmic OCT II
Wolfgang Drexler; Cardiff Univ., UK, Presider

WL1 • 16.30 Invited
High-Speed and High-Sensitive Optical Coherence Angiography, *Shuichi Makita, Masahiro Yamanari, Yoshiaki Yasuno; Computational Optics Group, Univ. of Tsukuba, 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.

WL2 • 17.00
Heartbeat-Induced Axial Eye Motion Artifacts during Optical Coherence Tomography Measurements, *Roy de Kinkelder[1,2], Jeroen Kalkman[1], Pauline H. B. Kok[1], Dirk J. Faber[1], Frank D. Verbraak[1], Ton G. van Leeuwen[1]; [1]Academic Medical Ctr., The Netherlands, [2]Topcon Europe Medical b.v., The Netherlands.* The relation between the axial eye movements during optical coherence tomography measurements and heart beat is investigated. Correlations are found of 0.64, 0.51 and 0.71 between low frequency movements and heartbeat in three healthy volunteers.

WL3 • 17.15
Imaging of the Whole Anterior Eye Segment with Full-Range Complex Spectral Domain Optical Coherence Tomography, *Johannes Jungwirth, Bernhard Baumann, Erich Götzinger, Michael Pircher, Christoph K. Hitzenberger; 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.

WL4 • 17.30 Invited
Ultrahigh Speed Spectral/Fourier Domain OCT Imaging in Ophthalmology, *Benjamin Potsaid[1,2], Iwona Gorczynska[1,3], Vivek J. Srinivasan[1], Yueli Chen[1,3], Jonathan Liu[1], James Jiang[2], Alex Cable[2], Jay S. Duker[3], James G. Fujimoto[1]; [1]MIT, USA, [2]Thorlabs, Inc., USA, [3]New England Eye Ctr. and Tufts Medical Ctr., USA.* Ultrahigh speed spectral/Fourier domain ophthalmic OCT imaging at 70,000-312,500 axial scans per second is demonstrated. Dense 2-D/3-D data sets and 4-D-OCT repeated volume imaging may offer alternative methods for diagnostics and monitoring of disease.

Room 11, 1st Floor, Congress Centre

Therapeutic Laser Applications and Laser-Tissue Interactions

16.30–18.15
WM • Novel Approaches
Christoph Haisch; Tech. Univ. Munich, Germany, Presider
Ronald Sroka; Univ. of Munich, Germany, Presider

WM1 • 16.30
Dependence of Optoacoustic Transients on Exciting Laser Parameters for Online Monitoring of Retinal Photocoagulation, *Jens Langejürgen[1], Kerstin Schlott[2], Marco Bever[2], Katharina Herrmann[2], Wenfeng Xia[1], Reginald Birngruber[2], Ralf Brinkmann[1,2]; [1]Inst. of Biomedical Optics, Univ. of Luebeck, Germany, [2]Medical Laser Ctr. Luebeck, Germany.* Retinal photocoagulation can be monitored real-time by optoacoustics. Amplitudes and frequencies of acoustic waves excited by ns to µs laser pulses of different wavelengths are examined using different ultrasonic detectors to optimize the method.

WM2 • 16.45
Dynamic and Interaction of fs-Laser Induced Cavitation Bubbles for Analysing the Cutting Effect, *Nadine Tinne, Silvia Schumacher, Tammo Ripken, Holger Lubatschowski; Laser Zentrum Hannover e.V., Germany.* Fs-laser pulses with different repetition rates and pulse energies lead to observable changes in tissue dissection quality. We present a high-speed photography analysis of cavitation bubble interaction varying the spatial and temporal distance.

WM3 • 17.00
Novel Approaches for Selective Laser-Induced Transport of Histological Sections and Cells, *Sebastian Eckert[1], Maike Blessenohl[2], Kristina Lachmann[3], Claus-Peter Klages[3], Andreas Gebert[2], Alfred Vogel[1]; [1]Inst. of Biomedical Optics, Univ. of Luebeck, Germany, [2]Inst. of Anatomy, Univ. of Luebeck, Germany, [3]Fraunhofer-Inst. for Surface Engineering and Thin Films, Germany.* We present a non-fluorescent adhesive layer system for contact-free procurement of large pieces of histologic material. In a second approach, plasma generation within the glass slide creates a shock wave that drives material transport.

WM4 • 17.15
Microfluidics and Femtosecond Laser Technology Enable High-Throughput *in vivo* Study of Neural Regeneration, *Christopher Rohde, Fei Zeng, Cody Gilleland, Chrysanthi Samara, Mehmet F. Yanik; MIT, USA.* We present microfluidic technologies for manipulating and immobilizing the nematode *C. elegans*, which enable rapid studies of neural regeneration using powerful optical techniques including multi-photon microscopy and femtosecond laser nanosurgery.

WM5 • 17.30
Development of a Localized X-Ray Source for the Pin-Point Treatment of Cancers Using Femt-Second Laser, *Nobuki Kawashima[1], Hironori Muramatsu[2], Chuji Yanagimoto[2], S. Kajiwara[1], Masaaki Miyazawa[1], I. Imasaki[3]; [1]Kinki Univ., Japan, [2]Laserck Inc, Japan, [3]Inst. of Laser Technology, Japan.* A localized X-ray source for the pin-point treatment of cancers using a femt-second laser has been developed. An hour irradiation resulted in almost a complete death of a layer of cancer cells.

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

Clinical and Biomedical Spectroscopy

16.30–18.15
WN • Biospectroscopy and Point-of-Care Diagnostics II
Roberto Pini; Inst. di Fisica Applicata, Consiglio Nazionale delle Ricerche, Italy, Presider

WN1 • 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 März[1], Thomas Henkel[2], Jürgen Popp[1,2]; [1]Friedrich-Schiller-Univ. Jena, Germany, [2]Inst. für Photonische Technologien, 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.

WN2 • 16.45
Spectral Cytopathology: Infrared and Raman Spectroscopy of Individual Human Cells, *Max Diem[1], Benjamin Bird[1], Christian Matthäus[1], Miloš Miljković[1], Jennifer Schubert[1], Tatyana Chernenko[1], Kostas Papamarkakis[1], Nora Laver[2]; [1]Northeastern Univ., USA, [2]Tufts Univ. Medical Ctr., USA.* Microspectral data of individual cells reveal 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.

WN3 • 17.00
Two-Dimensional Resonance-Raman Signatures for Identification of Cells and Bacteria in Complex Environments, *Jacob Grun[1], Pratima Kunapareddy[2], Sergei Nikitin[2], David Gillis[1], Zheng Wang[1], Robert Lunsford[2], Charles Manka[2], Jeffrey Bowles[1]; [1]NRL, USA, [2]Res. Support Instruments, USA.* Two-dimensional resonance-Raman signatures of bacteria and cells, stimulated by sequential illumination with wavelengths between 210 and 280 nm at intervals of about 1nm, are measured, to enable rapid identification in complex environments and bio matrices.

WN4 • 17.15
Localization and Identification of Bacteria by Means of Micro-Raman Spectroscopy and Fluorescence Imaging, *Petra Rösch[1], Stephan Stöckel[1], Susann Meisel[1], Wilm Schumacher[1], Jürgen Popp[1,2]; [1]Inst. of Physical Chemistry, Friedrich-Schiller-Univ. Jena, Germany, [2]Inst. für Physikalische Hochtechnologie e. V., Germany.* Bacteria identification without time delay is essential for e.g. medical diagnosis. Combining fluorescence imaging for the localization and micro-Raman spectroscopy for the identification of single microbial cells fulfills this requirement without the need of cultivation.

WN5 • 17.30
UTI Diagnosis and Antibiogram Using Raman Spectroscopy, *Evdokia Kastanos[1], Alexandros Kyriakides[2], Katerina Hadjigeorgiou[2], Constantinos Pitris[2]; [1]Univ. of Nicosia, Cyprus, [2]Univ. of Cyprus, Cyprus.* Raman spectroscopy is investigated for performing identification and antibiogram 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.

Room 5, Ground Floor, Congress Centre

Optical Coherence Tomography and Coherence Techniques

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 Grulkowski, 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 enable reconstructing the blood vessels situated in choroidal and scleral layers.

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*, *Radu G. Cucu[1], Mark W. Hathaway[2], Adrian Podoleanu[1,3], Richard B. Rosen[2,3]; [1]Univ. of Kent, UK, [2]Ophthalmic Technologies Inc - OPKO, Canada, [3]New 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.

Room 11, 1st Floor, Congress Centre

Therapeutic Laser Applications and Laser-Tissue Interactions

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 Gharekhan[1], Ashok Oza[1], M. B. Sureshkumar[2], Prasanta K. Panigrahi[3,4], Asima Pradhan[5]; [1]C.U. Shah Science College, India, [2]Dept. of Physics, Faculty of Science, The M.S. Univ. of Baroda, India, [3]Physical Res. Lab, India, [4]Indian Inst. of Science Education and Res. (IISER), India, [5]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 Buard[1,2], Wojciech Trzepizur[3,4], Guillaume Mahe[3], François Chapeau-Blondeau[2], David Rousseau[2], Frédéric Gagnadoux[4], Pierre Abraham[3], Anne Humeau[1,2]; [1]Groupe ESAIP, France, [2]Lab d'Ingénierie des Systèmes Automatisés (LISA), Univ. d'Angers, France, [3]Lab de Physiologie et d'Explorations Vasculaires, Ctr. Hospitalier Universitaire d'Angers, France, [4]Dept. de Pneumologie, Ctr. Hospitalier Universitaire d'Angers, France.* 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

Clinical and Biomedical Spectroscopy

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 Rommel[1], Sabine Przibilla[2], Gert von Bally[2], Björn Kemper[2], Juergen Schnekenburger[1]; [1]Dept. of Medicine B, Univ. of Muenster, Germany, [2]Ctr. 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.

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

Room 5, Ground Floor, Congress Centre

Clinical and Biomedical Spectroscopy

9.00–10.00
ThA • Minimally Invasive Diagnostics I
Paul French; Imperial College London, UK, Presider

ThA1 • 9.00 Invited
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 eflectance 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 Zheng, Jianhua Mo, Xiaozhuo 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.

Room 11, 1st Floor, Congress Centre

Therapeutic Laser Applications and Laser-Tissue Interactions

9.00–10.00
ThB • Photodynamic Therapy I
Barbara Krammer; Univ. of Salzburg, Austria, Presider

ThB1 • 9.00
Antimicrobial Properties of Light-Activated Polyurethane Containing Indocyanine Green, *Stefano Perni[1], Clara Piccirillo[2], Polina Prokopovich[3], Jonathan Pratten[1], Ivan P. Parkin[2], Mike Wilson[1]; [1]Eastman Dental Inst., Univ. College London, UK, [2]Materials Chemistry Res. Ctr., Dept. of Chemistry, Univ. College London, UK, [3]Wolfson School of Mechanical and Manufacturing Engineering, Loughborough Univ., UK.* Polyurethane containing indocyanine green was prepared through swell-encapsulation. When exposed to laser light (808 nm), MRSA and *Staphylococcus epidermidis* showed 2 $\log_{10}$ reduction, whilst for *Escherichia coli* and *Pseudomonas aeruginosa* the reduction was 0.5 $\log_{10}$.

ThB2 • 9.15
Merocyanine-540 Mediated Photodynamic Effects on *Staphylococcus epidermidis* Biofilms, *Maria Sonia Sbarra[1,2], Antonella Di Poto[1,2], Enrica Saino[1,2], Livia Visai[1,2], Paolo Minzioni[3], Francesca Bragheri[3], Ilaria Cristiani[3]; [1]Univ. of Pavia, Biochemistry Dept., Italy, [2]Ctr. for Tissue Engineering, Italy, [3]CNISM and Univ. of Pavia, Italy.* We evaluated the antimicrobial activity of laser-activated merocyanine-540 on the survivability of two *Staphylococcus epidermidis* strains. Significant inactivation of cells was observed in the biofilms treated with MC-540 and then exposed to laser radiation.

ThB3 • 9.30
Photochemical Model of Photodynamic Therapy Applied to Skin Diseases by a Topical Photosensitizer, *Félix Fanjul-Vélez[1], Irene Salas-García[1], Luis Alberto Fernández-Fernández[2], María López-Escobar[3], Luis Buelta-Carrillo[4], Noé Ortega-Quijano[1], José Luis Arce-Diego[1]; [1]Applied Optical Techniques Group, TEISA Dept., Univ. of Cantabria, Spain, [2]Mathematics, Statistics and Computation Dept., Univ. of Cantabria, Spain, [3]Dermatology Dept., Marqués de Valdecilla Univ. Hospital, Spain, [4]Medical and Surgery Sciences Dept., Univ. of Cantabria, Spain.* Photodynamic therapy (PDT) is efficient on skin diseases. We use a photochemical model of the PDT process applied to the skin by means of a topical photosensitizer, in order to optimize the PDT parameters.

ThB4 • 9.45
Laser-Induced Ion Channel Activation in HaCaT Keratinocytes: A Possible Role for Singlet Oxygen Mediation, *Svetlana A. Zolotovskaya[1], Sergei G. Sokolovski[1], Julie Woods[2], Irwin McLean[3], Paul A. Campbell[1,3], Edik U. Rafailov[1]; [1]Carnegie Lab of Physics, School of Engineering, Physics and Mathematics, Univ. of Dundee, UK, [2]Dept. of Dermatology, Ninewells Hospital & Medical School, Univ. of Dundee, UK, [3]Div. of Molecular Medicine, College of Life Sciences, Univ. of Dundee, UK.* Direct photoactivation of molecular oxygen in organic solutions of singlet oxygen quenchers by means of a novel laser diode, emitting at 1262nm, is demonstrated. Laser-induced single channel activation of HaCaT immortalised skin keratinocytes is observed.

10.00–10.30 Coffee Break, *Exhibition Hall*

Room 5, Ground Floor, Congress Centre

Clinical and Biomedical Spectroscopy

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 Cutaneous Blood Perfusion, *Pavel Zakharov, Mark Talary, Andreas Caduff; Solianis Monitoring AG, Switzerland.* A double-wavelength optical sensor for monitoring of cutaneous blood perfusion is presented. A simulation of partial differential pathlengths 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. Huong, 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. Weston[1,2], Michael S. Patterson[1,2]; [1]McMaster Univ., Canada, [2]Juravinski Cancer Ctr., Canada.* MLL 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, *André Steimers[1], Markus Gramer[1], Branislav Ebert[1], Martina Füchtemeier[2], Georg Royl[2], Christoph Leithner[2], Jens Dreier[2], Ute Lindauer[2,3], Matthias Kohl-Bareis[1]; [1]RheinAhrCampus, Univ. of Applied Sciences Koblenz, Germany, [2]Neurologische Klinik, Charité – Universitätsmedizin Berlin, Germany, [3]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 spectrroscopy.

ThC5 • 11.30
Using Broadband Spatially Resolved NIRS to Assess Muscle Oxygenation during Altered Running Protocols, *Georg Koukourakis[1], Maria Vafiadou[1], André Steimers[1], Dmitri Geraskin[1], Patrick Neary[2], Matthias Kohl-Bareis[1]; [1]Univ. of Applied Sciences Koblenz, Germany, [2]Univ. of Regina, Canada.* We used broad-band NIRS 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 accelerometry (body movement).

ThC6 • 11.45
A Compact Time-Resolved System for NIR Spectroscopy, *Rebecca Re[1], Davide Contini[1], Matteo Caffini[1], Lorenzo Spinelli[2], Rinaldo Cubeddu[1,2,3,4], Alessandro Torricelli[1,3]; [1] Dept. di Fisica , Politecnico di Milano, Italy, [2]IFN-CNR Inst. di Fotonica e Nanotecnologie, Sezione di Milano, Italy, [3]Res. Unit IIT, Politecnico di Milano, Italy, [4]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 Gerz[1], Dmitri Geraskin[1], Patrick Neary[2], Julia Franke[3,4], Petra Platen[3,4], Matthias Kohl-Bareis[1]; [1]Univ. of Applied Sciences Koblenz, RheinAhrCampus, Germany, [2]Univ. of Regina, Canada, [3]Ruhr-Univ. Bochum, Germany, [4]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, *Costel Flueraru[1], Dan P. Popescu[2], Youxin Mao[1], Shoude Chang[1], Michael G. Sowa[2]; [1]Inst. for Microstructural Sciences, Natl. Res. Council of Canada, Canada, [2]Inst. for Biodiagnostics, 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.

Room 11, 1st Floor, Congress Centre

Therapeutic Laser Applications and Laser-Tissue Interactions

10.30–12.30
ThD • Photodynamic Therapy II
Dominic Robinson; Erasmus Univ. Medical Ctr., The Netherlands, Presider
Herbert Stepp; Univ. of Munich, Germany, Presider

ThD1 • 10.30 Invited
Photobleaching Reconstruction for Interstitial Photodynamic Therapy Dosimetry, *Johan Axelsson[1], Johannes Swartling[2], Stefan Andersson-Engels[1]; [1]Dept. of Physics, Lund Univ., Sweden, [2]SpectraCure AB, Sweden.* A method for reconstructing three-dimensional photosensitizer-bleaching is presented. The potential use is in interstitial photodynamic therapy dosimetry. Results are shown from optical phantom experiments and human prostate from an ongoing clinical trial.

ThD2 • 11.00
Instrumentation for Photodynamic Therapy and Photodynamic Therapy Dosimetry of Human Brain Tumors, *Ann Johansson[1], Herbert Stepp[1], Tobias Beck[1], Wolfgang Beyer[1], Thomas Pongratz[1], Friedrich Kreth[2], Ronald Sroka[1], Reinhold Baumgartner[1]; [1]LIFE-Zentrum, Germany, [2]Neurochirurgische Klinik und Poliklinik, Germany.* A setup, relying on cylindrical diffusors, for minimally invasive measurement of light and photosensitizer distribution in relation to interstitial photodynamic therapy of brain tumors is being proposed.

ThD3 • 11.15
The First Experience of Photodynamic Therapy of Brain Metastases, *Valery I. Chissov, I. V. Reshetov, Victor V. Sokolov, A. M. Zaytsev, A. A. Shelesko, D. G. Sukhin; P.A. Hertzen Moscow Res. Oncology Inst., Russian Federation.* Treatment of metastatic brain tumors is a significant problem of neurooncology and includes surgical resection of metastases, postoperative radiotherapy and chemotherapy. Fluorescent navigation and photodynamic therapy are the promising modality to improve surgical treatment's results.

ThD4 • 11.30
Targeted Opening of the Blood-Brain Barrier by Photochemical Internalization, *Steen J. Madsen[1], Michelle J. Zhang[1], H. Michael Gach[2], Francisco A. Uzal[3], David Chighvinadze[1], Henry Hirschberg[4,1]; [1]Univ. of Nevada at Las Vegas, USA, [2]Nevada Cancer Inst., USA, [3]Univ. of California at Davis, USA, [4]Univ. of California at Irvine, USA.* Photochemical internalization is an efficient technique for inducing localized disruption of the blood-brain barrier. The extent of barrier opening peaked on day 3 and the barrier was restored on day 18 post-treatment.

ThD5 • 11.45
Photodynamic Therapy (PDT) in Prostate Cancer (PC) Patients, *Igor Rusakov[1], Boris Alekseev[1], Victor V. Sokolov[1], Sergey Bystrov[1], Victor Loschenov[2], Sergey G. Kuzmin[3]; [1]P.A. Hertzen Moscow Res. Oncology Inst., Russian Federation, [2]A.M. Prokhorov General Physics Inst. of RAS, Russian Federation, [3]State Scientific Ctr., Russian Federation.* PDT with Radachlorin (5 patients) and Photosens (13 patients) was performed in patients with prostate cancer. No complications were observed. PDT is an alternative treatment in PC patients not eligible for surgery or radiation therapy.

ThD6 • 12.00
Photodynamic Therapy of Primary Multiple Lung Cancer, *Victor V. Sokolov, Larisa V. Telegina, A. H. Trakhtenberg, O. V. Pikin, G. A. Frank; P.A. Hertzen Moscow Res. Oncology Inst., Russian Federation.* For the period 1984–2007 original methodologies of intraluminal endoscopic surgery, PDT and their combinations were used for treatment of 24 patients with 61 early PMLC. Complete regression was strongly depended on tumor size.

ThD7 • 12.15
Laparoscopic Intraperitoneal Photodynamic Diagnosis (PDD) and Photodynamic Therapy (PDT) in Oncology, *Valery I. Chissov, Nikolay Grishin, Victor V. Sokolov, Levan Vashakmadze, Elena Novikova, Elena Filonenko, Dmitry Sidorov, Mikhail Lozhkin, Vladimir Lukin, Alexander Shevchuk, Alexey Butenko, Georgy N. Vorozhtsov; P.A. Hertzen Moscow Res. Oncology Inst., Russian Federation.* For the period from 2001 to 2007, fluorescent laparoscopy with local spectroscopy in the combination with laparoscopic operation and PDT was performed in 63 patients aged from 18 to 72.

12.30–14.00 Lunch Break *(on your own)*

Room 5, Ground Floor, Congress Centre

Clinical and Biomedical Spectroscopy

14.00–16.00
ThE • Clinical and Preclinical Tissue Characterization I
Katarina Svanberg; Lund Univ., Sweden, Presider

ThE1 • 14.00
Time-Resolved Transmittance Spectroscopy of Breast *in vivo* up to 1100 nm: Test on 10 Volunteers, *Paola Taroni, Andrea Bassi, Daniela Comelli, Rinaldo Cubeddu, 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*.

ThE2 • 14.15
Spatially Offset Raman Spectroscopy for Breast Tumor Surgical Margin Evaluation, *Matthew D. Keller[1], Shovan K. Majumder[2], Mark C. Kelley[3], Anita Mahadevan-Jansen[1]; [1]Vanderbilt Univ., USA, [2]Raja Ramanna Ctr. for Advanced Technology, India, [3]Vanderbilt 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.

ThE3 • 14.30 Invited
Translation Applications of Photonics to Breast Cancer, *Nimmi Ramanujam; 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.

ThE4 • 15.00
***In vivo* Assessment of Microstructural and Functional Alterations in Cervical Neoplasia,** *Costas Balas[1,2,3], George Papoutsoglou[1], Costas Loukas[2,3], Yiannis Skiadas[2,3], Christos Pappas[2,3], Dimitris Haidopoulos[4], Emmanuel Diakomanolis[4], W. P. Soutter[5]; [1]Technical Univ. of Crete, Greece, [2]Forth Photonics Hellas SA, Greece, [3]Forth Photonics Ltd., UK, [4]Dept. of Gynaecology, First Univ. Clinic, Alexandra Hospital, Greece, [5]Dept. of Gynaecological Oncology, Hammersmith Hospital, UK.* Dynamic optical parameters expressing the temporal characteristics of the AW effect, measured *in vivo* in cervical tissue sites, are correlated with microstructural features measured in histological/biopsy samples from the same tissue sites.

ThE5 • 15.15
Automated Interpretation of Scatter Signatures Aimed at Tissue Morphology Identification, *Pilar B. Garcia-Allende[1], Venkat Krishnaswamy[2], Kimberley S. Samkoe[2], P. Jack Hoopes[2,3], Brian W. Pogue[2,3], Olga M. Conde[1], Jose M. Lopez-Higuera[1]; [1]Photonics Engineering Group, Univ. of Cantabria, Spain, [2]Thayer School of Engineering, Dartmouth College, USA, [3]Dept. 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.

ThE6 • 15.30
Scatter Spectroscopy Imager for Breast Tumor Margin Delineation, *Venkataramanan Krishnaswamy[1], Wendy A. Wells[2], Ashley M. Laughney[1], Brian W. Pogue[1]; [1]Dartmouth College, USA, [2]Dartmouth-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.

ThE7 • 15.45
Fractal Processing of Pathological Changed Muscular Tissue Images, *V. P. Ungurian, O. Ya. Wanchuliak; Bucovinian 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 architectonics are accompanied with the transformation of polarization self-similar structure into statistic one.

Room 11, 1st Floor, Congress Centre

Therapeutic Laser Applications and Laser-Tissue Interactions

14.00–16.00
ThF • Modeling
Stefan Andersson-Engels; Lund Inst. of Technology, Sweden, Presider
Alfred Vogel; Univ. of Luebeck, Germany, Presider

ThF1 • 14.00 Invited
Modeling of Optical Properties and Temperature Distribution in and around Gold Nanorods, *Florian Rudnitzki, Marco Bever, Katrin Brieger, Ramtin Rahmanzadeh, Gereon Hüttmann; Inst. of Biomedical Optics, Univ. of Luebeck, Germany.* Pulsed laser irradiated gold nanoparticles can be used to modify or destroy cells and proteins. In contrast to spherical particles nanorods are not as suitable. The reasons and main issues are clarified in this work.

ThF2 • 14.30
Efficient Multi-Threaded Monte Carlo Simulations of Light Propagation in Turbid Media Using Graphics Processing Units, *Norbert Zolek, Adam Liebert; Inst. of Biocybernetics and Biomedical Engineering, PAS, Poland.* Efficient multi-threaded Monte Carlo code for simulation of light transport in turbid media with the use of graphics processing units was developed. Speed of code is about 100 times higher than speed of sequential code.

ThF3 • 14.45
GPU-Accelerated Monte Carlo Simulation for Photodynamic Therapy Treatment Planning, *William Chun Yip Lo[1], Tianyi David Han[2], Jonathan Rose[2], Lothar Lilge[1]; [1]Dept. of Medical Biophysics, Ontario Cancer Inst., Princess Margaret Hospital, Canada, [2]Edward S. Rogers Sr. Dept. of Electrical and Computer Engineering, Univ. of Toronto, Canada.* A gold standard Monte Carlo code for light propagation, MCML, was accelerated 18 times on a graphics processing unit (GPU) compared to a top-notch processor. The code optimizations highlight the unique challenges in GPU programming.

ThF4 • 15.00
A Diffuse Reflectance Method of Evaluation of Optical Properties of Biological Tissues in a New Kinetic Light Propagation Model, *Alexander V. Lappa, Tamara A. Makarova; Chelyabinsk State Univ., Russian Federation.* The method is based on a two-parameter radiation transport equation approximation. Parameters are evaluated from diffuse reflectance measurements with two optical fiber detectors. Original non-analog Monte Carlo technique is used to resolve the inverse problem.

ThF5 • 15.15
A Combined Mathematical-Physical Model of Laser-Induced Thermotherapy (LITT), *Marie S. Enevoldsen, Ove Skovgaard, Peter E. Andersen; Technical Univ. of Denmark, Denmark.* A new computational model of LITT is presented. Using optical fibers, multiple light sources are applied to an arbitrary shaped tumor in the liver. The fast computational model can predict the outcome of a treatment.

ThF6 • 15.30
Effect of Skin Tumor Properties on Laser Penetration, *Aletta E. Karsten, Ann Singh; Biophotonics Group, Natl. Laser Ctr., CSIR, South Africa.* The optical properties of different skin tumors were evaluated as a function of penetration depth into the skin. The different properties of the tumors can lead to 20% less absorption compared to healthy dermis.

ThF7 • 15.45
Determination of the Optical Properties of PNIPAAm Gels Used in Biological Applications, *Ann Singh[1], Aletta E. Karsten[1], Itumeleng Mputle[2], Avashnee Chetty[2]; [1]Biophotonics Group, Natl. Laser Ctr., CSIR, South Africa, [2]Materials Science and Manufacturing, CSIR, South Africa.* The first known measurements of the absorption (μ_a) and reduced scattering (μ'_s) coefficients, as a function of temperature, of a series of crosslinked PNIPAAm gels, is presented at a wavelength of 632.8 nm.

16.00–16.30 Coffee Break, *Exhibition Hall*

Room 5, Ground Floor, Congress Centre

Clinical and Biomedical Spectroscopy

16.30–18.30
ThG • Clinical and Preclinical Tissue Characterization II
Katarina Svanberg; Lund Univ., Sweden, Presider

ThG1 • 16.30
Raman and CARS-Based Tissue Analysis, *Benjamin Dietzek[1,2], Christoph Krafft[2], Denis Akimov[1,2], Christiane Bielecki[3], Michael Schmitt[2], Iver Petersen[4], Andreas Stallmach[3], Jürgen Popp[1,2]; [1]Insitute of Physical Chemistry, Friedrich-Schiller Univ., Germany, [2]Inst. of Photonic Technology, Germany, [3]Dept. of Internal Medicine II, Friedrich-Schiller Univ., Germany, [4]Inst. of Pathology, Univ. Hospital, 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[1], Robert H. Wilson[1], James Scheiman[2], Diane Simeone[2], Barbara McKenna[2], Julianne Purdy[2], Mary-Ann Mycek[1,2]; [1]Univ. of Michigan, USA, [2]Univ. 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. Orzekowsky-Schroeder[1], Gereon Hüttmann[1], Norbert Koop[1], Alfred Vogel[1], Antje Klinger[2], Maike Blessenohl[2], Andreas Gebert[2]; [1]Inst. of Biomedical Optics, Univ. of Lübeck, Germany, [2]Inst. of Anatomy, Univ. of Lübeck, 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 Hexvix® for the Detection of Early Bladder Carcinoma, *Blaise Lovisa[1], Daniela Aymon[2], Patrice Jichlinski[2], Bernd-Claus Weber[3], Georges Wagnières[1], Hubert van den Bergh[1]; [1]Ecole Polytechnique Federale de Lausanne, Switzerland, [2]Ctr. Hospitalier Univ. Vaudois, Switzerland, [3]Richard 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 Alexandratou, Dido Yova; School of Electrical Engineering, Lab of Biomedical Optics and Applied Biophysics, Natl. Technical Univ. of Athens, Greece.* Confocal microscopy imaging was applied by 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 o**varian 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, *Yuting He[1,2], Shuoyu Xu[1,2,3], Hanary Yu[1,4], Peter So[5]; [1]Singapore-MIT Alliance, Natl. Univ. of Singapore, Singapore, [2]Inst. of Bioengineering and Nanotechnology, Singapore, [3]Bioinformatics Res. Ctr., Nanyang Technological Univ., Singapore, [4]Dept. of Physiology, Natl. Univ. of Singapore, Singapore, [5]Dept. 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[1], Martin Hunter[1], Molly McLaughlin-Drubin[2], Karl Münger[2], Irene Georgakoudi[1]; [1]Tufts Univ., USA, [2]Harvard 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.

Room 11, 1st Floor, Congress Centre

Therapeutic Laser Applications and Laser-Tissue Interactions

16.30–18.30
ThH • Clinical Laser Therapy
Raimund Hibst; Inst. fur Lasertechnologien, Germany, Presider

ThH1 • 16.30
Surgical Guidance by Means of Autofluorescence Imaging: Limitations, *Alexandre Douplik[1], Azhar Zam[1], Florian Stelzle[2]; [1]Erlangen Graduate School in Advanced Optical Technologies (SAOT), Friedrich-Alexander Univ. Erlangen-Nuremberg, Germany, [2]Dept. of Oral and Maxillofacial Surgery, Friedrich-Alexander Univ. Erlangen-Nuremberg, Germany.* Laser ablation leads to dramatic alterations of the tumor contrast on autofluorescence images.

ThH2 • 16.45 Invited
OCT-Aided Femtosecond Laser Microsurgery Device, *Ole Massow[1], Fabian Will[2], Holger Lubatschowski[1,2]; [1]Laser Zentrum Hannover e.V., Germany, [2]Rowiak GmbH, Germany.* The combination of an fs-laser and OCT device using the same high numerical objectives provides cutting within the precision of both systems. Cuts according to tissue structures were applied in transparent and scattering biological tissue.

ThH3 • 17.15
Femtosecond Laser Microstructuring of Titanium Surfaces for Middle Ear Ossicular Replacement Prosthesis—Results of Preliminary Studies, *Slavomir Biedron[1], Justus F. R. Ilgner[1], Elena Fadeeva[2], Boris Chichkov[2], Andreas Prescher[3], Manfred Bovi[4], Martin Westhofen[1]; [1]Dept. of Otorhinolaryngology, Plastic Head and Neck Surgery, Rhenish-Westphalian Technical Univ. Aachen Univ., Germany, [2]Laser Zentrum Hannover e.V., Germany, [3]Inst. of Molecular and Cellular Anatomy, Rhenish-Westphalian Technical Univ. Aachen Univ., Germany, [4]Inst. of Pathology, Rhenish-Westphalian Technical Univ. Aachen Univ., Germany.* The application of micro-structures by means of Ti:Sapphire femtosecond laser on titanium surfaces for middle ear prosthetic treatment was evaluated and the influence of these micro-structures on human auricular chondrocytes was studied *in vitro*.

ThH4 • 17.30
Partial Porcine Kidney Resection *in vivo* Using a 1.92 µm Fibre Laser System, *Dirk Theisen-Kunde[1,2], Soenke Tedsen[3], Veit Danicke[1], Ralf Brinkmann[1]; [1]Inst. of Biomedical Optics, Univ. Luebeck, Germany, [2]Medical Laser Ctr. Luebeck, Germany, [3]Dept. of Urology, Univ. Hospital Schleswig-Holstein, Campus Luebeck, Germany.* Partial porcine renal parenchyma resection and hemi nephrectomy was performed using a 1.92 µm fibre laser system. The healing process was observed over 3 weeks, survival rate was 100%, and no inflammation or renal fistula were found.

ThH5 • 17.45
Acute Effects of Radial Laser Light Energy Application for Endovenous Laser Treatment, *Ronald Sroka, Kathrin Weick, Aaron von Conta, Sabine Scheibe, Ina Sroka, Stefan Winter, Radka Blagova, Reinhold Baumgartner; Laser-Res. Lab, LIFE-Ctr., Univ. Munich, Germany.* A radial emitting laser-fibre is tested in combination with a laser emitting light at 1470nm in the *ex vivo* cow-foot-model using different treatment parameters. It could be demonstrated that the induced tissue alterations are circumferential uniform.

ThH6 • 18.00
Endovenous Laser Treatment (EVLT) of Safernous Vein Reflux with 1.56 µm Laser, *Vladimir P. Minaev[1], Alexander L. Sokolov[2], Konstantin V. Lyadov[2], Maxim M. Lutsenko[2], Kirill M. Zhilin[1]; [1]IRE-Polus Co., Russian Federation, [2]Ctr. of Treatment and Rehabilitation Health Ministry RF, Russian Federation.* We present a study showing advantages of EVLT at 1.56 µm wavelength in comparison with 0.97 µm. In particular, the water and blood absorption at 1.56 µm give better EVLT conditions than at 0.81-1.5 µm.

ThH7 • 18.15
Selective Treatment of Atherosclerotic Plaques Using Nanosecond Pulsed Laser with a Wavelength of 5.75 µm for Less-Invasive Laser Angioplasty, *Katsunori Ishii, Hideki Tsukimoto, Hisanao Hazama, Kunio Awazu; Osaka Univ., Japan.* We studied the effectiveness of nanosecond pulsed laser at 5.75 µm for the development of novel laser angioplasty. As a result, less-invasive treatment parameters for removing atherosclerotic plaques in a wet condition were confirmed.

Key to Authors and Presiders

(**Bold** denotes Presider or Presenting Author)

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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 Nakayama[1], Satoshi Matsuo[1], Naotaka Sakashita[1], Koichiro Sakaguchi[1], Takushige Katsura[2], Kyoko Yamazaki[2], Naoki Tanaka[2], Hideo Kawaguchi[2], Atsushi Maki[2], Eiji Okada[1]; [1]Keio Univ., Japan, [2]Advanced 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. Kalitzeos[1], Azhar Zam[1], Florian Stelzle[2], Eckhard G. Hahn[3], Martin Raithel[3], Alexandre Douplik[1]; [1]Erlangen Graduate School in Advanced Optical Technologies (SAOT), Friedrich-Alexander Univ. Erlangen-Nuremberg, Germany, [2]Univ. Hospital Erlangen, Dept. of Oral and Maxillofacial Surgery, Friedrich-Alexander Univ. of Erlangen-Nuremberg, Germany, [3]Univ. 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.*