Digital Holography and 3-D Imaging (DH)

28 April - 2 May 2012, Miami, Florida, United States

This topical meeting consists of two closely interrelated topics; 3D display and digital holography. The aspect of the meeting overing digital holography provides a forum for disseminating the latest research results in the field of holographic and digital methods and its use in the solution of difficult optical imaging problems in research and field application. The other principal topic covered relates to the latest advances in the technological development of 3D display technology for research as well as commercial applications. Digital holographic topics cover recent advances in the development of holographic devices and material used therein, compressive holographic approaches, readout and holographic formation for volume storage, and uses of the technology to solve problems in laser radar and communications, phase error correction, imaging through turbidity, and tissue imaging using non-linear holographic microscopic technologies to mention a few.

Online Conference Program

Searchable Conference Program Available Online!

- Browse speakers and the Schedule at a Glance
- Browse sessions by type or day.
- Use Advanced Search to search the program by author, title, OCIS code and more.
- Plan and print your personal itinerary before coming to the conference.

Download Pages from the Program Book!

- Abstracts (pdf)
- Schedule at a Glance (pdf)
- Key to Authors and Presiders (pdf)
- Map of the Hilton Miami Downtown (pdf)

Congress Joint Plenary Speakers:

Byoungho Lee, *Seoul National Univ., South Korea*
3D Display - Where We Are and Where to Go

George Smith
Recipient of 2009 Nobel Prize in Physics
The Invention and Early History of the CCD

Topic Categories

- Biomedical Applications of Digital Holography (Joint BIO)
- Digital Holographic Microscopy
- Digital Holographic Optical Processing
- Entrepreneurship in Optics
- Novel Applications of Digital Holography
- Special Techniques of Digital Holography
- Three-Dimensional Display

General Chairs

Myung K. Kim, *Univ. of South Florida, USA*, General Chair
George Barbastathis, *MIT, USA*, General Co-Chair

Top 5 Downloaded DH Meeting InfoBase Papers:

- Compressive Holography
- Phase-space Imaging of Partially Coherent beams…
- Single-Exposure Phase-Shifting Digital Holography…
- Hybrid CGH by Digitized Holography:CGH for Mixed…
- Fractional optics for image processing and measur…

Go to Optics InfoBase for a listing of all meeting paper archives. View the 2011 Meeting Archive (pdf)

Sponsor:

OSA

Biomedical Optics and 3D Imaging

29 April - 2 May 2012, Miami Hilton Downtown, Miami, Florida, USA

Online Conference Program

Searchable Conference Program Available Online!

- Browse speakers and the Schedule at a Glance
- Browse sessions by type or day.
- Use Advanced Search to search the program by author, title, OCIS code and more.
- Plan and print your personal itinerary before coming to the conference.

Download Pages from the Program Book!

- Abstracts (pdf)
- Schedule at a Glance (pdf)
- Key to Authors and Presiders (pdf)
- Map of the Hilton Miami Downtown (pdf)

Congress Joint Plenary Speakers:

Byoungho Lee, *Seoul National Univ., South Korea*
3D Display - Where We Are and Where to Go

George Smith
Recipient of 2009 Nobel Prize in Physics
The Invention and Early History of the CCD

A general scope for the two meetings in the congress is listed below, and more detailed information (including the list of topics for consideration) for each topical meeting is available by following the meeting link.

Biomedical Optics

The Biomedical Optics meeting covers the diversity of cutting edge biomedical research topics and brings together leading scientists, engineers and physicians engaged in forefront biological and medical research using optical methods. Advances in biological and drug delivery imaging, optical coherence tomography, microscopy, optical probe development, and the application of bio-optical techniques in clinical environments will be covered. Optical bio/medical imaging is now established as offering unique capabilities that compliment and in several cases exceed the capabilities of related imaging approaches such as PET and CT imaging. This optical technology is being developed for image guided surgery, imaging of bio-markers, drug delivery studies and shallow tissue imaging with research trying to extend the range to deep tissue. In multiple laboratories, optical nano-technologies are being studied for enhanced molecular probing to examine cell function as well as early disease detection and monitoring. Optical technologies also offer the promise of improved therapies for several medical problems. This meeting will present comprehensive review of the latest important advances in biomedical optical field. View the 2010 Meeting Archive containing the final program (PDF)

Digital Holography and 3D Imaging

This topical meeting consists of two closely interrelated topics; 3D display and digital holography. The aspect of the meeting covering digital holography provides a forum for disseminating the latest research results in the field of holographic and digital methods and its use in the solution of difficult optical imaging problems in research and field application. The other principal topic covered relates to the latest advances in the technological development of 3D display technology for research as well as commercial applications. Digital holographic topics cover recent advances in the development of holographic devices and material used therein, compressive holographic approaches, readout and holographic formation for volume storage, and uses of the technology to solve problems in laser radar and communications, phase error correction, imaging through turbidity, and tissue imaging using non-linear holographic microscopic technologies to mention a few.
Topics included in the 3D display section of the meeting illustrate advances that are leading to commercialization of this technology. The latest advances in display technology including 3D sensing, 3D visualization, stereoscopic 3D technologies, lens-less image projection, volumetric displays using holography, multiple projector displays, etc will be reviewed by well known experts in this field. This meeting as a whole provides the attendees a comprehensive picture of the state of the art in 3D display and digital holography. View the 2011 Meeting Archive containing the final program (PDF)

Special Events

The congress has a variety of special events throughout the meeting including the OIDA Rump session, Congress Reception and special presentations. For more detailed information, view our Special Events page.

Exhibit

Exhibit space at this Congress is very limited; so be sure to sign up for your tabletop exhibit space today! Call Regan Pickett at 202-416-1474 or email exhibitsales@osa.org for more information.

Corporate Sponsor: AMERICAN ELEMENTS® **Sponsor:** OSA

Digital Holography and 3-D Imaging (DH)
Conference Program

About Digital Holography and Three Dimensional Imaging
Digital Holography and Three Dimensional Imaging (DH): The topical meeting on Digital Holography and Three-Dimensional Imaging provides a forum for disseminating the fundamentals and applications of holographic and digital methods in optical science and technology, including holographic interferometry for deformation or contour measurement, new technologies for phase unwrapping, 3D optical remote sensing, 3D holographic microscopy, 3D optical image processing, 3D display, and digital holography for life science or nanophotonics applications.

Plenary Speaker

George Smith, Recipient of 2009 Nobel Prize in Physics
Monday, 30 April
8:00-8:45 a.m., Symphony I & II
The Invention and Early History of the CCD
Abstract: As the first practical solid state imaging device, the invention of the Charge Coupled Device has profoundly affected image sensing technology. They are used in a wide range of applications both as area and linear imaging devices starting with the replacement of imaging tubes used in commercial TV cameras and cam-corders. The rapid rise of their use in digital cameras has initiated the demise of film photography and created vast new markets with great economic benefit for many. Other uses include a wide variety of scientific, medical, surveillance and scanning applications. The inception of the device at Bell Labs by Willard S. Boyle and George E. Smith in 1969 was strongly influenced by several unique factors existing both within Bell Labs and the current world state of technology. These factors and their relevance will be discussed along with the train of thought leading to the invention. Early experimental devices and their initial applications were vigorously pursued and will be described. Mention of current applications will be given.

Byoungho Lee,
Seoul National Univ., South Korea
Monday 30 April
8:45 â€“ 9:30 a.m., Symphony I & II
3D Display - Where We Are and Where to Go
Abstract: An overview of history and present state of three-dimensional display is given, covering technical and market aspects. Possible research directions that will be considered important in the future are also discussed.

DH Tutorials
DH Tutorial - DTu1C.1

George Barbastathis, *MIT,USA.*
Tuesday, 1 May
8:00 - 8:45 *Concerto D*
Title to be announced.

DH Tutorial - DTu2C.1

Partha P. Banerjee, *Univ. of Dayton, USA*
Tuesday, 1 May
10:00-10:45 *Concerto D*
Digital Holographic Interferometry - Principles and Applications to Deformation Measurement
Abstract: Starting from basic principles of holography and digital holography, we discuss its application to digital holographic interferometry for 3D object deformation. Dual wavelength holography, digital holographic microscopy and single beam holographic tomography are also discussed

Special Events

The congress has a variety of special events throughout the meeting including the OIDA Rump session, Congress Reception and special presentations. For more detailed information, view our Special Events page

Invited Speakers

- **Digital Holography for the Life Sciences**, Gert von Bally, *Westfaelische Wilhelms Univ. Munster, Germany*
- **Using Light Coherence and Wave Control in 3D Biomedical Imaging**, Albert-Claude Boccara, *Ecole Sup Physique Chimie Industrielles, France*
- **Multiplex Holography for Walk-Around Viewing**, Yih-Shyang Cheng, *National Central Univ., China*
- **Recent Progresses in Digital Holographic Microscopy with Spatial Partial Coherent Light and Applications**, Frank Dubois, *Universite Libre de Bruxelles, Belgium*
- **Enhanced Dynamic Holography in Organic-Inorganic Hybrid Devices**, Dean Evans, *US Air Force Research Laboratory, USA*
- **Digital Holographic Interferometry and ESPI at Long Infrared Wavelengths with CO2 Lasers**, Marc Georges, *Univ. de Liege, Belgium*
- **Adaptive LC-Lens Array for 3D Display and Capturing**, Yi-Pai Huang, *National Chiao Tung Univ., Taiwan*
- **Optical Information Processing by Polarization-Holographic Elements**, George Kakauridze, *Institute of Cybernetics, Georgia*
- **3D Tracking of the Brownian Motion of Polystyrene Beads with DHM**, Dug Young Kim, *Gwangju Inst. of Science and Technology, South Korea*
- **Digital Holography of Cellular Motions in Live Tissue**, David Nolte, *Purdue Univ., USA*
- **Cell Dynamics Studied by Quantitative Phase Imaging**, Gabriel Popescu, *Univ. of Illinois at Urbana-Champaign, USA*
- **Analysis and Characterization of Digital Holographic Systems**, John Sheridan, *Univ. College Dublin, Ireland*
- **Compressing Sensing Techniques for Holography: Theory and Examples**, Adrian Stern, *Ben Gurion Univ. of the Negev, Israel*
- **3D Display Using Electronic Holography and 3D Data Acquisition Using 300-Camera Array**, Kenji Yamamoto, *NICT, Japan*
- **Digital Holographic Three-Dimensional Imaging Spectrometry**, Kyu Yoshimori, *Iwate Univ., Japan*
- **Analysis and Experimental Achievement of High Resolution Imaging in Digital Holography**, Jianlin Zhao, *Northwestern Polytechnical Univ., China*

Biomedical Optics & 3D Imaging:
OSA Optics & Photonics 2012

Biomedical Optics (BIOMED)
Digital Holography and Three-Dimensional Imaging (DH)

28 April-2 May, 2012

Miami Hilton Downtown,

Miami, Florida, USA

Conference Program

Biomedical Optics (BIOMED)

28 April—2 May 2012

Miami, Florida

Welcome to Miami, Florida, and to the 10th biennial **Biomedical Optics Topical Meeting**. We hope you enjoy all the opportunities that Miami offers, and take full advantage of the scientific sessions before you. This meeting has been a favorite over the years because of its focused topics, quality peer-reviewed presentations, and pleasant surroundings.

There are ample opportunities for networking between sessions, and the multiple poster sessions allow for lively discussions of the latest research. Despite the popularity of the meeting, we have strived to maintain a "small meeting" feel with only two parallel oral sessions. The meeting has grown in size and scope, ranging from basic technology development to clinical studies. We received a record number of paper submissions for this year's meeting. The diversity of topics allows plenty of room for physicists and engineers to rub shoulders with biologists and clinicians. You will see the latest cutting edge optical technologies, and also see how these technologies can be applied. We believe that it is critical to create as many forums as possible for technical and applied interactions to occur in order to facilitate the next advances in medical care and research.

We have a busy four days ahead of us twenty invited and plenary talks, and 137 contributed talks. Because there are only two parallel sessions, there are far more poster papers than oral papers—247 poster papers altogether. You will find many outstanding papers in the poster sessions, some of which may win our poster awards; so don't miss them.

We hope you enjoy the meeting!

Sincerely,

Xingde Li
Johns Hopkins University, USA
General Chair

Claude Boccara,
Institut Langevin, France
General Chair

Lev T. Perelman
Harvard Univ., USA
General Chair

Digital Holography and Three-Dimensional Imaging (DH)
28 April-2 May 2012
Miami, Florida

Welcome to the **6th Digital Holography and Three-Dimensional Imaging (DH) Topical Meeting** in Miami, Florida. The DH Topical Meeting is the world's premier forum for disseminating the science and technology geared towards 3-D information processing. Since the meeting's inception in 2007, it has steadily and healthily grown to 103 presentations this year.

The four-day program includes a plenary speaker, 2 tutorials, 16 invited speakers, 65 contributed oral presentations, and 19 poster presentations. At this meeting, expect to hear about the latest research on 3-D imaging, digital holographic microscopy, digital/electronic holography, 3-D displays and systems, integral photography and imaging, and holographic interferometry/modulators/filters/materials as well as applications in BIOMEDical imaging, optical processing, and metrology.

We look forward to meeting you in Miami, Florida.

Sincerely,

Myung K. Kim
Univ. of South Florida, USA
General Chair

George Barbastathis
MIT, USA
General Co-Chair

BIOMEDical Optics Program Committee

General Chairs
Claude Boccara, *Institut Langevin, France*
Xingde Li, *Johns Hopkins Univ., USA*
Lev T. Perelman, *Harvard Univ., USA*

BIOMED 1: Joint DH
No BIOMED subcommittee members were selected.

BIOMED 2: BioNanophotonics and Molecular Probes
Samuel Achilefu, *Washington Univ. in St Louis, USA*, **Co-Chair**
Gang Zheng, *Univ. of Toronto, Canada,* **Co-chair**
Stephen A. Boppart, *Univ of Illinois at Urbana-Champaign*, USA
Shawn Chen, *National Instit. Of Biomedical Imaging and Bioengineering, USA*
Christopher Contag, *Stanford Univ., USA*
Ute Resch-Genger, *BAM Federal Institute for Materials Research and Testing, Germany*
Andrew Tsourkas, *Univ. of Pennsylvania, USA*
Yasuteru Urano, *Univ. of Tokyo, Japan*
Itamar Willner, *Hebrew Univ. of Jerusalem, Israel*

BIOMED 3: Optical Microscopy Techniques
Peter So, *MIT, USA,* **Co-Chair**
Tony Wilson, *Univ. of Oxford, UK,* **Co-Chair**
Adela Ben-Yakar, *Univ. of Texas at Austin, USA*
Paul J Campagnola, *Univ. of Wisconsin-Madison, USA*
Kristen Carlson Maitland, *Texas A&M Univ., USA*
Ji-Yen Cheng, *Center for Applied Sciences/Academia Sinica, Taiwan*
Wonshik Choi, *Korea Univ., South Korea*
Alberto Diaspro, *Italian Institute of Technology, Italy*
David L. Dickensheets, *Montana State Univ., USA*
Melike Lakadamyali, *Instit. of Photonic Science, ICFO, Spain*
Dan Oron, *Weizmann Institute of Science, Israel*
Jianan Y. Qu, *Hong Kong Univ. of Science & Technology, Hong Kong*

BIOMED 4: Photoacoustic Imaging and Spectroscopy
Lihong V. Wang, *Washington Univ. in St Louis, USA,* **Co-Chair**
Wiendelt Steenbergen, *Universiteit Twente/MIRA Institute, Netherlands,* **Co-Chair**
Mark A. Anastasio, *Washington Univ. in St Louis, USA*
Paul C. Beard, *Univ. College London, UK*
Stanislav Emelianov, *Univ. of Texas at Austin, USA*
Martin Frenz, *Universitat Bern, Inst. of Applied Physics, Switzerland*
Jan Laufer, *Univ. College London, UK*
Pai-Chi Li, *National Taiwan Univ., Taiwan*
Alexander A. Oraevsky, *Fairway Medical Technologies Inc*, *USA*
Guenther Paltauf, *Karl-Franzens-Universitaet Graz, Austria*
Roger J Zemp, *Univ. of Alberta, Canada*

BIOMED 5: Optical Coherence Tomography
James G. Fujimoto, *MIT, USA,* **Co-Chair**
Christoph K. Hitzenberger, *Medizinische Universität Wien, Austria,* **Co-Chair**
Iwona Maria Gorczynska, *Nicolaus Copernicus Univ., Poland*
Robert Huber, *Ludwig-Maximillians-Universität Munchen, Germany*
Michael W Jenkins, *Case Western Reserve Univ., USA*
Michael Pircher, *Medical Univ. of Vienna, Austria*
Guillermo J. Tearney, *Harvard Medical School, USA*
Alex Vitkin, *Ontario Cancer Institute, Canada*
Ruikang K. Wang, *Univ. of Washington, USA*
Yoshiaki Yasuno, *Univ. of Tsukuba, Japan*

BIOMED 6: Optical Imaging and Tomography
Stefan Andersson-Engels, *Lunds Universitet, Sweden,* **Co-Chair**
Brian W. Pogue, *Dartmouth College, USA,* **Co-Chair**
Randall L. Barbour, *SUNY Downstate Medical Center, USA*
David Cuccia, *Modulated Imaging, USA*
Hamid Dehghani, *Univ. of Birmingham, UK*
Jeremy C. Hebden, *Univ. College London, UK*
Huabei Jiang, *Univ. of Florida, USA*
Robert J. Nordstrom, *NIH/NCI, USA*
Eiji Okada, *Keio Univ., Japan*
Michael S. Patterson, *Juravinski Cancer Centre, Canada*
Antonio Pifferi, *Politecnico di Milano, Italy*
Nirmala Ramanujam, *Duke Univ., USA*
Ilya Turchin, *Institute of Applied Physics, Russia*
Arjun Yodh, *Univ. of Pennsylvania, USA*
Quing Zhu, *Univ. of Connecticut, USA*

BIOMED 7: Optical Spectroscopy
Vadim Backman, *Northwestern Univ., USA,* **Co-Chair**
Valery V. Tuchin, *Saratov State Univ., Russia,* **Co-Chair**
Jennifer Barton, *Univ. of Arizona, USA*
Irving J. Bigio, *Boston Univ., USA*
Nada Boustany, *Rutgers University, USA*
Rinat Esenaliev, *Univ .of Texas Medical Branch Galveston, USA*
Bob Filkins, *General Electric, USA*
Kirill Larin, *Univ. of Houston, USA*
Martin Leahy, *Univ. of Limerick, Ireland*
Qingming Luo, *Huazhong Univ. of Science and Technology, China*
Igor Meglinsky, *Univ. of Otago, New Zeeland*
Herbert Schneckenburger, *Hochschule Aalen, Germany*
Dick Sterenborg, *Univ. Hospital Rotterdam-Daniel den Hoed Cancer Center, The Netherlands*
Bruce Tromberg, *Univ. of California, Irvine, USA*
Urs Utzinger, *Univ.* of *Arizona, USA*
Martin Wolf, *Univ. Hospital of Zurich, Switzerland*

Digital Holography and Three-Dimensional Imaging (DH) Program Committee

General Chairs

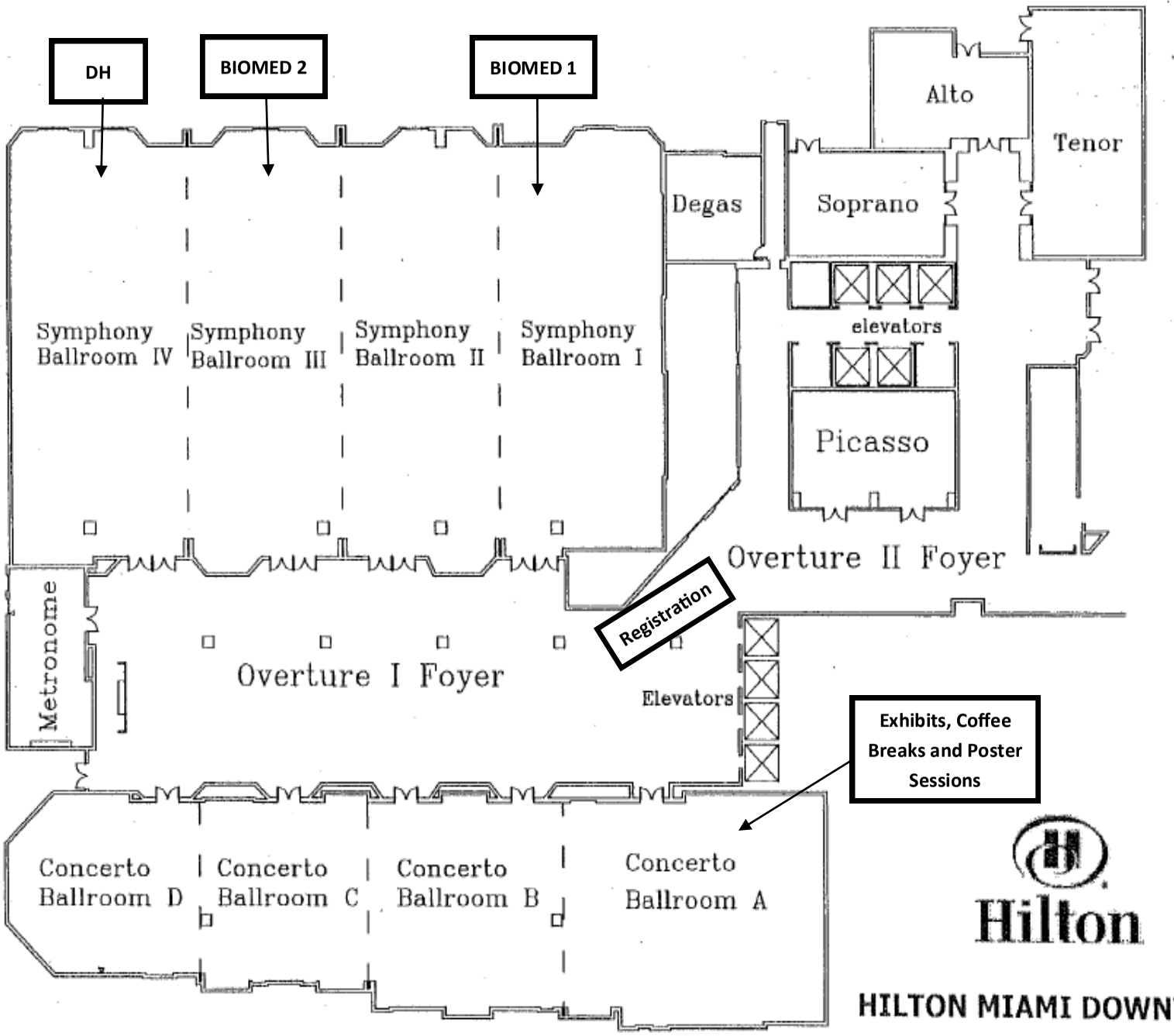
Myung K. Kim, *Univ. of South Florida, USA*, **General Chair**
George Barbastathis, *Massachusetts Inst. of Technology, USA*, **General Co-Chair**

Advisory Committee

Ting-Chung Poon, *Virginia Tech, USA,* Chair
Partha P. Banerjee, *University of Dayton, USA*
Byoungho Lee, *Seoul National Univ., South Korea*
Kehar Singh, *IIT Delhi, India*
Ichirou Yamaguchi, *Gunma Univ., Japan*
Toyohiko Yatagai, *Utsunomiya Univ., Japan*

Committee Members

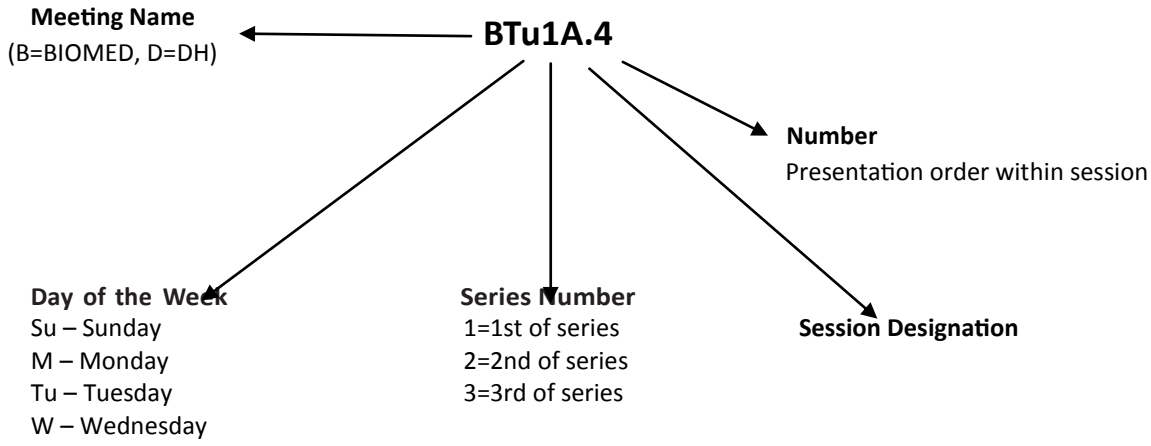
Anand Asundi, *Nanyang Tech University, Singapore*
Michael Bove, *MIT, USA*
Chau-Jern Cheng, *National Taiwan Normal Univ., Taiwan*
Gary Cook, *AFRL, USA*
Pietro Ferraro, *INO, Italy*
James W Fleischer, *Princeton Univ., USA*
Yoshio Hayasaki, *Utsunomiya Univ., Japan*
Thomas Kreis, *BIAS, USA*
Nickolai Kukhtarev, *Alabama A&T Univ., USA*
Jung-Ping Liu, *Feng Chia Univ., Taiwan*
Takanori Nomura, *Wakayama Univ., Japan*
Aydogan Ozcan, *UCLA, USA*
Nasser Peyghambarian, *Univ. of Arizona, USA*
Pascal Picart, *Lemans Univ., France*
Joseph Rosen, *Ben Gurion Univ., Israel*
Yasuhiro Takaki, *Tokyo Univ. A&T, Japan*
Hiroshi Yoshikawa, *Nihon Univ., Japan*
Changhe Zhou, *Academia Sinica, China*



Hilton

HILTON MIAMI DOWNTOWN

Explanation of Session Codes



The first letter of the code designates the meeting (For instance, A=BIOMED, D=DH). The second element denotes the day of the week (Monday=M, Tuesday=Tu, Wednesday=W). The third element indicates the session series in that day (for instance, 1 would denote the first parallel sessions in that day). Each day begins with the letter A in the fourth element and continues alphabetically through a series of parallel sessions. The lettering then restarts with each new series. The number on the end of the code (separated from the session code with a period) signals the position of the talk within the session (first, second, third, etc.). For example, a presentation coded BTu1A.4 indicates that this paper is part of BIOMED meeting (B) and is being presented on Tuesday (Tu) in the first series of sessions (1), and is the first parallel session (A) in that series and the fourth paper (4) presented in that session.

Exhibits

The exhibits will be taking place during the Conference Reception and most Poster Sessions in Concerto Ballroom. Please note: Coffee breaks will take place in the same location.

Date	Coffee Breaks*	Poster Sessions
Sunday, 29 April*	15:00 – 15:30	13:00 – 15:00
Monday, 30 April	9:30 – 10:00 15:00 – 15:30	13:00 – 15:00 18:30 – 20:00 (Conference Reception)
Tuesday, 1 May	9:30 – 10:00 15:00 – 15:30	13:00 – 15:00
Wednesday 2 May*	10:00 – 10:30 15:30 – 16:00	

- *Optional for Exhibitors to be present during Sunday and Wednesday times and for all coffee breaks.*

Agenda of Sessions

Saturday, 28 April 2012

15:00—18:00	**Registration,** ***Overture Foyer***

Agenda of Sessions

Sunday, 29 April 2012

ROOM	SYMPHONY I & II	SYMPHONY III	SYMPHONY IV
	BIOMED 1	BIOMED 2	DH
07:00 – 18:00	Registration, *Overture Foyer*		
07:50—08:00	BIOMED Opening Remarks		DH Opening Remarks
08:00—09:30	BSu1A: BIOMED Plenary Speakers I: Lihong Wang and Mathias Fink		DSu1C: Three-Dimensional Display I
09:30—10:00	Coffee Break, *Concerto Ballroom*		
10:00 – 12:00	BSu2A: Brain Imaging	BSu2B: Microscopy Imaging: Novel Fluorescence Contrast	DSu2C: Special Techniques of Digital Holography I
12:00 – 13:00	Lunch on Your Own		
13:00 – 15:00	BSu3A: BIOMED Poster Session I and Exhibits *Overture I Foyer & Concerto Ballroom*		DSu3C: Digital Holographic Microscopy I (ends at 14:45)
15:00 – 15:30	Coffee Break, *Concerto Ballroom*		
15:30 – 17:30	BSu4A: Brain Signals I	BSu4B: Microscopy Imaging: Novel Contrast Mechanisms	DSu4C: Biomedical Applications of Digital Holography I
18:30—20:00	BIOMED Postdeadline Papers, *Symphony I & II*		DH Postdeadline Papers, *Symphony IV*

Session is being recorded

Agenda of Sessions

Monday, 30 April 2012

ROOM	SYMPHONY I & II	SYMPHONY III	SYMPHONY IV
	BIOMED I	BIOMED 2	DH
07:00 – 18:30	Registration, *Overture Foyer*		
08:00 - 09:30	JM1A: Joint Plenary Speakers: George Smith and Byoungho Lee, *Symphony I & II*		
09:30 - 10:00	Coffee Break, *Concerto Ballroom*		
10:00 – 12:30	BM2A: BioNanophotonics and Molecular Probes	BM2B: Photoacoustic Tomography	DM2C: Three-Dimensional Digital Display II (until 11:45)
12:00 – 13:00	Lunch on Your Own		
13:00 – 15:00	JM3A: BIOMED/DH Joint Poster Session and Exhibits, *Overture Foyer and Concerto Ballroom*		
15:00 – 15:30	Coffee Break, *Concerto Ballroom*		
15:30 – 17:30	BM4A: Brain Signals II	BM4B: Microscopy Imaging: Novel Techniques and Applications	DM4C: Digital Holographic Optical Processing
17:30 - 18:30			
18:30 – 20:00	Conference Reception, *Overture Foyer & Concerto Ballroom*		

Session is being recorded

Agenda of Sessions

Tuesday, 1 May 2012

ROOM	SYMPHONY I & II	SYMPHONY III	SYMPHONY IV
	BIOMED 1	BIOMED 2	DH
07:30 – 18:00	Registration, *Overture Foyer*		
08:00 - 09:30	BTu1A: BIOMED Plenary Speakers II: Bruce Tromberg and Xiaowei Zhuang		DTu1A: Digital Holographic Microscopy II
09:30 - 10:00	Coffee Break, *Concerto Ballroom*		
10:00 – 12:00	BTu2A: Imaging of Vascular Dynamics	BTu2B: Optical Coherence Tomography in Ophthalmology	DTu2C: Novel Applications of Digital Holography I
12:00 – 13:00	Lunch on Your Own		
13:00 – 15:00	BTu3A: BIOMED Poster Session II and Exhibits, *Overture Foyer and Concerto A,B,C*		DTu3C: Special Techniques of Digital Holography II
15:00 – 15:30	Coffee Break, *Concerto Ballroom*		
15:30 – 17:30	BTu4A: Fluorescence Imaging	BTu4B: Optical Coherence Tomography: Clinical Applications	DTu4C: Three-Dimensional Display III (ends 17:15)
18:00 - 20:00	OIDA Rump Session, *Symphony IV*		

Session is being recorded

Agenda of Sessions

Wednesday, 2 May 2012

ROOM	SYMPHONY I & II	SYMPHONY III	SYMPHONY IV
	BIOMED 1	BIOMED 2	DH
07:30 – 17:00	Registration, *Overture Foyer*		
08:00 – 10:00	BW1A: Nevel Techniques and Models	BW1B: Non-linear and Fluorescence Spectroscopy	DW1C: Novel Applications of Digital Holography II
10:00 – 10:30	Coffee Break, *Concerto Ballroom*		
10:30 – 12:30	BW2A: Optical Coherence Tomography: Technology and Applications	BW2B: Spectroscopy of Elastic Light Scattering I	DW2C: Biomedical Applications of Digital Holography II
12:30 – 13:30	Lunch on Your Own		
13:30 – 15:30	BW3A: Breast Cancer Imaging	BW3B: Spectroscopy of Elastic Light Scattering II	DW3C: Digital Holographic Microscopy III (ends 15:15)
15:30 – 16:00	Coffee Break, *Concerto Ballroom*		
16:00 – 18:00	BW4A: Tomography	BW4B: New Spectroscopic Techniques and Applications	DW4C: Special Techniques of Digital Holography III
18:00 – 18:15	BIOMED Closing Remarks		DH Closing Remarks

Session is being recorded

Biomedical Optics (BIOMED) and Digital Holography and Three-Dimensional Imaging (DH) Joint Plenary Speakers

The Invention and Early History of the CCD, George Smith, Recipient of 2009 Nobel Prize in Physics
Monday, 30 April
08:00—08:45, *Symphony I & II*

George E. Smith was born in White Plains, New York, in 1930. He received the B. A. in Physics from the University of Pennsylvania in 1955, the M. S. and Ph. D. in Physics from the University of Chicago in 1956 and 1959 respectively. Following graduation, he joined Bell Laboratories (1959) where he initially studied the electrical properties and band structures of semimetals, mostly bismuth and bismuth antimony alloys. These studies were largely microwave resonance experiments and investigations of a variety of magnetothermoelectric and galvanomagnetic effects. In 1964 he became Head of the Device Concepts Department, a group formed to devise next generation solid state devices. In this capacity, he was involved in a variety of investigations including junction lasers, semiconducting ferroelectrics, electroluminescence, transition metal oxides, the silicon diode array camera tube and Charge-Coupled Devices. In April 1986 he retired from his position at Bell Laboratories as Head of the VLSI Device Department where his responsibilities covered the physics of devices made with submicron lithography and their use in high performance digital and analog circuits. He then started a world cruise aboard his 9.5 meter sailing vessel APOGEE which was completed in 2003 after 55,000 miles of ocean sailing. He is now living in Barnegat, New Jersey. Smith's major technical accomplishment was the inception of the Charge Coupled Device with Willard S. Boyle. They hold the basic patent (US 3,858,232) and published the first paper disclosing the device concept accompanied by a paper on its experimental verification. A following invention of the Buried Channel Charge Coupled Device (US patent 3,792,322) significantly improved the performance of the original CCD. Their accomplishment has been recognized in a number of awards, the most notable of which is the 2009 Nobel Prize in Physics.

3D Display - Where We Are and Where to Go, Byoungho Lee, *Seoul National Univ., South Korea*
Monday, 30 April
08:45—9:30, *Symphony I & II*

Byoungho Lee received his PhD degree from EECS, University of California at Berkeley in 1993. Since September 1994, he has been with the School of Electrical Engineering, Seoul National University, Korea as a faculty member, where he became a full professor in 2005. He is a fellow of OSA and SPIE and a member of the Korean Academy of Science and Technology. He received many awards including the Presidential Young Scientist Award of Korea (2002) and the Scientist of the Month Award of Korea (Sep. 2009). He served as a Director-at-Large of OSA and is currently serving as the chair of MES Council of OSA and chair of the Holography and Diffractive Optics Technical Group of OSA. He has also served as a topical editor of Applied Optics for six years, and was a co-founder of DH topical meeting. His research fields are digital holography, 3D display and plasmonics. His research group has published more than 290 international journal papers and presented more than 500 international conference papers including more than 80 invited talks.

Biomedical Optics (BIOMED) Plenary Speakers

Time Reversal in Biomedical Methods, Mathias Fink, *Langevin Institute ESPCI ParisTech, France*
Sunday, 29 April
08:45—09:30, *Symphony I & II*

Mathias Fink is a professor of physics at the Ecole Superieure de Physique et de Chimie Industrielles de la Ville de Paris (ESPCI ParisTech), Paris, France. In 1990 he founded the Laboratory Ondes et Acoustique at ESPCI that became in 2009 the Langevin Institute. In 2002, he was elected at the French Academy of Engineering, in 2003 at the French Academy of Science and in 2008 at the College de France on the Chair of Technological Innovation. Mathias Fink's area of research is concerned with the propagation of waves in complex media and the development of numerous instruments based on this basic research. His current research interests include time-reversal in physics, super-resolution, metamaterials, medical ultrasonic imaging, ultrasonic therapy, multiwave imaging, acoustic smart objects, underwater acoustics, geophysics and telecommunications. He has developed different techniques in medical imaging (ultrafast ultrasonic imaging, transient elastography, supersonic shear imaging), wave control and focusing in complex media with time-reversal mirrors. He holds more than 55 patents, and he has published more than 350 peer reviewed papers and book chapters. 4 start-up companies have been created from his research (Echosens, Sensitive Object, Supersonic Imagine and Time Reversal Communications)

Diffuse Optical Spectroscopy: Technology Development and Clinical Translation, Bruce J. Tromberg, *Beckman Laser Institute and Medical Clinic, University of California, Irvine, USA*
Tuesday, 1 May
08:00—08:45, *Symphony I & II*

Dr. Tromberg is the Director of the Beckman Laser Institute and Medical Clinic (BLI) at the University of California, Irvine (UCI) and principal investigator of the Laser Microbeam and Medical Program (LAMMP), an NIH National BIOMEDical Technology Center. He is a Professor in the departments of Biomedical Engineering and Surgery, co-leads the Onco-imaging and Spectroscopy Program in UCI's Chao Family Comprehensive Cancer Center, and has been a member of the BLI faculty since 1990. His research interests are in Biophotonics and Biomedical Optics, including diffuse optics, non-linear microscopy, cancer imaging, and photodynamic therapy.

Photoacoustic Tomography: Ultrasonically Breaking through the Optical Diffusion Limit, Lihong Wang, *Washington Univ. in St. Louis, USA*
Sunday, 29 April
08:00—08:45, *Symphony I & II*

Lihong Wang is a Gene Beare Distinguished Professor at Washington Univ. His book entitled, *BIOMEDical Optics: Principles and Imaging*, won the J. Goodman Award. He has published more than 280 peer-reviewed journal articles with an h-index of 57 and delivered more than 31 keynote/plenary/invited talks. He has received 31 research grants as PI with a cumulative budget of more than $34M. He is the Editor-in-Chief of the Journal of Biomedical Optics. He chairs the annual conference on Photons plus Ultrasound, and chaired the 2010 Gordon Conference on Lasers in Medicine and Biology and the 2010 OSA Topical Meeting on Biomedical Optics. Wang serves as the founding chairs of the scientific advisory boards for two companies commercializing photoacoustic tomography. He was awarded OSA's C.E.K. Mees Medal and IEEE's Technical Achievement Award for seminal contributions to photoacoustic tomography and Monte Carlo modeling of photon transport in biological tissues and for leadership in the international biophotonics community.

Biomedical Optics (BIOMED) Plenary Speakers—Continued

Bioimaging at the Nanoscale: Single-molecule and Super-resolution Fluorescence Microscopy, Xiaowei Zhuang, *Howard Hughes Medical Inst., Harvard Univ., USA*
Tuesday, 1 May
08:30—08:45, *Symphony I & II*

Xiaowei Zhuang, Professor of Chemistry and Chemical Biology and Professor of Physics at Harvard University, Investigator of Howard Hughes Medical Institute Investigator. Zhuang is a leading expert in single-molecule biology and bioimaging. Her lab develops and applies advanced optical imaging techniques, such as super-resolution light microscopy and single-molecule imaging approaches, to study biological systems quantitatively. Zhuang has pioneered single-molecule fluorescence studies of biomolecules. Her studies have yielded fundamental understandings of nucleic-acid folding and nucleic-acid-protein interactions. Her lab recently invented a super-resolution fluorescence microscopy method, STORM, which breaks the diffraction limit and allows fluorescence imaging with nanometer-scale resolution. This innovation has been adopted worldwide for high-resolution bioimaging and generated important insights into cellular structures. Zhuang received her B.S. degree in Physics from the University of Science and Technology of China, and her Ph.D. Degree in Physics from University of California at Berkeley. In 2001, she joined the faculty of Harvard University as an assistant professor. She was promoted to associate professor in 2005 and full professor in 2006. Zhuang received numerous awards, including the MacArthur Fellowship, Sloan Fellowship, Packard Fellowship for Science and Engineering, Beckman Young Investigator Award, Searle Scholar award, NSF CAREER award, ONR Young investigator award, TR Worlds Top 100 Young Innovators Award, Camille Dreyfus Teacher-Scholar Award, Coblentz Award, ACS Pure Chemistry Award, HHMI Collaborative Innovation Award, APS Max Delbruck Prize in Biological Physics and Raymond & Beverly Sackler International Prize in Biophysics, etc.

Notes

Digital Holography and Three-Dimensional Imaging (DH) Tutorial Speakers

Title Not Available, George Barbastathis, *MIT, USA*
Tuesday, 1 May
8:00—8:45, *Symphony IV*

George Barbastathis is Professor of Mechanical Engineering at MIT and holds the Singapore Research Professorship in Optics for the year 2011. Between December 2010 - August 2011 he is Faculty Resident with the Singapore-MIT Alliance for Research and Technology (SMART) Centre. He received the Diploma in Electrical and Computer Engineering from the National Technical University of Athens in 1993, and the M.Sc. and Ph.D. in Electrical Engineering from Caltech in 1994 and '97, respectively. Between 1997-99 he was a Post-doctoral Research Associate with the Beckman Institute at the University of Illinois, Urbana-Champaign. Between 2006-2007 he was Visiting Scholar with the School of Engineering and Applied Science at Harvard University. He has been the recipient of the Nikolaos Kritikos award in Mathematics, the 3M Innovation Award, the NSF Young Investigator Award, and the Esther & Harold E. Edgerton junior chair at MIT. His research is centered on the physics and engineering of 3D optical systems, in particular digital holography, volume holography, gradient-index media, and transformation optics.

Digital Holographic Interferometry - Principles and Applications to Deformation Measurement, Partha P. Banerjee, *Univ. of Dayton, USA*
Tuesday, 1 May
10:00—10:45, *Symphony IV*

Partha P. Banerjee is Professor of Electro-Optics and Electrical and Computer Engineering at the University of Dayton, where he was Chair of the ECE department from 2000-2005. Prior to that, he was with the Electrical and Computer Engineering department at the University of Alabama in Huntsville from 1991-2000, and Syracuse University from 1984-2001. He received his BTech from the Indian Institute of Technology in 1979, and his MS and PhD from the University of Iowa in 1980 and 1983, respectively. His areas of interest include optical processing, nonlinear optics, photorefractive materials and acousto-optics. He has authored/coauthored 5 books, several book chapters, over 120 refereed journal articles, and over 120 conference papers/presentations. He is a Fellow of the OSA and the SPIE, and a senior member of the IEEE. He received the NSF Presidential Young Investigator Award in 1987.

Special Events

Postdeadline Session

BIOMED Postdeadline Session
Sunday, 29 April
18:30—20:00, *Symphony I & II*

DH Postdeadline Session
Sunday, 29 April
18:30—20:00., *Symphony IV*

The postdeadline sessions will give participants the opportunity to hear new and significant material in rapidly advancing areas. Only those papers judged to be truly excellent and compelling in their timeliness were accepted. More information, including the schedule, will be posted in the weeks preceding the conference.

Conference Reception

Monday, 30 April
18:30—20:00, *Overture Foyer & Concerto Ballroom*

This Reception brings together the Biomedical Optics and Digital Holography & 3D Imaging meetings for a fun evening of networking with light appetizers and drinks. This event will take place in the Overture Foyer and the Concerto Ballroom.

OIDA Rump Session

Tuesday, 1 May
18:00—20:00, *Symphony IV*

OSA's 2012 Biomedical Optics and 3-D Imaging Congress will include a special event hosted by the Optoelectronics Industry Development Association (OIDA) and sponsored by OIDA Member **Hamamatsu Photonics K.K.** This session will be a unique opportunity to exchange ideas in an energized and fun environment and *we look forward to your joining in!*

Program Description: An early evening reception and session that engages research and industry attendees in a fast-paced, highly participatory discussion of a topic of key interest to both the academic and applied communities. Guest speakers will make brief presentations on "Growth opportunities for photonics companies in healthcare" followed by an “open microphone” segment where attendees are asked to address the audience with their comments and ideas.

This session is free to all BIOMED and DH registrants!

Poster Sessions

Sunday, 29 April, 13:00—15:00, *Concerto Ballroom and Overture Foyer*
Monday, 30 April, 13:30 – 15:30, *Concerto Ballroom and Overture Foyer*
Tuesday, 1 May, 13:00 – 15:00, *Concerto Ballroom and Overture Foyer*

The poster sessions are an integral part of the technical program and offer a unique networking opportunity, where presenters can discuss their results one-to-one with interested parties. Each author is provided with a 4 ft. x 8 ft. (1.22 m x 2.44 m) board on which to display the summary and results of his or her paper. The poster sessions will be held in the Concerto Ballroom and Overture Foyer.

Indicates that the session is being recorded

Symphony I & II	**Symphony IV**
BIOMED	DH
REGISTRATION, *Overture Foyer*	

7:50—8:00
BIOMED Opening Remarks

7:50—8:00
DH Opening Remarks

08:00 - 09:30
BSu1A • BIOMED Plenary
Xingde Li; John Hopkins Univ., USA, Presider

08:00 - 09:30
DSu1C • Three—Dimensional Display I
Yasuhiro Takaki; Tokyo Univ. of Agriculture & Technology, Japan, Presider

BSu1A.1 • 08:00 **Plenary**
Photoacoustic Tomography: Ultrasonically Breaking through the Optical Diffusion Limit, Lihong V. Wang[1]; [1]*Department of BIomedical Engineering, Washington Univ. in St. Louis, USA.* PAT, embodied in the forms of scanning photoacoustic microscopy or photoacoustic computed tomography, is the only modality capable of imaging across the length scales of organelles, cells, tissues, and organs with consistent contrast.

DSu1C.1 • 08:00 **Invited**
Enhanced Dynamic Holography in Organic-Inorganic Hybrid Devices, Dean Evans[1]; [1]*US Air Force Research Laboratory, USA.* We describe dynamic holographic coupling in a hybridized photorefractive device. Ferroelectric nanoparticles incorporated in hybrids, resulted in improved coupling efficiency. Nanoparticles fabrication and characterization will be discussed, including techniques to separate strong and weak dipoles.

DSu1C.2 • 08:30
Off-axis integral floating system using concave mirror, Young Min Kim[1], Sung-Wook Min[1], Byoung-Sub Song[1]; [1]*Kyung Hee Univ., Republic of Korea.* Off-axis integral floating display system using concave mirror is proposed for the simple structure and the high optical efficiency. The image distortion due to the off-axis optics is resolved using the compensated integrated image.

BSu1A.2 • 08:45 **Plenary**
Biomedical Applications of Ultrasonic Time-reversal, Mathias Fink[1]; [1]*Langevin Inst., Ecole Sup Physique Chimie Industrielles, France.* An overview on research conducted on ultrasonic time-reversal methods medical applications. Time-reversal focuses wave through complex and heterogeneous media and shows exciting results both in ultrasound therapy and ultrasonic imaging.

DSu1C.3 • 08:45
The Fast Calculation Method for Computer-Generated Holograms Compatible with Self Oclusion, Yusuke Sando[1], Daisuke Barada[1], Toyohiko Yatagai[1]; [1]*Center for Optical Research and Education, Utsunomiya Univ., Japan.* We have proposed the fast calculation method of computer-generated holograms compatible with self occlusion by the occlusion process and the extraction of spectrum with respect to each direction. This method has been verified by simulation.

DSu1C.4 • 09:00
Optical block module for autostereoscopic three-dimensional display, Youngmin Kim[1,2], Keehoon Hong[1], Jiwoon Yeom[1], Jisoo Hong[1], Byoungho Lee[1]; [1]*School of Electrical Engineering, Seoul National Univ., Republic of Korea;* [2]*Realistic Media Platform Research Center, Korea Electronics Technology Inst., Republic of Korea.* Optical block module for autostereoscopic three-dimensional display is presented. By using a polarizer and a quarter-wave retarding film, the proposed method can be incorporated in frontal projection-type parallax barrier display.

DSu1C.5 • 09:15
Depth-fused Display with Enhanced Viewing Region, Soon-gi Park[1], Jae-Hyun Jung[1], Youngmin Kim[2], Byoungho Lee[1]; [1]*School of Electrical Engineering, Seoul National Univ., Republic of Korea;* [2]*Realistic Media Platform Research Center, Korea Electronics Technology Inst., Republic of Korea.* We propose a viewing region enhanced depth-fused display(DFD) system. Combination of multi-view rear image and transparent front image reduces the mismatching problem of conventional DFD system. We demonstrate the feasibility with experiment.

Symphony I & II	Symphony III	Symphony IV
BIOMED I	BIOMED 2	DH
9:30—10:00 COFFEE BREAK, Concerto A,B,C		
10:00 - 12:00 **BSu2A • Brain Imaging** Brian Pogue; *Dartmouth College, USA, Presider*	**10:00 - 12:00** **BSu2B • Microscopy Imaging: Novel Fluorescence Contrast** *Paul Campagnola; Univ. of Wisconsin, USA, Presider*	**10:00 - 12:00** **DSu2C • Special Techniques of Digital Holography I** *David Nolte; Purdue Univ., USA, Presider*
BSu2A.1 • 10:00 Invited **Multimodal Integration of fMRI, EEG, and NIRS,** Mark E. Pflieger[1], Randall L. Barbour[2]; [1]*Source Signal Imaging, Inc., USA;* [2]*Department of Pathology, SUNY Downstate Medical Center, USA.* Multimodal integration in the field of human brain mapping has evolved from structural-functional co-registrations toward functional-functional combinations. This paper briefly reviews fMRI-EEG, fMRI-NIRS, EEG-NIRS, and fMRI-EEG-NIRS combinations.	**BSu2B.1 • 10:00** **Multiphoton Microscopic (MPM) Endoscopy Imaging within Lung Tissue for Medical Diagnostics,** Watt W. Webb[1], Ina Pavlova[1]; [1]*Applied & Engineering Physics, Cornell Univ., USA.*Elusive lung cancer diagnostics have motivated evolution of in situ benign spectroscopic nano-imaging by newly evolved multiphoton microscopic (MPM) endoscopy offering internal tissue diagnostics.	**DSu2C.1 • 10:00 Invited** **Digital Holographic Interferometry and ESPI at Long Infrared Wavelengths with CO2 Lasers,** Marc Georges[1], Jean-François Vandenrijt[1], Cedric Thizy[1], Frank Dubois[2], Patrick Queeckers[2], Dominic Doyle[3], Igor Alexeenko[4], Giancarlo Pedrini[4], Wolfgang Osten[4]; [1]*Centre Spatial de Liege, Universite de Liege, Belgium;* [2]*Microgravity Research Center, Universite Libre de Bruxelles, Belgium;* [3]*ESTEC, ESA, Netherlands;* [4]*Institut für Technische Optik, Universität Stuttgart, Germany.*Holography and speckle techniques for various metrology and non destructive applications were developed in the 10 µm wavelength range allowing large displacements measurement. Other specific advantages are emphasized like combining temperature and displacement measurement.
	BSu2B.2 • 10:15 **In Vivo, Deep Tissue Three-Photon Imaging at the 1700-nm Spectral Window,** Nicholas G. Horton[1], Demirhan Kobat[1], Ke Wang[1], Chris Xu[1]; [1]*Cornell Univ., USA.* We demonstrate deep tissue three-photon microscopy at the new spectral window of 1700 nm. We imaged vasculature and RFP-tagged neurons up to 1 mm below the cortical surface, and RFP-tagged neurons below an unthinned skull.	
BSu2A.2 • 10:30 **Investigating Hemodynamics in Scalp and Brain Using High-resolution Diffuse Optical Tomography in Humans,** Christina Habermehl[1], Christoph Schmitz[1,2], Stefan P. Koch[1], Jan Mehnert[1,3], Jens Steinbrink[1,4]; [1]*Neurology, Charité Berlin, Germany;* [2]*Nirx Medizintechnik, Germany;* [3]*Neurology, Max Planck Inst. for Human Cognitive and Brain Sciences, Germany;* [4]*Center for Strokeresearch Berlin (CSB), Charité Berlin, Germany.* We investigate prerequisites for developing a cw-NIRS brain perfusion monitor. Based on the separation of superficial and cortical layers using HR-DOT we investigate the power and distribution of low frequency oscillations in the brain and scalp.	**BSu2B.3 • 10:30** **High-Speed Simultaneous in vivo Multiphoton Microscopy and Fluorescence Lifetime Microscopy,** Scott Howard[1], Adam Straub[2], Chris Xu[2]; [1]*Elecitrcal Engineering, Univ. of Notre Dame, USA;* [2]*Applied and Engineering Physics, Cornell Univ., USA.* We present full-frame (256x500 pixel) simultaneous MPM and FLIM imaging, in vivo. Parallel excitation and collection on a single element detector allows for a two orders of magnitude increase in pixel rate over serial scanning and deep imaging.	**DSu2C.2 • 10:30** **Path-independent phase unwrapping using phase derivative and total-variation (TV) denoising,** Yuanhao Huang[1], Lei Tian[2], Z. Zhang[1], Yi Liu[2], George Barbastathis[1,2]; [1]*Singapore MIT Alliance for Research and Technology (SMART) Center, Singapore;* [2]*Mechanical Engineering, Massachusetts Inst. of Technology, USA.*A path-independent method for phase unwrapping is proposed and demonstrated in the case of a noisy wrapped phase map obtained from a shearography experiment.
BSu2A.3 • 10:45 **Quantification of Cerebral Blood Flow and Oxygen Metabolism by Combining Time-Resolved Near-Infrared Spectroscopy and Diffuse Correlation Spectroscopy** Kyle Verdecchia[1,2]; [1]*Imaging Division, Lawson Health Research Inst., Canada;* [2]*Medical Biophysics, Univ. of Western Ontario, Canada.* A time-resolved near-infrared and diffuse correlation spectroscopy hybrid method to measure absolute cerebral blood flow and oxygen metabolism measurements dynamically. Arterial and venous blood samples are drawn for validation in newborn piglets.	**BSu2B.4 • 10:45** **Nonlinear Imaging of Intrinsic Tissue Contrast with a Fiber-optic Scanning Endomicroscope,** Yuying Zhang[1], Kartikeya Murari[1], Wenxuan Liang[1], Kristine Glunde[2], Ming-Jun Li[3], Xingde Li[1]; [1]*Department of BIOMEDical Engineering, Johns Hopkins Univ. School of Medicine, USA;* [2]*Department of Radiology, Johns Hopkins Univ. School of Medicine, USA;* [3]*Science and Technology, Corning Incorporated, USA.* We present a fiberoptic scanning endomicroscope with a 2-mm diameter and a 32-mm rigid length capable of imaging two-photon excitation fluorescence from intrinsic fluorophors and second harmonic generation from non-centerosymmetric molecules.	**DSu2C.3 • 10:45** **Spatial Phase Calibration Used to Improve Holographic Optical Trapping,** David Engström[1], Martin Persson[1], Mattias Goksör[1]; [1]*Department of Physics, Univ. of Gothenburg, Sweden.*We demonstrate that a spatial phase calibration strongly improves the trapping pattern generated by a holographic optical trapping setup. The main advantage is the decreased power in the zeroth order.

Symphony I & II	Symphony III	Symphony IV
BIOMED I	BIOMED 2	DH

BSu2A • Brain Imaging—Continued

BSu2A.4 • 11:00
Performance Assessment of Time-Domain Optical Brain Imagers: The nEUROPt Protocol, Heidrun Wabnitz[1], Alexander Jelzow[1], Mikhail Mazurenka[1], Oliver Steinkellner[1], Rainer Macdonald[1], Antonio Pifferi[2,3], Alessandro Torricelli[2], Davide Contini[2], Lucia Zucchelli[2], Lorenzo Spinelli[3], Rinaldo Cubeddu[2,3], Daniel Milej[4], Norbert Zolek[4], Michal Kacprzak[4], Adam Liebert[4], Salavat Magazov[5], Jeremy Hebden[5], Fabrizio Martelli[6], Paola Di Ninni[6], Giovanni Zaccanti[6]; *[1]Physikalisch-Technische Bundesanstalt, Germany; [2]Dipartimento di Fisica, Politecnico di Milano, Italy; [3]Consiglio Nazionale delle Ricerche-Istituto di Fotonica e Nanotecnologie, Italy; [4]Inst. of Biocybernetics and BIOMEDical Engineering, Poland; [5]Department of Medical Physics and Bioengineering, Univ. College London, UK; [6]Dipartimento di Fisica e Astronomia, Università degli Studi di Firenze, Italy.* A novel protocol to determine sensitivity, spatial resolution and quantification of absorption changes in optical brain imaging was applied to assess time-domain instruments and methods of data analysis.

BSu2A.5 • 11:15
Combining and optimizing NIRS and EEG to study inter-ictal epileptic discharges, Robert J. Cooper[1], Meryem A. Yucel[1], Louis Gagnon[1,2], Nao Suzuki[1], Naoaki Tanaka[1], Claus Reinsberger[1,3], David Boas[1], Steve Stufflebeam[1]; *[1]Martinos Center for BIOMEDical Imaging, MGH, USA; [2]Division of Health Sciences and Technology, Harvard-MIT, USA; [3]Department of Neurology, Brigham and Women's Hospital, USA.* We describe our ongoing application of NIRS-EEG to the study of inter-ictal discharges in adult epilepsy. We discuss optimizing NIRS-EEG data acquisition and analysis and we present preliminary NIRS-EEG results for an epileptic patient.

BSu2A.6 • 11:30
Fast multispectral diffuse optical tomography system for in vivo imaging of seizure dynamics, Tao Zhang[1]; *[1]BIOMEDical Engineering, Univ. of Florida, USA.* We report a multispectral continuous-wave diffuse optical tomography system for real time noninvasive 3D imaging of hemodynamic changes. The system is validated by tissue-like phantoms, and further demonstrated by in vivo animal seizure model.

BSu2A.7 • 11:45
Potential Use of Low-Frequency Oscillations of Cortical Hemodynamics in Pediatric Epilepsy Surgery, Yinchen Song[1], Sanjiv Bhatia[2], John Ragheb[2], Prasanna Jayakar[2], Wei-Chiang Lin[1]; *[1]Deparment of BIOMEDical Engineering, Florida International Univ., USA; [2]Neurosurgery Department, Miami Children's Hospital, USA.* Low-frequency oscillations in cortical hemodynamics were observed from the cortex of pediatric patients undergoing epilepsy surgery; they may be used to identify the functional and/or the epileptic cortex intraoperatively.

BSu2B • Microscopy Imaging: Novel Fluorescence Contrast—Continued

BSu2B.5 • 11:00
Multifocal multiphoton endoscope, David R. Rivera[1], Christopher M. Brown[1], Dimitre G. Ouzounov[1], Watt W. Webb[1], Chris Xu[1]; *[1]AEP, Cornell Univ., USA.* We report a miniaturized resonant/non-resonant multifiber raster scanner that is paired with a gradient-index assembly to achieve a compact (3 mm OD) multifocal multiphoton endoscope capable of transverse and longitudinal parallel image acquisition.

BSu2B.6 • 11:15
Non-invasive Optical Detection of Cell Differentiation Status Using Endogenous Sources of Optical Contrast, Kyle P. Quinn[1], Rebecca S. Hayden[1], David L. Kaplan[1], Irene Georgakoudi[1]; *[1]BIOMEDical Engineering, Tufts Univ., USA.* Two-photon fluorescence and second harmonic generation images of mesenchymal stem cells undergoing osteoblastic differentiation demonstrate the cell redox ratio of FAD/(NADH+FAD) can serve as non-invasive biomarker of cell differentiation status

BSu2B.7 • 11:30
Monolithic Micro-Structures Fabricated by Wide Field Two Photon Polymerization, Yun-Ho Jang[1,2], Daekeun Kim[2,3], Peter So[2,4]; *[1]Femtofab, Inc., USA; [2]Biological Engineering, MIT, USA; [3]Biological Engineering, Dankook Univ., Republic of Korea; [4]Mechanical Enigneering, MIT, USA.* We examined the feature size of micro-structures and demonstrated microfluidic channels based on wide field two photon polymerization for the applications requiring monolithic three-dimensional micro-structures such as microfluidic devices or tissue engineered scaffolds.

BSu2B.8 • 11:45
9.6-mm diameter femtosecond laser microsurgery probe, Christopher L. Hoy[1], Onur Ferhanoglu[1], Murat Yildirim[1], Wibool Piyawattanametha[2], Hyejun Ra[2], Olav Solgaard[2], Adela Ben-Yakar[1]; *[1]Mechanical Engineering, The Univ. of Texas at Austin, USA; [2]Electrical Engineering, Stanford Univ., USA.* We present a 9.6-mm fiber-coupled probe for femtosecond laser microsurgery and nonlinear imaging. Towards enabling clinical use, we successfully reduced the volume of our earlier 18-mm surgery probe by 5 times, while improving optical performance.

DSu2C • Special Techniques of Digital Holography I—Continued

DSu2C.4 • 11:00
Digital in-line holography with a spatially partially coherent beam, Clément Remacha[2,1], Jean-Marc Dorey[2], Franck David[2], Denis Lebrun[1], Sébastien Coëtmellec[1]; *[1]G2O, CORIA, France; [2]MFEE, EDF, France.* We propose in this paper an analytical solution to the problem of scalar diffraction of a partially coherent beam by an opaque disk. This analytical solution is applied in digital in-line holography of particles.

DSu2C.5 • 11:15
3D relative locations and diameters measurements of spherical particles by Fourier Interferometry Imaging (FII), Paul Briard[1], Gérard Gréhan[1], Xue Cheng Wu[2], Ling Hong Chen[2], Siegfried Meunier-Guttin-Cluzel[1], Sawatree Saengkaew[1]; *[1]Coria, France; [2]Zhejiang Univ., China.* This paper presents the possibility to measure the diameters and relative locations of a set of spherical particles. The method is based on the analysis of the interference patterns in in the 2D associated Fourier space.

DSu2C.6 • 11:30
Dynamic Hologram Recording on an Azo-Containing Polymer-Liquid Crystal Hybrid System, Sarfaraz Baig[1], Pengfei Wu[2], Qunhui Sun[2], Michael R. Wang[1]; *[1]Dept. of Electrical and Computer Engineering, Univ. of Miami, USA; [2]New Span Opto-Technology Inc., USA.* Holograms with significantly improved diffraction efficiency are recorded on a new Azo-containing polymer-liquid crystal hybrid composite film, allowing dynamic recording and readout. Local heating can facilitate hologram erasure for re-recording.

DSu2C.7 • 11:45
Withdrawn

Concerto Ballroom and Overture Foyer

BIOMED

12:00—13:00
LUNCH ON YOUR OWN

13:00—15:00
BSu3A: BIOMED Poster Session I

BSu3A.1
Axial displacement and position measurement of single particle using optical tweezers, Mary-Clare C. Dy[1], Tadao Sugiura[1], Kotaro Minato[1]; *[1]Information Science, Nara Inst. of Science and Technology, Japan.* A simple yet sensitive scheme is developed to transport a particle using optical tweezers and measure the particle displacement in the axial direction. This technique can be applied to axial force measurement of cells.

BSu3A.2
Development of a vertically and horizontally applicable multi-frequency alternating-magnetic-field device for hyperthermia of glioma in rodent model using iron oxide based nanoparticles, Daqing Piao[1], Kelvin Le[2], Debra Saunders[3], Nataliya Smith[3], Jessica Goddard[2], Daniel Figueroa[2], Jerzy Krasinski[1], Rheal A. Towner[3]; *[1]School of Electrical and Computer Engineering, Oklahoma State Univ., USA; [2]Department of Engineering and Physics, Univeristy of Central Oklahoma, USA; [3]Advanced Magnetic Resonance Center, Oklahoma Medical Research Foundation, USA.* We developed an alternating-magnetic-field (AMF) device of operating either vertically for in vitro or horizontally for animal study, with frequency ranging from 0.209-1.1MHz. Heating of 10nm-core iron-oxide nanoparticles was demonstrated in vivo.

BSu3A.3
In vivo near infrared fluorescence imaging of efficient systemic siRNA delivery with HDL-mimicking peptide lipid nanoparticles, Qiaoya Lin[1,3], Juan Chen[1], Zhihong Zhang[1,3], Gang Zheng[1,2]; *[1]Campbell Family Cancer Research Inst. and Ontario Cancer Inst., Univ. Health Network, Canada; [2]Department of Medical Biophysics, Univ. of Toronto, Univ. of Toronto, Canada; [3]Britton Chance Center for BIOMEDical Photonics, Wuhan National Laboratory for Optoelectronics-Huazhong Univ. of Science & Technology, China.* The big challenge for RNAi therapeutics is systemic delivery of siRNA.Here,we report the successful in vivo targeted delivery of siRNA using HDL-Mimicking Peptide Phospholipid Scaffold (HPPS) nanoparticle proved by near infrared fluorescence imaging.

BSu3A.4
Raman-Coded Nanoparticles for Multiplexed Molecular Endoscopy of the Esophagus, Anushree Srivastava[1], Jack Zhou[2], Danni Wang[1], Steven Y. Leigh[1], Ye Chen[1], Jonathan T. Liu[1]; *[1]BIOMEDical Engineering, State Univ. of New York (SUNY) at Stony Brook, USA; [2]Ward Melville High School, USA.* In order to perform quantitative molecular imaging of a large panel of disease biomarkers in a rat model of esophageal cancer, a rigid endoscopic probe is being developed to image molecularly targeted SERS nanoparticles.

BSu3A.5
Development of a Highly Sensitive Label-Free Nucleic Acid Biosensor, Bailin Zhang[1], Shatha Dallo[1], Ralph Peterson[1], Syed Hussain[1], Tao Weitao[1], Jing Yong Ye[1]; *[1]Univ. of Texas at San Antonio, USA.* We have demonstrated the development of a highly sensitive label-free nucleic acid biosensor based on a unique open optical micro-cavity using a photonic crystal structure in a total-internal-reflection configuration.

BSu3A.6 Photodynamic diagnosis model for depth evaluation of basal cell carcinomas, Irene Salas-García[1], Félix Fanjul-Vélez[1], Noé Ortega-Quijano[1], Jose L. Arce-Diego[1]; *[1]TEISA, Univ. of Cantabria, Spain.* The present work is devoted to the development of a diagnostic model based on photodynamic therapy to obtain an estimation of a skin tumor depth from the measurement of the photosensitizer fluorescence emission.

BSu3A.7
Withdrawn

BSu3A.8
Optically Controlled Opening of Self-Sealing Giant Unilamellar Vesicles, Elizabeth Huynh[1,2], Jonathan F. Lovell[3], Gang Zheng[1,2]; *[1]Univ. of Toronto, Canada; [2]Univ. Health Network, Canada; [3]Univ. at Buffalo, State Univ. of New York, USA.* Micron-scale giant unilamellar vesicles were readily opened using a focused laser beam in situ. These giant unilamellar vesicles have potential use as versatile microreactors possessing temporally and spatially controlled optical opening.

BSu3A.9
Porphysomes: Multifunctional Nanovesicles to Treat Hypoxic Tumour by Photothermal Therapy, Cheng Jin[1,2], Jonathan F. Lovell[2,3], Gang Zheng[2,3]; *[1]Pharmaceutical Sciences, Univ. of Toronto, Canada; [2]Inst. for Biomaterials and Bioengineering, Univ. of Toronto, Canada; [3]Ontario Cancer Inst., Univ. Health Network, Canada.* Porphysomes are multifunctional nanovesicles and potent photothermal agents. Their photothermal efficacy was compared to Photofrin PDT on normoxic and hypoxic tumors. Porphysomes were investigated to treat hypoxic tumor by photothermal therapy.

BSu3A.10
From random lasing to single-nanoparticle detection, Seung Ho Choi[1], Zhengbin Xu[1], Qinghai Song[2], Young Kim[1]; *[1]Purdue Univ., USA; [2]Harbin Inst. of Technology, China.* We review our recent studies on random lasers for spectroscopic and biosensing approaches, using the unique combination of its intriguing physical principle, its simplicity of realization, and its sensitivity to nanoscale perturbations.

BSu3A.11
Withdrawn

BSu3A.12
Study on the Cytosolic delivery mechanism of HDL-mimicking Peptide-Phospholipid Scaffold (HPPS) By Confocal Microscopy, Qiaoya Lin[1,2], Juan Chen[1], Zhihong Zhang[1,2], Gang Zheng[1,3]; *[1]Campbell Family Cancer Research Inst. and Ontario Cancer Inst., Univ. Health Network, Canada; [2]Britton Chance Center for BIOMEDical Photonics, Wuhan National Laboratory for Optoelectronics-Huazhong Univ. of Science & Technology, China; [3]Department of Medical Biophysics, Univ. of Toronto, Canada.* The cytosolic drug delivery mechanism is a key advantage for the delivery of intracellular active cancer agents. Here, we use confocal microscopy to investigate the cytosolic delivery mechanism of HDL-mimicking peptide-phospholipid scaffold (HPPS).

BSu3A: BIOMED Poster Session I—Continue

BSu3A.13
Optical Fiber Biosensor with Self-Assembled Nanoscale Coatings for Rapid Detection of Methicilin-Resistant Staphylococcus Aureus, James R. Heflin[1], Ziwei Zuo[1], Abey Bandara[2], Anne Hyman[2], Thomas Inzana[2], Siddharth Ramachandran[3]; *[1]Physics, Virginia Tech, USA; [2]BIOMEDical Sciences and Pathobiology, Virginia Tech, USA; [3]Electrical Engineering, Boston Univ., USA.* A turnaround point long-period grating with an ionic self-assembled multilayer film and monoclonal antibody on the cladding surface can detect methicilin-resistant staphylococcus aureus at a level of 450 cells/ml in under an hour.

BSu3A.14
Exploring the Multifunctional Capabilities of Porphysomes for Prostate Cancer Imaging, Tracy W. Liu[1], Thomas D. MacDonald[1], Cheng Jin[1], Brian C. Wilson[1], Gang Zheng[1]; *[1]Medical Biophjysics, Univ. of Toronto/Ontario Cancer Inst., Canada.* We explore the multimodal imaging capacity of porphysomes beyond bionanophotonics. Porphysomes demonstrate PET treatment planning capabilities for prostate cancer that can be translated onto the surgical table by fluorescence guided therapy.

BSu3A.15
Gold nanocages as contrast agents for two-photon luminescence endomicroscopy, Yongping Chen[1], Yuying Zhang[1], Xingde Li[1]; *[1]Johns Hopkins Univ., USA.* We reported the contrast agents based on structured Au nanocages for enhancing TPL endomicroscopic imaging. Cancer cells and tissues TPL endomicroscopy imaging with the Au nanocages were performed, demonstrating significant contrast enhancement.

BSu3A.16
Modeling AlGaInP-Au Lasers in Photodynamic Therapy for Tumors and Cancers, Meng-Mu Shih[1]; *[1]Univ. of Florida, USA.* This work develops multi-parametric models to compute coupling coefficients of semiconductor-metal lasers at around 633 nm for photodynamic therapy. Numerical results computed by the photonic and the optical methods have excellent agreements.

BSu3A.17
An Edge Detection Approach for Mapping of the Human Cone Photoreceptor Mosaic using Adaptive Optics Scanning Laser Ophthalmoscope, Shahab Chitchian[1,2], Adam R. Boretsky[1], Frederik J. van Kuijk[3], Massoud Motamedi[1,2]; *[1]Center for BIOMEDical Engineering, Univ. of Texas Medical Branch, USA; [2]Department of Ophthalmology, Univ. of Texas Medical Branch, USA; [3]Department of Ophthalmology, Univ. of Minnesota, USA.* In this study, a novel edge detection algorithm and an adaptive optics scanning laser ophthalmoscopy were applied to visualize the cone photoreceptor mosaic from approximately 4° to 8° eccentricities in the vertical, superior retina.

BSu3A.18
Confocal Retinal Imaging using Scanning Laser Opthalmoscopy with Annular Beams, Brian Vohnsen[1], Benjamin Lochocki[1], Carmen Vela-Garcia[1], Diego Rativa[1]; *[1]School of Physics, Univ. College Dublin, Ireland.* The human retina has been imaged in-vivo using scanning laser ophthalmoscopy employing annular incident beams adapted for resolution optimization. The pros and cons of the approach are discussed and the importance of coherence is explored.

BSu3A.19
Influence of Wavefront Slope on Effective Retinal Images Using a Spatial Light Modulator, Sara Castillo[1], Brian Vohnsen[2]; *[1]School of Physics, Univ. college dublin, Ireland; [2]School of Physics, Univ. college dublin, Ireland.* A spatial light modulator has been used to project two coherent Maxwellian point sources on to the eye and study the Stiles-Crawford effect dependence on the wavefront slope create at the retina.

BSu3A.20
In vivo cytometry using two-photon autofluorescence microscopy, Yan Zeng[1], Jin Xu[2], Dong Li[1], Li Li[2], Zilong Wen[2], Jianan Y. Qu[1]; *[1]Department of Electronic and Computered Engineering, Hong Kong Univ. of science and technology, Hong Kong; [2]Department of Biochemistry, Hong Kong Univ. of Science and Technology, Hong Kong.* We demonstrate an in vivo cytometry based on two-photon excited autofluorescence in zebrafish blood vessels. The plasma and NADH fluorescence provide contrasts for visualizing and counting of red blood cells and white blood cells, respectively.

BSu3A.21
Lensed Fiber Raster Scanner for a Large Field-of-View, High-Resolution Microendoscope, David R. Rivera[1], Christopher M. Brown[1], Dimitre G. Ouzounov[1], Watt W. Webb[1], Chris Xu[1]; *[1]AEP, Cornell Univ., USA.* A lensed fiber is used in a miniaturized fiber-raster scanner for a microendoscope with large field-of-view and high-resolution. Paired with a miniature lens, the scanner achieves a 1.1-um lateral resolution with a 440-um-diameter FOV.

BSu3A.22
Optical Microfluidics for Cell Studies, Sanhita S. Dixit[1], Hanyoup Kim[1], Kanaka Hettiarachchi[1], Gregory W. Faris[1]; *[1]Molecular Physics Laboratory, SRI International, USA.* We apply optical microfluidic methods to cell studies including: nanoliter polymerase chain reaction amplification of DNA/RNA, useful for circulating tumor cells; and preparing artificial bilayers, useful for transmembrane protein function.

BSu3A.23
Extended depth of field microscopy by using digital optics, Yung Lin Chen[1]; *[1]ITRI, Taiwan.* The shallow depth of field (DOF) of the microscope is the inherent problem due to its high numerical aperture (NA), the paper proposed a method to extend the DOF by using spherical phase coding, DOF can be extended 2 times

BSu3A.24
Two-photon volume imaging with a nondiffracting beam: a simulation study based on a scalar diffraction method, Juanjuan Zheng[1], Yanlong Yang[1], Ming Lei[1], Baoli Yao[1], Peng Gao[1], Tong Ye[1]; *[1]State Key Laboratory of Transient Optics and Photonics, Xi'an Inst. of Optics and Prescision Mechanics, Chinese Academy of Sciences, China.* A two-photon excitation fluorescence volume imaging method is proposed with a non-diffracting and self-reconstructing Bessel beam and investigated with a simulation approach based on a scalar diffraction method.

BSu3A: BIOMED Poster Session I—Continue

BSu3A.25
Study on vibration characteristics of two nodal wedges controlled NSOM probe submerged partially in water, Wonjun Lee[1], Dae-Chan Kim[1], Seung Gol Lee[1]; *[1]Inha Univ., Republic of Korea.* Vibration characteristics of a dithering NSOM probe being controlled mechanically with two nodal wedges, whose tip end was partially submerged in water, was studied. The optimum controlling condition was found for measuring samples in water.

BSu3A.26
Needle-free Microscopy for Malaria Diagnostics, Jennifer Burnett[1], Rebecca Richards-Kortum[1]; *[1]Bioengineering, Rice Univ., USA.* This is a proof-of-concept study to assess whether in vivo confocal microscopy coupled with topical proflavine staining can be used to recognize malaria-infected RBCs. Results from a chicken embryo model indicate this may be feasible.

BSu3A.27
Withdrawn

BSu3A.28
A simple, cost efficient fiber amplifier wavelength extension unit for broadly tunable, femtosecond pulse Ti-sapphire lasers for CARS microscopy, Attila Kolonics[1,2], Dániel Csáti[1], Péter Antal[1], Róbert Szipöcs[1,2]; *[1]Research Inst. for Solid State Physics and Optics, Hungary; [2]R&D Ultrafast Lasers Ltd, Hungary.* An inherently synchronized Yb-fiber amplifier based extension unit for femtosecond pulse, broadly tunable Ti-sapphire lasers is introduced, which is well suited for coherent anti-Stokes Raman scattering microscopy.

BSu3A.29
Aberration correction of sub-10-fs pulse focusing with high-numerical-aperture microscope objective, Miaochan Zhi[1], Holly Gibbs[1], Alvin Yeh[1]; *[1]BIOMEDical Engineering, Texas A&M Univ., USA.* Deformable mirror is used to correct radially varying group delay in a nonlinear optical microscopy setup aiming to improve signal generation and image resolution. Simulations and experiments which support the efficacy of our method are presented.

BSu3A.30
Phase derivative microscopy for label-free imaging of dynamic biological structures, Taewoo Kim[1], Gabriel Popescu[1]; *[1]Electrical and Computer Engineering, Univ. of Illinois, Urbana-Champaign, USA.* Laplace and gradient field microscopy use a spatial light modulation in the Fourier plane of a microscope image to measure the intensity of field derivatives which is valuable in studying the dynamics of biological samples.

BSu3A.31
Computation of baseline flow across the mouse cortex using two-photon microscopy and vascular anatomical network modeling, Louis Gagnon[1,2], Emiri T. Mandeville[3], Mohammad A. Yaseen[2], Vivek J. Srinivasan[2], Eng Lo[3], Emmanual Roussakis[4], Sergei A. Vinogradov[4], Anna Devor[5], David Boas[2,1], Sava Sakadzic[2]; *[1]Harvard-MIT Division of Health Sciences and Technology, USA; [2]Athinoula A. Martinos Center for BIOMEDical Imaging, Department of Radiology, Massachusetts General Hospital, Harvard Medical School, USA; [3]Departments of Radiology and Neurology, Massachusetts General Hospital, Harvard Medical School, USA; [4]Department of Biochemistry and Biophysics, Univ. of Pennsylvania, USA; [5]Departments of Neurosciences and Radiology, Univ. of California San Diego, USA.* We demonstrate the feasibility of computing baseline flow in the mouse cortex using vascular anatomical network constructed from two-photon microscopy measurements. The values obtained are in good agreement with values reported in the literature.

BSu3A.32
In Vivo Imaging of Unstained Rat Tissue Using a Multiphoton Microendoscope, Christopher M. Brown[1], David R. Rivera[1], Dimitre G. Ouzounov[1], Ina Pavlova[1], Watt W. Webb[1], Chris Xu[1]; *[1]AEP, Cornell Univ., USA.* Unstained liver, kidney, and colon tissue from an anesthetized rat was imaged in vivo using a compact and flexible raster scanning endoscope. Endoscopic image acquisition was guided using a wide field infrared imaging system.

BSu3A.33
Elucidating metabolic, subcellular, and tissue-level changes induced by HPV-related oncoproteins, Joanna Xylas[1], Margaret McLaughlin-Drubin[2], Karl Münger[2], Irene Georgakoudi[1]; *[1]BIOMEDical Engineering, Tufts Univ., USA; [2]Brigham and Women's Hospital, USA.* We use tissue engineering and a Human papillomavirus (HPV) model of carcinogenesis to associate specific molecular changes to optical precancerous biomarkers.

BSu3A.34
Polarization Imaging System for Colposcopy, Victor Chernomordik[1], Alexander Sviridov[2,1], Moinuddin Hassan[1], Jana M. Kainerstorfer[1], Laleh Najafizadeh[1], Paul D. Smith[3], Amir Gandjbakhche[1]; *[1]Program in Physical Biology, Lab. of Integrative and Medical Biophysics, National Inst. of Child Health and Human Development, National Inst.s of Health, USA; [2]Inst. for Laser and Information Technologies of Russian Academy of Sciences, Russian Federation; [3]Ecole Superinieure de Physique et de Chimie Industrielle de Paris, France.* The designed polarization adapter is incorporated into a colposcope, provides illumination with polarized light and capturing of orthogonally polarized images, using liquid crystal retarder and polarizer.

BSu3A.35
Fiber-optic Second Harmonic Generation Endomicroscopy: A Potential tool for Diagnosis of Preterm Birth, Yuying Zhang[1], Meredith L. Akins[2], Kartikeya Murari[1], Ming-Jun Li[4], Katherine Luby-Phelps[3], Mala Mahendroo[2], Xingde Li[1]; *[1]Department of BIOMEDical Engineering, Johns Hopkins Univ. School of Medicine, USA; [2]Department of Obstetrics and Gynecology, UT Southwestern Medical Center, USA; [3]Department of Cell Biology, UT Southwestern Medical Center, USA; [4]Science and Technology, Corning Incorporated, USA.* We present a fiber-optic scanning second harmonic generation (SHG) endomicroscopy system that can detect the morphological changes in cervical collagen fiber during gestation with sub-micrometer resolution.

BSu3A.36
Lissajous Scanning Fiber-optic Nonlinear Endomicroscope with Precise Position Calibration, Kartikeya Murari[1], Wenxuan Liang[1], Yuying Zhang[1], Jiefeng Xi[1], Xingde Li[1]; *[1]Johns Hopkins Univ., USA.* Using an acousto-optic modulator that froze beam positions on frames captured by an ordinary CCD camera, we were able to calibrate the Lissajous scanning pattern on a fiber-optic nonlinear endomicroscope quickly and precisely.

BSu3A: BIOMED Poster Session I—Continue

BSu3A.37
White Light Diffraction Phase Microscopy (wDPM) for quantitative phase imaging, Basanta Bhaduri[1]; [1]*Electrical and Computer Engineering, Univ. of Illinois at Urbana Champaign, USA.* We present white-light diffraction phase microscopy (wDPM) as a fast and sensitive quantitative phase imaging method and a successive derivatives based phase reconstruction method. We illustrate the utility of wDPM with measurements on live cells.

BSu3A.38
Response to Optical Trapping by Red Blood Cells (RBCs) from a Transfused Sickle Cell Patient, Daniel Erenso[1], Aline Pellizzaro[3], Gabriel Welker[1], Omar Mohammed[1], Anthony Farone[3], Mary Farone[3], Maria del Pilar Aguinaga[2]; [1]*Physics & Astronomy, Middle Tennessee State Univ, USA;* [2]*Obstetrics and Gynecology3, Meharry Sickle Cell Center, Meharry Medical College, USA;* [3]*Biology, Middle Tennessee State Univ, USA.* The response of RBCs from a transfused sickle cell anemia (Hb S and Hb A) patient has been studied in comparison with RBCs from a healthy person (Hb AA) when directly trapped by a laser.

BSu3A.39
Stimulated Emission Depletion Microscopy with a Single Ultrafast Laser, Tong Ye[1], Yuhua Zhang[2], Xun Ai[3], Lucas Pozzo-Miller[1], Kent Keyser[4]; [1]*Department of Neurobiology, Univ. of Alabama at Birmingham, USA;* [2]*Ophthalmology, Univ. of Alabama at Birmingham, USA;* [3]*Medicine, Univ. of Alabama at Birmingham, USA;* [4]*Vision Science, Univ. of Alabama at Birmingham, USA.* We present a stimulated emission depletion microscopy system that has been built around a single ultrafast laser system. Excitation beams are provided by a supercontinuum generation with the same laser.

BSu3A.40
Selective Sampling in Hyperspectral Raman Micro-Spectroscopy: Obtaining Maximum Data with Minimal Sampling Time, Christopher Rowlands[1,2], Ioan Notingher[1]; [1]*Physics, Univ. of Nottingham, UK;* [2]*Biological Engineering, MIT, USA.* We present a new method for selectively sampling hyperspectral Raman maps in order to maximize the information that can be obtained for a given sample time. Example maps and comparisons with alternative methods are provided.

BSu3A.41
Infrared Cholangiography in open surgery and its projection to minimally invasive surgery, Patricio E. Fluxa[1,3], Carlos Castilla[2], Mario Garavaglia[1,3], Jannick Rolland[4]; [1]*CIOp Centro de Investigaciones Opticas, Argentina;* [2]*Fac. de Ciencias Medicas, Universidad Nacional de La Plata, Argentina;* [3]*Dpto. de Fisica, Universidad Nacional de La Plata, Argentina;* [4]*The Inst. of Optics, Univ. of Rochester, USA.* This paper describes an alternative method for imaging the bile ducts during Cholecystectomy. X-Rays are not needed. Positive results in open cholecystectomy are shown and the design of an IR endoscope is evaluated.

BSu3A.42
Reflection-mode submicron-resolution photoacoustic microscopy in vivo, Chi Zhang[1], Konstantin Maslov[1], Song Hu[1], Ruimin Chen[2], Qifa Zhou[2], Kirk Shung[2], Lihong V. Wang[1]; [1]*BIOMEDical Engineering, Washington Univ. in St. Louis, USA;* [2]*BIOMEDical Engineering, Univ. of Southern California, USA.* We developed the first reflection-mode submicron-resolution photoacoustic microscopy system. With a lateral resolution of ~0.5 μm and a maximum penetration depth of ~0.42 mm in soft tissue, it is suitable for in vivo high-resolution imaging.

BSu3A.43
Ring-shaped confocal photoacoustic computed tomography for small-animal whole-body imaging, Jun Xia[1], Muhammad Chatni[1], Konstantin Maslov[1], Zijian Guo[1], Rebecca Sohn[1], Jeffrey Arbeit[1], Mark Anastasio[1], Quing Zhu[2], Lihong V. Wang[1]; [1]*BIOMEDical Engineering, Washington Univ. in St. Louis, USA;* [2]*Electrical Engineering, Univ. of Connecticut, USA.* We developed a new photoacoustic tomography system for small-animal whole-body imaging. With the novel design of ring-shaped light delivery and full-ring ultrasonic array detection, the system can generate a cross-sectional image in 1.6 seconds.

BSu3A.44
Finite-element-method based reconstruction of heterogeneous conductivity distribution under point-illumination in trans-rectal imaging geometry for thermo-acoustic tomography, Sovanlal Mukherjee[1], Charles F. Bunting[1], Daqing Piao[1]; [1]*Oklahoma State University, USA.* We simulate trans-rectal thermo-acoustic tomography by using a convex-array of ultrasound transducer and a point microwave illuminator. Tissue conductivity distribution is reconstructed by decoupling the electrical field from the power loss density.

BSu3A.45
FEM model based optimization of transducer geometry for photoacoustic imaging, Wenfeng Xia[1], Daniele Piras[1], Spiridon van Veldhoven[2], Christian Prins[2], Ton G. van Leeuwen[1,3], Wiendelt Steenbergen[1], Srirang Manohar[1]; [1]*BIOMEDical Photonic Imaging, Netherlands;* [2]*Oldelft Ultrasound B.V., Netherlands;* [3]*BIOMEDical Engineering and Physics, Netherlands.* We optimize the design of an ultrasound transducer for photoacoustic breast imaging using FEM analysis. We arrive at a detector design which shows significant improvement in image quality when used in photoacoustic tomographic simulations.

BSu3A.46
Iterative Algorithm for Multiple Illumination Photoacoustic Tomography using Transducer Channel Data, Roger J. Zemp[1], Peng Shao[1]; [1]*Electrical & Computer Engineering, Univ of Alberta, Canada.* We present an algorithm for quantitative photoacoustic tomography based on minimizing an error functional between measured photoacoustic channel data and a calculated forward model. Simulations using multiple illuminations show improved conditioning over single illumination.

BSu3A.47
Toward quantitative fluorescence by using ultrasound modulation of light, Khalid Daoudi[1], Wiendelt Steenbergen[1]; [1]*BIOMEDical Photonic Imaging group, Univ. of Twente MIRA Inst. for BIOMEDical Technology and Technical Medicine, Netherlands.* we propose a method to quantify fluorophore absorption coefficient by combining acousto-optics and fluorescence. Using Monte Carlo simulations we explain a methodology and we show a possibility to estimate absorption coefficient within 10% accuracy

BSu3A.48
Intraoperative photoacoustic tumor imaging, Lei Xi[1], Stephen Grobmyer[1], Lei Wu[1], Ruimin Chen[2], Guangyin Zhou[1], Luke Gutwein[1], Jingjing Sun[1], Wenjun Liao[1], Qifa Zhou[2], Huikai Xie[1], Huabei Jiang[1]; [1]*Univ. of Florida, USA;* [2]*Department of BIOMEDical Engineering, Univ. of Southern California, USA.* We report a microelectromechanical systems based intraoperative PAT technique, and demonstrate its ability for accurately mapping tumors in three-dimension and inspecting the completeness of tumor resection during surgery in an animal model.

BSu3A: BIOMED Poster Session I—Continue

BSu3A.49
Spectrally Encoded Photoacoustic Microscopy Using a Digital Mirror Device, Yu Wang[1], Konstantin Maslov[1], Lihong Wang[1]; *[1]Dept. of BIOMEDical Engineering, Washington Univ. in St. Louis, USA.* We developed a spectrally encoded photoacoustic microscope system using a digital mirror device. Using spectrally encoded PA measurement, the imaging system can recover chromophore absorption spectra at a low laser pulse energy.

BSu3A.50
Quantitative photoacoustic tomography assisted by diffuse optical tomography: A simulation study, Xiaoqi Li[1], Huabei Jiang[1]; *[1]BIOMEDical Engineering, Univ. of Florida, USA.* We present a new method that can enhance quantitative recovery of optical absorption coefficient in heterogeneous media from photoacoustic data by considering inhomogeneous scattering coefficient distribution provided by diffuse optical tomography.

BSu3A.51
Modeling GaAs/AlGaAs/Ag Lasers for Photoacoustic Diagnosis of Bone Density by Photonic and Optical Methods, Meng-Mu Shih[1]; *[1]Univ. of Florida, USA.* This work develops models to compute coupling coefficients of semiconductor-metal lasers for photoacoustic diagnosis of bone density variations. Numerical results computed by the photonic and the optical methods have close values.

BSu3A.52
Photoacoustic detection of iron oxide nanoparticles in resected rat lymph nodes, Diederik J. Grootendorst[1], Jithin Jose[1], Raluca Fratila[3], Martijn Visscher[3], Aldrik Velders[2], Bennie Ten Haken[3], Ton G. van Leeuwen[1,5], Wiendelt Steenbergen[1], Srirang Manohar[1], Theo J. Ruers[4]; *[1]BIOMEDical Photonic Imaging, Univ. of Twente, Netherlands; [2]BIOMEDical Chemistry, Univ. of Twente, Netherlands; [3]Neuro IMaging, Univ. of Twente, Netherlands; [4]Nanobiophysics, Univ. of Twente, Netherlands; [5]BIOMEDical Engineering and Physics, Academic Medical Center Univ. of Amsterdam, Netherlands.* Photoacoustic detection of superparamagnetic iron oxide nanoparticles was performed in resected rat lymph nodes opening up possibilities for intra-operative nodal staging in oncology.

BSu3A.53
In-vivo Imaging of Embedded Surgical Sutures and the Surrounding Physiology with Photoacoustic Microscopy, Alexia Giannoula[1], Lutz Funk[2], Christine Weis[2], Pau Turon[2], Turgut Durduran[1]; *[1]Inst. of Photonic Sciences, Spain; [2]BBraun Surgical SA, Spain.* We image surgical sutures embedded in tissue and the surrounding tissue physiology using photoacoustic microscopy (PAM). PAM can be used to monitor the suture integrity, the healing process, infections and bleeding non-invasively at high-resolution.

BSu3A.54
Water-Immersible MEMS Scanning Mirror Enhanced Optical-Resolution Photoacoustic Microscopy, Junjie Yao[1], Chih-Hsien Huang[2], Konstantin Maslov[1], Lidai Wang[1], Liang Gao[1], Jun Zou[2], Lihong V. Wang[1]; *[1]BIOMEDical Engineering, Washington Univ. in St. Louis, USA; [2]Department of Electrical and Computer Engineering, Texas A&M Univ., USA.* A fast scanning optical-resolution photoacoustic microscopy has been developed using a water-immersible MEMS mirror. A B-scan rate of 400 Hz over a 3 mm scanning range has been demonstrated in phantom studies.

BSu3A.55
Generation of Photonic Shell Microbubbles, Elizabeth Huynh[1,2], Jonathan F. Lovell[3], Brandon Helfield[1,4], Chulhong Kim[3], David Goertz[1,4], Gang Zheng[1,2]; *[1]Univ. of Toronto, Canada; [2]Univ. Health Network, Canada; [3]Univ. at Buffalo, State Univ. of New York, USA; [4]Sunnybrook Health Sciences Center, Canada.* Photonic shell microbubbles demonstrated unique physical properties including enhanced serum stability, superior size monodispersity and increased microbubble yield. They are also suitable for both ultrasound and photoacoustic imaging.

BSu3A.56
Fiber Laser Based Realtime Optical-Resolution Photoacoustic Microscopy and Microendoscopy, Roger J. Zemp[1], Wei Shi[1], Peng Shao[1], Parsin Hajireza[1]; *[1]Electrical & Computer Engineering, Univ of Alberta, Canada.* We present an OR-PA microendoscope system based on an image-guide fiber, a high-repetition-rate fiber laser, and a fast-scanning mirror system. The system is capable of imaging 800 micron field of views in realtime.

BSu3A.57
Optoacoustic detection of small volume of tissue and cell clusters targeted with modified gold nanorods, Anton Liopo[1], Andre Conjusteau[1], Sergey Ermilov[1], Alexander Oraevsky[1]; *[1]Tomowave Laboratories Inc.,, USA.* We propose the use of surface-modified gold nanorods (GNR) as a contrast agent for optoacoustic detection into small volume of tissue or cell clusters.Accumulation of targeted GNR in cells will yield increased, selective laser-cell interactions.

BSu3A.58
Multispectral imaging as a potential predictor of treatment efficacy for Kaposi's sarcoma skin lesions, Jana M. Kainerstorfer[1,2], Mark N. Polizzotto[1], Thomas S. Uldrick[1], Moinuddin Hassan[1], Rafa Rahman[1], Laleh Najafizadeh[1], Kathleen M. Wyvill[1], Karen Aleman[1], Paul D. Smith[1], Robert Yarchoan[1], Amir Gandjbakhche[1]; *[1]National Inst.s of Health, USA; [2]Department of BIOMEDical Engineering, Tufts Univ., USA.* Assessment of the response of Kaposi's sarcoma lesions to therapy is challenging. We propose diffuse multispectral imaging for lesion follow-up as an objective measure for treatment efficacy.

BSu3A.59
Time-bin Optimization in Time-resolved Near Infrared Fluorescence Tomography, Hamid Dehghani[1], Qun Zhu[1], Fredric Leblond[2], Kenneth M. Tichauer[2], Robert Holt[2], Brian Pogue[2]; *[1]Univ. of Birmingham, UK; [2]Thayer School of Engineering, Dartmouth College, USA.* In this work we present a general method for the optimization of time-bins for accurate recovery of fluorophores in NIR tomography, which provide both high resolution and contrast, particularly in the presence of multiple targets.

BSu3A.60
Whole body optical imaging without a scattering background, Kevin J. Webb[1], Vaibhav Gaind[1], Hsiao-rho Tsai[1], Brian Bentz[1], Venkatesh Chelvam[1], Philip Low[1]; *[1]Purdue Univ., USA.* An imaging method that utilizes a laser topography scan and a multigrid reconstruction based on a diffusion model avoids the scattering emulsion background. Image reconstructions for a tissue phantom and fluorescence in a mouse are shown.

BSu3A: BIOMED Poster Session I—Continue

BSu3A.61
Model-based demonstration of spectral tomographic imaging, Shikhar Uttam[1], Sergey Alexandrov[1], Rajan K. Bista[1], Yang Liu[1]; [1]*Univ. of Pittsburgh, USA.* Simulation results for a novel optical diffraction tomography approach using spectral diversity to access Fourier components of the sample permittivity contrast are presented. Structure characterization of the sample reconstruction is also presented.

BSu3A.62
3D localization and tracking of gold particles in biological environment using digital holography, Michel Gross[1], Frédéric Verpillat[1], Pierre Desbiolles[1]; [1]*Laboratoire Charles Coulomb - UMR 5221 CNRS-UM2, France.* By using the dark field holographic microscopy technique described in Opt. Express, 19 pp26044-26055 (2011) we have track gold particles in brownian motion in living cells. First results are presented.

BSu3A.63
An fMRI based Method for Characterizing Superficial Layer Contribution to fNIRS Signals, Sinem B. Erdogan[1], Turan D. Nevsehirli[1], Yasemin Keskin-Ergen[1], Ata Akin[1]; [1]*BIOMEDical Engineering, Bogazici Univ., Turkey.* This study aims at extracting scalp and gray matter fMRI data obtained during breathhold and mental arithmetic tasks to quantify the degree and pattern of systemic fluctuations that are hypothesized to contaminate the fNIRS signal.

BSu3A.64
Application of Compressive Sensing to Bioluminescence Tomography, Hector R. Basevi[1,2], James A. Guggenheim[1,2], Hamid Dehghani[1,2], Iain B. Styles[2]; [1]*PSIBS, Univ. of Birmingham, UK;* [2]*School of Computer Science, Univ. of Birmingham, UK.* Bioluminescence Tomography characteristics suggest its suitability to Compressive Sensing-based reconstruction. Numerical simulations examining reconstruction quality in the presence of noise demonstrate improved robustness and compactness.

BSu3A.65
Cell Life Cycle Characterization Based on Generalized Morphological Parameters for Interferometric Phase Microscopy, Pinhas Girshovitz[1], Natan Shaked[1]; [1]*BIOMEDical Engineering, Tel Aviv Univ., Israel.* We developed new biological cell analysis tools for interferometric phase microscopy based directly on the quantitative phase profile and used them to characterize cancer-cell life cycle, and uniquely distinguish and predict the cell life phases.

BSu3A.66
Parametric level-set method for diffuse optical tomography with a hard l1 norm sparsity constraint, Fridrik Larusson[1], Pamela G. Anderson[2], Roni Cantor-Balan[2], Geethika Weliwitigoda[2], Angelo Sassaroli[2], Sergio Fantini[2], Eric Miller[1]; [1]*Electrical and Computer Engineering, Tufts Univ., USA;* [2]*BIOMEDical Engineering, Tufts Univ., USA.* We implement a parametric level-set (PaLS) method to reconstruct images for diffuse optical tomography (DOT). The method uses a large dictionary matrix with a hard l1 norm constraint allowing for accurate recovery of a wide array of shapes.

BSu3A.67
The Effect of Instrumentation on the Experimental Reduction of Photon Scatter in Time-Resolved Diffuse Fluorescence Tomography, Niksa Valim[1], Mark Niedre[1]; [1]*Electrical and Computer Engineering, Northeastern Univ., USA.* Time-resolved detection of transmitted photons through diffusive media can be used to reduce scatter, but experimentally this is limited by instrument design. We investigate the impact of geometry, temporal response and sensitivity on this effect.

BSu3A.68
Tomographic reconstruction of absorption and diffusion coefficient maps in biological media using time-dependent parabolic simplified spherical harmonics equations, Jorge Bouza Domìnguez[1], Yves Bérubé-Lauzière[1]; [1]*Electrical Engineering, Université de Sherbrooke, Canada.* We present a diffuse optical tomography algorithm based on the time-dependent parabolic simplified spherical harmonics equations and adjoint variables for reconstructing images of absorption and diffusion coefficient distributions.

BSu3A.69
The transport of intensity equation and partially coherent fields, Jonathan Petruccelli[1], Lei Tian[1], George Barbastathis[1,2]; [1]*Massachusetts Inst. of Technology, USA;* [2]*Singapore-MIT Alliance for Research and Technology (SMART) Centre, Singapore.* We examine the physical meaning of the phase recovered from the transport of intensity equation (TIE) with partially coherent illumination and verify experimentally a modification of the TIE which removes effects of nonuniform illumination from measurements of sample thickness.

BSu3A.70
Assessments of cerebral blood volume and oxygenation asymmetry in neonatal cardiopulmonary bypass by near infrared spectroscopy, Fenghua Tian[1], Joshua Koch[2], Joseph M. Forbess[3], Katrina Vandebruinhorst[2], Dorothy Kelly[2], Hanli Liu[1]; [1]*Bioengineering, Univ. of Texas at Arlington, USA;* [2]*Pediatrics, Univ. of Texas Southwestern Medical Center at Dallas, USA;* [3]*Cardiovascular and Thoracic Surgery, Univ. of Texas Southwestern Medical Center at Dallas, USA.* We use a NIRS device to monitor the neonatal brain during cardiopulmonary bypass. The focus is to assess the blood and oxygenation asymmetry caused by selective cerebral perfusion that has become standard of care.

BSu3A.71
Optimizing statistical analysis for DOT to image rapid brain function events, Mahlega Hassanpour[1], Brian R. White[1], Adam T. Eggebrecht[2], Silvina L. Ferradal[3], Joseph P. Culver[2,1]; [1]*Department of Physics.Washington Univ. in St. Louis, USA;* [2]*Department of Radiology, Washington Univ. School of Medicine, USA;* [3]*Department of BIOMEDical Engineering , Washington Univ. in St. Louis, USA.* A general linear model was used to statistically analyze HD-DOT data during rapid, event-related brain activation. Spatial and temporal properties of data were evaluated and used in the response modeling and statistical inference.

BSu3A.72
Capturing Task-Evoked Functional Brain Connectivity Using Combined NIRS/EEG, Nader Shahni Karamzadeh[1,3], Andrei Medvedev[2], Atieh Bakhtiar[1], Jana M. Kainerstorfer[1], Amir Gandjbakhche[1], Laleh Najafizadeh[1,3]; [1]*Eunice Kennedy Shriver National Inst. of Child Health and Human Development, NIH, USA;* [2]*Center for Functional and Molecular Imaging, Georgetown Univ., USA;* [3]*Center for Neuroscience and Regenerative Medicine, Henry M. Jackson Foundation, USA.* To capture the dynamics of brain interactions subjects were exposed to an auditory and a visual task while their EEG/NIRS data were simultaneously being collected. Data analysis highlighted connectivity between multiple parts of the brain.

BSu3A: BIOMED Poster Session I—Continue

BSu3A.73
Registration and Analysis of Multi-spectral Images Acquired During Uterine Transplantation Surgery, Neil T. Clancy[1,2], Vincent Sauvage[1,2], Srdjan Saso[3], Danail Stoyanov[4], David J. Corless[5], Michael Boyd[6], David Noakes[6], Guang-Zhong Yang[1,7], Sadaf Ghaem-Maghami[8], J. R. Smith[8], Daniel S. Elson[1,2]; [1]*Hamlyn Centre for Robotic Surgery, Imperial College London, UK;* [2]*Department of Surgery and Cancer, Imperial College London, UK;* [3]*Inst. of Reproductive and Developmental Biology, Hammersmith Hospital, Imperial College London, UK;* [4]*Centre for Medical Image Computing, Department of Computer Science, Univ. College London, UK;* [5]*Department of Surgery, Leighton Hospital, UK;* [6]*Royal Veterinary College, UK;* [7]*Department of Computing, Imperial College London, UK;* [8]*Gynaecological Oncology, West London Gynaecological Cancer Centre, Hammersmith Hospital, Imperial College London, UK.* Organ transplant success is dependent on blood supply health. A multispectral imaging laparoscope has been used to monitor tissue oxygenation during a rabbit uterine transplant. A feature tracking algorithm was used to compensate for movement.

BSu3A.74
Flexible Gen-2 Hand-held Optical Imager: Flat and Curved Phantom Studies, Manuela Roman[1], Sarah J. Erickson[1], Jean Gonzalez[1], Pallavi Joshi[1], Anuradha Godavarty[1]; [1]*BIO-MEDical Engineering, Florida International Univ., USA.* A gen-2 hand-held based optical imager is developed with a flexible probe head to contour to different curved breast tissues. Targets are imaged within slab and curved breast phantoms, and resolution studies are ongoing.

BSu3A.75
Handheld near infrared imaging device for hemorrhage detection, Jason D. Riley[1], Franck Amyot[1], Tom Pohida[1], Randall Pursley[1], Yasaman Ardeshirpour[1], Jana M. Kainerstorfer[1], Laleh Najafizadeh[1], Victor Chernomordik[1], Paul D. Smith[1], James Simrniotopoulos[2], Eric Wassermann[1], Amir Gandjbakhche[1]; [1]*SAFB/PPITS/NICHD, NIH, USA;* [2]*Uniformed Service Univ., USA.* We present a Near-infra red handheld device for imaging subsurface hemorrhage such as hematomas. The device uses novel motion-based measurement techniques to detect inclusions in real-time. We present phantom studies to demonstrate the technique.

BSu3A.76
Real-time in vivo visualization of tissue oxygenation and autofluorescence with a snapshot hyperspectral camera for detection of precancerous lesions, Noah Bedard[1], Tomasz Tkaczyk[1]; [1]*Bioengineering, Rice Univ., USA.* A new type of snapshot hyperspectral camera shows promising preclinical results for real-time in vivo detection of oral and esophageal cancers. Maps of hemoglobin content, tissue oxygenation and autofluorescence are presented for oral cavity tissue.

BSu3A.77
Widefield Mesh-based Monte Carlo method in time-domain FMT, Jin chen[1]; [1]*RPI, USA.* We evaluated the potential of mesh-based Monte Carlo method for widefield time-resolved fluorescence tomography in preclinical settings. The in silico results established that this method is computationally efficient for optical tomography.

BSu3A.78
A frequency domain near-infrared spectroscopy oximeter using high-speed, direct analog to digital conversion, Bernhard Zimmermann[1,2], Juliette Selb[1], Stefan Carp[1], Qianqian Fang[1], Joe Stadtmiller[3], Robert Dewsnap[3], Ron Altman[3], David Boas[1]; [1]*Athinoula A. Martinos Center for BIOMEDical Imaging, Massachusetts General Hospital, USA;* [2]*Department of Electrical Engineering and Computer Science, Massachusetts Inst. of Technology, USA;* [3]*TechEn, Inc., USA.* A frequency-encoded frequency domain near-infrared spectroscopy (FD-NIRS) oximeter with two wavelengths has been constructed. The system digitizes the 67.5MHz and 75MHz waveforms using a high speed (180MSPS) 16-bit analog to digital converter.

BSu3A.79
Using few-mode fiber to improve the signal-to-noise ratio of DCS flow-oximeter measurements, Lian He[1], Yu Lin[1], Yu Shang[1], Guoqiang Yu[1]; [1]*Center for BIOMEDical Engineering, Univ. of Kentucky, USA.* Single-mode and few-mode fibers are used and compared for exploring the possibility to improve the signal-to-noise ratio of diffuse correlation spectroscopy (DCS) flow-oximeter measurements.

BSu3A.80
Design of a Multi-Wavelength Time-Domain Imager Based on a Supercontinuum Laser, Juliette Selb[1], Bernhard Zimmermann[1], Mark Martino[1], David Boas[1]; [1]*The Optics Division at the Athinoula A. Martinos Center for BIO-MEDical Imaging, Massachusetts General Hospital, USA.* We developed a multi wavelength time domain imager for baseline hemoglobin measurements and functional imaging. A multiplexed supercontinuum pulsed laser and gated parallel detection on an intensified CCD camera allow for multi channel imaging.

BSu3A: BIOMED Poster Session I—Continue

BSu3A.81
Time-resolved spectral imaging of fluorescent inclusions in optically turbid medium: a phantom study, Daniel Milej[1], Marcin Botwicz[1], Anna Gerega[1], Norbert Zolek[1], Adam Liebert[1]; *[1]IBBE PAS, Poland.* Time-resolved measurements of diffuse reflectance and fluorescence carried out on polyurethane phantom with ICG inclusions confirm that fluorescence data may allow for depth selective detection of inclusions in the turbid medium.

BSu3A.82
A novel method for measurement of dynamic light scattering phase function of particles utilizing laser-Doppler power density spectra, Stanislaw Wojtkiewicz[1], Adam Liebert[1], Herve Rix[2], Piotr Sawosz[1], Roman Maniewski[1]; *[1]IBBE PAS, Poland; [2]I3S CNRS, France.* We developed a novel method of measurement of the dynamic light scattering phase function of particles utilizing laser Doppler technique. We show: theoretical background, validation carried out on Monte Carlo and proposition of measurement setup.

BSu3A.83
Photodynamic Molecular Beacons: An Image -Guided Therapeutic Approach for Vertebral Metastases, Tracy W. Liu[1], Margarete K. Akens[1,2], Juan Chen[1], Lisa Wise-Milestone[2], Brian C. Wilson[1], Gang Zheng[1]; *[1]Medical Biophysics, Univ. of Toronto/Ontario Cancer Inst., Canada; [2]Sunnybrook Health Science Centre, Univ. of Toronto, Canada.* We demonstrate the metastatic-specific activation of photodynamic molecular beacons by MMPs as a useful image-guidance tool with an unprecedented level of PDT selectivity for the therapeutic management of breast cancer spinal metastases.

BSu3A.84
Depth sensitivity in multi-distance NIRS measurements in humans, Christina Habermehl[1], Christoph H. Schmitz[1,4], Stefan P. Koch[1], Jan Mehnert[1,3], Jens Steinbrink[1,2]; *[1]Neurology, Charité Berlin, Germany; [2]Center for Strokeresearch Berlin (CSB), Charité Berlin, Germany; [3]Neurology, Max Planck Inst. for Human Cognitive and Brain Sciences, Germany; [4]Nirx Medizintechnik, Germany.* We review different experiments using HR-DOT to monitor functional activation or brain perfusion in humans. We show the demand of an objective depth correction algorithm, especially when intrinsic contrast agents are used.

BSu3A.85
NIRS Captured Changes in Resting State Functional Connectivity after Performing a Working Memory Task, Laleh Najafizadeh[1,2], Fatima Chowdhry[2], Nader Shahni karamzadeh[2], Jana M. Kainerstorfer[2,3], Franck Amyot[2], Jason D. Riley[2], Amir Gandjbakhche[2]; *[1]Center for Neurscience and Regenerative Medicine, Henry M. Jackson Foundation, USA; [2]Section on Analytical and Functional BioPhotonics/PPITS, Eunice Kennedy Shriver National Inst. of Child Health and Human Development/NIH, USA; [3]Department of BIOMEDical Engineering, Science & Technology Center, Tufts Univ., USA.* We investigate changes in the resting-state functional connectivity (RSFC) in the prefrontal cortex before and after executing a working memory task, using NIRS. Preliminary results demonstrate changes in RSFC after executing a working memory task.

BSu3A.86
Solving Inverse Problem of Diffuse Optical Tomography with Global Optimization, Behnoosh Tavakoli[1], Quing Zhu[1]; *[1]ECE, Univ. of connecticut, USA.* A new imaging reconstruction based on a global optimization approach is presented. Simulation and phantom results have demonstrated superior performance in accurately mapping absorption distribution compared with that of conjugate-gradient method.

BSu3A.87
Target Tumor Hypoxia with 2-nitroimidazole-ICG dye Conjugate, Yan Xu[1], Quing Zhu[1]; *[1]ECE, UCONN, USA.* We systemically evaluated the sensitivity of the hypoxia targeted 2-nitroimidazole-ICG conjugate using piperazine linker in in-vivo tumor models, which showed hypoxia can be targeted with twice higher signal strength than that of untargeted ICG.

BSu3A.88
An Anatomical Atlas-Based Method for fNIRS Imaging of the Rhesus Macaque, Yong Xu[1,4], Tigran Gevorgyan[1,3], Douglas Pfeil[1], Daniel C. Lee[2,3], Randall L. Barbour[1,3]; *[1]Pathology, SUNY Downstate Medical Center, USA; [2]Surgery, SUNY Downstate Medical Center, USA; [3]Surgery, Interfaith Medical Center, USA; [4]NIRx Medical Technologies LLC., USA.* An anatomical atlas-based method for rhesus monkey brain imaging is presented. Numerical simulation, phantom experiment, and animal studies show that the method is computation-efficient in the generation and registration of 3D image findings.

BSu3A.89
Bioluminescence Tomography With A PDE-Constrained Algorithm Based On The Equation Of Radiative Transfer, Hyun K. Kim[1,2], Andreas H. Hielscher[1,2]; *[1]BIOMEDical Engineering, Columbia Univ., USA; [2]Radiology, Columbia Univ., USA.* We present the first bioluminescence tomography algorithm that makes use of the PDE-constrained concept, which has shown to lead to significant savings in computation times in similar applications.

BSu3A.90
Methods For Simultaneous Optical And Electrical Measurement Of Neurovascular Coupling in Awake Rats, Jason Sutin[1], Weicheng Wu[1], Lana Ruvinskaya[1], Maria Angela Franceschini[1]; *[1]Athinoula A. Martinos Center for BIOMEDical Imaging, Massachusetts General Hospital / Harvard Medical School, USA.* Development of an implantable EEG and diffuse optical imaging probe for longitudinal measurements in awake rats to investigate neurovascular coupling.

BSu3A.91
Breast Cancer Detection by Optomechanical Imaging, Rabah M. Al abdi[1], Harry L. Graber[1,2], Yong Xu[1,2], Randall L. Barbour[1,2]; *[1]Pathology, SUNY Downstate Medical Center, USA; [2]NIRx Medical Technologies, USA.* A new functional imaging system, which combines precise mechanical articulation and dynamic optical tomography for the detection breast cancer, is presented. Results obtained indicate that a wealth of new contrast features is accessible.

BSu3A.92
Optomechanical Imaging: Biomechanic and Hemodynamic Responses of the Breast to Controlled Articulation, Rabah M. Al abdi[1], Gavriel Feuer[1], Harry L. Graber[1,2], Subrata Saha[1], Randall L. Barbour[1,2]; *[1]Pathology, SUNY D.M.C., USA; [2]2NIRx Medical Technologies LLC., USA.* The optomechanical response of the breast was explored during fine articulation as a function of the applied force protocol. Comparisons between calculated internal pressure or stress maps and reconstructed hemodynamic images show strong correlations.

BSu3A: BIOMED Poster Session I

BSu3A.93
A Programmable Laboratory Testbed in Support of Evaluation of Functional Brain Activation, Randall L. Barbour[1,3], Harry L. Graber[1,3], Yong Xu[1,3], Yaling Pei[3], Christoph H. Schmitz[4], Douglas Pfeil[1], Anandita Tyagi[1], Randall Andronica[1], Daniel C. Lee[2,5], San-Lian S. Barbour[3], John D. Nichols[6], Mark E. Pflieger[6]; *[1]Pathology, SUNY Downstate Medical Center, USA; [2]Surgery, SUNY Downstate Medical Center, USA; [3]NIRx Medical Technologies LLC., USA; [4]NIRx Medizintechnik GmbH, Germany; [5]Interfaith Medical Center, USA; [6]Source Signal Imaging, Inc., USA.* Near infrared spectroscopy and electroencelphalography are well suited to explore the brain's response to neuroactivation. We have established a stable, programmable testbed that provides for experimental measures and analysis of neuroactivation-linked bioelectric and hemodynamic responses

BSu3A.94
Carbogen Inspiration Enhances Hemodynamic Contrast in the Cancerous Breast, Rabah M. Al abdi[1], Harry L. Graber[1,2], Randall L. Barbour[1,2]; *[1]Pathology, SUNY D.M.C., USA; [2]NIRx Medical Technologies LLC., USA.* We have explored the vascular response of the breast to inspiration of Carbogen. Results show greater changes in vasoconstriction and HbSat in the tumor-bearing breast compared to the healthy contralateral breast of the same patient.

BSu3A.95
Brain Connectivity via Traffic Engineering Approach, Serdar Aslan[1], Yasemin Keskin-Ergen[1], Ata Akin[1]; *[1]Inst. of BIOMEDical Engineering, Bogazici Univ., Turkey.* Brain connectivity via fNIRS multi-channel data collected during s Stroop task is investigated via traffic engineering approach. Right lateralized increase in "brain traffic" was detected for incongruent condition compared to neutral one.

BSu3A.96
Quantitative diffuse optical tomography using a mobile phone camera and automatic 3D photo stitching, Qianqian Fang[1]; *[1]Radiology, Massachusetts General Hospital, USA.* We show proof-of-concept for using an ultra-portable mobile-phone-based imaging system for quantitative 3D diffuse optical tomography. Phantom images were successfully recovered using a photo-stitched 3D model and near-infrared images, both acquired from a mobile-phone camera.

BSu3A.97
Monte Carlo simulation of realistic transmission breast optical tomography data for optimization of finite element image reconstruction, Mark Martino[1], Qianqian Fang[1], David Boas[1], Stefan Carp[1]; *[1]Massachusetts General Hospital, USA.* We use mesh based Monte Carlo simulations to generate a realistic dataset for transmission breast diffuse optical tomography. We use these controlled conditions to test the impact of data degradation on finite element diffusion based image reconstructions.

Symphony IV

DH

13:00 - 14:45
DSu3C • Digital Holographic Microscopy I
T.-C. Poon; Virginia Tech, USA, Presider

DSu3C.1 • 13:00 **Invited**
Analysis and Experimental Achievement of High Resolution Imaging in Digital Holography, Jianlin Zhao[1]; [1]*Department of Applied Physics, School of Science, Northwestern Polytechnical Univ., China.*Based on optical information theory, the propagation, recording and numerical reconstruction of the object wave are analyzed in a digital holographic image system, and several methods are presented to improve the resolution of reconstructed image.

DSu3C.2 • 13:30
Dual wavelength digital holographic imaging of cells with phase background subtraction, Alexander Khmaladze[1], Rebecca Matz[1], Joshua Jasensky[1], Emily Seeley[1], Mark M. Banaszak Holl[1], Zhan Chen[1]; [1]*Univ. of Michigan, USA.*We describe a simple dual wavelength phase imaging method, which allows three dimensional measurements of a wide variety of biological systems and microstructures. Additionally, an effective method of removing phase background curvature is presented.

DSu3C.3 • 13:45
A Simple Lensless Digital Holographic Microscope, Shakil Rehman[1,2], Kiyofumi Matsuda[3], Makoto Yamauchi[3], Mikiya Muramatsu[4], George Barbastathis[1,5], Colin Sheppard[1,2]; [1]*BioSym, SMART, Singapore;* [2]*Bioengineering, National Univ. of Singapore, Singapore;* [3]*BIOMEDical Imaging, AIST, Japan;* [4]*Institiue of Physics, Univ. of Sao Paolo, Brazil;* [5]*Chemical Engineering, MIT, USA.*Transparent objects can be imaged with high resolution along the optical axis by numerical reconstruction of digitally recorded holograms. A simple lensless digital holographic microscope is demonstrated to image optically transparent phase objects.

DSu3C.4 • 14:00
Iterative zero-order suppression from an off-axis hologram based on the 2D Hilbert transform, Florian B. Soulard[1], Alan Purvis[1], Richard McWilliam[1], Joshua Cowling[1], Gavin Williams[2], Jose J. Toriz-Garcia[2], N. Luke Seed[2], Peter A. Ivey[3]; [1]*School of Engineering and Computing Sciences, Durham Univ., UK;* [2]*Department of Electronic and Electrical Engineering, Univ. of Sheffield, UK;* [3]*Innotec Ltd, UK.*The two-dimensional demodulation of a hologram using the 2D Hilbert transform requires the suppression of the background illumination beforehand. We propose an iterative algorithm based on a spiral phase function for this purpose.

DSu3C.5 • 14:15
Image formation of digital holographic microtomography, Chau-Jern Cheng[1]; [1]*Inst. of Electro-Optical Science and Technology, Taiwan.*We describe a three-dimensional image formation based on the digital holographic microtomography. The refractive index distribution inside a sample can be determined by the technique. Experiments and simulation results are presented and discussed.

DSu3C.6 • 14:30
Tracking of micrometer-sized objects with high-numerical aperture lensless digital holographic microscopy, Jorge Garcia-Sucerquia[1], Jhon F. Restrepo[1]; [1]*Physics, Universidad Nacional de Colombia Sede Medellin, Colombia.*We present a method to track automatically micrometer-sized objects with high numerical aperture lensless holographic microscopy. The method is tested with modeled in-line holograms and real experiments to track bubbles in cubic millimeters of soda.

Symphony I & II	Symphony III	Symphony IV
BIOMED I	BIOMED 2	DH

15:00—15:30
COFFEE BREAK, *Overture Foyer*

15:30 - 17:30
BSu4A • Brain Signals 1
Stefan Andersson-Engels; Lund Univ., Sweden, Presider

15:30 - 17:30
BSu4B • Microscopy Imaging: Novel Contrast Mechanisms
Adela Ben-Yakar; Univ. of Texas at Austin, USA, Presider

15:30 - 17:30
DSu4C • BIOMEDical Applications of Digital Holography I
Chau-Jern Cheng; Inst. of Electro-Optical Science and Technology, Taiwan, Presider

BSu4A.1 • 15:30 **Invited**
Bed-side Neuro-critical Monitoring with Hybrid Diffuse Optics, Turgut Durduran[1]; [1]*ICFO, Spain.* Transcranial, non-invasive monitoring of cerebral hemodynamics, autoregulation and metabolism at the neuro-intensive care has a great deal of potential. I present the latest advances in hybrid diffuse optical and correlation spectroscopies as neuro-monitors.

BSu4B.1 • 15:30
SHG imaging of Cancer, Paul Campagnola[1], Molly A. Brewer[4], Visar Ajeti[1], Patricia Keely[2,1], Kevin Eliceiri[1], Manish Patankar[3], Karissa Tilbury[1]; [1]*BIOMEDical Engineering, Univ. of Wisconsin, USA;* [2]*Department of Cell and Regenerative Biology, Univ. of Wisconsin-Madiosn, USA;* [3]*Obstetrics and Gynecology, Univ. of Wisconsin-Madiosn, USA;* [4]*Obstetrics and Gynecology, Univ. of Connecticut Health Center, USA.*SHG imaging microscopy is used to quantitatively study structural changes in the collagen organization in the ECM in ovarian and breast cancers using in in vitro models, animal models and ex vivo human tissues.

DSu4C.1• 15:30 **Invited**
Albert-Claude Boccara[1]; [1]*Ecole Sup Physique Chimie Industrielles.* We will discuss how wave control using OCT improves the possibility to correct wavefronts in optical microscopy and tomography and that controlling a large number of modes opens the path to imaging in highly scattering media.

BSu4B.2 • 15:45
In Vivo Pump-Probe Microscopy of Eumelanin, Pheomelanin in Melanoma, Tanya Mitropoulos[1], Jesse W. Wilson[1], Simone Degan[1], M. Angelica Selim[2], Jennifer Y. Zhang[3], Warren S. Warren[1,4]; [1]*Chemistry, Duke Univ., USA;* [2]*Pathology, Duke Univ., USA;* [3]*Dermatology, Duke Univ., USA;* [4]*BIOMEDical Engineering, Duke Univ., USA.*We employ pump-probe microscopy to highlight eumelanin versus pheomelanin content of in vivo pigmented skin lesions, and combine it with confocal reflectance and fluorescence microscopies to gain a more complete illustration of the skin.

BSu4A.2 • 16:00
A quantitative spatial comparison of high-density diffuse optical tomography and fMRI cortical mapping, Adam T. Eggebrecht[1], Brain R. White[1,2], Silvina L. Ferradal[1,3], Yuxuan Zhan[4], Abraham Z. Snyder[1,5], Hamid Dehghani[4], Joseph P. Culver[1,2]; [1]*Radiology, Washington Univ. School of Medicine, USA;* [2]*Physics, Washington Univ., USA;* [3]*BIOMEDical Engineering, Washington Univ., USA;* [4]*Computer Science, Univ. of Birmingham, UK;* [5]*Neurology, Washington Univ. School of Medicine, USA.* Image-quality of high-density diffuse optical tomography is evaluated against fMRI using functional maps of visual cortex as a benchmark. Co-registered subject-specific light models have an average localization error of 4.4 +/- 1 mm.

BSu4B.3 • 16:00
Coherent Confocal Light Absorption and Scattering Spectroscopic Microscopy, Le Qiu[1], Vladimir Turzhitsky[1], Edward Vitkin[1], Lianyu Guo[1], Eugene Hanlon[1], Irving Itzkan[1], Lev T. Perelman[1]; [1]*Center for Advanced BIOMEDical Imaging and Photonics, Harvard Univ., USA.* We report development of coherent CLASS microscopy which provides dramatically higher spectral contrast compared to the existing incoherent technique. It can non-invasively monitor subcellular dynamics without the need for exogenous agents.

DSu4C.2 • 16:00 **Invited**
Digital Holography of Cellular Motions in Live Tissue, David Nolte[1]; [1]*Purdue Univ., USA.*Subcellular motions inside live tissue are sensitive indicators of cellular health and cellular response to applied drugs. Digital holography volumetrically captures these motions in a tissue dynamics spectroscopy approach to live-tissue drug screening.

BSu4A.3 • 16:15
Characterization of post-Occlusion Oxygen Tension in Cortical Arterioles in vivo, S. M. Shams Kazmi[1]; [1]*BIOMEDical Engineering, The Univ. of Texas at Austin, USA.*Depth-resolved pO2 and blood flow in descending arterioles after occlusion is characterized with two-photon lifetime imaging in the mouse brain. Oxygen tension decreases rapidly in depth with branches supplementing pO2 levels after occlusion.

BSu4B.4 • 16:15
Third-Harmonic Generation Microscopy For Label-Free Brain Imaging, Stefan Witte[1,3], Nikolay V. Kuzmin[1,3], Adrian Negrean[2,3], Johannes C. Lodder[2,3], Guilherme T. Silva[2,3], Christiaan P. de Kock[2,3], Huibert D. Mansvelder[2,3], Marloes L. Groot[1,3]; [1]*LaserLaB, VU Univ., Netherlands;* [2]*CNCR, VU Univ., Netherlands;* [3]*Neuroscience Campus Amsterdam, VU Univ., Netherlands.* We demonstrate high-resolution live brain tissue imaging without fluorescent dyes, using third-harmonic generation. Targeted patching of living neurons is demonstrated, and label-free images of fixed human brain tissue have been obtained.

17:30—19:30
BIOMED Postdeadline Papers

17:30—19:30
DH Postdeadline Papers

Symphony I & II	Symphony III	Symphony IV
BIOMED I	BIOMED 2	DH

BSu4A • Brain Signals 1—Continue

BSu4A.4 • 16:30
Histopathological and Radiological Validation of Continuous Wave (CW) Near Infrared Spectroscopy (NIRS) Recordings During Cerebral Intravascular Manipulations, Tigran Gevorgyan[2,6], Douglas Pfeil[1], Harry L. Graber[1,7], Yong Xu[1,7], Sundeep Mangla[3], Frank C. Barone[4], Jenny Libien[1], Jean Charchaflieh[5], Randall L. Barbour[1,7], Daniel C. Lee[2,6]; *[1]Pathology, SUNY Downstate Medical Center, USA; [2]Surgery, SUNY Downstate Medical Center, USA; [3]Interventional Neuroradiology, SUNY Downstate Medical Center, USA; [4]Neurology, SUNY Downstate Medical Center, USA; [5]Anesthesiology, SUNY Downstate Medical Center, USA; [6]Interfaith Medical Center, USA; [7]NIRx Medical Technologies, LLC., USA.*An experimental animal stroke mode, complicated with subarachnoid hemorrhage, was monitored using CW-NIRS DOT. Comparison of results with histopathology and radiology findings demonstrate the utility of CW-NIRS for functional imaging and monitoring.

BSu4A.5 • 16:45
Assessments of posttraumatic stress disorder by functional near infrared spectroscopy: A preliminary report, Fenghua Tian[1], Alexa Smith-Osborne[2], Amarnath Yennu[1], Hanli Liu[1]; *[1]Bioengineering, Univ. of Texas at Arlington, USA; [2]School of Social work, Univ. of Texas at Arlington, USA.*Post-traumatic stress disorders (PTSD) affect up to 20% of service members in the global war on terror. We use a portable multi-channel fNIRS device to assess student veterans with PTSD; preliminary results are reported.

BSu4A.6 • 17:00
Regional and hemispheric asymmetries of cerebral hemodynamic and oxygen metabolism in newborns, Pei-Yi Lin[1], Mathieu Dehaes[2], Nadege Roche-Labarbe[1], Angela Fenoglio[1], P. Ellen Grant[2], Maria Angela Franceschini[1]; *[1]Athinoula A. Martinos Center for BIOMEDical Imaging, Massachusetts General Hospital, USA; [2]Fetal-Neonatal Neuroimaging and Developmental Science Center, Children's Hospital Boston, USA.*By using noninvasive optical techniques, we presented higher cerebral hemoglobin oxygenation and metabolism in the temporal and parietal than in the frontal region and higher metabolism in the right than in the left in newborns.

BSu4A.7 • 17:15
Functional connectivity mapping in hospitalized infants using diffuse optical tomography, Silvina L. Ferradal[1,2], Steve M. Liao[3], Adam T. Eggebrecht[2], Terrie E. Inder[2,3], Joseph P. Culver[1,2]; *[1]BIOMEDical Engineering, Washington Univ. in St. Louis, USA; [2]Radiology, Washington Univ. in St. Louis, USA; [3]Pediatrics, Washington Univ. in St. Louis, USA.* Resting-state functional connectivity is an attractive tool for studying brain function in neonates. Here, we present fcDOT maps of multiple networks detected in premature infants at the bedside.

BSu4B • Microscopy Imaging: Novel Contrast Mechanisms—Continue

BSu4B.5 • 16:30
Ratiometric Molecular Microscopy: Towards Real-Time Quantitative Delineation of Brain Tumor Margins, Steven Y. Leigh[1], Danni Wang[1], Ye Chen[1], Michael J. Mandella[2], Henry Haeberle[2], Olav Solgaard[3], Christopher Contag[2], Jonathan T. Liu[1]; *[1]BIOMEDical Engineering, State Univ. of New York (SUNY) at Stony Brook, USA; [2]Clark Center, Stanford Univ. School of Medicine, USA; [3]Electrical Engineering, Stanford Univ., USA.*An achromatic version of a micro-mirror-scanned surgical dual-axis confocal microscope has been developed for ratiometric quantification of biomarker expression as revealed by the topical application of fluorescent contrast agents..

BSu4B.6 • 16:45
Fallopian Tube Imaging Using An Articulating Confocal Microlaparoscope, Tzu-Yu Wu[1,2], Arthur F. Gmitro[1,2], Andrew R. Rouse[2]; *[1]College of Optical Sciences, Univeristy of Arizona, USA; [2]Radiology, Univ. of Arizona, USA.* A confocal microlaparoscope for in-vivo imaging of early stage cancer inside the fallopian tube is presented. Feasibility is demonstrated using a rigid microlaparoscope and preliminary in-vivo results with the new articulating catheter are expected.

BSu4B.7 • 17:00
Epi-Detected Stimulated Raman Scattering Microscopy Using Long-Wavelength Excitation, Terumasa Ito[1,2], Minbiao Ji[1], Gary Holtom[1], X. Sunney Xie[1]; *[1]Chemistry and Chemical Biology, Harvard Univ., USA; [2]Core Device Development Group, Sony Corporation, Japan.*Epi-detected stimulated Raman scattering microscopy using a high NA objective and long-wavelength excitation is presented. The increased NA and reduced scattering loss allow for high resolution imaging with deeper tissue penetration.

BSu4B.8 • 17:15
Coherent Super-Resolution Structured Illumination Microscopy of Non-Fluorescent Samples, Shwetadwip Chowdhury[1], Al-Hafeez Dhalla[1], Joseph Izatt[1]; *[1]Duke Univ., USA.*We introduce a framework for coherent structured illumination, which may extend advantages of far-field super-resolution microscopy to non-fluorescent samples. Experimental confirmation is obtained in a target at moderate numerical aperture.

DSu4C • BIOMEDical Applications of Digital Holography I—Continue

DSu4C.3 • 16:30
Automated 3D detection of particles using digital holographic microscopy with partially coherent source - Applications in environmental monitoring, El Mallahi Ahmed[1], Minetti Christophe[1], Frank Dubois[1]; *[1]Université libre de Bruxelles, Belgium.* We investigate the automated 3D detection of particles by digital holographic microscopy (DHM) with a partial coherent light source. We have successfully applied the developed process to several particles of interest for the environmental monitoring.

DSu4C.4 • 16:45
Quantitative Phase Imaging Flow Cytometry, Sai Siva Gorthi[1], Ethan Schonbrun[1]; *[1]Rowland Institue at Harvard Univ., USA.* This paper introduces a fluidics based focus-stack collecting microscope. Images from the focus stacks are used to reconstruct the quantitative phase of red blood cells in flow with the Transport-of-Intensity-Equation method.

DSu4C.5 • 17:00
Elastic Depth Profiling of Soft Tissue by Holographic Imaging of Surface Acoustic Waves, Karan Mohan[1], William Sanders[1], Amy Oldenburg[1,2]; *[1]Department of Physics & Astronomy, Univ. of North Carolina at Chapel Hill, USA; [2]BIOMEDical Research Imaging Center, Univ. of North Carolina at Chapel Hill, USA.*Digital holography is used to image surface acoustic waves in tissue-mimicking silicone phantoms. Elastic depth profiles, at depths up to 30mm, are then obtained from the phase velocity dispersion curves by solving the inverse problem.

DSu4C.6 • 17:15
Quantitative imaging of surface deformation on substrata due to cell motility by digital holography, Xiao Yu[1], Michael Cross[1], Changgeng Liu[1], David C. Clark[1], Donald Haynie[1], Myung K. Kim[1]; *[1]Physics, Univ. of South Florida, USA.*Quantitative phase microscopy by digital holography (QPM-DH) is introduced for quantitatively imaging surface deformation on soft material for cellular adhesion.

Symphony I & II

Joint BIOMED and DH

REGISTRATION, *Overture Foyer*

08:00 - 09:30

JM1A • BIOMED/DH Joint Plenary Session

Lev Perelman; Harvard Univ., USA, and George Barbastathis,; MIT, USA, Presiders

JM1A.1 • 08:00 **Plenary**

The Invention and Early History of the CCD, George Smith; *Recipient of 2009 Nobel Prize in Physics, USA.* As the first practical solid state imaging device, the invention of the Charge Coupled Device has profoundly affected image sensing technology. They are used in a wide range of applications both as area and linear imaging devices starting with the replacement of imaging tubes used in commercial TV cameras and camcorders. The rapid rise of their use in digital cameras has initiated the demise of film photography and created vast new markets with great economic benefit for many. Other uses include a wide variety of scientific, medical, surveillance and scanning applications. The inception of the device at Bell Labs by Willard S. Boyle and George E. Smith in 1969 was strongly influenced by several unique factors existing both within Bell Labs and the current world state of technology. These factors and their relevance will be discussed along with the train of thought leading to the invention. Early experimental devices and their initial applications were vigorously pursued and will be described. Mention of current applications will be given.

JM1A.2 • 08:45 **Plenary**

3D Display - Where We Are and Where to Go, Byoungho Lee[1]; [1]*School of Electrical Engineering, Seoul National Univ., Republic of Korea.* An overview of history and present state of three-dimensional display is given, covering technical and market aspects. Possible research directions that will be considered important in the future are also discussed.

Notes

Symphony I & II	Symphony III	Symphony IV
BIOMED 1	BIOMED 2	DH

9:30—10:00
COFFEE BREAK, *Concerto A,B,C & Overture Foyer*

Symphony I & II — BIOMED 1

10:00 - 12:30
BM2A • BioNanophotonics and Molecular Probes
Gang Zheng; Univ. of Toronto, Canada, Presider

BM2A.1 • 10:00 Invited
Molecular probes in Photodynamic Therapy, Tayyaba Hasan[1]; *[1]Harvard Medical School, USA.* Advances in optical technologies combined with targeted molecular probes enable therapeutics optimization by earlier disease detection or by therapy monitoring. Photodynamic therapy (PDT) is exceptional in that the same molecule may serve as the therapeutic and diagnostic agent. Development and use of targeted probes in DT will be discussed. PDT will be discussed.

BM2A.2 • 10:30 Invited
Imaging RNA in Single Living Cells: Recent Advances and Future Outlook, Xuemei Zhang[1], Antony Chen[1], Andrew Tsourkas[1]; *[1]Department of Bioengineering, Univ. of Pennsylvania, USA.* Recently, we developed an oligonucleotide-based probe for imaging RNA in living cells, i.e. Ratiometric BiMolecular Beacons (RBMBs). RBMBs are highly sensitive, exhibit little/no false-positives, and can be used for prolonged imaging of single RNA transcripts.

BM2A.3 • 11:00
In vivo assessment of HER2 Receptors Expression, Using NIR Fluorescence Imaging with Affibody-DyLight Probe, Victor Chernomordik[1], Moinuddin Hassan[1], Yasaman Ardeshirpour[1], Rafal Zielinski[3,2], Jacek Capala[2], Amir Gandjbakhche[1]; *[1]Program in Physical Biology, Lab. of Integrative and Medical Biophysics, National Inst. of Child Health and Human Development, National Inst.s of Health, USA; [2]National Cancer Inst., National Inst.s of Health, USA; [3]UT MD Anderson Cancer Center, USA.* Her2 overexpression in different carcinoma types is assessed in vivo (mouse model), using time sequences of fluorescence images after injection of HER2-specific fluorescent probes with fast pharmacokinetics.

Symphony III — BIOMED 2

10:00 - 12:30
BM2B • Photoacoustic Tomography
Wiendelt Steenbergen; Univ. of Twente / Inst. MIRA, Netherlands, Presider

BM2B.1 • 10:00 Invited
Detecting Circulating Tumor Cells (CTCs) with Integrated Photoacoustic/Ultrasonic Imaging, Matthew O'Donnell[1], Chen-wei Wei[1], Jinjun Xia[1], Ivan Pelivanov[2,1], Xiaohu Gao[1], Xiaoge Hu[1]; *[1]Department of Bioengineering, Univ. of Washington, USA; [2]Physics Faculty, of M.V. Lomonosov, Moscow State Univ., Russian Federation.* Magnetic trapping and manipulation of polystyrene beads mimicking magnetically targeted circulating tumor cells (CTCs) has been demonstrated using magnetomotive photoacoustic (mmPA) imaging. These techniques appear promising for the detection of rare CTCs in the vasculature.

BM2B.2 • 10:30 Invited
Sound and Light Catheters
Ton van der Steen[1]; *[1]Erasmus MC, Netherlands.*
Abstract not available.

BM2B.3 • 11:00
Preclinical photoacoustic imaging using all-optical detection and time-reversal image reconstruction.
Paul Beard[1]; *[1]UCL, UK.* 3D photoacoustic images of the vasculature in mice were obtained in vivo using a photoacoustic scanner based on a Fabry Perot polymer film ultrasound sensor and an attenuation compensated acoustic time reversal image reconstruction method.

Symphony IV — DH

10:00 - 11:45
DM2C • Three-Dimensional Display II
Kenji Yamamoto; NICT, Japan, Presider

DM2C.1 • 10:00 Invited
Adaptive Liquid Crystal Lens(LC Lens) Array for 3D Display and Capturing, Yi-Pai Huang[1,2], Yu-Cheng Chang[1], Chi-Wei Chen[1], Lin-Yao Liao[1], Po-Tuan Shieh[1], Tai-Hsien Jen[1], Tsu-Han Chen[2]; *[1]Department of Photonics/Display Inst., National Chiao Tung Univ, Taiwan; [2]School of Electrical and Computer Engineering, Cornell Univ., USA.* A low driving voltage with fast response LC lens was developed. By implementing the LC-lens as an array structure, it can be adaptively used for 2D/3D switching and 3D rotation on autostereoscopic display. Additionally, it also can be utilized as a depth sensor for 3D capturing.

DM2C.2 • 10:30
Fully Updatable Three-dimensional Holographic Display Device Using a Monolithic Compound, Naoto Tsutsumi[1], Kenji Kinashi[1], Wataru Sakai[1], Junichi Nishide[2], Yutaka Kawabe[2], Hiroyuki Sasabe[2]; *[1]Kyoto Inst. of Technology, Japan; [2]Chitose Inst. of Science and Technology, Japan.* Paper shows the updatable three-dimensional holographic display with capability of recording and displaying new images within a few seconds using a non-electric field photorefractive device of monolithic compound doped transparent polymer film.

DM2C.3 • 10:45
Enhanced Layered 3D with a Lens, Stefan Muenzel[1], Laura A. Waller[1], Jason Fleischer[1]; *[1]Electrical Engineering, Princeton Univ., USA.* We augment layered 3D displays using optical elements placed in front of or in between attenuation layers, which improves resolution or field-of-view of the display. We also significantly reduce memory requirements for layer calculations.

DM2C.4 • 11:00
Multiplexed holographic display based on a fast response liquid crystal film, Hongyue Gao[1,2], Xiao Li[1], Zhenghong He[1], Yikai Su[1], Ting-Chung Poon[2]; *[1]Center for Opto-electronic Materials and Devices, Shanghai Jiao Tong Univ., China; [2]Bradley Department of Electrical and Computer Engineering, Virginia Tech, USA.* Real-time holographic display with angularly multiplexed holograms is presented with holographic response time of ~1ms in a liquid crystal thin film, showing the possibility of a color holographic three-dimensional display with this film.

Symphony I & II	Symphony III	Symphony IV
BIOMED I	BIOMED 2	DH

BM2A • BioNanophotonics and Molecular Probes—Continue

BM2A.4 • 11:15

In Vivo Fluorescence Lifetime Detection of a Cathepsin-Activatable Probe in Infarcted Myocardium, Craig J. Goergen[1], Howard H. Chen[2], Alexei Bogdanov[3], David E. Sosnovik[1,2], Anand T. Kumar[1]; *[1]Martinos Center for BIOMEDical Imaging, Massachusetts General Hospital, USA; [2]Center for Molecular Imaging Research, Massachusetts General Hospital, USA; [3]Department of Radiology, Univ. of Massachusetts Medical School, USA.* Using a protease-activatable near-infrared probe, we demonstrate that lifetime-based time domain imaging can improve fluorescence contrast useful for detecting myocardial infarctions in vivo and for isolating the non-specific signal from the liver.

BM2A.5 • 11:30

Porphysomes: Intrinsically Multifunctional Nanovesicles for Photothermal Therapy, Cheng Jin[1,2], Jonathan F. Lovell[2,3], Gang Zheng[2,3]; *[1]Pharmaceutical Sciences, Univ. of Toronto, Canada; [2]Inst. for Biomaterials and Bioengineering, Univ. of Toronto, Canada; [3]Ontario Cancer Inst., Univ. Health Network, Canada.* Porphysomes are intrinsically multifunctional nanovesicles with unique structure-dependent fluorescence self-quenching and photothermal properties. We investigated imaging and photothermal effect on subcutaneous and orthotopic prostate tumor models.

BM2A.6 • 11:45

Multimodal video-rate fluorescence DOT and SPECT/CT for small animals, Metasebya Solomon[1,2], Ralph Nothdurft[2], Walter Akers[2], W. Barry Edwards[2], Kexian Liang[2], Baogang Xu[2], Hamid Dehghani[4], Yuan-Chuan Tai[2], Sam Achilefu[1,3], Joseph P. Culver[1,2]; *[1]BIOMEDical Engineering, Washington Univ. in Saint Louis, USA; [2]Department of Radiology, Washington Univ. School of Medicine, St. Louis, MO, USA; [3]Biochemistry and Molecular Biophysics,, Washington Univ. School of Medicine, St. Louis, MO, USA; [4]School of Computer Science, The Univ. of Birmingham Birmingham, UK, UK.* We integrated our fiber-based video-rate fluorescence diffuse optical tomography with a preclinical NanoSPECT/CT.This design permits visualization of anatomically co-registered physiological events with combined optical-nuclear platforms.

BM2B • Photoacoustic Tomography—Continue

BM2B.4 • 11:15

Volumetric Photoacoustic Endoscopy, Joon-Mo Yang[1], Christopher Favazza[1], Ruimin Chen[2], Junjie Yao[1], Xin Cai[1], Konstantin Maslov[1], Qifa Zhou[2], Kirk Shung[2], Lihong V. Wang[1]; *[1]BIOMEDical Engineering, Washington Univ. in St. Louis, USA; [2]BIOMEDical Engineering, Univ. of Southern California, USA.* Photoacoustic endoscopy provides unique functional information through its broad spectroscopic imaging capability. The imaging results presented here suggest its potential for use as a comprehensive endoscopic tool in various medical applications.

BM2B.5 • 11:30

Quantitative Photoacoustic Imaging by Acousto-Optically Measured Light Fluence, Altaf Hussain[1], Khalid Daoudi[1], Erwin Hondebrink[1], Wiendelt Steenbergen[1]; *[1]BIOMEDical Photonic Imaging group, Univ. of Twente, MIRA Inst. for BIOMEDical Technology and Technical Medicine, Netherlands.* We propose a methodology to measure the absolute local absorption coefficient in biological tissue using photoacoustics in combination with reflection mode acousto-optics. We provide proof of the concept with numerical simulations and experiments.

BM2B.6 •11:45

Simultaneous in vivo imaging of dual molecular contrasts in the retina with multimodal photoacoustic ophthalmoscopy, Shuliang Jiao[1], Hao F. Zhang[2]; *[1]Ophthalmology, Univ. of Southern California, USA; [2]BIOMEDical Engineering, Northwestern Univ., USA.* We combined photoacoustic ophthalmoscopy with autofluorescence imaging for simultaneous in vivo imaging of dual molecular contrasts in the retina using single light source. The dual molecular contrasts come from melanin and lipofuscin in the RPE.

DM2C • Three-Dimensional Display II—Continue

DM2C.5 • 11:15

Development of a Holographic Display Module Using a 4k2k-SLM Based on the Resolution Redistribution Technique, Yasuhiro Takaki[1], Junya Nakamura[1]; *[1]Tokyo Univ. of Agriculture and Technology, Japan.* A holographic display module with a viewing zone angle of 10.5° and a screen size of 2'' was developed using a 4k2k-SLM. This module has a frameless screen so that multiple modules can be arranged seamlessly.

DM2C.6 • 11:30

Two-dimensional and three-dimensional see-through screen using holographic optical elements, Keehoon Hong[1], Jisoo Hong[1], Jiwoon Yeom[1], Byoungho Lee[1]; *[1]Seoul National Univ., Republic of Korea.* In this paper, we propose two-dimensional and three-dimensional see-through screen using lens-array holographic optical element (HOE). Recording scheme for HOE is presented and the proposed see-thorough screen is experimentally verified.

Symphony I & II	Symphony III	Symphony IV
BIOMED I	BIOMED 2	DH

BM2A • BioNanophotonics and Molecular Probes—Continue

BM2A.7 • 12:00
Comparative Study on Photothermal Therapy of Cancer Cells with Different Localizations of Gold Nanorods, Varun Pattani[1], James Tunnell[1]; *[1]BIOMEDical Engineering, The Univ. of Texas at Austin, USA.* Photothermal therapy was performed by targeting gold nanorods to two locations on cancer cells. We demonstrated a fluence rate threshold difference during therapy, suggesting certain damage pathways are more

BM2A.8 • 12:15
Plasmonic Gold Nanostars: A Potential Agent for Molecular Imaging and Cancer Therapy, Hsiangkuo Yuan[1], Christopher Khoury[1], Andrew Fales[1], Christy Wilson[1], Gerald Grant[1], Tuan Vo-Dinh[1]; *[1]Duke Univ., USA.* Gold nanostars, with tunable plasmon in the near infrared tissue optic window, generate intense two-photon photoluminescence capable of in vitro cell labeling and in vivo particle tracking. Efficient photothermal ablation therapy is demonstrated.

BM2B • Photoacoustic Tomography—Continue

BM2B.7 • 12:00
Feasibility of Contrast-Enhanced Photoacoustic Liver Imaging at a Wavelength of 1064 nm, Yun-Sheng Chen[1,2], Kimberly Homan[1], David Xu[1], Wolfgang Frey[1], Stanislav Emelianov[1,2]; *[1]BIOMEDical Engineering, The Univ. of Texas at Austin, USA; [2]Electrical and Computer Engineering, The Univ. of Texas at Austin, USA.* The feasibility of photoacoustic imaging in ex-vivo liver tissue was demonstrated. Studies were performed using a pulsed laser at 1064 nm to reduce background noise. Gold nanorods resonant at 1064 nm were visualized in the blood-laden liver.

BM2B.8 • 12:15
Dichroism optical-resolution photoacoustic microscopy, Song Hu[1], Konstantin Maslov[1], Ping Yan[2], Jin-Moo Lee[2], Lihong V. Wang[1]; *[1]Department of BIOMEDical Engineering, Washington Univ. in St. Louis, USA; [2]Department of Neurology, Washington Univ. School of Medicine, USA.* We developed dichroism photoacoustic microscopy capable of imaging polarization-dependent optical absorption with excellent specificity. This innovation enriches photoacoustic contrasts and holds potential for detecting amyloid-associated diseases.

DM2C • Three-Dimensional Display II—Continue

12:30—13:00
LUNCH ON YOUR OWN

11:30—3:00
LUNCH ON YOUR OWN

Concerto Ballroom & Overture Foyer

BIOMED and DH

13:00—15:00
JM3A—Joint BIOMED/DH Poster Session

JM3A.1
Detection of hemoglobin variants using surface enhanced Raman scattering, Maria Navas-Moreno[1], Josef T. Prchal[1], Valy Vardeny[2]; *[1]Physics and Astronomy, Univ. of Utah, USA; [2]Hematology and Pathology, Univ. of Utah, USA.* Hemoglobin variants are abnormal hemoglobin molecules and some of them elude current methods of detection, making proper diagnosis rather difficult. We investigate SERS as an alternative for hemoglobin variant detection.

JM3A.2
A Novel Optical Property Recovery Algorithm for Use in the Optical Biopsy of Brain Tissue, Derek J. Cappon[1], Zhaojun Nie[2], Thomas J. Farrell[1], Qiyin Fang[2,3], Joseph E. Hayward[1,3]; *[1]Department of Medical Physics & Applied Radiation Sciences, McMaster Univ., Canada; [2]School of BIOMEDical Engineering, McMaster Univ., Canada; [3]Department of Engineering Physics, McMaster Univ., Canada.* A novel fibre optic probe design and Monte Carlo based optical property recovery algorithm for use in the optical biopsy of brain tissue are described. The algorithm's performance is characterized when subjected to random noise.

JM3A.3
Quantitative measurement of Cerebral Blood Flow, using broad band, continuous wave near infrared spectroscopy, Hadi Zabihi Yeganeh[1], Vladislav Toronov[1], Jonathan T. Elliot[2], Mamadou Diop[2], Keith St Lawrence[2], Ting-Yim Lee[3,2]; *[1]Physics, Ryerson Univ., Canada; [2]Imaging program, Lawson Health Research Inst., Canada; [3]Imaging Labs, Robarts Research Inst., Canada.* We present a broad-band, continuous wave spectral approach by using an algorithm based on a solution of diffusion equation to quantify cerebral blood flow of a pig model from dynamic contrast-enhanced near infrared spectroscopy technique.

JM3A.4
Wavelet synchronization index to assess variations in regional cerebral oxygenation in infants on life support, Maria Papademetriou[1], Ilias Tachtsidis[1], Aparna Hoskote[2], Martin J. Elliott[2], Clare Elwell[1]; *[1]Medical Physics and Bioengineering, Univ. College London, UK; [2]Cardiothoracic Unit, Great Ormond Street Hospital, UK.* We used synchronisation index between mean arterial pressure and oxyhaemoglobin concentration measured by optical topography to demonstrate regional variations in cerebral autoregulation in infants undergoing extracorporeal membrane oxygenation.

JM3A.5
Recipes for Organic Phantoms and Characterization by Time-Resolved Diffuse Optical Spectroscopy, Giovanna Quarto[1], Antonio Pifferi[1], Ilaria Bargigia[1], Andrea Farina[1], Rinaldo Cubeddu[1], Paola Taroni[1]; *[1]Physics, Politecnico di Milano, Italy.* Three recipes for tissue constituent-equivalent phantoms of water and lipids are presented. The phantom optical characterization showed good homogeneity and reproducibility. Estimates of composition by time-resolved spectroscopy were also performed.

JM3A.6
Optimal Wavelength Combinations for Resolving in-vivo Changes of Haemoglobin and Cytochrome-c-oxidase Concentrations with NIRS, Tingting Zhu[1], Stuart Faulkner[3], Tushaar Madaan[1], Alan Bainbridge[2], David Price[2], David Thomas[4], Ernest Cady[2], Nicola Robertson[3], Xavier Golay[4], Ilias Tachtsidis[1]; *[1]Medical Physics and Bioenegineering, Univ. College London, UK; [2]Medical Physics and Bioengineering, Univ. College London Hospitals, UK; [3]Inst. for Women's Health, Univ. College London Hospitals, UK; [4]Inst. of Neurology, Univ. College London Hospitals, UK.* Novel method used to identify the optimal three and four wavelength combinations (out of 120, 780-900nm) to accurately resolve the concentration changes in haemoglobin and cytochrome-c-oxidase during hypoxic-ischaemia in a neonatal preclinical model.

JM3A.7
Spectral Distortions in Time-Resolved Diffuse Optical Spectroscopy Due to AOTFs, Andrea Farina[2], Antonio Pifferi[1,2], Paola Taroni[1], Ilaria Bargigia[1]; *[1]Physics, Politecnico di Milano, Italy; [2]Consiglio Nazionale delle Ricerche-Istituto di Fotonica e Nanotecnologie, CNR-IFN, Italy.* This work discusses the spectral distortions occurring when time-resolved diffuse spectroscopy is performed by a system based on supercontinuum generation of radiation spectrally filtered by a prism and by an acousto-optics tunable filter.

JM3A.8
Noninvasive Optical Quantification of Absolute Blood Flow and Oxygen Consumption Rate in Exercising Skeletal Muscle,
Katelyn Gurley[1], Yu Shang[1], Guoqiang Yu[1]; *[1]Center for BIOMEDical Engineering, Univ. of Kentucky, USA.* Diffuse optical technologies (NIRS/DCS) are combined with a novel gating algorithm to continuously and noninvasively quantify absolute blood flow, blood oxygenation, and oxygen consumption rate in exercising skeletal muscle for the first time.

JM3A.9
Optical Spectroscopic Properties of Brown Fat Reveal Pathophysiological Conditions, Lianyu Guo[1], Wanzhu Jin[1], Le Qiu[1], Vladimir Turzhitsky[1], Edward Vitkin[1], Eugene Hanlon[1], Irving Itzkan[1], Lev T. Perelman[1]; *[1]Center for Advanced BIOMEDical Imaging and Photonics, Harvard Univ., USA.* A double-integrating-sphere system measures the absorption and scattering coefficients of brown and white fat. The optical spectroscopic properties of the fat tissue are sensitive to the pathophysiological conditions of mice.

JM3A.10
Color of Human Tissues as Viewed in a Higher Range of Spectra, Igor Meglinski[1], Alexander Doronin[1], Harry T. Whelan[2], Georgi I. Petrov[3], Vladislav V. Yakovlev[3]; *[1]Department of Physics, Univ. of Otago, New Zealand; [2]Department of Neurology, Medical College of Wisconsin, USA; [3]Department of BIOMEDical Engineering, Texas A&M Univ., USA.* The near-IR transmittance spectra obtained for various parts of human body in vivo are analyzed in framework of CIE L*a*b* color space and the regularities of the color variation are examined by Monte Carlo simulation.

JM3A.11
Development of a wireless near-infrared tissue oxygen monitor system with high sampling rate, Takashi Watanabe[1], Toshihiko Mizuno[1,2], Takahiro Shikayama[1], Mitsuharu Miwa[1]; *[1]Optical Diagnostic Technology Group, Development Center, Hamamatsu Photonics K.K., Japan; [2]DynaSense Inc., Japan.* We developed a portable near-infrared tissue oxygen monitor having both wireless data communication capability and high sensitivity. This device is able to measure relative changes in oxy- and deoxyhemoglobin concentrations in real time.

JM3A.12
Diffuse Spectroscopy for Tissue Characterization: Application to Skin Tests Reading, Anne Koenig[1], Amir Nahas[2], Anne Planat-Chrétien[1], Vincent Poher[1], Jean-Marc Dinten[1]; *[1]DTBS/STD/LISA, CEA Grenoble, France; [2]Institut Langevin ESPCI, France.* In this paper, we present a low-cost optical instrument, usable in a clinical environment, to enable early skin tests reading before the onset of visual signs. Results on an ongoing clinical study are presented.

JM3A—Joint BIOMED/DH Poster Session - Continue

JM3A.13
Microvascular Blood Flow Changes in Human Breast During Simulated Mammography, David R. Busch[1], Regine Choe[2], Turgut Durduran[3], Wesley B. Baker[1], Ellen K. Foster[1], Tiffany A. Alverna[1], Daniel Friedman[1], Mark A. Rosen[1], Michael D. Schnall[1], Arjun G. Yodh[1]; *[1]Univ. of Pennsylvania, USA; [2]Univ. of Rochester, USA; [3]ICFO-Institut de Ciencies Fotoniques, Spain.* We employ Diffuse Correlation Spectroscopy to measure microvascular blood flow in human breast during mammographic-like compression. Our results suggest that blood flow is reduced significantly by mild and ~90% by mammographic compression.

JM3A.14
Long Term Monitoring of Cerebral Blood Flow in Subarachnoid Hemorrhage Patients Using Diffuse Correlation Spectroscopy, Malavika Chandra[1], David L. Minkoff[1], Steven S. Schenkel[1], Suzanne Frangos[1], Rickson C. Mesquita[1,2], Jennifer A. Kosty[1], Soojin Park[1], W. Andrew Kofke[1], Arjun G. Yodh[1]; *[1]Univ. of Pennsylvania, USA; [2]Univ. of Campinas, Brazil.* We used diffuse correlation spectroscopy to continuously monitor cerebral blood flow changes in subarachnoid hemorrhage patients due to interventions in the clinic, and present a novel index for assessing cerebral autoregulation in these patients.

JM3A.15
Cherenkov emission spectroscopy for tissue oxygen saturation assessment, Adam Glaser[1], Johan Axelsson[1], Rongxiao Zhang[2], David Gladstone[3], Brian Pogue[1,2]; *[1]Thayer School of Engineering, Dartmouth College, USA; [2]Department of Physics and Astronomy, Dartmouth College, USA; [3]Norris Cotton Cancer Center, Dartmouth College, USA.* Radiation from a linear accelerator induces Cherenkov emission in tissue. The absorption and scatter of this light imparts spectral changes which can be made quantitative through the use of standard spectroscopic techniques.

JM3A.16
Optical Spectroscopy up to 1700 nm: a Time-Resolved Approach Combined with an InGaAs/InP Single-Photon Avalanche Diode, Ilaria Bargigia[1], Alberto Tosi[2], Andrea Farina[3], Andrea Bassi[1], Paola Taroni[1], Andrea Bahgat Shehata[2], Adriano Della Frera[2], Alberto Dalla Mora[1], Franco Zappa[2], Rinaldo Cubeddu[1,3], Antonio Pifferi[1,3]; *[1]Physics, Politecnico di Milano, Italy; [2]Elettronica e Informazione, Politecnico di Milano, Italy; [3]Istituto di Fotonica e Nanotecnologie, Consiglio Nazionale delle Ricerche, Italy.* Time-resolved spectroscopy has been exploited mostly up to 1100 nm: our system reaches up to 1700 nm, thanks to a supercontinuum laser source and an InGaAs/InP Single-Photon Avalanche Diode. A first in-vivo application is presented.

JM3A.17
Image-Guided Treatment Planning and Dosimetry for Interstitial Photodynamic Therapy, Timothy M. Baran[1], Thomas H. Foster[1,2], Daryl P. Nazareth[3]; *[1]Inst. of Optics, Univ. of Rochester, USA; [2]Imaging Sciences, Univ. of Rochester, USA; [3]Department of Radiation Medicine, Roswell Park Cancer Inst., USA.* The treatment scenario for photodynamic therapy (PDT) can vary between patients. We present a method that combines clinical images, radiation therapy planning contours, and Monte Carlo simulation in order to design individualized PDT treatment plans.

JM3A.18
Optically-Measured Dose-Dependent Increase in Cerebral Blood Flow Caused by Sodium Bicarbonate Therapy, Erin M. Buckley[1,2], Jennifer M. Lynch[2], Donna A. Goff[3], Maryam Y. Naim[4], Susan Nicolson[5], Lisa Montenegro[5], Laura K. Diaz[5], Mark Fogel[3], Daniel J. Licht[1], Arjun G. Yodh[2]; *[1]Neurology, Children's Hospital of Philadelphia, USA; [2]Physics and Astronomy, Univ. of Pennsylvania, USA; [3]Cardiology, Children's Hospital of Philadelphia, USA; [4]Critical Care Medicine, Children's Hospital of Philadelphia, USA; [5]Cardiothoracic Anesthesia, Children's Hospital of Philadelphia, USA.* Sodium bicarbonate (NaHCO3) is used to treat metabolic acidemia, despite a link between treatment and brain injury. We observe a dose-dependent increase in cerebral blood flow after NaHCO3, possibly explaining the cause of this injury.

JM3A.19
Auto-fluorescence lifetime spectroscopy for prostate cancer detection: an optical biopsy approach, Vikrant Sharma[1], Payal Kapur[2], Ephrem Olweny[3], Jeffrey Cadeddu[3], Claus G. Roehrborn[3], Hanli Liu[1]; *[1]Bioengineering, The Univ. of Texas at Arlington, USA; [2]Pathology, The Univ. of Texas Southwestern Medical Center at Dallas, USA; [3]Urology, The Univ. of Texas Southwestern Medical Center at Dallas, USA.* We report the use of auto-fluorescence lifetime as a biomarker for prostate cancer diagnosis. 23 human ex vivo prostates were measured post-prostatectomy, and compared to histology. Significant differences in cancer and benign tissue were identified.

JM3A.20
Cerebral Oxygen Extraction Decreases with Age in Preoperative Neonates With Congenital Heart Defects, Erin M. Buckley[1,2], Jennifer M. Lynch[2], Maryam Y. Naim[5], Donna A. Goff[3], Susan Nicolson[4], Lisa Montenegro[4], Daniel J. Licht[1], Arjun G. Yodh[2]; *[1]Neurology, Children's Hospital of Philadelphia, USA; [2]Physics and Astronomy, Univ. of Pennsylvania, USA; [3]Cardiology, Children's Hospital of Philadelphia, USA; [4]Cardiothoracic Anesthesia, Children's Hospital of Philadelphia, USA; [5]Critical Care Medicine, Children's Hospital of Philadelphia, USA.* Diffuse optical spectroscopy is used to quantify cerebral oxygen saturation, total hemoglobin concentration, & oxygen extraction fraction in neonates with congenital heart defects. Preoperative cerebral oxygen extraction increased with day of life.

JM3A.21
Light reflectance spectroscopy and auto-fluorescence lifetime: potential tools for intra-operative breast cancer margin detection, Vikrant Sharma[1], Shivaranjani Shivalingaiah[1], Yan Peng[2], David Euhus[3], Hanli Liu[1]; *[1]Bioengineering, The Univ. of Texas at Arlington, USA; [2]Pathology, The Univ. of Texas Southwestern Medical Center at Dallas, USA; [3]Surgery, The Univ. of Texas Southwestern Medical Center at Dallas, USA.* This paper reports the use of light reflectance spectroscopy and auto-fluorescence lifetime for detecting breast cancer in human ex vivo samples. Preliminary results show significant differences using both techniques.

JM3A.22
In vivo quantification of tumor metabolic demand in pre-clinical models using optical spectroscopy, Tony Jiang[1], Narasimhan Rajaram[1], Chengbo Liu[1,2], Fangyao Hu[1], Nimmi Ramanujam[1]; *[1]BIOMEDical Engineering, Duke Univ., USA; [2]School of Life Science and Technology, Xi'an Jiatong Univ., China.* We report the dose-dependent uptake and kinetics of 2-NBDG, a fluorescent glucose analog, in pre-clinical models using intrinsic fluorescence spectroscopy. Extracted in vivo concentrations of 2-NBDG were proportional to the injected dose in tumors.

JM3A.23
In vivo Spectroscopy of Cervical Tissue, Judith R. Mourant[1], Oana C. Marina[1], Harriet O. Smith[2]; *[1]Bioscience, LANL, USA; [2]Montefiore Medical Center, USA.* We have collected in vivo spectroscopy data of cervical lesions from two separate locations. The data are analyzed to determine spectroscopic and colposcopic accuracy as compared to the gold standard of pathology.

JM3A.24
Cerebral Hemodynamic Effects of Hyperoxia Linked to Severity of Pediatric Pulmonary Hypertension, Jennifer M. Lynch[1], Erin M. Buckley[1,2], Peter Schwab[2], Brian D. Hanna[3], Daniel J. Licht[2], Arjun G. Yodh[1]; *[1]Physics and Astronomy, Univ. of Pennsylvania, USA; [2]Neurology, Children's Hospital of Philadelphia, USA; [3]Cardiology, Children's Hospital of Philadelphia, USA.* We employ diffuse optical spectroscopies to measure cerebral hemodynamic effects of hyperoxia in pediatric patients treated with pulmonary vasodilators and demonstrate the potential of diffuse optics to probe severity of pulmonary hypertension.

JM3A—Joint BIOMED/DH Poster Session - Continue

JM3A.25
Gender-specific hemodynamics in prefrontal cortex during visual-verbal working memory by near-infrared spectroscopy,
Ting Li[1,2], Qingming Luo[1], Hui Gong[1]; [1]*Britton Chance Center for BIOMEDical Photonics, Wuhan National Laboratory for Optoelectronics, Huazhong Univ. of Science and Technology, China;* [2]*Center of Neuro-Inf., Univ. of Electron. Sci. & Technol. of China, China.* A NIRS study during working memory tested the gender effect on [oxy-Hb], [deoxy-Hb], and [tot-Hb] for hemodynamic-based neuroimaging studies, and found females possess more efficient hemodynamics in PFC, emphasizing the importance of PFC in gender.

JM3A.26
Raman Spectroscopy Sensor for Surgical Robotics - Instrumentation and Tissue Differentiation Algorithm,
Praveen C. Ashok[1], Nikola Krstajić[1], Mario E. Giardini[2], Kishan Dholakia[1], Wilson Sibbett[1]; [1]*School of Physics & Astronomy, Univ. of St Andrews, UK;* [2]*School of Medicine, Univ. of St Andrews, UK.* A fiber Raman probe based sensor is designed to be integrated into a surgical robot. The chemical information obtained from this sensor would assist tissue margin detection and surgical guidance during laparoscopic surgical procedures.

JM3A.27
In-Vivo Measurements of Brain Haemodynamics and Energetics using Multimodal Spectroscopy in Perinatal Hypoxia-Ischaemia,
Ilias Tachtsidis[1], Alan Bainbridge[2], Stuart Faulkner[3], David Price[2], Elizabeth Powell[3], David Thomas[4], Ernest Cady[2], Nicola Robertson[3], Xavier Golay[4]; [1]*Medical Physics and Bioengineering, Univ. College London, UK;* [2]*Medical Physics and Bioengineering, Univ. College London Hospitals, UK;* [3]*Inst. for Women's Health, Univ. College London Hospitals, UK;* [4]*Inst. of Neurology, Univ. College London Hospitals, UK.* We report a novel multimodal spectroscopy methodology that combines broadband near-infrared spectroscopy and magnetic resonance spectroscopy to monitor brain tissue oxygenation and metabolism in a preclinical model of hypoxic-ischaemic neonatal encephalopathy.

JM3A.28
Cerebral vasomotor reactivity in micro- and macro-vasculature of patients with severe steno-occlusive internal carotid artery lesions,
Peyman Zirak[1], Raquel Delgado-Mederos[2], Lavinia Dinia[2], Joan Marti Fabregas[2], Turgut Durduran[1]; [1]*BIOMEDical Optics group, The Inst. of Photonic Sciences, ICFO, Spain;* [2]*Department of Neurology, Hospital de la Santa Creu i Sant Pau, Spain.* Cerebral-vasomotor-reactivity(CVR) is evaluated in patients with severe internal-carotid-artery steno-occlusion by diffuse optics and transcranial Doppler ultrasound. The micro- and macro-vascular CVR diverged for affected arteries/ hemispheres.

JM3A.29
Modeling InGaAs/AlGaAs/Au Lasers for Brain Surgery,
Meng-Mu Shih[1]; [1]*Univ. of Florida, USA.* This work develops parametric models to compute coupling coefficients of semiconductor -metal lasers at 980 nm for brain surgery. Numerical results computed by the photonic and the optical methods are close.

JM3A.30
The strong influence of CO2 on cerebral hemodynamics and oxygenation during functional near-infrared spectroscopy (fNIRS) studies,
Felix Scholkmann[1,2], Ursina Gerber[1], Martin Wolf[2], Sabine Klein[1], Ursula Wolf[1]; [1]*Inst. of Complementary Medicine KIKOM, Univ. of Bern, Switzerland;* [2]*BIOMEDical Optics Research Laboratory, Division of Neonatology, Univ. Hospital Zurich, Switzerland.* We employed fNIRS to investigate the relationship between cerebral hemodynamics/ oxygenation (HD/OX) and end-tidal CO2 (PETCO2). We found a strong influence of PETCO2 on HD/OX during task-evoked brain activity.

JM3A.31
Multi-wavelength time-resolved measurements of diffuse reflectance: phantom study with dynamic inflow of ICG,
Anna Gerega[1], Daniel Milej[1], Wojciech Weigl[2], Norbert Zolek[1], Piotr Sawosz[1], Roman Maniewski[1], Adam Liebert[1]; [1]*Inst. of Biocybernetics and BIOMEDical Engineering PAS, Poland;* [2]*Department of Anesthesiology and Intensive Care, Medical Univ. of Warsaw, Poland.* Multi-wavelength detection of time-resolved diffuse reflectance signal was carried out in phantom experiments with dynamic inflow of ICG at different depths in a turbid media.

JM3A.32
Individualised Optimisation of Modelled Cerebral Oxygenation Near-Infrared Spectroscopy Signals,
Beth Jelfs[1], Jasmina Panovska-Griffiths[1], Ilias Tachtsidis[1], Murad Banaji[2], Clare Elwell[1]; [1]*Department of Medical Physics & Bioengineering, Univ. College London, UK;* [2]*Department of Mathematics, Univeristy of Portsmouth, UK.* Responses of NIRS signals in a healthy volunteer are predicted using a model of brain circulation. Optimisation using partial data is shown to increase the model's predictive power which can aid the interpretation of NIRS signals in individuals.

JM3A.33
Measuring chromophore's concentration and scattering coefficient in a turbid medium using back reflection spectroscopy,
Murat Canpolat[1], Aslinur Sircan-Kucuksayan[1]; [1]*Biophysics, Akdeniz Univ., Turkey.* Scattering and absorption coefficients were estimated within an error of 4.8% and 13.3% respectively using the back reflection spectral measurements and Monte Carlo simulations results from tissue phantoms consist of Intralipid and methylene blue.

JM3A.34
Diffuse Near Infrared Spectroscopy Assessment of Diabetic Foot Ulcers: A Human Study,
Joshua Samuels[1], Michael Neidrauer[1], Leonid Zubkov[1], Michael S. Weingarten[2], David Diaz[1], Xiang Mao[1], Elisabeth S. Papazoglou[1]; [1]*BIOMEDical Engineering, Drexel Univ., USA;* [2]*Surgery, Drexel Univ. College of Medicine, USA.* Forty-six human diabetic foot ulcers were measured with Diffuse Near-Infrared Spectroscopy. The weekly change in oxy-hemoglobin concentration could distinguish healing and non-healing ulcers with a sensitivity of 0.9 and specificity of 0.86 ($p<0.002$)

JM3A.35
Fluorescence Suppression Using Modulated Wavelength Raman Spectroscopy for Tissue and Cell Analysis,
Bavishna Balagopal[1], Praveen C. Ashok[1], Robert F. Marchington[1], Michael Mazilu[1], Alastair D. Gillies[1], Simon Herrington[2], Andrew Riches[2], Kishan Dholakia[1]; [1]*School of Physics & Astronomy, Univ. of St Andrews, UK;* [2]*School of Medicine, Univ. of St Andrews, UK.* Fluorescence suppression using modulated wavelength Raman spectroscopy has been investigated using a fiber Raman probe and micro-Raman spectroscopy. This may lead to enhanced differentiation between normal and cancerous tissues and cells.

JM3A.36
A New, Modular Frequency Domain Diffuse Optical Monitor in the Digital Domain,
Udo M. Weigel[1], Ruben Revilla[1], Nestor H. Oliverio[1], Alberto A. Gonzalez[1], Jose C. Cifuentes[1], Peyman Zirak[1], Ricardo Saiz[1], Daniel Mitrani[1], Jordi Ninou[1], Oscar Casellas[1], Turgut Durduran[1]; [1]*BIOMEDical Optics, ICFO, Spain.* State-of-the-art digital electronics can be utilized to improve performance and scalability of frequency domain diffuse optical monitors. We present a new design based on an under-sampled, heterodyne approach without limitations of analog hardware.

JM3A—Joint BIOMED/DH Poster Session - Continue

JM3A.37
Hemodynamic Monitoring of Spinal Cord with Diffuse Optical & Correlation Spectroscopies, Rickson C. Mesquita[1,2], Angela D'Souza[3], Asher Emanuel[3], Steven S. Schenkel[2], Robert M. Galler[3], Thomas V. Bilfinger[3], Arjun G. Yodh[2], Thomas Floyd[3]; *[1]Inst. of Physics, Univ. of Campinas, Brazil; [2]Department of Physics & Astronomy, Univ. of Pennsylvania, USA; [3]Stony Brook Univ. Medical Center, USA.* We employ diffuse optics to measure spinal cord hemodynamics in response to pharmacologic and mechanical perturbations for the first time. Comparison of blood flow and blood pressure responses demonstrate robust spinal cord autoregulation.

JM3A.38
Correction of shape-induced artifacts in spectroscopic imaging of biological media, Jessica C. Ramella-Roman[1]; *[1]BIOMEDical Engineering, Catholic Univ., USA.* Imaging spectroscopy results are often biased by the surface structure of the imaged object. A combination of software and experimental tools has been designed to study and minimize this effect

JM3A.39
Withdrawn

JM3A.40
Pulsatile and static hemodynamics of human patella during rest and cuff inflation, Parisa Farzam[1], Peyman Zirak[1], Tiziano Binzoni[2,3], Turgut Durduran[1]; *[1]ICFO-Institut de Ciencies Fotoniques, Spain; [2]Departement des Neurosciences Fondamentales, Switzerland; [3]l'Imagerie et des Sciences de l'Information Medicale, Switzerland.* Pulsatile and static hemodynamics of the human patella (knee-cap) were studied at rest and at arterial cuff-occlusion. Differences in hemodynamics between the patella and the muscle were observed.

JM3A.41
Withdrawn

JM3A.42
Development of a Non-Invasive Optical Method for Assessment of Skin Barrier to External Penetration, Georgios N. Stamatas[1], Elise Boireau-Adamezyk[1]; *[1]R&D, Johnson & Johnson Santé Beauté France, France.* Confocal Raman Microspectroscopy was used to compute the concentration profiles of topically applied caffeine through the skin. Parameters relating to the skin barrier function were calculated from the caffeine concentration profiles.

JM3A.43
Assessment of Breast Cancer Induced Bone Quality Changes Using Raman Spectroscopy, Xiaohong Bi[1], Julie Sterling[2], Daniel Perrien[3], Alyssa Merkel[2], Jeffry Nyman[3], Barbara Rowland[2], Anita Mahadevan-Jansen[1]; *[1]BIOMEDical Engineering, Vanderbilt Univ., USA; [2]Clinical Pharmacology, Vanderbilt Univ., USA; [3]Orthopaedics and Rehab, Vanderbilt Univ., USA.* Cancer bone metastases result in bone degradation and pathologic fracture. This study investigated compositional alterations in metastatic bones from a mouse model of breast cancer and showed significant cancer induced difference in bone quality.

JM3A.44
Evaluation of Skin Vascular Malformations' Laser Treatment by RGB and Multi-spectral Imaging, Dainis Jakovels[1], Ilona Kuzmina[1], Anna Berzina[2], Janis Spigulis[1]; *[1]Inst. of Atomic Physics and Spectroscopy, Biophotonics Laboratory, Univ. of Latvia, Latvia; [2]The Clinic of Laser Plastics, Latvia.* RGB imaging system for mapping and monitoring of hemoglobin changes in skin has been tested for evaluation of vascular malformations' laser treatment. The multi-spectral imaging system was used as the reference.

JM3A.45
Chemotherapeutic Effects on Breast Malignant Cells Evaluated by Native Fluorescence Spectroscopy, Yang Pu[1], Guichen Tang[1], Wubao Wang[1], H. E. Savage[2], S. P. Schantz[2], Robert R. Alfano[1]; *[1]Physics, Inst. for Ultrafast Spectroscopy and Lasers, City College of City Univ of New York, USA; [2]Division of Head and Neck Surgery, Manhattan Eye, Ear & Throat Hospital, USA.* The decreasing relative content of tryptophan, NADH and flavin of the retinoic acid-treated breast cancerous cells were demonstrated using native fluorescence spectra. The changes may be used to evaluate the chemotherapeutic effects on cancer.

JM3A.46
Normative database of judgment of complexity task with functional near infrared spectroscopy - Application for TBI, Franck Amyot[1], Trelawny Zimmermann[2], Jason D. Riley[1], Jana M. Kainerstorfer[1], Victor Chernomordik[1], Laleh Najafizadeh[1], Eric Wassermann[2], Amir Gandjbakhche[1]; *[1]SFAB, NICHD / NIH, USA; [2]BNU, NINDS / NIH, USA.* We construct a normative database for a simple cognitive test which can be useful in evaluating cognitive disability such as mild traumatic brain injury. Our results with fNIRS show activation from the medial frontopolar cortex

JM3A.47
In Vivo Measurement of Carcinogenesis-Associated Shape Alterations of the Refractive Index Correlation Function, Andrew J. Gomes[1], Sarah Ruderman[1], Mart DelaCruz[2], Ramesh Wali[2], Hemant K. Roy[2], Vadim Backman[1]; *[1]BIOMEDical Engineering, Northwestern Unviersity, USA; [2]Internal Medicine, Northshore Univ. Health System, USA.* We employed polarization-gating spectroscopy in the azoxymethane-treated rat model of colon carcinogenesis and found differences in the shape of the refractive index correlation function that correlated with risk of neoplasia. This marker has potential in predicting tumor development.

JM3A.48
Frontal Activation Assessment Using Near-Infrared Spectroscopy and Electroencephalography, Jing Dong[1], Chidambaram Yegappan[1], Renzhe Bi[1], Kijoon Lee[1]; *[1]SCBE/BIE, Nanyang Technological Univ., Singapore.* Here, we focus on assessing frontal activation of normal subjects in response to verbal fluency test. A multimodal instrument, combining NIRS and EEG, was used. The results lead to a better understanding of brain functionality.

JM3A—Joint BIOMED/DH Poster Session - Continue

JM3A.49
Efficient simulation of intensity profile of light through subpixel-matched lenticular lens array for auto-stereoscopic liquid crystal display, Yia-Chung Chang[1], Li-Chuan Tang[1], Chun-Yi Yin[1]; [1]*The Research Center for Applied Sciences, Academia Sinica, Taiwan.* We present numerical simulation of the accumulating intensity profile of a lenticular lens array on a liquid crystal display. This efficient method allows one to adjust the parameters and crosstalks of a subpixel-matched autostereoscopic display.

JM3A.50
Portable and low-cost digital holographic microscopy using web camera, point light source LED and open-source libraries,
Tomoyoshi Shimobaba[1], Yusuke Taniguchi[1], Atsushi Shiraki[2], Nobuyuki Masuda[1], Tomoyoshi Ito[1]; [1]*Graduate school of Engineering, Chiba Univ., Japan;* [2]*Department of Information and Computer Engineering, Kisarazu National College of Technology, Japan.* We report a portable and low-cost digital holographic microscopy (DHM). By adopting the Gabor hologram and using a web camera, point light source LED and open-source libraries, development costs were decreased

JM3A.51
Numerical investigation of holographic wavefront retrieval using Laplacian reconstruction, Tomoyoshi Shimobaba[1], Nobuyuki Masuda[1], Tomoyoshi Ito[1]; [1]*Graduate school of Engineering, Chiba Univ., Japan.* We numerically investigated holographic wavefront retrieval using Laplacian reconstruction. We used Laplacian reconstruction as a wavefront retrieval technique in which the equation of Laplacian reconstruction was regarded as a Poisson equation.

JM3A.52
3D image enlargement without distortion based on the optical reversibility theorem, Jia Jia[1], Yongtian Wang[1], Juan Liu[1], Xin Li[1], Jinghui Xie[1]; [1]*School of Optoelectronics, Beijing Inst. of Technology, China.* We propose a method to enlarge the 3D image in holographic display using a lens based on the optical reversibility theorem. The 3D image is magnified without any distortion, and the image distance is shortened.

JM3A.53
Design of Virtual Image for 360-degree Viewable Image-plane Disk-type Multiplex Holography, Yih-Shyang Cheng[1], Chih-Hung Chen[1], Zheng-Feng Chen[1]; [1]*NCU, Taiwan.* In this paper, the fabrication method and the parameter design of multiplex holograms for virtual image display in walk-around viewable disk-type holography is introduced.

JM3A.54
GPU based acceleration of incoherent Fourier hologram capture using integral imaging, Kyeong-Min Jeong[1], Hee-Seung Kim[1], Sung-In Hong[1], Hyun-Eui Kim[1], Jae-Hyeung Park[1]; [1]*Chungbuk National Univesity, Republic of Korea.* GPU based acceleration of incoherent Fourier hologram capture technique using integral imaging is reported. It is demonstrated that parallel processing using GPU reduces processing time for hologram generation and numerical reconstruction.

JM3A.55
Superposition Procedure for Improvement of Digital Holographic Particle Field Reconstruction, Abhishek Nigam[1]; [1]*Mechanical Enginnering, IIT kanpur, India.* The present study proposes a superposition procedure during the holographic reconstruction of 3 -D particle field. Both simulated and experimental holograms have been used to demonstrate the improvement in the performance of proposed algorithm.

JM3A.56
Generation of Fresnel Complex Holograms with Packed Ray-Tracing Software, Wang-Yu Hsieh[1], Jung-Ping Liu[1], Shih-Hsin Ma[1]; [1]*Department of Photonics, Feng Chia Univ., Taiwan.* We use packaged ray-tracing software to generate complex Fresnel holograms. The principle is that the wavefront can be decomposed to Gaussian beams, and the propagation of a Gaussian beam can be calulated by ray tracing.

JM3A.57
A Practical Holographic Encryption/ Decryption Technique, Shaohua Tao[1]; [1]*School of Physics and Electronics, Central South Univ., China.* A digital holographic decryption technique is proposed to decode holograms that are printed as gray-scale images. The technique has high security and can be conveniently applied for protecting confidential information.

JM3A.58
Dynamic holographic images using photorefractive composites, Kenji Kinashi[1], Yu Wang[1], Sho Tsujimura[1], Wataru Sakai[1], Naoto Tsutsumi[1]; [1]*Department of Macromolecular Science and Engineering, Kyoto Inst. of Technology, Japan.* We have studied the effect of Mw of PVCz on dynamic holographic imaging. The appropriate performance for dynamic holographic imaging was obtained by the photorefractive polymeric composite film with Mw:23,000 PVCz.

JM3A.59
A New Hologram Generating Algorithm for Improved Control of Diffraction Spot Intensities, Martin Persson[1], David Engström[1], Mattias Goksör[1]; [1]*Physics, Univ. of Gothenburg, Sweden.* We demonstrate a novel method for generating phase holograms, which compensates for interaction between adjacent pixels in liquid crystal based spatial light modulators. A method for characterizing SLMs in this aspect is also provided.

JM3A.60
Three-dimensional blood vessel imaging using integral imaging, Sung-In Hong[1], Hee-Seung Kim[1], Kyeong-Min Jeong[1], Jae-Hyeung Park[1]; [1]*Chungbuk National Univesity, Republic of Korea.* Three-dimensional imaging of blood vessel using integral imaging technique is proposed. With a near infrared illumination, a finger is imaged through a lens array and three-dimensional structure of the blood vessel in the finger is visualized.

JM3A—Joint BIOMED/DH Poster Session - Continue

JM3A.61
Biological imaging by Digital Holographic Adaptive Optics, Changgeng Liu[1], Myung K. Kim[1]; [1]*Phyiscs, Univ. of South Florida, USA.* The basic principles of DHAO have been presented and demonstrated in a recent paper [Opt. Lett. 36, 2710-2712(2011)]. In this paper, the application of DHAO in biological imaging is investigated.

JM3A.62
Geometrical Characterization of Micro-fiber in 3D Volume using Digital In-line Holography, Dhananjay K. Singh[1]; [1]*Mechanical Engineering, I. I. T. Kanpur, India.* The present study proposes a method to determine orientation, length and location of micro fiber in 3D volume using digital in-line holography. The proposed algorithm is validated using experimental hologram of micro fiber inside object volume.

JM3A.63
Analysis of 2D Digital Holography using Synthesized Holograms, Isao Matsubara[1], Chung-Chieh Yu[1], William J. Dallas[2,3]; [1]*Optics Research Laboratory, Research & Development Center, Canon U.S.A., Inc., USA;* [2]*College of Optical Sciences, Univ. of Arizona, USA;* [3]*Department of Radiology, College of Medicine, Univ. of Arizona, USA.* An algorithm to generate synthesized holograms is described, and the results are validated by comparing them with an experiment. The system's axial resolution is analyzed using the algorithm as an example of the algorithm's capabilities.

JM3A.64
A Flicker-Reduced Full-Resolution Autostereoscopic Liquid Crystal Display with Multi-Viewpoints using a Multi-Directional Backlight Unit, Hyunkyung Kwon[1], Minyoung Park[1], Hee-Jin Choi[1]; [1]*Department of Physics, Sejong Univ., Republic of Korea.* The loss of resolution is one of the most important issues of autostereoscopic displays. In this paper, a method to realize an autostereoscopic LCD with full-resolution and reduced flicker using a multi-directional backlight unit is proposed.

JM3A.65
Distributed Scan SDOCT Improves Post Refractive Surgery Corneal Biometry, Ryan P. McNabb[1], Francesco LaRocca[1], Sina Farsiu[2, 1], Anthony Kuo[2], Joseph Izatt[1, 2] ;[1]*Biomedical Engineering, Duke University, USA;* [2]*Ophthalmology, Duke University Eye Center, USA.* We report on a preliminary study comparing corneal refractive power acquired using distributed scanning OCT (DSOCT) to corneal topography and Scheimpflug photography in normal subjects both before and after refractive surgery.

JM3A.66
Holographic image acquisition and rendering for laser Doppler angiography, Michael Atlan[1], Benjamin Samson[1], Nicolas Verrier[1], Max Lesaffre[1]; [1]*CNRS, France.* A brief review of acquisition and rendering methods of optically-acquired holograms in frequency-shifting and off-axis conditions is presented. Applications to laser Doppler imaging in angiography are reported, as well as our latest technical developments in image reconstruction.

JM3A.67
Intensity Based Holographic Reconstruction of Symmetric and Asymmetric Object Field, Satya P. Gupta[1,2], Abhishek Nigam[1], Dhananjay K. Singh[1], Pradeepta K. Panigrahi[1,3]; [1]*Mechanical Engineering, Indian Inst. of Technology, India;* [2]*Materials Science Programme, Indian Inst. of Technology, India;* [3]*Center for Laser Technology, Indian Inst. of Technology, India.* The paper reports the performance of intensity based holographic reconstruction approach for characterization of symmetric and asymmetric objects. Silver particles inside cavity represent symmetric object field. Fiber and crystals inside volume represent asymmetric object field.

JM3A.68
Spectrally constrained functional diffuse optical tomography of the adult brain, Yuxuan Zhan[1], Adam T. Eggebrecht[2], Joseph P. Culver[2], Hamid Dehghani[1]; [1]*School of Computer Science, The Univ. of Birmingham, The Univ. of Birmingham, UK;* [2]*Department of Radiology, Washington Univ. School of Medicine, Washington Univ. School of Medicine, USA.* We present a spectrally constrained DOT image reconstruction scheme which demonstrates better imaging artifacts suppression due to poor signal to noise ratio as compared with the standard scheme.

JM3A.69
Diffuse Optical Tomography Imaging of the Hemodynamic Response to a Breath Hold for Use in Breast Cancer Detection, Molly Flexman[1], Jacqueline E. Gunther[1], Hyun K. Kim[1], Emerson Lim[2], Elise Desperito[3], Randall L. Barbour[4], Dawn Hershman[2], Andreas H. Hielscher[1,3]; [1]*BIOMEDical Engineering, Columbia Univ., USA;* [2]*Department of Oncology & Internal Medicine, Columbia Univ., USA;* [3]*Department of Radiology, Columbia Univ., USA;* [4]*Department of Pathology, State Univ. of New York - Downstate Medical Center, USA.* We discuss here a recent study using diffuse optical tomography to make simultaneous dual-breast measurements in 21 subjects during a breath hold. An exponential fit to the transient response differentiates between tumor-bearing and healthy breasts.

JM3A.70
Monitoring Tumor Response to Neoadjuvant Chemotherapy using Ultrasound-guided Near Infrared Light, Quing Zhu[1]; [1]*ECE, Univ. of Connecticut, USA.* In this paper, we show that initial tumor vascularity is a good predictor of final pathologic response. Additionally, the vascular changes during early treatment cycles assessed by %total hemoglobin can further predict final pathologic response.

JM3A.71
Multi-Color in vivo fluorescence lifetime tomography, Leilei Peng[1], Weibin Zhou[2], Ming Zhao[1]; [1]*College of Optical Sciences, Univ. of Arizona, USA;* [2]*Department of Pediatrics and Communicable Diseases, Univ. of Michigan Medical School, USA.* We present an in vivo multi-color fluorescence lifetime imaging method based on scanning laser optical tomography and Fourier fluorescence lifetime excitation-emission matrix spectroscopy. The system was tested with live transgenic zebrafish embryo.

JM3A.72
Processing of Dynamic Phase Images of Moving Organisms, Katherine Creath[1,2], Goldie Goldstein[1,2]; [1]*4D Technology Corp, USA;* [2]*College of Optical Sciences, The Univ. of Arizona, USA.* Recent work utilizing an interference microscope system imaging live biological samples to create phase image movies tracking dynamic motions and volumetric changes is presented. Measurement examples highlight background leveling and unwrapping phase in time.

Symphony I & II	Symphony III	Symphony IV
BIOMED I	BIOMED 2	DH

15:30 - 17:30
BM4A • Brain Signals 2
Randall Barbour, SUNY Downstate Medical Center, USA, Presider

BM4A.1 • 15:30
Multimodality fNIRS-EEG, fMRI-EEG and TMS Clinical Study on Cortical Response During Motor Task in Adult Volunteers and Epileptic Patients with Movement Disorders, Lorenzo Spinelli[1], Alessandro Torricelli[2], Davide Contini[2], Matteo Caffini[2], Lucia Zucchelli[2], Rinaldo Cubeddu[2], Erika Molteni[3], Anna Maria Bianchi[3], Giuseppe Baselli[3], Sergio Cerutti[3], Elisa Visani[4], Isabella Gilioli[4], Davide Rossi Sebastiano[4], Elena Schiaffi[4], Ferruccio Panzica[4], Silvana Franceschetti[4]; *[1]Istituto di Fotonica e Nanotecnologie, CNR, Italy; [2]Physics, Politecnico di Milano, Italy; [3]Bioengineering, Politecnico di Milano, Italy; [4]Unità Operativa Neurofisiopatologia ed Epilettologia diagnostica, Centro per l'Epilessia, Fondazione IRCCS Istituto Neurologico Carlo Besta, Italy.* A multimodality fNIRS-EEG, fMRI-EEG and TMS clinical study was performed on adult volunteers and epileptic patients with movement disorders to assess cortical response during motor tasks

BM4A.2 • 15:45
Biophysical Model Estimation from Multispectral Intrinsic Optical Imaging in a Rat Model of Epilepsy, Philippe Pouliot[1,2], Tri Truong Van[1,3], Cong Zhang[1], Simon Dubeau[1], Dang Khoa Nguyen[3], Frédéric Lesage[1,2]; *[1]Electrical Engineering and BIOMEDical Imaging, Ecole Polytechnique Montreal, Canada; [2]Research Center, Montreal Heart Inst., Canada; [3]Service de Neurologie, Hôpital Notre-Dame du CHUM, Canada.* The hemodynamic responses to 4-AP induced focal epileptic spikes and electrical stimulations are compared in a rat model. Nonlinearities are quantified with biophysical models. Supranormal oxygen consumption from epileptic spikes is inferred.

BM4A.3 • 16:00
Imaging of Motor Activity in Freely Moving Subjects Using a Wearable NIRS Imaging System, Arne Krüger[1], Stefan P. Koch[1], Jan Mehnert[1], Christina Habermehl[1], Sophie Piper[1], Jens Steinbrink[1], Hellmuth Obrig[2,3], Christoph H. Schmitz[1,4]; *[1]Neurology, Charité Univ. Medicine Berlin, Germany; [2]Max Planck Inst. for Human Cognitive and Brain Sciences, Germany; [3]Clinic for Cognitive Neurology, Univ. Hospital Leipzig, Germany; [4]NIRx Medizintechnik Gmbh, Germany.* We present a miniaturized multichannel NIRS imaging system for functional brain imaging in unrestrained settings suitable for any aspect of the head. Performance is demonstrated in a motor execution paradigm performed during bicycle riding.

15:30 - 17:30
BM4B • Microscopy Imaging: Novel Techniques and Applications
Peter So; MIT, USA, Presider

BM4B.1 • 15:30 **Invited**
ePetri: Self-imaging Petri Dish Platform for Autonomous Cell Culture Tracking, Changhuei Yang[1]; *[1]Electrical Engineering, California Inst. of Technology, USA.* Here we show that autonomous self-imaging bright-field and fluorescence ePetri systems can be constructed compactly and cheaply with low cost commercially available CMOS chips.

BM4B.2 • 16:00
Imaging sub-cellular structures using three-dimensional sparse deconvolution SLIM, Mustafa Mir[1,2], S. Derin Babacan[2], Michael Bednarz[3], Minh N. Do[1,2], Ido Golding[3,4], Gabriel Popescu[1,2]; *[1]Electrical Engineering, Univ. of Illinois at Urbana Champaign, USA; [2]Beckman Inst. for Advanced Science and Technology, USA; [3]Department of Physics, Center for the Physics of Living Cells, Univ. of Illinois at Urbana-Champaign, USA; [4]Venna and Marrs McLean Department of Biochemistry and Molecular Biology, Baylor College of Medicine, USA.* We demonstrate a 2.5x resolution enhancement of three-dimensional quantitative phase maps using a novel sparse deconvolution method. This method was used to visualize and characterize two previously invisible coil-like structures in E. coli cells.

15:30 - 17:30
DM4C • Digital Holographic Optical Processing
John Sheridan; Univ. College Dublin, Ireland, Presider

DM4C.1 • 15:30 **Invited**
Optical Information Processing by Polarization-Holographic Elements, Barbara Kilosanidze[1], George Kakauridze[1]; *[1]Laboratory of Holographic Recording and Processing of Information, Inst. of Cybernetics of the Georgian Technical Univ., Georgia.* A new polarimetric method of real-time complete analysis of the polarization state of light based on the integral polarization-holographic element is considered. The advantages and applications of this method in optical information processing are discussed.

DM4C.2 • 16:00
Multi-Plane Image Reconstruction Using Cascaded Phase Elements, A. Alkan Gulses[1], B. Keith Jenkins[1]; *[1]Electrical Engineering, Univ. of Southern California, USA.* Cascaded phase only holograms, designed by a deterministic iterative algorithm, are used for multi-plane image formation. Numerical results are presented. This technique could be applicable to a static micro-holographic 3D display.

Symphony I & II	Symphony III	Symphony IV
BIOMED I	BIOMED 2	DH

BM4A • Brain Signals 2—Continue

BM4A.4 • 16:15
Evoked Hemodynamic Responses to Auditory Stimulation Following Sleep Deprivation in Humans, Jennifer L. Schei[1,2], Joseph E. Cahall[3,4], Gregory Belenky[4], David M. Rector[3]; *[1]P-21 Applied Modern Physics, Los Alamos National Laboratory, USA; [2]Physics and Astronomy, Washington State Univ., USA; [3]Department of Veterinary, Comparative Anatomy, Pharmacology, and Physiology, Washington State Univ., USA; [4]Sleep and Performance Research Center, Washington State Univ., USA.* Evoked hemodynamic responses measured following sleep deprivation were larger compared baseline and recovery sleep nights. Attention differences during sleep deprivation showed larger responses in alert individuals than sleepy individuals, suggesting differences in vascular compliance.

BM4A.5 • 16:30
Phase relationship between the low-frequency oscillatory components of cerebral [HbO] and [Hb] assessed by NIRS during sleep in human subjects, Michele L. Pierro[1], Angelo Sassaroli[1], Sergio Fantini[1], Peter Bergethon[2]; *[1]BME, Tufts Univ., USA; [2]Boston Univ. School of Department of Anatomy & Neurobiology, Boston Univ. School of Medicine, USA.* We measured the phase of low-frequency oscillations (LFOs) of [Hb] and [HbO] in the human brain during sleep. We found that, on average, the phase lead of [Hb] vs [HbO] LFOs is greater during slow-wave sleep than during REM sleep.

BM4A.6 • 16:45
Noninvasive Optical Detection of Spontaneous Low Frequency Oscillations in Cerebral Blood Flow, Ran Cheng[1], Guoqiang Yu[1], Yu Shang[1]; *[1]Center for BIOMEDical Engineering, Univ. of Kentucky, USA.* A diffuse correlation spectroscopy was used to quantify low frequency oscillations in cerebral blood flow of healthy volunteers at rest, during head-up-titling (HUT) and during enforced breathing. The HUT is found to be a robust and stable protocol.

BM4A.7 • 17:00
Optical intrinsic signal imaging of functional connectivity in the mouse brain, Adam Q. Bauer[1], Brian R. White[1], Abraham Z. Snyder[1,2], Jin-Moo Lee[2], Bradley L. Schlaggar[1,2], Joseph P. Culver[1,3]; *[1]Radiology, Washington Univ. in Saint Louis, USA; [2]Neurology, Washington Univ. in Saint Louis, USA; [3]BIOMEDical Engineering, Washington Univ. in Saint Louis, USA.* We develop functional connectivity optical intrinsic signal imaging (fcOIS) for mice, with validation in acollosal mice. FcOIS provides mouse researchers with a method analogous to the new standards in resting state functional human neuroimaging.

BM4B • Microscopy Imaging: Novel Techniques and Applications—Continue

BM4B.3 • 16:15
3D Super-resolution Imaging of Microtubules with a Double Helix Point Spread Function Microscope, Ginni Grover[1], Keith DeLuca[2], Sean Quirin[1], Jennifer DeLuca[2], Rafael Piestun[1]; *[1]Department of Electrical Computer and Energy Engineering, Univ. of Colorado, Boulder, USA; [2]Department of Biochemistry and Molecular Biology, Colorado State Univ., USA.* Double Helix PSF Imaging of PtK1 cells reveals 3D intracellular structure beyond the diffraction limit. The 3D super-resolution microscope is built around a photon-efficient PSF design and phase mask matched to an optimal estimation algorithm.

BM4B.4 • 16:30
3D microfluidic microscopy using a tilted channel, Nicolas C. Pégard[1], Jason Fleischer[1]; *[1]Princeton Univ., USA.* We present a 3D microfluidic microscope. Using a microfluidic channel that is tilted along the optical axis of the objective, we record and deconvolve a focal stack as the sample passes across the focal plane.

BM4B.5 • 16:45
Spectral-domain Differential Interference Contrast (SD-DIC) Microscopy for Measuring Live Cell Dynamics, Yizheng Zhu[1], Michelle R. Lyons[2], Anne E. West[2], Lisa L. Satterwhite[1], Adam Wax[1]; *[1]BIOMEDical Engineering, Duke Univ., USA; [2]Neurobiology, Duke Univ., USA.* We present spectral-domain DIC microscopy, a novel technique for high-resolution, quantitative measurement of optical pathlength gradients. Imaging and dynamic monitoring of live neurons and cardiomyocytes were demonstrated.

BM4B.6 • 17:00
Targeted Alteration of Real and Imaginary Refractive Index of Biological Cells by Histological Staining, Lusik Cherkezyan[1], Hariharan Subramanian[1], Seungmoo Yang[1], Dhwanil Damania[1], Vadim Backman[1]; *[1]Northwestern Univ., USA.* Histological staining changes the intracellular refractive index due to the Kramers-Kronig relation. We present a method for creating 2-D maps of real and imaginary refractive index of stained biological cells using their thickness and absorptance.

DM4C • Digital Holographic Optical Processing—Continue

DM4C.3 • 16:15
Comparison of different digital holographic setup configurations, Daniel Claus[1], Daciana Iliescu[2], John Watson[3], John Rodenburg[1]; *[1]Univ. of Sheffield, UK; [2]Univ. of Warwick, UK; [3]Univ. of Aberdeen, UK.* This paper presents a comparison of the most commonly applied digital holographic setups, namely Fourier hologram, Fresnel hologram and Image-plane hologram.

DM4C.4 • 16:30
Speckle noise reduction for digital holography using longitudinal shifting, Chung-Chieh Yu[1], Isao Matsubara[1], William J. Dallas[2,3]; *[1]Optics Research Laboratory, Research & Development Center, Canon U.S.A., Inc., USA; [2]College of Optical Sciences, Univ. of Arizona, USA; [3]Department of Radiology, College of Medicine, Univ. of Arizona, USA.* A method of reducing speckle noise for digital holography is developed by shifting the sample longitudinally. The averaging of phase images is achieved using numerical focusing. Significant noise reduction is observed experimentally.

DM4C.5 • 16:45
Weak-Object Image Reconstructions with Single-Shot Digital Holography, Abbie E. Tippie[1], James R. Fienup[1]; *[1]Inst. of Optics, Univ. of Rochester, USA.* Weak object signals with less than one photoelectron per detector pixel can be recovered using off-axis digital holography. We show image reconstructions in simulation with a single exposure.

DM4C.6 • 17:00
Tomographic Compressive Holography, Georges Nehmetallah[1], Logan Williams[1]; *[1]ECE, Univ. of Dayton, USA.* Compressive holography with multiple projection tomography are applied to solve the inverse ill-posed problem of 3D reconstruction of phase as well as amplitude objects with high axial accuracy. Brief theory and experimental results are shown.

Symphony I & II	Symphony III	Symphony IV
BIOMED I	BIOMED 2	DH

BM4A • Brain Signals 2—Continue

BM4A.8 • 17:15
Neurovascular Coupling Varies with Level of Global Cerebral Ischemia in a Rat Model, Wesley B. Baker[1], Teruyuki Hiraki[2], Zhenghui Sun[2], Mary Putt[3], Martin Reivich[2], Arjun G. Yodh[1], Joel H. Greenberg[2]; *[1]Physics and Astronomy, Univ. of Pennsylvania, USA; [2]Neurology, Univ. of Pennsylvania, USA; [3]Biostatistics, Univ. of Pennsylvania, USA.* We employed optical imaging to study the acute effects of global cerebral ischemia on cerebral blood flow and metabolic functional responses to forepaw stimulation in rats. We compared these responses to the underlying neuronal activity.

BM4B • Microscopy Imaging: Novel Techniques and Applications—Continue

BM4B.7 • 17:15
Phase contrast spectroscopy using spatial light modulator, Hoa Pham[1], Gabriel Popescu[1]; *[1]ECE, Univ. of Illinois at Urbana-Champaign, USA.* We developed a phase contrast spectroscopy (PCS) using spatial light modulator (SLM) capable of measuring at multiple wavelengths. We demonstrate the capability of the setup by dispersion measurements of microsphere beads and red blood cells.

DM4C • Digital Holographic Optical Processing—Continue

DM4C.7 • 17:15
Scanning Holography with Simultaneous Optical Filtering, Chieh-Cheng Lee[1], Ting-Chung Poon[2,1], Dao-Zheng Luo[1], Jung-Ping Liu[1]; *[1]Department of Photonics, Feng Chia Univ., Taiwan; [2]Bradley Department of Electrical and Computer Engineering, Virginia Tech., USA.* We proposed to acquire optically filtered digital holograms by using the optical scanning holography. Experimental demonstrations of the low-pass and the high-pass filtering were provided.

CONFERENCE RECEPTION
18:30—20:00, *Concerto Ballroom and Overture Foyer*

Symphony I & II

BIOMED

08:00 - 09:30
BTu1A • BIOMED Plenary II
Claude Boccara; Institut Langevin , France, Presider

BTu1A.1 • 08:00 **Plenary**
Diffuse Optical Spectroscopy: Technology Development and Clinical Translation
Bruce J. Tromberg[1]; [1]*Univ. of California Irvine, USA.* This talk describes the development of Diffuse Optical Spectroscopy (DOS) using spatially- and temporally-modulated sources and model-based analyses. DOS methods are capable of dynamic in vivo functional imaging with variable, but limited, spatial localization. Multiple optical contrast elements such as absorption, scattering, fluorescence, and speckle are detectable at relatively low cost. Quantitation of these signals can be achieved using methods for controlling optical path length in conjunction with computational models and visualization techniques.

BTu1A.2 • 08:45 **Plenary**
Bioimaging at the Nanoscale: Single-moleculre and Super-resolution Flourescence Microscopy, Xiaowei Zhuang[1]; [1] *Howard Hughes Medical Inst., USA.* Optical microscopy is an essential tool in biological research. However, the spatial resolution of optical microscopy, classically limited by diffraction to several hundred nanometers, is substantially larger than typical molecular length scales in cells, leaving many biological structures unresolvable. We recently developed a new form of super-resolution light microscopy, stochastic optical reconstruction microscopy (STORM), that surpasses the diffraction limit. STORM uses single-molecule imaging and photoswitchable fluorescent probes to temporally separate the spatially overlapping images of individual molecules. This approach allows the localization of fluorescent probes with nanometer precision and the construction of sub-diffraction-limit images. Using this method, we have achieved multicolor and three-dimensional (3D) imaging of living cells with nanometer-scale resolution. In this talk, I will discuss the general concept, recent technical advances and biological applications of STORM.

Symphony IV

DH

08:00 - 09:30
DTu1C • Digital Holographic Microscopy II
Gabriel Popescu; Univ of Illinois at Urbana-Champaign USA, Presider

DTu1C.1 • 08:00 **Tutorial**
Title Not Available, George Barbastathis, *MIT, USA.*. Abstract not available.

DTu1C.2 • 08:45
Phase Retrieval using Nonlinear Diversity, Chien-Hung Lu[1], Christopher Barsi[1,2], Jason Fleischer[1]; [1]*Electrical Engineering, Princeton Univ., USA;* [2]*Media Laboratory, Massachusetts Inst. of Technology, USA.* We extend the Gerchberg-Saxton algorithm to a nonlinear optical system. We experimentally demonstrate the technique by reconstructing an input phase distribution from two output intensity measurements taken at different values of the nonlinearity.

DTu1C.3 • 09:00
High Dynamic Range Holographic Microscopy, William J. Dallas[1], Isao Matsubara[2], Chung-Chieh Yu[2]; [1]*Optical Sciences, Univ. of Arizona, USA;* [2]*Optics Research Laboratory, Canon U.S.A., Inc., USA.* A spatial-filtering method for demodulating interlace-sampled off-axis digital holograms is applied to holograms made in monochromatic illumination using a color sensor. The end results are high dynamic-range images. Includes experimental results.

DTu1C.4 • 09:15
Multi-wavelength digital in-line holographic microscopy, Jorge Garcia-Sucerquia[1], Daniel Velasquez[2]; [1]*Physics, Universidad Nacional de Colombia Sede Medellin, Colombia;* [2]*Basic sciences, Universidad EAFIT, Colombia.* We present multi-wavelength digital in-line holographic microscopy (DIHM): the simplest approach to color holographic microscopy. As the technique is applied to study a biological sample it surpasses the performance of monochrome DIHM.

Symphony I & II	Symphony III	Symphony IV
BIOMED I	BIOMED 2	DH

COFFEE BREAK
9:30—10:00, *Concerto Ballroom*

10:00 - 12:00
BTu2A • Imaging of Vascular Dynamics
Huabei Jiang; Univ. of Florida, USA, Presider

10:00 - 12:00
BTu2B • Optical Coherence Tomography in Ophthalmology
James Fujimoto; Massachusetts Inst. of Technology, USA; Christoph Hitzenberger; Medical Univ. of Vienna , Austria, Presiders

10:00 - 12:00
DTu2C • Novel Applications of Digital Holography I
Pascal Picart; LAUM CNRS, France, Presider

BTu2A.1 • 10:00
Simulation and Experimental Studies of Transrectal Diffuse Optical Tomography for Monitoring Laser Interstitial Thermal Therapy of Localized Prostate Cancer, Jie He[1,2], Robert Weersink[2], Israël Veilleux[2], Sean Davidson[2], John Trachtenberg[1,2], Brian C. Wilson[1,2]; *[1]Univ. of Toronto, Canada; [2]Ontario Cancer Inst., Canada.* We validate the sensitivity of changes in the diffuse reflectance optical signal to localize the photocoagulation boundary within ±1 mm in transrectal monitoring of interstitial NIR laser treatment of focal prostate cancer.

BTu2B.1 • 10:00 **Invited**
Intraoperative OCT for Vitreoretinal Surgery, Joseph Izatt[1]; *[1]Duke Univ., USA.* We report on the design and initial clinical trials of a surgical microscope-integrated OCT system for image-guided vitreoretinal microsurgery, including real-time OCT imaging and surgical instrument tracking.

DTu2C.1 • 10:00 **Tutorial**
Digital Holographic Interferometry - Principles and Applications to Deformation Measurement, Partha Banerjee[1]; *[1]Univ. of Dayton, USA.* Starting from basic principles of holography and digital holography, we discuss its application to digital holographic interferometry for 3D object deformation. Dual wavelength holography, digital holographic microscopy and single beam holographic tomography are also discussed.

BTu2A.2 • 10:15
Small Animal Tomographic In Vivo Flow Cytometry with Diffuse Fluorescence Light, Eric Zettergren[1], Judith Runnels[2], Charles P. Lin[2], Mark Niedre[1]; *[1]Electrical and Computer Engineering, Northeastern Univ., USA; [2]Wellman Center for Photomedicine, Harvard Medical School and Massachusetts General Hospital, USA.* We have developed a new approach for fluorescence sensing, enumeration and tomographic localization of rare circulating cells with diffuse light. We validate our instrument using multiple-myeloma cells in optical phantoms and in mice in vivo.

BTu2A.3 • 10:30
Pharmacokinetic Analysis for Tumor Characterization Using MR-Guided Dynamic Contrast Enhanced Diffuse Optical Tomography, Mitchell Hsing[1], Yuting Lin[1], Gultekin Gulsen[1]; *[1]Univ. of California, Irvine, USA.* Pharmacokinetic analyses for tumor characterization performed using perfectly co registered DCE-DOT and DCE-MR parameters to produce the first ever quantitative MR-DCE-DOT kinetic parameters used for tumor characterization are derived in this study.

BTu2B.2 • 10:30
Extended Coherence Range Megahertz FDML Laser for Imaging the Human Anterior Segment, Wolfgang Wieser[1], Thomas Klein[1], Desmond C. Adler[2], Francois Trépanier[3], Christoph Eigenwillig[1], Sebastian Karpf[1], Joseph M. Schmitt[2], Robert A. Huber[1]; *[1]BMO, Univ. of Munich (LMU), Germany; [2]LightLab Imaging, St. Jude Medical, USA; [3]TeraXion Inc, Canada.* We present a 1300nm FDML laser for OCT application with greatly improved coherence length operating at a scan rate of 1.6 MHz and demonstrate OCT imaging of the anterior segment of the human eye.

BTu2A.4 • 10:45
Measurement of Vascular Response within the Foot Using Dynamic Diffuse Optical Tomography, Michael Khalil[1], Hyun K. Kim[1], Molly Flexman[1], In-Kyong Kim[3], Rajeev Dayal[3], Andreas H. Hielscher[1,2]; *[1]BIOMEDical Engineering, Columbia Univ., USA; [2]Radiology, Columbia Univ., USA; [3]Vascular Surgery, New York-Presbyterian Columbia Univ. Medical Center, USA.* We present case studies using dynamic diffuse optical tomographic imaging to view the vascular perfusion of patients with Peripheral Arterial Disease with and without calcifications as well as a healthy control group.

BTu2B.3 • 10:45
Simultaneous Swept Source Optical Coherence Tomography of the Anterior Segment and Retina, Al-Hafeez Dhalla[1], Derek Nankivil[1], Theresa Bustamante[1], Anthony Kuo[2], Joseph Izatt[1,2]; *[1]BIOMEDical Engineering, Duke Univ., USA; [2]Ophthlamology, Duke Univ. Medical Center, USA.* We report on the implementation of swept source optical coherence tomography for simultaneous imaging of the anterior segment and retina. The system achieves depth-encoding by coherence revival heterodyning and a polarization-encoded sample arm.

DTu2C.2 • 10:45
Measuring Vapour Cloud Concentrations with Digital Holography, Sam Dehaeck[1], Pierre Colinet[1]; *[1]TIPs, Universite Libre de Bruxelles, Belgium.* In a Mach-Zehnder interferometer, the vapour cloud surrounding an evaporating droplet is imaged with digital holography. Using an Abel inversion, quantitative local evaporation rates can be measured precisely for the first time.

Symphony I & II	Symphony III	Symphony IV
BIOMED I	BIOMED 2	DH

BTu2A • Imaging of Vascular Dynamics—Continue

BTu2A.5 • 11:00
DCS Measurement Can Be Gated Via Monitoring Muscle Movement to Derive Accurate Blood Flow in Exercising Muscle, Guoqiang Yu[1], Katelyn Gurley[1], Yu Shang[1]; *[1]Univerisity of Kentucky, USA.* We demonstrate that the diffuse correlation spectroscopy (DCS) measurement can be gated via monitoring muscle movement by a dynamometer to continuously derive accurate blood flow information in exercising skeletal muscle.

BTu2A.6 • 11:15
A Geometric-Differential-Sensitivity Based Reconstruction Algorithm Improves Target-Depth Localization for Trans-Lumenal Outward-Imaging Diffuse Optical Tomography, Guan Xu[1], Daqing Piao[1]; *[1]School of Electrical and Computer Engineering, Oklahoma State Univ., USA.* We demonstrate experimentally that reconstruction based on a geometric-differential-sensitivity method improves target localization in trans-lumenal outward-imaging diffuse optical tomography than do with conventional depth-compensation methods.

BTu2A.7 • 11:30
Intrinsic optical imaging and Doppler OCT assessment of vascular reactivity with aging under caloric restriction, Frédéric Lesage[1,2], Simon Dubeau[2], Cong Zhang[1,2], Edward Baraghis[1,2], Guylaine Ferland[3], Pierrette Gaudreau[4], Philippe Pouliot[1,2]; *[1]Genie Electrique, Ecole polytechnique Montréal, Canada; [2]Research Center, Montréal Heart Inst., Canada; [3]Nutrition department, Université de Montréal, Canada; [4]Biochemistry department, Université de Montréal, Canada.* Optical imaging and Doppler OCT were used to measure vascular reactivity in old rats fed ad-libitum or put under caloric restriction. Gas challenges and Doppler OCT were used to measure vessel reactivity and pulsatility.

BTu2A.8 • 11:45
Simultaneous Morphological And Biochemical Optical Imaging Of Coronary Atherosclerotic Plaques, Paritosh Pande[1], Sebina Shrestha[1], Jesung Park[1], Fred Clubb[1,2], Brian E. Applegate[1], Javier A. Jo[1]; *[1]BIOMEDical Engineering, Texas A&M Univ., USA; [2]Veterinary Pathobiology, Texas A&M Univ., USA.* We demonstrated that simultaneous optical coherence tomography and fluorescence lifetime imaging microscopy imaging allows the identification of most types of coronary atherosclerotic plaques based on their morphological/biochemical characterization.

BTu2B • Optical Coherence Tomography in Ophthalmology—Continue

BTu2B.4 • 11:00
Passive Component Based Multi-Functional Jones Matrix Optical Coherence Tomography for Doppler and Polarization Sensitive Imaging of Retina, Yi-heng Lim[1], Youngjoo Hong[1], Lian Duan[1], Yoshiaki Yasuno[1]; *[1]Univ. of Tsukuba, Japan.*
A fiber based multi-functional optical coherence tomography was developed based on a novel Jones matrix detection. Simultaneous in vivo measurement of intensity, phase retardation, and Doppler flow imaging of a retina is demonstrated.

BTu2B.5 • 11:15
High-speed polarization-sensitive optical coherence tomography (PS-OCT) at 1060 nm, Teresa Torzicky[1], Michael Pircher[1], Sebastian Marschall[2], Marco Bonesi[1], Stefan Zotter[1], Erich Götzinger[1], Thomas Klein[3], Wolfgang Wieser[3], Benjamin Biedermann[3], Robert A. Huber[3], Peter Andersen[2], Christoph K. Hitzenberger[1]; *[1]Medical Univ. of Vienna, Austria; [2]DTU Denmark, Denmark; [3]LMU Munich, Germany.* In this work we are using a high-speed swept source PS-OCT system working at 1060 nm, for acquiring intensity, retardation, fast axis and dregree of polarization uniformity images of retina, choroid and sclera in vivo.

BTu2B.6 • 11:30
Image analysis and quantification in anterior segment OCT: techniques and applications, Sergio Ortiz[1], Pablo Perez-Merino[1], Enrique Gambra[1], Susana Marcos[1]; *[1]Instituto de Optica (CSIC), Spain.* We present a methodology to extract accurate data from OCT systems, including calibration, distortion compensation, and 3D data processing for several applications of cornea and lens (topography, aberrations analysis and geometrical changes).

BTu2B.7 • 11:45
Wide tuning range wavelength-swept laser at 1020 nm for ultra-high resolution ophthalmic FD-OCT, Sang-Won Lee[1,2], Hyun-Woo Song[1], Moon-Youn Jung[1], Seunghwan Kim[1]; *[1]BT convergence research department, Electronics and Telecommunications Research Inst., Republic of Korea, [2]Center for Nano-Bio Convergence, Korea Research Inst. of Standards and Science, Republic of Korea.* e demonstrated a wide tuning range wavelength-swept laser at 1020 nm for ultra-high resolution ophthalmic Fourier-domain optical coherence tomography. The swept laser using a polygon mirror had a tuning range of 142 nm at a scan speed of 18 kHz. We obtained the measured axial resolution of 4.2 μm.

DTu2C • Novel Applications of Digital Holography I—Continue

DTu2C.3 • 11:00
Angular spectrum method for different sampling rates on source and destination planes: Scaled angular spectrum method,
Tomoyoshi Shimobaba[1], Nobuyuki Masuda[1], Tomoyoshi Ito[1]; *[1]Graduate school of Engineering, Chiba Univ., Japan.* We propose a scaled angular spectrum method that calculates diffraction at different sampling rates on source and destination planes, and verify the method in a one-dimensional case. In addition, we describe the two numerical implementations.

DTu2C.4 • 11:15
Digital holographic position measurement of an optically-trapped dielectric nanosphere in water, Yoshio Hayasaki[1], Takayuki Higuchi[1], Akira Sato[1], Quang D. Pham[1], Satoshi Hasegawa[1]; *[1]Utsunomiya Univ., Japan.* We demonstrate the three-dimensional position measurement of a nanometer-sized polystyrene sphere held in optical tweezers in water using an in-line low-coherence digital holographic microscope with three-dimensional sub-pixel estimation.

DTu2C.5 • 11:30
Time-Division Multiplexing of Iterated Holograms for Lithography on 3D Surfaces, Joshua Cowling[1], Jose J. Toriz-Garcia[2], Alan Purvis[1], Richard McWilliam[1], Gavin Williams[2], Florian B. Soulard[1], N. Luke Seed[2], Peter A. Ivey[3]; *[1]Engineering and Computing Science, Durham Univ., UK; [2]Department of Electronic and Electrical Engineering, Univ. of Sheffield, UK; [3]Innotec Ltd, UK.* A 3D substrate is lithographically patterned using a set of holograms generated by a multi-plane iterative algorithm. The substrate is exposed to multiple phase-only holograms over the duration of an exposure, thus averaging noise.

DTu2C.6 • 11:45
Real-time detection of 3-D field distribution of a single terahertz pulse based on pulsed digital holography, Xiaolei Wang[1], Lujie Li[1], Hongchen Zhai[1]; *[1]Inst. of modern optics,Nankai Univ., China.* A pulsed digital holographic approach for real-time detecting the 3D field distribution of a single-shot terahertz pulse in time resolution of the femtosecond order based on electro-optic sampling technique is proposed and experimentally implemented.

12:00—13:00
LUNCH ON YOUR OWN

Concerto Ballroom and Overture Foyer

BIOMED

13:00 - 15:00
BTu3A • BIOMED Poster Session II

BTu3A.01
A surface recognition approach for in vivo optical imaging applications using a micro-lens-array light detector, Xiaoming Jiang[1], Liji Cao[1], Wolfhard Semmler[1], Jörg Peter[1]; *[1]Medical physics in Radiology, German Cancer Research Center, Germany.* A method for surface recognition is presented whereby surface information is obtained considering multiview images from an MLA detector at a low number of detector projections. Simulated and experimental phantom data are presented.

BTu3A.02
Reconstruction Algorithm for Fluorescence Tomography Using a Reduced Space of Eigenvectors and Optimized Source Permissible Region, Mohamed A. Naser[1], Michael S. Patterson[2]; *[1]Medical Physics & Applied Radiation Sciences, McMaster Univ., Canada; [2]Juravinski Cancer Center, Canada.* A 3D fluorescence tomography algorithm has been developed. The ill-posedness of the problem has been reduced using a reduced space of eigenvectors and shrinking the permissible source region to find a unique solution.

BTu3A.03
Imaging of interacting nano-objects with superlenses, Timo Hakkarainen[1], Tero Setälä[1], Ari T. Friberg[1,2]; *[1]Department of Applied Physics, Aalto Univ. School of Science, Finland; [2]Department of Physics and Mathematics, Univ. of Eastern Finland, Finland.* Employing rigorous electromagnetic theory we show that near-field imaging of point-like objects with subwavelength resolution is achieveable with superlenses. We also illustrate how the interactions among the objects and the lens affect the imaging.

BTu3A.04
Modeling Light Propagation in Tissues Using the Corrected Diffusion Approximation, Ossi Lehtikangas[1], Tanja Tarvainen[1,2], Arnold Kim[3]; *[1]Department of Applied Physics, Univ. of Eastern Finland, Finland; [2]Department of Computer Science, Univ. College London, UK; [3]School of Natural Sciences, Univ. of California, USA.* Recently introduced corrected diffusion approximation is numerically implemented. An additive correction term is computed for the diffusion approximation at the boundary based on asymptotic analysis of the radiative transport equation.

BTu3A.05
Approximation Errors and Model Reduction in Three-Dimensional Diffuse Optical Tomography, Ville Kolehmainen[1], Martin Schweiger[2], Ilkka Nissilä[3], Tanja Tarvainen[1], Simon R. Arridge[2], Jari P. Kaipio[4,1]; *[1]Department of Applied Physics, Univ. of Eastern Finland, Finland; [2]Department of Computer Science, Univ. College London, UK; [3]Department of BIOMEDical Engineering and Computational Science, Aalto Univ. (School of Science), Finland; [4]Department of Mathematics, Univ. of Auckland, New Zealand.* We apply the Bayesian approximation error model for treatment of model reduction by domain truncation and coarse computation mesh in diffuse optical tomography. The approach is tested with a three-dimensional example using experimental data.

BTu3A.06
Fully Automatic Ultrasound Guided Diffuse Optical Tomography (US-DOT) System for Whole Breast Imaging, Zixin Deng[1], Yuting Lin[1], Judith Zimmermann[1], Gultekin Gulsen[1]; *[1]Tu and Yuen Center for Functional Onco-Imaging and Department of Radiological Sciences, Univ. of California, Irvine, USA.* A priori information can be used to guide near-infrared diffuse optical tomography reconstruction and improve quantification. The goal of this study is to develop a hands-free, fully automatic US-DOT system for quantitative whole breast imaging.

BTu3A.07
Versatile Picosecond Laser Sources for Time-Resolved Fluorescence Microscopy and Diffuse Optical Imaging, Thomas Schoenau[1], Dietmar Klemme[1], Romano Haertel[1], Kristian Lauritsen[1], Rainer Erdmann[1], Thorsten Siebert[1]; *[1]PicoQuant GmbH, Germany.* Picosecond laser sources operating over an order of magnitude in repetition rates and pulse energies at selected emission wavelengths from the UV to IR range are presented for time-correlated single-photon counting in demanding imaging applications.

BTu3A.08
Time-resolved optical imaging for monitoring response of breast cancer patients to therapy, Louise Enfield[1], Jeremy Hebden[1], Michael Douek[2], Adam P. Gibson[1]; *[1]Dept. of Medical Physics and Bioengineering, Univ. College London, UK; [2]Dept of Research Oncology, Kings College London, UK.* The use of optical tomography to monitor changes in the uncompressed breast in response to neoadjuvant treatment of breast cancer. An investigation of the reproducibility of data and images from healthy volunteers was also conducted.

BTu3A.09
One-Click Mesh Generation: Going From Multi-Region 2D Images to Tetrahedral Mesh, Hamid R. Ghadyani[1], Brian Pogue[1], Keith D. Paulsen[1]; *[1]Thayer School of Engineering, Dartmouth College, USA.* '1click' toolbox for tetrahedral mesh generation is presented that uses stack of 2D images with multiple regions. GUI-based approach to quality inspection and optimization of mesh bridges the gap from volume imaging to mesh generation.

BTu3A.10
Using Gold Nanoparticles to Enhance the Contrast in Optical Imaging using Short-Pulse laser, Amir Y. Sajjadi[1], Kunal Mitra[1], Michael Grace[2]; *[1]Mechanical and Aerospace Engineering, Florida Inst. of Technology, USA; [2]Biological Sciences, Florida Inst. of Technology, USA.* Intravenously administration of spherical gold nanoparticles, which accumulate in tumors due to the leakiness of their vasculature, enhances the resolution of laser-based cancer detection system by increasing the contrast of the images.

BTu3A.11
Influences of Tissue Optical Properties on Diffuse Correlation Spectroscopy Blood Flow Measurements, Lixin Dong[1]; *[1]Center for BIOMEDical Engineering, Univ. of Kentucky, USA.* The influences of optical property assumptions on DCS flow index measurements were evaluated by phantom experiments, computer simulation and in-vivo measurements. The results suggest tissue scattering influence is greater than that of absorption.

BTu3A.12
Noninvasive diffuse optical monitoring of hemodynamic changes in head and neck tumor during radiation delivery, Lixin Dong[1]; *[1]Center for BIOMEDical Engineering, Univ. of Kentucky, USA.* A remote-operated DCS flow-oximeter was built to monitor hemodynamic changes in head and neck tumors during radiation delivery. The results indicate instant hemodynamic responses can be optically detected without being overly burdensome on patients.

BTu3A • BIOMED Poster Session II—Continue

BTu3A.13
Feasibility of a Simple and Cost-Effective Wide-Angle Corneal Topography Method for Placido-based Videokeratographs, Luis A. Carvalho[1,2]; *[1]Grupo de Óptica, Universidade de Sao Paulo, Brazil; [2]Ophthalmology, Federal Univ. of Sao Paulo, Brazil.* The instrumentation and software for wide-angle corneal topography using a Placido based videokeratographer was developed. Measurement of the entire area of the cornea using a simple adaptation to the Placido mire is possible

BTu3A.14
Elliptically Polarized Light for Depth Resolved Optical Imaging, Anabela Da Silva[1], Carole Deumié[1], Ivo Vanzetta[2]; *[1]Institut Fresnel CNRS UMR 6133, France; [2]Institut des Neurosciences Cognitives CNRS UMR 6193, France.* Using elliptically polarized light allows performing a selection of a well defined subsurface volume in a turbid medium. This offers the possibility to probe biological tissues in depth. The method and preliminary results are presented.

BTu3A.15
An FFT-based Software Autocorrelator in Diffuse Correlation Spectroscopy System, Jing Dong[1], Renzhe Bi[1], Kijoon Lee[1]; *[1]School of Chemical and BIOMEDical Engineering/Division of Bioengineering, Nanyang Technological Univ., Singapore.* We present an FFT-based software autocorrelator which was controlled by LabVIEW for DCS. Without much compromise in speed, the minimum decay time is in μ -second scale. Not only is it cost-effective, but also is flexible for raw signal processing.

BTu3A.16
Efficiently "seeded" perturbation Monte Carlo Method for photon migration, Angelo Sassaroli[1]; *[1]Tufts Univ., USA.* We present a perturbation Monte Carlo method which can be used for light propagation in heterogeneous diffusive media.The method is based on the correspondence between the seed of a random number generator and the sequence of random numbers.

BTu3A.17
Estimating Hemoglobin Changes with an Extended Fusion Model Incorporating DOT, BOLD and ASL Data, Meryem A. Yucel[1], Theodore Huppert[2], David Boas[1,3], Louis Gagnon[1,3]; *[1]MGH/MIT/HMS Athinoula A. Martinos Center for BIOMEDical Imaging, Department of Radiology, Massachusetts General Hospital, Harvard Medical School, USA; [2]Department of Radiology and Bioengineering, Univ. of Pittsburg, USA; [3]Harvard-MIT Division of Health Sciences and Technology, USA.* Combining arterial spin labeling (ASL), diffuse optical tomography (DOT) and blood oxygen level dependent (BOLD) recordings, we obtained better estimates of changes in hemoglobin species and BOLD calibration factor M without a hypercapnia challenge.

BTu3A.18
A deconvolution method for recovering tissue impulse response from time-resolved measurements, Mamadou Diop[1,2], Keith St Lawrence[1,2]; *[1]Imaging Division, Lawson Health Research Inst., Canada; [2]Department of Medical Biophysics, Univ. of Western Ontario, Canada.* A deconvolution method for extracting tissue impulse response (TIR) from time-resolved measurements is presented. The algorithm is stable and can recover TIR with high fidelity, even from noisy data.

BTu3A.19
Confocal Fluorescence Microscopy for Evaluation of Breast Cancer in Human Breast Tissue, Jessica L. Dobbs[1], Hao Ding[1], Ana Benveniste[2], Henry Keurer[3], Savitri Krishnamurthy[4], Wei Yang[2], Rebecca Richards-Kortum[1]; *[1]Bioengineering, Rice Univ., USA; [2]Diagnostic Radiology, U.T. M.D. Anderson Cancer Center, USA; [3]Surgical Oncology, U.T. M.D. Anderson Cancer Center, USA; [4]Pathology, U.T. M.D. Anderson Cancer Center, USA.* Abstract: Confocal fluorescence microscopy can be used to rapidly acquire high resolution images of normal, benign, and neoplastic breast cellular features in ex vivo human breast tissue.

BTu3A.20
Assessment of brain perfusion disorders by ICG bolus tracking with time-resolved fluorescence monitoring, Adam Liebert[1], Daniel Milej[1], Wojciech Weigl[2], Anna Gerega[1], Michal Kacprzak[1], Ewa Mayzner-Zawadzka[2], Roman Maniewski[1]; *[1]Nalecz Inst. of Biocybernetics and BIOMEDical Engineering, Poland; [2]Department of Anesthesiology and Intensive Care, Medical Univ. of Warsaw, Poland.* Time resolved measurements were carried out on the surface of the head during inflow of indocyanine green (ICG) in patients with severe brain perfusion disorders. Advantages of fluorescence light detection over diffuse reflectance was presented.

BTu3A.21
Integrated diffuse optical tomography and photoacoustic tomography, Xiaoqi Li[1], Lei Xi[1], Ruixin Jiang[1], Lei Yao[1], Huabei Jiang[1]; *[1]BIOMEDical Engineering, Univ. of Florida, USA.* We designed, fabricated and tested a novel imaging system that fuses DOT and PAT in a single platform which can potentially provide dual-modality two dimensional functional and cellular images of the breast quantitatively.

BTu3A.22
Comparison of L1 and L2 Regularizations in Diffuse Optical Tomography, Venkaiah C. Kavuri[1], Zi-Jing Lin[1], Hanli Liu[1]; *[1]Department of Bioengineering, Univ. of Texas at Arlington, USA.* We compare L1 versus L2 regularizations in diffuse optical tomography (DOT). Both methods were applied after the application of DCA (Depth compensation algorithm). L1 regularization clearly shows improvement in the spatial resolution of DOT images.

BTu3A.23
Improved OPT reconstructions based on the MTF and extension to FLIM-OPT, Lingling Chen[1], James McGinty[1], Harriet B. Taylor[2], Laurence Bugeon[2], Jonathan R. Lamb[2], Margaret J. Dallman[2,3], Paul French[1]; *[1]Photonics Group, Department of Physics, Imperial College London, UK; [2]Division of Cell and Molecular Biology, Department of Life Sciences, Imperial College London, UK; [3]Centre for Integrative Systems Biology, Department of Life Sciences, Imperial College London, UK.* We demonstrate the improved reconstruction of OPT datasets by incorporating the measured MTF in the reconstruction process. We also extend OPT to FLIM-OPT and demonstrate its use for imaging live zebrafish embryos displaying autofluorescence.

BTu3A.24
Detection of Specific Binding to HER2 Receptors by in vivo Fluorescence Lifetime Imaging, Yasaman Ardeshirpour[1], Victor Chernomordik[1], Moinuddin Hassan[1], Rafal Zielinski[2], Gary Griffiths[3], Olga Vasalatiy[3], Aleksandr Smirnov[4], Jay Knutson[4], Sam Achilefu[5], Jacek Capala[2], Amir Gandjbakhche[1]; *[1]Eunice Kennedy Shriver National Inst. of Child Health and Human Development, National Inst.s of Health, USA; [2]National cancer Inst., National Inst.s of Health, USA; [3]Imaging Probe Development Center, National Inst.s of Health, USA; [4]National Inst.s of Lung and Blood, National Inst.s of Health, USA; [5]School of Medicine, Washington Univ., USA.* In this study we have shown that in-vivo fluorescence lifetime imaging can be used for early detection of specific probe binding to HER2 receptors, providing information on HER2 overexpression.

BTu3A • BIOMED Poster Session II—Continue

BTu3A.25
A Pilot study of Multispectral Digital Colposcopy (MDC) for Detection of Clinical Cervical Intraepithelial Neoplasia, Michele Follen[1], Sylvia F. Lam[2], Martial Guillaud[2], Deanna Ceron[2], Jessica N. McAlpine[3], Tom Ehlen[3], Dianne Miller[3], Dennis D. Cox[4], E. N. Atkinson[5], Roderick Price[1], Dirk van Niekerk[6], Timon Buys[2], Pierre Lane[2], Calum E. MacAulay[2]; *[1]Department of Obstetrics & Gynecology, Drexel Univ. College of Medicine, USA; [2]Integrative Oncology, BC Cancer Research Centre, Canada; [3]Department of Obstetrics & Gynecology, Univ. of British Columbia, Canada; [4]Department of Statistics, Rice Univ., USA; [5]Department of Biostatistics, The Univ. of Texas M. D. Anderson Cancer Center, USA; [6]Department of Pathology and Laboratory Medicine, British Columbia Cancer Agency, Canada.* We report clinical imaging results for an MDC that has been applied to more than 50 patients with suspected cervical precancer and analyze against matched histopathology results. For high grade dysplasia: sensitivity ~90%, specificity ~55%.

BTu3A.26
Time-resolved spectroscopy method for breast cancer detection, Yukio Ueda[1], Kenji Yoshimoto[1], Etsuko Yamaki[1], Toshihiko Suzuki[1], Takeshi Yamanaka[1], Daisuke Yamashita[1], Hiroyuki Ogura[2], Hatsuko Nasu[3], Emiko Imi[3], Harumi Sakahara[3], Motoki Oda[1], Yutaka Yamashita[1]; *[1]Central Research Laboratory, Hamamatsu Photonics K.K.,, Japan; [2]Department of Breast Surgery, Hamamatsu Univ. School of Medicine, Japan; [3]Department of Radiology, Hamamatsu Univ. School of Medicine, Japan.* We have been developing time-resolved spectroscopy (TRS) systems for breast cancer diagnosis. Its principle is based on the optical properties of the patient's breast obtained by TRS measurements.

BTu3A.27
Diffuse optical detecting hemodynamic responses during fatiguing exercise in women with fibromyalgia, Yu Shang[1], Katelyn Gurley[1], Brock Symons[2], Douglas Long[3], Jonah Lee[3], Ratchakrit Srikuea[3], Leslie Crofford[4], Charlotte Peterson[3], Guoqiang Yu[1]; *[1]Center for BIOMEDical Engineering, Univ. of Kentucky, USA; [2]Department of Gerontology, Univ. of Kentucky, USA; [3]College of Health Sciences, Univ. of Kentucky, USA; [4]College of Medicine, Univ. of Kentucky, USA.* Muscle hemodynamics and oxygen metabolism were monitored by diffuse optical spectroscopies in women with and without fibromyalgia throughout fatiguing exercise. Less oxygen extraction was found in fibromyalgia women during fatiguing exercise.

BTu3A.28
Two-Photon Microscopy of Oxygen Distributions in Mouse Cerebral Microvasculature, Sava Sakadzic[1], Emiri T. Mandeville[1,2], Louis Gagnon[1], Anna Devor[3], Mohammad A. Yaseen[1], Joe Musacchia[1], Emmanuel Roussakis[4], Katharina Ekermann-Haerter[1,2], Vivek J. Srinivasan[1], Cenk Ayata[1,2], Eng Lo[1,2], Anders M. Dale[3], Sergei A. Vinogradov[4], David Boas[1]; *[1]Radiology, Massachusetts General Hospital / Harvard Medical School, USA; [2]Neurology, Massachusetts General Hospital, Harvard Medical School, USA; [3]Neurosciences and Radiology, Univ. of California San Diego, USA; [4]Biochemistry and Biophysics, Univ. of Pennsylvania, USA.* The two-photon microscopy imaging was used to obtain high-density PO2 maps in cortical microvasculature in anesthetized mice. The detailed PO2 distributions were presented as functions of various microvascular morphological parameters.

BTu3A.29
Hemodynamic monitoring of repeated cerebral ischemia in mice using diffuse optical spectroscopies, Yu Shang[1], Lei Chen[2], Michal Toborek[2], Guoqiang Yu[1]; *[1]Center for BIOMEDical Engineering, Univ. of Kentucky, USA; [2]Department of Neurosurgery, Univ. of Kentucky, USA.* Cerebral hemodynamics were monitored using diffuse optical spectroscopies in mice undergoing 5-day repeated transient forebrain ischemia. The results indicate that mouse adaptation to cerebral ischemia could be influenced by repeated preconditioning.

BTu3A.30
Comparison of diffuse optical spectroscopies and electroencephalogram for cerebral monitoring during carotid endarterectomy, Yu Shang[1], Ran Cheng[1], Lixin Dong[1], Stephen J. Ryan[2], Sibu P. Saha[3], Guoqiang Yu[1]; *[1]Center for BIOMEDical Engineering, Univ. of Kentucky, USA; [2]Department of Neurology, Univ. of Kentucky, USA; [3]Division of Cardiothoracic Surgery, Univ. of Kentucky, USA.* The cerebral blood flow responses to arterial clamping measured by near-infrared diffuse optical spectroscopies were found to be significantly faster, larger and more sensitive than electroencephalogram (EEG) responses during carotid endarterectomy.

BTu3A.31
Analysis of Vasoactive Optical Imaging of Breast Cancer, Sanhita S. Dixit[1], Hanyoup Kim[1], Christopher Comstock[2], Gregory W. Faris[1]; *[1]Molecular Physics Laboratory, SRI International, USA; [2]Moores Cancer Center, UC San Diego, USA.* We describe analysis of data acquired with near infrared transillumination imaging of breast cancer during inhalation of vasoactive gases. Detailed contrast signatures are obtained from multiwavelength cw image sets versus time.

BTu3A.32
Diffuse optical tomography to study ischemic stroke in pre-clinical rat models, Zi-Jing Lin[1], Ming Ren[2], Lin Li[1], Shaohua Yang[2], Hanli Liu[1]; *[1]Bioengineering, Univ. of Texas at Arlington, USA; [2]Pharmacology & Neuroscience, Univ. of North Texas Health Science Center, USA.* We investigated hyperacute cerebral ischemia using diffuse optical tomography with the depth compensation algorithm (DCA) in rat models. Results suggest that this methodology has a great potential to monitor the effect of antistroke therapies.

BTu3A.33
Novel method to improve 2D DOT spatial resolution using l1-regularization and noise-normalization, Jixing Yao[1], Fenghua Tian[2], Soontorn Oraintara[1], Hanli Liu[2]; *[1]Electrical Engineering, Univ. of Texas at Arlington, USA; [2]Bioengineering, Univ. of Texas at Arlington, USA.* The data used for reconstructing sparse DOT images are often with a large range of noise taken from different channels. A novel and effective reconstruction approach is developed by combining l1-regularization and noise normalization.

BTu3A.34
Measurement of brain activations to examine gender-specific risk decision making using functional near infrared spectroscopy (fNIRS), Lin Li[1], Zi-Jing Lin[1], Mary Cazzell[2], Hanli Liu[1]; *[1]Bioengineering, Univ. of Texas at Arlington, USA; [2]College of Nursing, Univ. of Texas at Arlington, USA.* We utilized fNIRS to examine gender differences in brain activation at the prefrontal cortex of forty healthy adults while performing the Balloon Analogue Risk Task (BART). It shows promises of fNIRS to study risk decision-making.

BTu3A.35
Adaptive Algebraic Reconstruction Technique Optimized for Fast Robust Bio-luminescence Tomography: Optical/CT Dual Modality In vivo Studies, Ali Behrooz[1,2], Heng Xu[1], Chaincy Kuo[1], Brad Rice[1]; *[1]Caliper, a PerkinElmer Company, USA; [2]Electrical and Computer Engineering, Georgia Inst. of Technology, USA.* An optimized adaptive algebraic reconstruction technique for fast robust 3D bioluminescence tomography is presented. Speed and performance of the algorithm in depth and flux quantification are examined by in silico, phantom and in vivo studies.

BTu3A.36
The Influence of Source-Detector Separation and Superficial Channel Choice upon NIRS Signal Correction, Andrew Berger[1], James R. Goodwin[2], Chantel R. Gaudet[3]; *[1]The Inst. of Optics, Univ. of Rochester, USA; [2]Queensland Univ. of Technology, Australia; [3]Univ. of Rochester, USA.* Near-infrared spectroscopy (NIRS) sensing of cerebral hemodynamics can be made more brain-specific by regressing against superficially-sensitive channels. Different distances and single channels versus global averages are discussed.

BTu3A • BIOMED Poster Session II—Continue

BTu3A.37
Heterogeneous Hierarchical Segmentation Method for Improved Prostate Cancer Imaging In Diffuse Optical Tomography: Simulation Study, Venkaiah C. Kavuri[1], Zi-Jing Lin[1], Hanli Liu[1]; *[1]Department of Bioengineering, Univ. of Texas at Arlington, USA.* We report a heterogeneous hierarchical segmentation method to image prostate cancer without prior cancer information, using combined Trans-rectal ultrasound and diffuse optical tomography. The method is validated by computer simulations

BTu3A.38
Classification of OT Images of Arthritic Joints Using Spatial-Fourier Frequency Coefficients, Ludguier D. Montejo[1], Hyun K. Kim[1,2], Jingfei Jia[1], Andreas H. Hielscher[1,2]; *[1]BIOMEDical Engineering, Columbia Univ., USA; [2]Radiology, Columbia Univ., USA.* Fourier Transform coefficients of absorption and scattering distributions, reconstructed from OT scans of PIP joints II-IV, are used in conjunction with discriminate analysis to diagnose rheumatoid arthritis (91.0% sensitivity and 90.0% specificity).

BTu3A.39
Fast-Fluorescence Camera (FFC) - A Consumer-Grade Digital Camera to Capture Endogenous Tissue Fluorescence, Pierre Lane[1,2], Sylvia F. Lam[1], Jessica N. McAlpine[2], Thomas G. Ehlen[2], Catherine Poh[1], Michele Follen[3], Calum E. MacAulay[1]; *[1]BC Cancer Agency, Canada; [2]Univ. of British Columbia, Canada; [3]Drexel Univ. College of Medicine, USA.* Imaging of endogenous tissue fluorescence can be challenging. We have developed a flash-excited fluorescence imaging system based on a consumer-grade digital camera to overcome the challenges associated with depth-of-field and motion artifact.

BTu3A.40
Corrected Diffusion Approximation in Layered Tissues, Shelley B. Rohde[1], Arnold Kim[1]; *[1]School of Natural Sciences, UC Merced, USA.* We present the corrected diffusion approximation for a thin beam incident on a layered medium. This model improves upon the diffusion approximation for small source-detector separation distances and is computationally efficient.

BTu3A.41
Utilising Approximation Error Modelling in Linear Reconstruction in Diffuse Optical Tomography, Tanja Tarvainen[1,2], Ville Kolehmainen[1], Simon R. Arridge[2], Jari P. Kaipio[1,3]; *[1]Univ. of Eastern Finland, Finland; [2]Univ. College London, UK; [3]Univ. of Auckland, New Zealand.* The relationship between conventional reference measurement correction and approximation error modelling in linear reconstruction in diffuse optical tomography is considered.

BTu3A.42
Compact & Portable In Vivo Multiphoton GRIN Endoscope, David Huland[1], Christopher M. Brown[1], Dimitre G. Ouzounov[1], Ina Pavlova[1], David R. Rivera[1], Watt W. Webb[1], Chris Xu[1]; *[1]School of Applied and Engineering Physics, Cornell Univ., USA.* We present a compact, portable, multiphoton GRIN endoscope system capable of imaging a field of view of 200 μm at 4 frames/s. In vivo images of unstained rat kidney, colon and liver are shown.

BTu3A.43
Photo-Magnetic Imaging: Optical Imaging at MRI resolution, Yuting Lin[1], David A. Thayer[1], Alex T. Luk[1], Gultekin Gulsen[1]; *[1]Center for functional onco imaging, UC Irvine, USA.* In this paper, we present a novel imaging technique, namely Photo-Magnetic Imaging (PMI), which overcomes the limitation of pure optical imaging and provides optical contrast at MRI spatial resolution.

BTu3A.44
Time-Resolved Reflectance Diffuse Optical Tomography by using Mellin -Laplace Transform, Lionel Hervé[1], Agathe Puszka[1], Anne Koenig[1], Anne Planat-Chrétien[1], Jean-Marc Dinten[1]; *[1]DTBS, CEA-LETI, Minatec, France.* In this paper, we show how the Mellin-Laplace Transform helps to obtain robust and relevant reconstructions of deep optical heterogeneity from time-resolved diffuse optical tomography measurements.

BTu3A.45
Dynamic Imaging of Cerebral Blood Flow Using Laser Speckle During Epileptic Events, Max Jiang[1], Ruixin Jiang[1], Junli Zhou[1], Lijun Ji[1], Paul Carney[1], Huabei Jiang[1]; *[1]Univ. of Florida, USA.* We present a method that is capable of imaging cerebral blood flow (CBF) using laser speckle imaging. In vivo images of dynamic relative CBF during seizure onset are obtained using a single-spectral system.

BTu3A.46
Toward Compressive Architecture for Image Acquisition in Optical Tomography: An Application of Compressed Sensing in Wavelet Compression of Fluorescence Tomography Data, Ali Behrooz[1], Ali A. Eftekhar[1], Ali Adibi[1]; *[1]Electrical and Computer Engineering, Georgia Inst. of Technology, USA.* Inspired by compressed sensing, we present and study a cost-effective compressive architecture for fast image acquisition in optical tomography that exploits wavelet compressibility of data. Theoretical results validated by experimental studies.

BTu3A.47
Simultaneous EEG-Correlated Noninvasive Imaging of Epilepsy Using Fast Diffuse Optical Tomography, Ruixin Jiang[1], Lijun Ji[1], Junli Zhou[1], Max Jiang[1], Zhen Yuan[1], Qizhi Zhang[1], Paul Carney[1], Huabei Jiang[1]; *[1]Univ. of Florida, USA.* We present a dynamic, noninvasive and functional diffuse optical brain imaging method that is done simultaneously with hippocampus CA1 LFP recordings for anesthetized rats under resting conditions and during acute chemoconvulant provoked seizures.

BTu3A.48
Confocal Reflectance/ Auto-Fluorescence Tomograpy (CRAFT) for Early Skin Cancer Diagnosis, Tong Peng[1,2], Hao Xie[1], Yichen Ding[1], Weichao Wang[3], Zhiming Li[4], Dayong Jin[5], Yuanhe Tang[2], Qiushi Ren[1,3], Peng Xi[1]; *[1]Deptartment of BIOMEDical Engineering, Peking Univ., China; [2]Department of Physics, Xi'an Univ. of Technology, China; [3]Department of BIOMEDical Engineering, College of Life Sciences and Biotechnology, Shanghai Jiao Tong Univ., China; [4]Department of Dermatology and Venereology, First Affiliated Hospital of Wenzhou Medical College, China; [5]Advanced Cytometry Labs, MQphotonics Research Centre, Macquarie Univ., Australia.* Through the combination of confocal reflectance imaging and confocal autofluorescence imaging in our system, both the morphological and pathological information can be obtained, yielding a clear separation of the cancerous sites from control sites.

BTu3A • BIOMED Poster Session II – Continue

BTu3A.49
Speckle contrast at deviations from best focus in microfluidic and in vivo, Yaaseen Atchia[1,2], Hart Levy[1,2], Suzie Dufour[1], Ofer Levi[1,2]; *[1]Electrical Engineering, Univ. of Toronto, Canada; [2]BIOMEDical Engineering, Univ. of Toronto, Canada.* Speckle contrast values with depth increments of 50 µm to 600 µm from best focus was analysed in microfluidic and in vivo. We show depth deviations are allowed for[|#31#|] Φ=200mm while conserving velocity change to less than 20 %.

BTu3A.50
Development of an optical non-contact time-resolved diffuse reflectance scanning imaging system, Mikhail Mazurenka[1], Heidrun Wabnitz[1], Alberto Dalla Mora[2], Davide Contini[2], Antonio Pifferi[2], Rinaldo Cubeddu[2], Alberto Tosi[3], Franco Zappa[3,4], Rainer Macdonald[1]; *[1]Physikalisch-Technische Bundesanstalt, Germany; [2]Dipartimento di Fisica, Politecnico di Milano, Italy; [3]Dipartimento di Elettronica e Informazione, Politecnico di Milano, Italy; [4]Micro Photon Devices Srl, Italy.* We report on the development and proof-of-principle tests of a scanning non-contact tissue imaging system for time-domain NIRS applications. The system is based on the null source-detector separation approach and a state-of-the-art fast-gated SPAD.

BTu3A.51
Analysis of Light Propagation in a Realistic Head Model Including Frontal Sinus, Kazuki Kurihara[1], Hiroshi Kawaguchi[2], Yosuke Takahashi[1], Takayuki Obata[2], Hiroshi Ito[2], Kaoru Sakatani[3], Eiji Okada[1]; *[1]Department of Electronics and Electrical Engineering, Keio Univ., Japan; [2]Molecular Imaging Center, National Inst. of Radiological Sciences, Japan; [3]Department of Neurological Surgery, Nihon Univ., Japan.* The light propagation in a head model including a frontal sinus was predicted to investigate the influence of the frontal sinus on NIRS measurements. The influence of the frontal sinus was not consistent across source-detector positions.

BTu3A.52
A dual-step steady state reflectance method for determination of the optical properties of turbid media, Florian Foschum[1], Alwin Kienle[1]; *[1]Institut für Lasertechnologien in der Medizin und Messtechnik an der Universität Ulm, Germany.* In the presented dual-step reflectance method we combine the measurements of the spatially resolved reflectance and of the total reflectance to determine the optical properties of semi-infinite turbid media with high spectral resolution.

BTu3A.53
Cerebral blood flow quantification during ischemia using a multi-distance moments-based time-resolved technique, Jonathan T. Elliott[1,2], Mamadou Diop[2], Ting-Yim Lee[1,3], Keith St Lawrence[1,2]; *[1]Department of Medical Biophysics, Univ. of Western Ontario, Canada; [2]Imaging Division, Lawson Health Research Inst., Canada; [3]Imaging Program, Robarts Research Inst., Canada.* We present a time-resolved moments-based bolus-tracking technique to determine blood flow, blood volume and mean transit time in scalp and brain. Measurements from an adult pig before and during ischemia agree with CT perfusion.

BTu3A.54
Low-cost diffuse optical tomography for the classroom, Taisuke Minagawa[1], Peyman Zirak[1], Udo M. Weigel[1], Anna Kristoffersen[1], Nicolas Mateos[1], Alejandra Valencia[1], Turgut Durduran[1]; *[1]ICFO, Spain.* We have developed simple tomograhic image scanner utilizing LEGO Mindstorms NXT. This could be introduced to students in BIOMEDical optics class to help them understand concept of photon propagation in tissue and new imaging modality.

BTu3A.55
Accelerating finite-element-based 3D optical imaging reconstruction by graphic processing units, Tao Zhang[1]; *[1]BIOMEDical Engineering, Univ. of Florida, USA.* We report an implementation of GPU to accelerate 3D image reconstruction in DOT. Using CUDA programming model, we parallelized our DOT algorithm and achieved a speed of more than 300x over the CPU based computation.

BTu3A.56
Optical Imaging of Hemodynamic Changes in Exposed Cortex of Awake Mice, Takahiro Kikuchi[1], Masashi Kusano[1], Hiroyuki Takuwa[2], Kazuto Masamoto[2,3], Iwao Kanno[2], Eiji Okada[1]; *[1]Electronics and Electrical Engineering, Keio Univ., Japan; [2]Molecular Imaging Center, National Inst. of Radiological Sciences, Japan; [3]Center for Frontier Science and Engineering, Univ. of Electro-Communications, Japan.* The hemodynamic change in the cortex of awake mice is measured by optical imaging. The movement of the awake mice during the measurement tends to affect the hemodynamic changes in somatosensory area.

BTu3A.57
Spectral encoding of spatial frequency approach for quantitative visualization and characterization of 3D structures, Sergey Alexandrov[1], Shikhar Uttam[1], Rajan K. Bista[1], Yang Liu[1]; *[1]Univ. of Pittsburgh, USA.* We present spectral encoding of spatial frequency approach to form color map, where wavelengths correspond to object's dominant 3D spatial frequencies, and to reconstruct 3D Fourier components of the scattering potential for each image point.

BTu3A.58
Temporal Mapping and Connectivity Using NIRS for Language-Related Tasks, Michael Hall[1], Ujwal Chaudhary[1], Gustavo Rey[2], Anuradha Godavarty[1]; *[1]BIOMEDical Engineering, Florida International Univ., USA; [2]The Brain Inst., Miami Children's Hospital, USA.* NIRS was employed in 15 healthy adults to understand functionality of the temporal cortex in response to language related tasks. Herein, activation, functional connectivity, and lateralization in the temporal cortex are correlated.

BTu3A.59
Using Partial Frequency Domain Data to Improve Reconstruction Accuracy in Continuous Wave Breast Tomosynthesis Guided Diffuse Optical Spectroscopy, Kelly Michaelsen[1], Venkataramanan Krishnaswamy[1], Brian Pogue[1], Keith D. Paulsen[1]; *[1]Dartmouth College, USA.* Limited frequency domain data measured with a handheld probe provides scattering information for a continuous wave multimodal system. Phantom measurements are used to quantify chromophore recovery and characterize the instrument performance.

BTu3A.60
Cognitive Response to Motor Tasks Using NIRS: Pilot Studies of Adults With And Without Spastic Cerebral Palsy, Ujwal Chaudhary[1], Michael Hall[1], Leonard Elbaum[1], Martha Bloyer[1], Anuradha Godavarty[1]; *[1]BIOMEDical Engineering, Florida International Univ., USA.* Near-infrared optical spectroscopy is employed to investigate the cognitive response to motor tasks in the prefrontal cortex of adults with and without cerebral palsy.

BTu3A • BIOMED Poster Session II—Continue

BTu3A.61
Absolute optical measurements of cerebral optical coefficients and hemoglobin concentrations in aging and younger human subjects, Bertan Hallacoglu[1], Angelo Sassaroli[1], Michael Wysocki[2], Elizabeth Guerrero-Baruah[2], Michal Beeri[2], Vahram Hartounian[2], Merav Shaul[3], Irwin Rosenberg[3], Aron M. Troen[4], Sergio Fantini[1]; *[1]Department of BIOMEDical Engineering, Tufts Univ., USA; [2]Department of Psychiatry, Mount Sinai School of Medicine, USA; [3]Nutrition and Neurocognition Laboratory, Jean Mayer USDA Human Nutrition Research Center on Aging at Tufts Univ., USA; [4]Inst. of Biochemistry, The Hebrew Univ. of Jerusalem, Israel.* We report non-invasive, absolute near-infrared spectroscopy measurements of optical coefficients and hemoglobin concentration/saturation on the forehead of aging and younger human subjects. Significant differences were found between the two groups.

BTu3A.62
Combined Image Deconvolution and Attenuation Correction for Intravascular Near Infrared Fluorescence Imaging, Georgios Mallas[1,2], Dana H. Brooks[1], Farouc A. Jaffer[2], Vasilis Ntziachristos[3]; *[1]Electrical and Computer Engineering, Northeastern Univ., USA; [2]Cardiovascular Research Center, Massachusetts General Hospital, USA; [3]Inst. for Biological and Medical Imaging, Technische Universität München, Germany.* Intravascular near-infrared fluorescence imaging detects fluorescent biomarkers through blood but the imaging resolution and imaged intensity degrades with target distance. We present a distance-dependent deconvolution/correction scheme.

BTu3A.63
Comparison of Monte Carlo and Diffusion Approximation Light Modeling in Small Animal Fluorescence Tomography, Jonathan T. Elliott[2], Kenneth M. Tichauer[1], Robert Holt[1], Stephen C. Kanick[1], Keith St Lawrence[2], Brian Pogue[1], Fredric Leblond[1]; *[1]Engineering, Dartmouth College, USA; [2]Department of Medical Biophysics, Univ. of Western Ontariio, Canada.* A comparison of the Diffusion approximation and a Monte Carlo approach in the context of small animal fluorescence tomography is presented, forming a foundation for hybrid approaches to improve accuracy of fluorescence tomography.

BTu3A.64
Design and Characterization of a Hybrid Frequency Domain - Continuous Wave Breast Imaging System, Fadi El-Ghussein[1], Shudong Jiang[1], Brian Pogue[1], Keith D. Paulsen[1]; *[1]Thayer School of Engineering, Dartmouth College, USA.* The design of a new hybrid breast optical imaging signal detection system is described using photodiodes together with PMTs. The goal of this design is to better quantify chromophores in tissue with a wider wavelength band.

BTu3A.65
Investigation of frontopolar cortex under noxious pain stimuli using functional near infrared spectroscopy, Amarnath S. Yennu[1], Sabin Khadka[1], Pritam Gautam[1], Fenghua Tian[1], Hanli Liu[1]; *[1]Bio-engineering, Univ. of Texas at Arlington, USA.* We report fNIRS signals from the human frontopolar cortex to investigate the hemodynamic responses under noxious pain stimuli. This study shows the potential role of frontopolar cortex in cognitive evaluation of pain by experimental evidence.

BTu3A.66
In vivo Breast Imaging Using a Gen-2 Hand-Held Optical Imager, Sarah J. Erickson[1], Manuela Roman[1], Jean Gonzalez[1], Richard Kiszonas[2], Cristina Lopez-Penalver[3], Anuradha Godavarty[1]; *[1]BIOMEDical Engineering, Florida International Univ., USA; [2]Breast Imaging, Sylvester Comprehensive Cancer Center, USA; [3]Advanced Medical Specialities, USA.* A portable gen-2 hand-held based optical imager has been developed toward breast cancer diagnosis. In vivo diffuse optical imaging studies are carried out in healthy subjects and breast cancer patients.

BTu3A.67
Time-domain photon diffusions evaluated on concave and convex cylindrical medium-applicator interfaces show opposite trends of the time to reaching the peak-fluence rate----An analytic model, Daqing Piao[1]; *[1]Oklahoma State Univ., USA.* The peak-fluence rate evaluated on the medium-applicator interface is reached sooner in a concave geometry and later in a convex geometry, when comparing to that on a semi-infinite interface, for the same line-of-sight source-detector distance.

BTu3A.68
Automated image analysis of in vivo microendoscopic images for quantitative diagnosis of esophageal squamous cell carcinoma, Dongsuk Shin[1], Marion-Anna Protano[2], Mark C. Pierce[3], Alexandros Polydorides[4], Fan Zhang[5], Rebecca Richards-Kortum[1]; *[1]Bioengineering, Rice Univ., USA; [2]Gastroenterology, Mount Sinai Medical Center, USA; [3]BIOMEDical Engineering, Rutgers Univ., USA; [4]Pathology, Mount Sinai Medical Center, USA; [5]Gastrointestinal Medicine, First Hospital of Jilin Univ., China.* This study introduces an approach for quantitative analysis of microendoscopic images to identify esophageal neoplasia. The approach quantifies morphologic parameters which distinguish esophageal neoplasia accurately in an independent validation set

BTu3A • BIOMED Poster Session II—Continue

BTu3A.69
Analytical and numerical examinations of continuous-wave photon fluence rate along unique spiral-paths on a long concave or convex cylindrical medium-applicator interface when the medium contains heterogeneity, Anqi Zhang[1], Daqing Piao[1]; *[1]School of Electrical and Computer Engineering, Oklahoma State Univ., USA.* CW photon remission along a unique set of spiral paths on a long cylindrical applicator-medium interface could be macroscopically indistinguishable from the remission along a straight line on a semi-infinite interface for single anomaly cases.

BTu3A.70
Hybrid PET/CT and Frequency-Domain Based NIRF Optical Tomography Modality for Preclinical Studies, Chinmay D. Darne[1], Yujie Lu[1], I-Chih Tan[1], Eva M. Sevick-Muraca[1]; *[1]Inst. for Molecular Medicine, The Univ. of Texas Health Science Center at Houston, USA.* We present the development of miniaturized system for performing preclinical NIRF optical tomography using frequency-domain approach suitable for incorporation in a preclinical hybrid PET/CT scanner.

BTu3A.71
Imaging of retinal lesions in age related macula degeneration using wide field polarization sensitive optical coherence tomography, Michael Pircher[1], Stefan Zotter[1], Philipp Roberts[1,2], Erich Götzinger[1], Teresa Torzicky[1], Hirofumi Yoshida[3], Futoshi Hirose[3], Mathias Bolz[2], Ursula Schmidt-Erfurth[2], Christoph K. Hitzenberger[1]; *[1]Center for Med. Physics and BIOMED. Engineering, Medical Univ. of Vienna, Austria; [2]Department of Ophthalmology and Visual Sciences, Medical Univ. of Vienna, Austria; [3]Canon Inc., Japan.* We present results of a newly developed wide-field polarization sensitive spectral domain OCT system for imaging retinal lesions in dry and wet age related macula degeneration (AMD).

BTu3A.72
Shear-wave generation using acoustic radiation force detected by Optical Coherence Elastography(OCE), Marjan Razani[1], Adrian Mariampillai[2], Cuiru Sun[2], Victor .X.D Yang[2], Michael C Kolios[1]; *[1]physics, Ryerson Univ., Canada; [2]Electrical and Computer Engineering, Ryerson Univ., Canada.* Optical Coherence Elastography measures tissue displacement and utilizes the high resolution of OCT to generate high resolution stiffness maps.We explored the potential of measuring shear wave propagation and mechanical properties of tissue using OCE

BTu3A.73
Retinal OCT Image Enhancement via Wavelet Denoising, Shahab Chitchian[1,2], Markus A. Mayer[3], Adam R. Boretsky[1], Frederik J. van Kuijk[4], Massoud Motamedi[1,2]; *[1]Center for BIOMEDical Engineering, Univ. of Texas Medical Branch, USA; [2]Department of Ophthalmology, Univ. of Texas Medical Branch, USA; [3]Pattern Recognition Lab, Erlangen Graduate School in Advanced Optical Technologies (SAOT), Germany; [4]Department of Ophthalmology, Univ. of Minnesota, USA.* A denoising algorithm using double-density dual-tree complex wavelet transform is applied to 2-frame OCT images of the retina to provide a comparable image quality in less acquisition time compared to commonly used multiple-frame averaging technique.

BTu3A.74
Extracting Diagnostic Information from Optical Coherence Tomography Images of Diabetic Retinal Tissues Using Depth-dependent Attenuation Rate and Fractal Analysis., Delia Cabrera DeBuc[1], Wei Gao[1], Erika Tatrai[2], Lenke Laurik[2], Boglarka Varga[2], Vera Olvedy[2], William Smiddy[1], Robert Tchintga[3], Aniko Somogyib[4], Gabor Somfai[2]; *[1]Ophthalmology, Univ. of Miami, USA; [2]Ophthalmology, Semmelweis Univ., Hungary; [3]Physics, Univ. of Dschang, Congo; [4]Internal Medicine, Semmelweis Univ., Hungary.* The sensitivity of OCT images to sample diabetic morphology is tested by calculating attenuation coefficients and fractal dimension. Fractal analysis provided a better sensitivity to early predict diabetic retinopathy.

BTu3A.75
Tissue elasticity imaging using Full-Field Optical Coherent Tomography, Amir Nahas[1,2], Claude Boccara[1,2]; *[1]Institut Langevin, ESPCI, France; [2]LLTech, France.* FF-OCT setup includes a static elastography system for multi-parameter images that could complement histopathology diagnostics. The setup creates various levels of compression. From stack of images one deduces displacements and elastic modulus maps.

BTu3A.76
Wide-field, high-speed polarization sensitive spectral domain OCT for measuring retardation, birefringence and retinal nerve fiber layer thickness, Stefan Zotter[1], Michael Pircher[1], Philipp Roberts[1,2], Erich Götzinger[1], Teresa Torzicky[1], Hirofumi Yoshida[3], Futoshi Hirose[3], Clemens Vass[2], Ursula Schmidt-Erfurth[2], Christoph K. Hitzenberger[1]; *[1]Center for Medical Physics and BIOMEDical Engeneering, Medical Univ. of Vienna, Austria; [2]Department of Opthalmology and Optometry, Medical Univ. of Vienna, Austria; [3]Canon Inc., Japan.* We present a newly developed high-speed, wide-field polarization sensitive spectral domain OCT system for measuring retardation, birefringence and retinal nerve fiber layer thickness in healthy and glaucoma eyes.

BTu3A.77
Detecting Glioma Tumor Features in Human Ex Vivo Samples Using Swept -Source OCT, Carmen Kut[1], Jiefeng Xi[1], Shaan Raza[2], Jessica Mavadia[1], Hugo Guerrero-Cazares[2], Elliot McVeigh[1], Alfredo Quinones-Hinojosa[2], Xingde Li[1]; *[1]BIOMEDical Engineering, Johns Hopkins School of Medicine, USA; [2]Neurosurgery, Johns Hopkins School of Medicine, USA.* Ex vivo human brain tissues from 8 glioma patients and 5 controls are imaged using SS-OCT, with higher glioma attenuation values and easily detectable and specific tumor features (microcyst, necrosis and pallisading) for intraoperative resections.

BTu3A.78
Investigation of Bacterial Biofilms in the Human Middle Ear using OCT Techniques and Acoustic Measurements, Cac T. Nguyen[1,2], Woonggyu Jung[1], Sarah Robinson[1,2], Jont B. Allen[1,2], Stephen Boppart[1,2]; *[1]Beckman Inst. for Advanced Science and Technology, UIUC, USA; [2]Electrical and Computer Engineering, UIUC, USA.* We investigate biofilms in human middle ear using OCT and acoustic measurements. OCT images visualize structure of the middle ear and confirm the biofilm. The acoustic measurements provide sound characteristics of the middle ears.

BTu3A.79
Design and Characterization of MEMS Based Optical Coherence Tomography Endoscopic Probe, Jingjing Sun[1], Can Duan[1], Sean Samuelson[1], Huikai Xie[1]; *[1]Electrical and computer engineering, Univ. of Florida, USA.* This study focused on the effects of the MEMS mirror, plastic housing and the variations in the assembly process on the performance of the MEMS-OCT imaging probes. Simulation and experimental results are shown and compared.

BTu3A.80
Tissue Surface as the Reference Arm in Fourier Domain Optical Coherence Tomography, Nikola Krstajić[1], Praveen C. Ashok[1], Wilson Sibbett[1], Christian T. Brown[1], Kishan Dholakia[1], Mario E. Giardini[2]; *[1]SUPA - School of Physics & Astronomy, Univ. of St Andrews, UK; [2]School of Medicine, Univ. of St Andrews, UK.* We present a method to use the tissue surface as reference in common-path Fourier domain optical coherence tomography. This allows a very long sample arm. The sensitivity is 94dB for 50 µs CCD integration time.

BTu3A • BIOMED Poster Session II—Continue

BTu3A.81
Hybrid Optical Coherence Tomography and Low-coherence Enhanced Backscattering Imager, Renzhe Bi[1], Jing Dong[1], Maria Winarni[1], Kijoon Lee[1]; [1]*Nanyang Technological Univ., Singapore.* We present a dual modality device for both low-coherence enhanced backscattering (LEBS) measurement and optical coherence tomography (OCT). They provide complementary information with different resolutions, various applications are demonstrated.

BTu3A.82
Extended depth of focus adaptive optics spectral domain optical coherence tomography, Kazuhiro Sasaki[1], Kazuhiro Kurokawa[1], Shuichi Makita[1], Yoshiaki Yasuno[1]; [1]*Computational optics group, Univ. of Tsukuba, Japan.* Adaptive optics spectral domain optical coherence tomography (AO-SDOCT) with a long focal range was developed by modulating the phase distribution of pupil using AO technology. The higher resolution human retinal imaging can be achieved.

BTu3A.83
Measuring known aberrations in rat brain slices with Coherence-Gated Wavefront Sensor based on a Linnik interferometer, Jinyu Wang[1,2], Jean-François Léger[1,2], Jonas Binding[5,6], Claude Boccara[4], Sylvain Gigan[4], Laurent Bourdieu[1,3]; [1]*Ecole Normale Supérieure, Institut de Biologie de l'ENS, IBENS, France;* [2]*Inserm, U1024, France;* [3]*CNRS,UMR 8197, France;* [4]*Institut Langevin, ESPCI ParisTech, CNRS UMR 7587, ESPCI, France;* [5]*Fondation Pierre-Gilles de Gennes pour la Recherche, France;* [6]*Max Planck Inst. for Medical Research, Germany.* Using a coherence-gated wavefront sensing scheme based on Linnik interferometer, we measured a known defocus up to 400µm into the highly scattering rat brain. The performances with objectives of different NA and magnification are compared.

BTu3A.84
New Design Options for Polarization-Sensitive Optical Coherence Tomography, Kristen Lurie[1], Audrey Ellerbee[1]; [1]*Electrical Engineering, Stanford Univ., USA.* We present a framework for designing polarization-sensitive optical coherence tomography (OCT) systems that yield analytical expressions for optic axis and retardance. The new designs have features amenable to adaptation into many OCT configuration.

BTu3A.85
Magnetomotive contrast in optical coherence tomography for detecting early-stage atherosclerosis using targeted microspheres, Adeel Ahmad[1], Jong S. Kim[1], Li Joanne[1], Jonathan Rasio[1], Zita Hubler[1], Eric J. Chaney[1], Marina Marjanovic[1], Kenneth Suslick[1], Stephen Boppart[1]; [1]*Univ. of Illinois at Urbana Champaign, USA.* We show molecularly-sensitive contrast in OCT using targeted multifunctional magnetic microspheres. Microspheres were perfused through the aorta inside the flow chamber and magnetomotive OCT was performed on the ex-vivo aorta specimens.

BTu3A.86
Fourier Domain Mode Locked laser for Optical Coherence Tomography Based on Dispersion-Shifted Fiber, Jianbing Xu[1], Rui Zhu[1], Po Ching Chui[1], Kenneth K. Wong[1]; [1]*Electrical and Electronic Engineering, The Univ. of Hong Kong, China.* We report a Fourier domain mode locked laser (FDML) for OCT based on dispersion-shifted fiber. Axial resolution and coherence length compared with the case without dispersion engineering is improved by 38% and 68%, respectively.

BTu3A.87
Registration of optical coherence tomography datasets with dermoscopy images, Thomas Richardson[1], Alexis Guyot[2], Raj Mallipeddi[3], Nisith Sheth[3], Andrew Coleman[1], Graeme Penney[2]; [1]*Medical Physics Department, Guy's and St Thomas' Foundation Trust, UK;* [2]*Division of Imaging Sciences,, King's College London, UK;* [3]*Dermatological Surgery and Laser Unit, St John's Inst. of Dermatology, UK.* A method of registering an OCT image data set with a dermoscopic image of a skin lesion is presented. This dual-modality system is shown to have value in delineating pre-surgical margins.

BTu3A.88
Inverse spectroscopic Optical Coherence Tomography (ISOCT): non-invasively quantifying the complete optical scattering properties from week scattering tissue, Ji Yi[1], Andrew J. Radosevich[1], Jeremy D. Rogers[1], Vadim Backman[1]; [1]*BIOMEDical Engineering, Northwestern Univ., USA.* The complete set of the scattering properties of tissue including the phase function can be locally quantified by ISOCT. The method inversely quantifies the tissue refractive index (R.I.) correlation function to deduce the optical properties.

BTu3A.89
Vernier-Tuned Single-Chip Semiconductor Laser for Optical Coherence Tomography Applications, Dennis Derickson[1], Chris Chiccone[1], David Gilbert[1], Michael Crawford[2], Michael Minneman[2], Jason Ensher[2]; [1]*Electrical Engineering, California Polytechnic, USA;* [2]*Insight Photonic Solutions, USA.* Vernier-Tuned Distributed Bragg Reflector lasers were initially designed for telecommunications. VT-DBR laser adaptations for OCT at 1550 nm and 1300 nm are described. 200 kHz sweep rates and coherence length are key OCT contributions.

BTu3A.90
Multi-MHz retinal OCT imaging using an FDML laser, Thomas Klein[1], Wolfgang Wieser[1], Raphael André[1], Christoph Eigenwillig[1], Robert A. Huber[1]; [1]*BioMolekulare Optik, Ludwig-Maximilians-Universität München, Germany.* We demonstrate multi-MHz OCT for ultrawide-field imaging in less than a second, using a 1050nm FDML laser at a sweep rate of up to 3.35MHz, doubled by a two-spot setup to 6.7MHz.

BTu3A.91
Polarization Sensitive Spectral Domain Optical Coherence Tomography of Cataract Lenses, Erich Götzinger[1], Matthias Bolz[2], Stefan Zotter[1], Teresa Torzicky[1], Michael Pircher[1], Philipp Roberts[2], Ferdinand Schlanitz[2], Ursula Schmidt-Erfurth[2], Christoph K. Hitzenberger[1]; [1]*center for medical physics, medical Univ. of vienna, Austria;* [2]*Department of Ophthalmology and Optometry, Medical Univ. of vienna, Austria.* We used a fiber based polarization sensitive spectral domain optical coherence tomography system using two CMOS line scan cameras to image the lens of healthy volunteers and cataract patients

BTu3A.92
Effects of Reduced Bit-Depth on Phase Data in Common-Path Optical Coherence Tomography, William Ling[1], Audrey Ellerbee[1]; [1]*Electrical Engineering, Stanford Univ., USA.* Abstract We report the effects of reduced digitization resolution on phase data in a common-path SD-OCT system. Nuances of common-path systems lead to different responses to bit-depth than in non-common-path systems.

BTu3A • BIOMED Poster Session II—Continue

BTu3A.93
Real-time Three-Dimensional Dynamic Imaging of Lower Airway Using Swept Source Optical Coherence Tomography, Jiefeng Xi[1], Wayne Mitnzer[2], Robert Brown[3], Rex Yung[4], Xingde Li[1]; *[1]Department of BIOMEDical Engineering, Johns Hopkins Univ., USA; [2]Department of Environmental Health Sciences, School of Public Health, Johns Hopkins Univ., USA; [3]Departments of Anesthesiology, Environmental Health Sciences, Medicine, and Radiology, Johns Hopkins Univ., USA; [4]Department of Medicine/ Oncology, Johns Hopkins Univ. School of Medicine, USA.* We investigated the feasibility of high-speed SS-OCT system along with a miniature side-viewing catheter to dynamically assess structures of the bronchus in vivo. Excellent correlations were achieved between OCT images and the corresponding histology

BTu3A.94
The first scattering-dominant structured gold nanoparticles for enhancing OCT backscattering and imaging contrast, Yongping Chen[1], Jiefeng Xi[1], Jessica C. Ramella-Roman[2], Xingde Li[1]; *[1]Department of BIOMEDical Engineering, Johns Hopkins Univ., USA; [2]Department of BIOMEDical Engineering, The Catholic Univ. of America, USA.* We reported the first scattering-dominant agent based on structured Au nanocages for enhancing OCT imaging contrast. Animal tumor imaging with the Au nanocages was performed, demonstrating significant in vivo contrast enhancement for the first time

BTu3A.95
In vivo and in vitro diagnostics using Full Field Optical Coherence Tomography, Osnath Assayag[1], Fabrice Harms[2,1], Eugénie Dalimier[2], Bertrand de Poly[2], Claude Boccara[1,2]; *[1]LLTech, France; [2]Institut Langevin, France.* Full Field OCT has found to be useful in helping both pathologists and surgeons in their per-operatory diagnosis. We describe, here, applications to breast, brain and skin cancers and demonstrate ex and in vivo capability.

BTu3A.96
A New Method to Improve Image Contrast in Full Field Holographic Coherence Domain Imaging, Haibo Lin[1], Ping Yu[1]; *[1]Univ. of Missouri, USA.* We propose a new method based on speckle statistics to improve image contrast in full field holographic optical coherence imaging. Theoretical analysis is compared with experimental results to validate the new method.

BTu3A.97
Gold nanoparticles for improving contrast in Optical Coherence Tomography images, Yenisey Ponce de Leon[1], Juan L. Pichardo-Molina[1], Noe Alcala-Ochoa[1], Jorge A. Lopez-Rios[2]; *[1]Centro de Investigaciones en Optica, Mexico; [2]División de Ciencias Naturales y Exactas, Universidad de Guanajuato, Mexico.* Gold nanoparticles of two different morphologies and sizes were tested as contrast agents for OCT images at a central wavelength of 1325nm. OCT images of the nanoparticles in water are shown.

BTu3A.98
Dental parodontium evaluation by spectral OCT, Cosmin Sinescu[1], Meda Lavinia Negrutiu[1], Stefan Ioan Stratul[1], Florin Ionel Topala[1], Raluca Mioara Cosoroaba[1], Mihai Rominu[1], Adrian Bradu[2], Adrian G. Podoleanu[2]; *[1]Dental Materials and Dental Technology Department, Univ. of Medicine and Pharmacy Victor Babes from Timisoara, Faculty of Dentistry, Romania; [2]Univ. of Kent, UK.* Optical coherence tomography in spectral mode was used to evaluate normal and affected dental parodontium as a noninvasive method. The results were validated by usual clinical evaluation procedures.

BTu3A.99
Comparison of Measured and Simulated Optical Coherence Tomography Images of Human Enamel, Alwin Kienle[1], Jan Schäfer[1]; *[1]Inst. of Laser Technologies, Germany.* Simulations of optical coherence tomography images based on the microstructure of enamel were performed using the Monte Carlo method and analytical solutions of Maxwell equations. A good agreement between calculated and measured images was obtained.

Symphony IV

DH

13:00 - 15:00
DTu3C • Special Techniques of Digital Holography II
Adrian Stern; Ben Gurion Univ. of the Negev, Israel, Presider

DTu3C.1 • 13:00 **Invited**
Recent Progresses in Digital Holographic Microscopy with Spatial Partial Coherent Light and Applications
Frank Dubois[1], El Mallahi Ahmed[1], Minetti Christophe[1], Yourassowski Catherine[1]; [1]*Universite Libre de Bruxelles, Belgium.*
We investigate the use of partially coherent source for digital holographic microscopes (DHM). Recent progresses and applications will be presented as the automated 3D detection and classification of particles or the analysis of vesicle suspension.

DTu3C.2 • 13:30 **Invited**
Opto-numeric systems: lenses and pixels
John Sheridan[1], Damien P. Kelly[2]; [1]*Electrical, Electronic & Communications Engineering, UCD, Ireland;* [2]*2Institut für Mikro- und Nanotechnologien, Macro-Nano,, Technische Universität Ilmenau, Germany.* In this manuscript we discuss the effect of filtering a signal in a generalized phase space domain and this viewpoint can be used to better understand the imaging performance of modern optical systems.

DTu3C.3 • 14:00
Holographic imaging and interferometry with non-Bragg diffraction orders in the volume gratings, Nickolai Kukhtarev[1], Tatiana Kukhtareva[1], Partha Banerjee[2], Georges Nehmetallah[2]; [1]*Physics, Alabama A&M Univ., USA;* [2]*ECE/EOP, Univ. of Dayton, USA.* Recording of holographic volume gratings lead to Bragg and non-Bragg diffracted beams with transformed images in each beam. In real-time mode fringes appear with a proper phase shift resulting in one shot phase shifting interferometry.

DTu3C.4 • 14:15
Long-depth three-dimensional object profilometry with low-coherent digital holography,
Quang D. Pham[1], Satoshi Hasegawa[1], Akihiro Kiire[1], Daisuke Barada[1], Toyohiko Yatagai[1], Yoshio Hayasaki[1]; [1]*Center for Optical Research and Education (CORE), Utsunomiya Univ., Japan.* We proposed a new method of digital holography with an ultra-broad band light source, coherence scanning method and a continuous chromatic phase-shifter to characterize the unlimited depth object with very high resolution.

DTu3C.5 • 14:30
Experimental observation of 4D Wigner and Ambiguity distribution functions, Guohai Situ[1], Laura A. Waller[1], Jason Fleischer[1]; [1]*Princeton Univ., USA.* We present a technique for measuring the 4D Wigner distribution function and Ambiguity function of 2D signals using a windowed Fourier transform. The method is demonstrated by numerical and experimental results.

DTu3C.6 • 14:45
Design of Volume Holograpic Imaging Point Spread Functions Using Multiple Point Deformations, Hanhong Gao[1], George Barbastathis[2,3]; [1]*Department of Electrical Engineering and Computer Science, Massachusetts Inst. of Technology, USA;* [2]*Department of Mechanical Engineering, Massachusetts Inst. of Technology, USA;* [3]*Singapore-MIT Alliance for Research and Technology (SMART) Centre, Singapore.* We present an analysis and design procedure for engineering the point-spread-function (PSF) of a volume hologram by deforming its exterior using a superposition of point indenters.

Symphony I & II	Symphony III	Symphony IV
BIOMED 1	BIOMED 2	DH

15:00—15:30
COFFEE BREAK, *Concerto Ballroom*

15:30 - 17:30
BTu4A • Fluorescence Imaging
Robert Nordstrom; National Inst. of Health, USA, Presider

BTu4A.1 • 15:30
Improving the Sensitivity and Specificity of Tumor Contrast in Fluorescence Imaging by Employing an Untargeted Fluorescent Reporter, Kenneth M. Tichauer[1], Kimberley S. Samkoe[2,1], Kristian J. Sexton[1], Jason R. Gunn[1], Tayyaba Hasan[3], Brian Pogue[1,2]; *[1]Thayer School of Engineering, Dartmouth College, USA; [2]Department of Surgery, Dartmouth Medical School, USA; [3]Wellman Center for Photomedicine, Massachusetts General Hospital, USA.* A dual-reporter fluorescence imaging approach is presented that can quantify biomarker expression in vivo. The approach was also demonstrated to provide better tumor contrast compared to targeted fluorescence uptake alone.

BTu4A.2 • 15:45
In Vivo Image-Guided Therapy of Oral Carcinoma using Topical Photodynamic Molecular Beacons, Tracy W. Liu[1], Eduardo H. Moriyama[1], Nicolas E. Wolter[1], Juan Chen[1], Brian C. Wilson[1], Gang Zheng[1]; *[1]Medical Biophysics, Univ. of Toronto/ Ontario Cancer Inst., Canada.* We demonstrate the capability of topical photodynamic molecular beacons as useful image-guidance tools during surgical resection to improve the identification of surgical margins surrounding oral cancer using a hamster cheek pouch carcinoma model.

BTu4A.3 • 16:00
High Signal-to-Noise Ratio Voltage Imaging: A Powerful Tool for Determining Electrophysiological Properties of CNS Axons,
Amanda J. Foust[1], Amanda E. Casale[1], Dejan Zecevic[2], David A. McCormick[1]; *[1]Neurobiology, Yale Univ., USA; [2]Cellular and Molecular Physiology, Yale Univ., USA.* Although axons play a key role in neuronal computation, the small size of CNS axons precludes direct characterization with electrical recordings. We implement high signal-to-noise ratio VSD imaging to determine cortical axon functional properties.

BTu4A.4 • 16:15
Frequency-domain Fluorescence-enhanced Optical Tomography for Primary Prostate Cancer with PET Validation in Siemens Inveon Scanner: A Preliminary Result, Yujie Lu[1], I-Chih Tan[1], Chinmay D. Darne[1], Nathaniel Wilganowski[1], Holly Robinson[1], John Rasmussen[1], Shikui Yan[2], Anne M. Smith[2], Eva M. Sevick-Muraca[1]; *[1]UTHSC-Houston, USA; [2]Molecular Imaging, Siemens Medical Solutions USA, Inc., USA.* With a dual-labeled imaging agent, Optical/CT/PET primary prostate cancer imaging was performed in a Siemens Inveon scanner. PET-based imaging validation shows the potential of the developed fluorescence tomography for preclinical research.

15:30 - 17:30
BTu4B • Optical Coherence Tomography: Clinical Applications
Michael Jenkins; Case Western Reserve Univ., USA, Presider

BTu4B.1 • 15:30 **Invited**
Applying OCT to Dermatology: Technology, Clinical Applications, and the Translational Process, Jon Holmes[1]; *[1]Michelson Diagnostics Ltd., UK.* The application of Optical Coherence Tomography (OCT) imaging to clinical dermatology is discussed, with reference to experience gained with in bringing a novel OCT scanner into the clinical setting on a commercial basis

BTu4B.2 • 16:00
Microvascular Imaging of Skin Lesions with High Speed Doppler extended focus OCT, Cedric Blatter[1], Jessica Weingast[2], Branislav Grajciar[1], Rainer A. Leitgeb[1]; *[1]Center Medical Physics and BIOMEDical Engineering, Medical Univ. Vienna, Austria; [2]Univ. Clinics of Dermatology, Medical Univ. Vienna, Austria.* We employ high speed swept source OCT with Bessel beams at 1300nm for microvascular imaging of skin diseases including basal cell carcinoma. The lesions show characteristic vascular patterns significantly different for healthy skin.

BTu4B.3 • 16:15
Forward-Imaging Needle OCT Probe for Stereotactic Neurosurgery, Chia-Pin Liang[1], Jeremiah Wierwille[1], Thais Moreira[3], Gary Schwartzbauer[2], Samir Samir Jafri[2,3], Cha-Min Tang[2,3], Yu Chen[1]; *[1]Bioengineering, Univ. of Maryland, College Park, USA; [2]Univ. of Maryland School of Medicine, USA; [3]VA Medical Center, USA.* We developed a forwarding-imaging needle-type OCT probe for avoiding the hemorrhage and guiding neurosurgeries. The feasibility of vessel detection and neurosurgical guidance were demonstrated on sheep brain in vivo and human brain ex vivo.

15:30 - 17:30
DTu4C • Three-Dimensional Display III
Hiroshi Yoshikawa; Nihon Univ., Japan, Presider

DTu4C.1 • 15:30 **Invited**
Multiplex Holography for Walk-around Viewing, Yih-Shyang Cheng[1]; *[1]Department of Optics and Photonics, National Central Univ., Taiwan.* Cylindrical, conical, and disk-type multiplex holograms can all generate 3D images for walk-around viewing. The pathway which led us to the development of image-plane disk-type multiplex holography is described.

DTu4C.2 • 16:00 **Invited**
3D data acquisition using ray-based image sensors and 3D display using electronic holography, Kenji Yamamoto[1]; *[1]NICT, Japan.* This paper introduces challenges and two prototype systems using ray-based image sensors and electronic holography display toward ultra-realistic communication. The first one uses integral photography, and the second one uses 300-camera array.

Symphony I & II	Symphony III	Symphony IV
BIOMED I	BIOMED 2	DH

BTu4A • Fluorescence Imaging—Continue

BTu4A.5 • 16:30
Experimental Demonstration of Angled Fluorescent Laminar Optical Tomography for Tissue Engineering, Chao-Wei Chen[1,2], Andrew B. Yeatts[1], Emily E. Coates[1], John P. Fisher[1], Yu Chen[1]; *[1]Fischell department of Bio-engineering, Univ. of Maryland, USA; [2]Department of Electrical and Computer Engineering, Univ. of Maryland, USA.* We developed an angled fluorescent laminar optical tomography, which enables 3D imaging of stem cell distribution within engineered tissue scaffold. Depth-resolved imaging in weakly- and highly-scattering tissue scaffolds is demonstrated.

BTu4A.6 • 16:45
Molecular Llaminar Optical Tomography of Thick Tissue Engineered Constructs, Lingling Zhao[1], Vivian Lee[1], Guohao Dai[1], Xavier Intes[1]; *[1]BIOMEDical Engineering, Rensselaer Polytechnic Inst., USA.* We integrated a mesoscopic fluorescence molecular tomography system, and visualized both the fluid flow and fluorescent-labeled living cells of vascular construct within thick scaffold at high-frame rates, with high sensitivity and accuracy.

BTu4A.7 • 17:00
Time Domain Diffuse Fluorescence Tomography Can Increase Small-Animal Imaging Throughput, Robert Holt[1], Kenneth M. Tichauer[2], Qun Zhu[3], Hamid Dehghani[3], Fredric Leblond[2], Brian Pogue[2]; *[1]Physics and Astronomy, Dartmouth College, USA; [2]Thayer School of Engineering, Dartmouth College, USA; [3]School of Computer Science, Univ. of Birmingham, UK.* Employing multiple time-bins in the image reconstruction of a time-domain fluorescence tomography dataset provides improved spatial resolution and contrast. Furthermore, these gains can be used to minimize tissue sampling and reduce imaging duration

BTu4A.8 • 17:15
Fluorescence Tomography using Temperature Modulation, Yuting Lin[1], Linden Bolinsay[2], Michael Ghijsen[1], Tiffany C. Kwong[1], Gultekin Gulsen[1]; *[1]Center for functional onco imaging, Department of Radiological Sciences, UC Irvine, USA; [2]InnoSense LLC, USA.* We describe a novel approach termed "temperature-modulated fluorescence tomography" that can acquire fluorescence images at focused ultrasound resolution by utilizing recently emerged temperature sensitive fluorescence contrast agents.

BTu4B • Optical Coherence Tomography: Clinical Applications—Continue

BTu4B.4 • 16:30
Flexible and rigid endoscopy for high-resolution in-depth imaging with Full-Field OCT, Anne Latrive[1,2], Claude Boccara[1,2]; *[1]Institut Langevin, ESPCI, France; [2]LLTech, France.* We propose a novel method for in situ cellular imaging of biological tissues using a full-field OCT setup with an entirely passive probe. Ex vivo results on human breast and first in vivo results on human skin are presented

BTu4B.5 • 16:45
Single-shot Stent Segmentation in Intravascular OCT Pullbacks, Zhao Wang[1], Michael W. Jenkins[1], Hiram Bezerra[2], Marco Costa[2], David Wilson[1], Andrew Rollins[1]; *[1]BIOMEDical Engineering, Case Western Reserve Univ, USA; [2]Harrington McLaughlin Heart & Vascular Inst., Univ. Hospitals Case Medical Center, USA.* We propose a novel method that can detect hundreds/thousands of stent struts in an entire OCT pullback at once. The method utilizes global object information and is potentially more robust than conventional 2D methods.

BTu4B.6 • 17:00
Dynamic imaging of in vitro human airway epithelium using optical coherence tomography, Amy Oldenburg[1,2], Raghav K. Chhetri[1], Brian M. Button[3], David B. Hill[3], Richard C. Boucher[3]; *[1]Physics and Astronomy, Univ. of North Carolina at Chapel Hill, USA; [2]BIOMEDical Research Imaging Center, Univ. of North Carolina at Chapel Hill, USA; [3]Cystic Fibrosis Center, Univ. of North Carolina at Chapel Hill, USA.* Ultrahigh-resolution optical coherence tomography (OCT) is employed to depth-resolve mucociliary transport on human bronchiepithelial cell cultures. This has relevance for monitoring airway mucus in lung diseases such as cystic fibrosis and COPD.

BTu4B.7 • 17:15
All-Fiber-Optic Based Catheter System for Simultaneous Endoscopic Optical Coherence Tomography and Fluorescence Imaging, Jessica Mavadia[1], Jiefeng Xi[1], Yongping Chen[1], Xingde Li[1]; *[1]BIOMEDical Engineering, Johns Hopkins Univ., USA.*
An all-fiber-optically based balloon catheter for simultaneous fluorescence imaging and OCT has been implemented. The performance of this multimodal catheter is demonstrated on tissue phantom, ex vivo pig esophagus and mouse tumor imaging.

DTu4C • Three-Dimensional Display III—Continue

DTu4C.3 • 16:30
Computer-generated cylindrical holographic stereogram made from 300-camera array images, Hiroshi Yoshikawa[1], Takeshi Yamaguchi[1], Kenji Yamamoto[2], Taiichiro Kurita[2]; *[1]Dpt. Electronics and Computer Science, Nihon Univ., Japan; [2]National Inst. of Information and Communications Technology, Japan.* We have investigated computer-generated holographic stereogram of cylindrical shape. An input image array is taken by 300-camera system and digitally processed to improve the image quality. The reconstructed image is observed with LED illumination.

DTu4C.4 • 16:45
Expression of Refractive Objects for Computer-Generated Hologram Using Ray Tracing Method, Tsubasa Ichikawa[1], Yuji Sakamoto[1]; *[1]Graduate School of Information Science and Technology, Hokkaido Univ., Japan.* In computer-generated hologram, researches on rendering techniques are inadequate. The study expressing photorefractive phenomena are not especially established. We propose a method to display transparent objects using the ray tracing method.

DTu4C.5 • 17:00
Simultaneous Color Doppler Phase-Shifting Digital Holography, Tomohiro Kiire[1], Daisuke Barada[2,1], Junichiro Sugisaka[1], Yoshio Hayasaki[1], Toyohiko Yatagai[1]; *[1]Center for Optical Research and Education, Utsunomiya Univ., Japan; [2]Graduate School of Engineering, Utsunomiya Univ., Japan.* Holograms of three color components in the color image are recorded simultaneously using single monochromatic camera. A reconstruction images in the color components obtained by the Doppler phase-shifting technique are combined to one color image.

16:00—20:00
OIDA RUMP SESSION, *Symphony IV*

Symphony I & II	Symphony III	Symphony IV
BIOMED I	BIOMED 2	DH

08:00 - 10:0

BW1A • Nevel Techniques and Models
David Cuccia; Modulated Imaging Inc., USA, Presider

BW1B • Non-linear and Fluorescence Spectroscopy
Rinat Esenaliev; Univ. of Texas Medical Branch ,USA, Presider

DW1C • Novel Applications of Digital Holography II
Yoshio Hayasaki; Utsunomiya Univ., Japan, Presider

BW1A.1 • 08:0

Time-Reversed Ultrasonically Encoded (TRUE) Optical Focusing into Soft Biological Tissue, Xiao Xu[1], Puxiang Lai[1], Honglin Liu[1], Lihong V. Wang[1]; *[1]BIO-MEDical Engineering, Washington Univ. in St. Louis, USA.* Optical imaging of soft biological tissue has limited depth due to strong light scattering. Our novel technique—Time-Reversed Ultrasonically Encoded (TRUE) optical focusing—can dynamically focus light into tissue. Experimental results are presented.

BW1B.1 • 08:00 **Invited**

Two-photon Excited Blood Autofluorescence for In Vivo Imaging and Flow Cytometry, Jianan Y. Qu[1]; *[1]Electrical and Computer Engineering, Hong Kong Univ. of Science and Technology, Hong Kong.* We report our recent discovery of two-photon autofluorescence from blood including red/white blood cells, platelets and plasma. We demonstrate the applications of blood autofluorescence for label-free in vivo imaging of microvasculature and flow cytometry.

DW1C.1 • 08:00 **Invited**

Digital Holographic Three-Dimensional Imaging Spectrometry, Kyu Yoshimori[1]; *[1]Iwate Univ., Japan.* This paper presents a brief review of the recent progress in a fully interferometric technique to obtain a set of spectral components of three-dimensional images for usual polychromatic objects.

BW1A.2 • 08:1!

Time-Resolved Reflectance DOT: Experimental Results for Imaging Absorption Contrast in Depth, Agathe Puszka[1], Mathieu Debourdeau[1], Lionel Hervé[1], Anne Planat-Chrétien[1], Anne Koenig[1], Jacques Derouard[2], Jean-Marc Dinten[1]; *[1]DTBS/STD/LISA, CEA-LETI Minatec, France; [2]LIPhy, Université Joseph Fourier, France.* Detecting and localizing precisely contrast in depth is the major challenge of reflectance Diffuse Optical Tomography. We present a dedicated time-resolved instrumentation and first experimental results using a Mellin-Laplace Transform based method.

BW1A.3 • 08:3(

Development of near-infrared swept laser based diffuse optical tomography system, Jaedu Cho[1], Yuting Lin[2], Gultekin Gulsen[2], Orhan Nalcioglu[1,2], Myung Yung Jeong[1], Chang-Seok Kim[1]; *[1]Cogno-Mechatronics Engineering, Pusan National Univ., Republic of Korea; [2]Tu and Yuen Center for Functional Onco-Imaging, Univ. of California Irvine, USA.* We have introduced a NIR swept source based diffuse optical tomography (DOT) system. We also demonstrate the capabilities of the NIR swept laser for multi-spectral DOT application with a turbid gelatin phantom measurement.

BW1B.2 • 08:30

Fluorescence goggle for surgical navigation, Yang Liu[1], Walter Akers[1], Adam Q. Bauer[1], Gail Sudlow[1], Kexian Liang[1], Joseph P. Culver[1], Sam Achilefu[1]; *[1]Washington Univ. in St. Louis, USA.* We developed a fluorescence goggle system for intraoperative imaging and surgical navigation. This system enables visualization of fluorescence information directly from the eyepieces in real time, which improves surgical accuracy.

DW1C.2 • 08:30

Quantitative Evaluation of Skin Vibration Induced by a Bone-Conduction Device Using Holographic Recording in a Quasi-Time-Averaging Regime, Mathieu Leclercq[1], Mayssa Karray[1], Vincent Isnard[1], François Gautier[1], Pascal Picart[1]; *[1]LAUM CNRS, France.* This paper proposes a first attempt to visualize and analyze sound propagating at the surface of a human skin induced by a bone conduction device. The proposed method is based on a so-called "quasi-time-averaging regime".

BW1A.4 • 08:4!

Noncontact diffuse correlation spectroscopy probe for deep tissue blood flow measurement, Yu Lin[1], Lian He[1], Yu Shang[1], Guoqiang Yu[1]; *[1]Center for BIO-MEDical engineering, Univ. of Kentucky, USA.* A noncontact diffuse correlation spectroscopy probe for deep tissue blood flow measurements has been designed and calibrated against a validated contact probe; flow changes measured concurrently are highly correlated in phantom and real-tissue tests.

BW1B.3 • 08:45

Label-Free Multimodal Nonlinear Optical Microscopy for In Vivo Diagnosis of Precancerous Squamous Epithelia, Seng Khoon Teh[1], Wei Zheng[2], Shuxia Li[3], Dong Li[2], Yan Zeng[2], Yanqi Yang[3], Jianan Y. Qu[2]; *[1]Divison of Bioengineering, Hong Kong Univ. of Science and Technology, Hong Kong; [2]Department of Electronic and Computer Engineering, Hong Kong Univ. of Science and Technology, Hong Kong; [3]School of Dentistry, The Univ. of Hong Kong, Hong Kong.* We explore in vivo diagnostic utility of an in-house developed multimodal nonlinear optical microscopy for detection of squamous epithelia precancer. Our results reveal all epithelial sublayers and stroma provide significant diagnostic information.

DW1C.3 • 08:45

When holography meets coherent diffraction imaging, Tatiana Latychevskaia[1], Jean-Nicolas Longchamp[1], Hans-Werner Fink[1]; *[1]Physics Inst., Univ. of Zurich, Switzerland.* There are two well-known solutions to the phase problem: holography and coherent diffraction imaging (CDI). We show how holography and CDI can be merged into one superior technique: holographic coherent diffraction imaging (HCDI).

Symphony I & II	Symphony III	Symphony IV
BIOMED I	BIOMED 2	DH

BW1A • Nevel Techniques and Models—Continue

BW1A.5 • 09:00

3D near-infrared imaging based on a single-photon avalanche diode array sensor: A new perspective on reconstruction algorithms, Juan Mata Pavia[1,2], Edoardo Charbon[2,3], Martin Wolf[1]; *[1]BIOMEDical Optics Research Laboratory(BORL), Division of Neonatology, Department of Obstetrics and Gynecology, Univ. Hospital Zurich, Switzerland; [2]Quantum Architecture Group(AQUA), Ecole Polytechnique Fédérale de Lausanne (EPFL), Switzerland; [3]TU Delft, Netherlands.* Recently, we demonstrated the potential of single-photon imagers in diffuse optical tomography (DOT). We present the advances of a new algorithm based on optical setups using this kind of sensors.

BW1A.6 • 09:15

Inter-Laboratory Comparison of Optical Properties Performed on Intralipid and India Ink, Lorenzo Spinelli[1], Marcin Botwicz[2], Norbert Zolek[2], Michal Kacprzak[2], Daniel Milej[2], Adam Liebert[2], Udo Weigel[3], Turgut Durduran[3], Florian Foschum[4], Alwin Kienle[4], François Baribeau[5], Sébastien Leclair[5], Jean-Pierre Bouchard[5], Isabelle Noiseux[5], Pascal Gallant[5], Ozzy Mermut[5], Antonio Pifferi[1,6], Alessandro Torricelli[6], Rinaldo Cubeddu[1,6], Hsin-Chia Ho[7,8], Mikhail Mazurenka[8], Heidrun Wabnitz[8], Katy Klauenberg[8], Olha Bodnar[8], Clemens Elster[8], Magali Bénazech-Lavoué[9], Yves Bérubé-Lauzière[9], Frédéric Lesage[10], Paola Di Ninni[11], Fabrizio Martelli[11], Giovanni Zaccanti[11]; *[1]Consiglio Nazionale delle Ricerche - Istituto di Fotonica e Nanotecnologie, Italy; [2]IBIB, Nalecz Instutute of Biocybernetics and BIOMEDical Engineering, Polish Academy of Sciences, Poland; [3]ICFO, Institut de Ciències Fotòniques, Parc Mediterrani de la Tecnologia, Spain; [4]ILM, Institut fur Lasertechnologien in der Medizin und Messtechnik an der Universitat Ulm, Germany; [5]INO, National Optics Institute, Canada; [6]POLIMI, Politecnico di Milano-Dipartimento di Fisica, Italy; [7]ITRI, Industrial Technology Research Institute, Taiwan; [8]PTB, Physikalisch-Technische Bundesanstalt, Germany; [9]TomOptUS, Département de génie électrique, Université de Sherbrooke, Canada; [10]Département de génie électrique, École Polytechnique de Montréal, Canada; [11]UNIFI, Dipartimento di Fisica e Astronomia, Università degli Studi di Firenze, Italy.* Intrinsic reduced scattering coefficient of Intralipid and intrinsic absorption coefficient of Indian ink at NIR wavelengths are accurately assessed in a multi-center study involving different techniques, instrumental set-ups, and analysis methods.

BW1B • Non-linear and Fluorescence Spectroscopy—Continue

BW1B.4 • 09:00

Development and Characterization of a Multi-Modal Probe for Early Skin Cancer Detection using Raman, Reflectance and Fluorescence Spectroscopies, Manu Sharma[1], Liang Lim[1], Eric Marple[2], William Riggs[3], James Tunnell[1]; *[1]BIOMEDical Engineering, The Univ. of Texas at Austin, USA; [2]EmVision LLC, USA; [3]DermDx, USA.* The development and characterization of a probe utilizing Raman, reflectance and fluorescence spectroscopies, towards providing a high-level of accuracy for early skin cancer detection, is described.

BW1B.5 • 09:15

Ex vivo multispectral multiphoton imaging of peripheral nerve regeneration, Dimitrios S. Tzeranis[1], Eric Soller[1], Rebecca Lin[2], Ioannis V. Yannas[1,2], Peter So[1,2]; *[1]Mechanical Engineering, MIT, USA; [2]Biological engineering, MIT, USA.* Multispectral multiphoton microscopy of ex vivo transected peripheral nerves treated with collagen scaffolds of varying cross-linking is applied to quantify how biomaterial properties modulate the wound healing response and induce regeneration.

DW1C • Novel Applications of Digital Holography II –Continue

DW1C.4 • 09:00

Digital Color Holography as A Tool for the Detection of Premature Cracks in Composite Materials, Mayssa Karray[1], Christophe Poilane[1], Denis Mounier[2], Pascal Picart[1]; *[1]LAUM CNRS, France; [2]LPEC CNRS, France.* This paper proposes a three-color holographic interferometer for the early crack detection in composite materials submitted to a shear test. Evaluation of shear strains at the surface provides a pertinent parameter to detect premature crack.

DW1C.5 • 09:15

Time-dependent Surface Response of Fluid to Transmission Optical Pressure Impulse, David C. Clark[1], Myung K. Kim[1]; *[1]Physics, Univ. of South Florida, USA.* Dynamic response to an optical pressure pulse can be a useful indicator of the mechanical properties of a fluid surface or membrane. We have mapped the time-dependent response of the water surface using precise measurement and timing techniques.

Symphony I & II	Symphony III	Symphony IV
BIOMED I	BIOMED 2	DH

BW1A • Nevel Techniques and Models—Continue

BW1A.7 • 09:30
A User-Enabling Visual Workflow for Near-Infrared Light Transport Modeling in Tissue, Michael Jermyn[1], Brian Pogue[1], Hamid R. Ghadyani[1], Scott Davis[1], Michael A. Mastanduno[1], Hamid Dehghani[1,2]; *[1]Thayer Engineering, Dartmouth College, USA; [2]Computer Science, University of Birmingham, United Kingdom.* The components of a user-enabling visual workflow for clinically-relevant quantitative imaging with light in tissue are demonstrated, including new tools for integration of segmentation, meshing, reconstruction & simulation, and visualization.

BW1A.8 • 09:45
Phase Function Corrected Diffusion Approximation for Light Transport in Turbid Media, Edward Vitkin[1], Vladimir Turzhitsky[1], Le Qiu[1], Lianyu Guo[1], Eugene Hanlon[1], Irving Itzkan[1], Lev T. Perelman[1]; *[1]Center for Advanced BIOMEDical Imaging and Photonics, Harvard University, USA.* Many optical imaging and spectroscopy applications require understanding how light propagates in turbid media near point-of-entry. We report an analytic solution to this problem that demonstrates excellent agreement with simulations and experiments.

BW1B • Non-linear and Fluorescence Spectroscopy—Continue

BW1B.6 • 09:30
Stokes Shift Spectroscopy and imaging for highlighting the difference of breast cancerous and normal tissues, Yang Pu[1], Wubao Wang[1], Yuanlong Yang[1], Laura Sordillo[1], Yury Budansky[1], Robert R. Alfano[1]; *[1]Physics, Inst. for Ultrafast Spectroscopy and Lasers, City College of City Univ of New York, USA.* Stokes Shift Spectroscopy (S3) and imaging offer a novel way to rapidly measure spectral fingerprints of fluorophores in tissue, which highlights the difference of cancerous and normal tissues.

BW1B.7 • 09:45
Using Raman Spectroscopy to Characterize Bone Metastasis and to Evaluate Treatment Response in Prostate Cancer Patients, Xiaohong Bi[1], Jeffry Nyman[2], Colm Morrissey[3], Martine Roudier[3], Alexander Dowell[3], Anita Mahadevan-Jansen[1]; *[1]BIOMEDical Engineering, Vanderbilt Univ., USA; [2]Orthopaedics and Rehab, Vanderbilt Univ., USA; [3]Urology, Univ. of Washington, USA.* Raman spectroscopy was applied in this study to investigate the structure and composition of metastatic bone from prostate patients. The ultimate goal is to identify spectral features related to cancer and treatment induced bone changes.

DW1C • Novel Applications of Digital Holography II –Continue

DW1C.6 • 09:30
Three-dimensional scanning microscopy through turbid media, Xin Yang[1], Chia-Lung Hsieh[1,2], Ye Pu[1], Demetri Psaltis[1]; *[1]Optics Laboratory, École Polytechnique Fédérale de Lausanne, Switzerland; [2]Electrical Engineering, California Inst. of Technology, USA.* We demonstrate three-dimensional imaging through turbid medium with digital phase conjugation of second harmonic signal emitted from a nanoparticle. Accurate three-dimensional images of a fluorescent sample placed behind a turbid medium are obtained.

DW1C.7 • 09:45
A Proposal for Astronomical Adaptive Optics by Incoherent Digital Holography, Myung K. Kim[1]; *[1]Physcis, Univ of South Florida, USA.* A new type of adaptive optics system is proposed for astronomical imaging. It replaces the wavefront sensing and modulation hardware of conventional adaptive optics with numerical processing capabilities of digital holography of incoherent sources.

Symphony I & II	Symphony III	Symphony IV
BIOMED I	BIOMED 2	DH

10:00—10:30
COFFEE BREAK, *Concerto A,B,C*

10:30 - 12:30
BW2A • Optical Coherence Tomography: Technology and Applications
Robert Huber; Ludwig-Maximillians-UniversitatMunchen Germany; Michael Pircher; Medical Univ. of Vienna, Austria, Presiders

BW2A.1 • 10:30
Interferometric Synthetic Aperture Microscopy with Computational Adaptive Optics for High-Resolution Tomography of Scattering Tissue, Steven Adie[1], Adeel Ahmad[1], Nathan Shemonski[1], Benedikt Graf[1], Heeseok Kim[1], Wen-Mei Hwu[1], P. Scott Carney[1], Stephen Boppart[1]; [1]*Univeristy of Illinois at Urbana-Champaign, USA.* We demonstrate interferometric synthetic aperture microscopy (ISAM) with post-acquisition computational aberration correction in scattering tissue, GPU-based 2D ISAM at 75 frames per second and pseudo-3D ISAM without the use of phase correction.

BW2A.2 • 10:45
Dual-Band FDML laser for Swept Source Spectroscopic OCT, Rui Zhu[1], Jianbing Xu[1], Edmund Y. Lam[1], Kenneth K. Wong[1]; [1]*Electrical and Electronic Engineering, The Univ. of Hong Kong, Hong Kong.* We report a synchronized dual-band-swept, Fourier domain mode locking (FDML) laser with sweeping rate of 97.6 kHz. It is the first time to achieve spectroscopic OCT based on dual-band FDML swept laser.

BW2A.3 • 11:00
Pump-probe optical coherence tomography imaging of Zenopus tadpole vasculature ex vivo, Oscar Carrasco-Zevallos[1], Ryan L. Shelton[1], Brian E. Applegate[1]; [1]*BIOMEDical Engineering, Texas A&M, USA.* We present a novel Pump-Probe Optical Coherence Tomography (PPOCT) system, capable of imaging both methylene blue and hemoglobin. Ex vivo images of Zenopus tadpole vasculature were obtained using hemoglobin as the contrast agent.

BW2A.4 • 11:15
Monitoring Electric Current in Biological Tissues by Optical Coherence Tomography, Krzysztof Wawrzyn[1], Barry Vuong[2], Mark K. Harduar[2], Victor X. D. Yang[2,3], Valentin Demidov[1], Vladislav Toronov[1], Yuan Xu[1]; [1]*Department of Physics, Ryerson Univ., Canada;* [2]*Department of Electrical and Computer Engineering, Ryerson Univ., Canada;* [3]*Division of Neurosurgery, Univ. of Toronto, Canada.* The capability of optical coherent tomography (OCT) to detect changes induced by physiological level electric field in biological tissue is demonstrated. The suggested method can potentially image the electro-kinetic properties of tissues with OCT.

10:30 - 12:30
BW2B • Spectroscopy of Elastic Light Scattering I
Vadim Backman; Northwestern Univ., USA, Presider

BW2B.1 • 10:30 **Invited**
Quantitative Monitoring of Apoptosis in Viable Cells with Elastic Scattering Spectroscopy, Irving J. Bigio[1], Christine Mulvey[1]; [1]*Boston Univ., USA.* Programmed cell death, apoptosis, entails a sequence of subcellular ultrastructure changes, which are monitored with elastic scattering spectroscopy. Changes are sensed earlier than possible by standard assays, invoking structures beneath the optical resolution limit.

BW2B.2 • 11:00
Measurement of the spatial backscattering impulse -response in colon field carcinogenesis using enhanced backscattering spectroscopy, Andrew J. Radosevich[1], Nikhil N. Mutyal[1], Jeremy D. Rogers[1], Sudeep Upadhye[2], Andrej Bogojevic[2], Hemant K. Roy[2], Vadim Backman[1]; [1]*BIOMEDical Engineering, Northwestern Univ., USA;* [2]*Department of Gastroenterology, Northshore Univ. Healthsystems, USA.* Optical tissue characterization in field carcinogenesis elucidates the mechanisms behind cancer development. Here we compute the backscattering impulse-response at subdiffusion lengthscales in colon biopsies with enhanced backscattering spectroscopy.

BW2B.3 • 11:15
Determination of Tissue Optical Properties by Interstitial Spectroscopy Using a Custom Fiber Optic Probe,
Timothy M. Baran[1], Thomas H. Foster[1,2]; [1]*Inst. of Optics, Univ. of Rochester, USA;* [2]*Imaging Sciences, Univ. of Rochester, USA.* We demonstrate a means for determination of tissue optical properties using a single interstitial optical probe. The probe contains a helical array of six side-firing fibers in an assembly that fits through an 18-gauge needle.

10:30 - 12:30
DW2C • BIOMEDical Applications of Digital Holography II
Claude Boccara; Institut Langevin, France,Presider

DW2C.1 • 10:30 **Invited**
Cell Dynamics Studied by Quantitative Phase Imaging, Gabriel Popescu[1]; [1]*Beckman Inst., Univ of Illinois at Urbana-Champaign, USA.* We examine intracellular traffic using spatial light interference microscopy (SLIM). The dispersion relation, i.e. decay rate vs. spatial mode, reveals that the mass transport is diffusive at short scales and deterministic at long scales.

DW2C.2 • 11:00 **Invited**
Digital Holography for the Life Sciences, Gert von Bally[1], Bjoern Kemper[1]; [1]*Center for BIOMEDical Optics and Photonics, Westfaelische Wilhelms Univ. Muenster, Germany.* In the life sciences digital holographic microscopy provides high resolving, on-line, label-free, quantitative, multi-focus phase contrast imaging for the analysis of morphology dynamics and migration tracking in living cells.

Symphony I & II	Symphony III	Symphony IV
BIOMED I	BIOMED 2	DH

BW2A • Optical Coherence Tomography: Technology and Applications—Continue

BW2A.5 • 11:30
Quantitative Optical Imaging of Vascular Structure and Function in a Model of Peripheral Arterial Disease, Kristin M. Poole[1], Craig Duvall[1], Melissa C. Skala[1]; *[1]BIOMEDical Engineering, Vanderbilt Univ., USA.* Optical coherence tomography and hyperspectral imaging were used to monitor the vascular response to hind limb ischemia. Measurements showed increases in collateral vessel formation and hemoglobin saturation consistent with existing techniques.

BW2A.6 • 11:45
Snapshot 3D Optical Coherence Tomography System using Image Mapping Spectrometer, Thuc-Uyen Nguyen[1], Nathan Hagen[1], Liang Gao[1], Tomasz Tkaczyk[1]; *[1]Bioengineering, Rice Univ., USA.* A snapshot 3D Optical Coherence Tomography system was developed using Image Mapping Spectrometry. This proof-of-concept system can give depth profile at different spatial points in one snapshot to reduce motion artifact and enhance throughput.

BW2A.7 • 12:00
Assessing Nanoparticle Concentration Using METRiCS Optical Coherence Tomography, You Li[1], Francisco Robles[1,2], Kevin Seekell[1], Adam Wax[1]; *[1]BIOMEDical Engineering, Duke Univ., USA; [2]Medical Physics Program, Duke Univ., USA.* We have recently developed METRiCS OCT to provide spatially resolved molecular information of chromosomes. Here we apply this method to measure the extinction spectra of nanoparticles at various concentrations for potential in vivo applications.

BW2A.8 • 12:15
Study on Non-invasive Micro-mechanical Biopsy using 3-Dimentional Optical Coherence Straingraphy, Yuki Ishii[1], Saeki Souichi[1]; *[1]Yamaguchi Univ., Japan.* Authors have developed 3D-OCSA, which visualize tissue micromechanics using OCT. In this study, this was ex vivo applied to atherosclerotic plaque. Consequently, 3D-OCSA was clarified to be clinically effective as Micro-Mechanical Biopsy.

BW2B • Spectroscopy of Elastic Light Scattering - Continue

BW2B.4 • 11:30
Optical Spectral Imaging For Breast Margin Assessment: A Comprehensive Assessment of Sources of Contrast, Torre M. Bydlon[1], J. Quincy Brown[1], Stephanie Kennedy[1], Jennifer E. Gallagher[1], Matthew Caldwell[1], Marlee Junker[1], Lee G. Wilke[2], William T. Barry[1], Joseph Geradts[1], Nimmi Ramanujam[1]; *[1]Duke Univ., USA; [2]Univ. of Wisconsin School of Medicine and Public Health, USA.* Achieving tumor-free margins is desired to avoid recurrence. Diffuse reflectance imaging can assess margin status; however, understanding kinetics, cautery, and patient variability is needed to exploit optical contrast to detect positive margins.

BW2B.5 • 11:45
Measurements of tissue scattering properties using multi-diameter single fiber reflectance spectroscopy: experimental validation, Ute A. Gamm[1], Stephen C. Kanick[1], Dominic J. Robinson[1], Henricus J. Sterenborg[1], Arjen Amelink[1]; *[1]Center for Optical Diagnostics nd Therapy, Erasmus Medical Center, Netherlands.* MDSFR spectroscopy is a method that allows the quantification of μ's and the phase function parameter γ We are presenting an experimental validation of this method based on phantoms containing polystyrene spheres and show preliminary in vivo data.

BW2B.6 • 12:00
Label-Free Spectroscopic Identification of Fetal Nucleated Red Blood Cells from Maternal Blood, Vladimir Turzhitsky[1], Le Qiu[1], Lianyu Guo[1], Edward Vitkin[1], Eugene Hanlon[1], Irving Itzkan[1], Kee-Hak Lim[1], Lev T. Perelman[1]; *[1]Center for Advanced BIOMEDical Imaging and Photonics, Harvard Univ., USA.* We present a spectroscopic microscopy system for measuring transmission and reflectance from erythrocytes. Spectroscopic markers are used to distinguish between fetal and adult cells for the application of genetic screening from maternal blood.

BW2B.7 • 12:15
Characterizing Intracellular Structural Dynamics with Optical Gabor Filtering, Heidy Sierra[1], Nada Boustany[1]; *[1]BIOMEDical Engineering, Rutgers Universidty, USA.* Optical Gabor filtering provides a linear measure of local object structure. We demonstrate the ability of this method to quantify directly object structure in a diatom, and present structural dynamic data in individual living cells.

DW2C • BIOMEDical Applications of Digital Holography II—Continue

DW2C.3 • 11:30
Dynamic of a vesicle suspension under shear flow by digital holographic microscopy, Minetti Christophe[1], Frank Dubois[1], Podgorski Thomas[2], Coupier Gwennou[2]; *[1]Ecole Polytechnique, Université libre de Bruxelles, Belgium; [2]Laboratoire de Spéctrométrie Physique, Université Joseph Fourier, France.* Vesicles are simplified models of living cells such as red blood cells. Hydrodynamical effects lead to a specific structure of the suspension that is analyzed by digital holographic microscopy on earth and in microgravity conditions.

DW2C.4 • 11:45
Digital Holographic Otoscope for the study of biomechanical properties of eardrum, Mauricio Flores-Moreno[1], Fernando Mendoza Santoyo[1], Cosme Furlong[2,3], John Rosowski[3,4]; *[1]Optics division, Centro de Investigaciones en Optica, Mexico; [2]Mechanical department, Worcester Polytechnic Inst., USA; [3]Eaton-Peabody Laboratory, Massachusetts Eye and Ear Infirmary, USA; [4]MIT-Harvard division of Health Sciences and Technology, USA.* A Digital Holographic system is used at clinic to study biomechanics properties of tympanic membranes; differences between the DH techniques used for digital recording and numerical reconstruction are discussed

DW2C.5 • 12:00
Field-Portable Pixel Super-Resolution Microscopy of Dense Samples using Lensfree Holograms Recorded at Multiple Heights,
Alon Greenbaum[1], Uzair Sikora[1], Aydogan Ozcan[1,2]; *[1]Electrical Engineering, Univ. of California, Los Angeles, USA; [2]Bioengineering, Univ. of California, Los Angeles, USA.* By capturing lensfree in-line holograms of objects at multiple heights, phase and amplitude images of dense specimens (e.g. Papanicolaou smears) can be iteratively reconstructed over a large field-of-view (~30 mm2) with sub-micron resolution.

Symphony I & II	Symphony III	Symphony IV
BIOMED I	BIOMED 2	DH

12:15—13:30
LUNCH ON YOUR OWN

13:30 - 15:30
BW3A • Breast Cancer Imaging
Ilya Turchin; Inst. of Applied Physics of the Russian Academy of Sciences ,Russian Federation, Presider

13:30 - 15:30
BW3B • Spectroscopy of Elastic Light Scattering II
Young Kim; Purdue Univ., USA, Presider

13:30 - 15:30
DW3C • Digital Holographic Microscopy III
Gert von Bally; Westfaelische Wilhelms Univ. Munster, Germany, Presider

BW3A.1 • 13:30 Invited
Near-infrared Imaging of Breast Cancer Using Intrinsic and Extrinsic Contrast Agents, Alexander Poellinger[1]; [1]*Radiology, Charité, Germany.* Breast cancer is the most common malignancy among women in industrialized countries. Optical imaging using intrinsic and extrinisic contrasts is a promising technique for breast cancer detection and differentiation between benign and malignant breast lesions.

BW3B.1 • 13:30 Invited
Multi-spectral Morphology Scanning for Margin Detection in Breast Surgery, Brian Pogue[1], Ashley Laughney[1], Venkataramanan Krishnaswamy[1], Wendy Wells[1], Keith D. Paulsen[1]; [1]*Engineering, Dartmouth College, USA.* A scanning full-spectrum imaging system was used to image and analyze the spectral morphology of resected breast cancer specimens, to evaluate the optimum parameters from which to diagnose involvement of cancer in the margins.

DW3C.1 • 13:30 Invited
3D Tracking of the Brownian Motion of Polystyrene Beads with DHM, Dug Young Kim[1], Yoonsung Bae[2]; [1]*Physics, Yonsei Univ., Republic of Korea;* [2]*Information & Communications, GIST, Republic of Korea.* Three dimensional particle tracking is useful technology to characterize live cell or surrounding environment by tracing small particles. We present a novel technique to find the 3D position of a 2 micrometer bead by using DHM.

BW3A.2 • 14:00
Joint image reconstruction for breast tumor diagnosis using both structural and functional information, Qianqian Fang[1], Stefan Carp[1], Mark Martino[1], Richard H. Moore[2], Daniel B. Kopans[2], David Boas[1]; [1]*Athinoula A. Martinos Center for BIOMEDical Imaging, Massachusetts General Hospital, USA;* [2]*Dept. of Radiology, Massachusetts General Hospital, USA.* We explore structural-prior-guided optical image reconstructions using a clinical population presenting breast lesions. We extend our algorithm with addition of tumor priors. This results in dramatic improvement in optical contrast of malignancy.

BW3B.2 • 14:00
Challenging the use of Intralipid as a scattering standard in tissue simulating phantoms measured by non-diffuse reflectance spectroscopy: the critical influence of scattering phase function, Stephen C. Kanick[1], Venkataramanan Krishnaswamy[1], Brian Pogue[1]; [1]*Thayer School of Engineering, Dartmouth College, USA.* This study shows the influence that the scattering phase function of Intralipid has on reflectance spectra. Significant spectral remission changes result from simply changing the reflectance probe geometries utilized in tissue spectroscopy research.

DW3C.2 • 14:00
Single-shot full field imaging in a dual-wavelength digital holographic microscope, Christophe Moser[1], Zahra Monemhaghdoust[1], Frederic Monfort[3], Yves Emery[3], Christian Depeursinge[2]; [1]*School of Engineering, LAPD, EPFL, Switzerland;* [2]*School of Engineering, LOA, EPFL, Switzerland;* [3]*LynceeTec, Switzerland.* We demonstrate volume diffractive structures to manipulate the coherence plane tilt at several two simultaneously to achieve full field 3D imaging in a low coherence digital off-axis holographic microscope (DHM) in a single shot.

BW3A.3 • 14:15
Nine-Wavelength Spectroscopy Guided by Magnetic Resonance Imaging Improves Breast Cancer Characterization, Michael A. Mastanduno[1], Shudong Jiang[1], Roberta diFlorio-Alexander[2], Brian Pogue[1], Keith D. Paulsen[1,2]; [1]*Dartmouth College, USA;* [2]*Department of Diagnostic Radiology, Dartmouth Hitchcock Medical Center, USA.* Combining nine discrete wavelengths for NIR Spectroscopy with MRI allows quantitative estimation of breast cancers in contrast scans. Combinations of PMT and spectrometers are used with validation in phantoms, normal subjects and pilot human cancers.

BW3B.3 • 14:15
Scattering anisotropy as an imaging contrast for tissue organization in mesoscopic imaging, Zhengbin Xu[1], Ally-Khan Somani[2], Young Kim[1]; [1]*Weldon School of BIOMEDical Engineering, Purdue Univ., USA;* [2]*Department of Dermatology, Indiana Univ. School of Medicine, USA.* We report the utilization of tissue scattering anisotropy as an intrinsic imaging contrast. This could potentially be used to probe tissue architecture and organization for mesoscopic (between microscopic and macroscopic) imaging settings.

DW3C.3 • 14:15
Studies on Digital Holographic Tomography, Anand Asundi[1], Wenjing Zhou[2], Wentao Hu[2]; [1]*School of Mechanical & Aerospace Engineering, Nanyang Technological Univ., Singapore;* [2]*Precision Mechanical Engineering, Shanghai Univ., China.*
In experiment, a section of optical fiber is used to be the tested object. It has parabola refraction index characteristic and symmetry 3D structure.

Symphony I & II	Symphony III	Symphony IV
BIOMED I	BIOMED 2	DH

BW3A • Breast Cancer Imaging—Continue

BW3A.4 • 14:30

Optical Assessment of Breast Density and its Dependence on Tissue Heterogeneity, Paola Taroni[1,2], Antonio Pifferi[1,2], Giovanna Quarto[1], Lorenzo Spinelli[2], Alessandro Torricelli[1], Francesca Abbate[3], Nicola Balestreri[4], Simona Menna[3], Enrico Cassano[3], Rinaldo Cubeddu[1,2]; *[1]Department of Physics, Politecnico di Milano, Italy; [2]CNR-Istituto di Fotonica e Nanotecnologie, Italy; [3]Breast Imaging Unit, European Inst. of Oncology, Italy; [4]Department of Radiology, European Inst. of Oncology, Italy.* The optical assessment of breast density was effectively performed using time domain 7-wavelength (635-1060 nm) optical mammography. Notwithstanding tissue heterogeneity, BI-RADS categories can be discriminated even with a single point measurement.

BW3A.5 • 14:45

Early Changes in Breast Cancer Blood Flow due to Chemotherapy: Potential Predictor for Therapeutic Efficacy, Regine Choe[1], Turgut Durduran[2,4], David R. Busch[3], So Hyun Chung[3], Saurav Pathak[3], Han Y. Ban[3], Ellen K. Foster[3], Tiffany Averna[3], Erin M. Buckley[3], Meeri N. Kim[3], Carolyn Mies[4], Mark A. Rosen[4], Mitchell D. Schnall[4], Angela DeMichele[4], Arjun G. Yodh[3]; *[1]BIOMEDical Engineering, Univ. of Rochester, USA; [2]ICFO, Spain; [3]Physics & Astronomy, Univ. of Pennsylvania, USA; [4]Hospital of the Univ. of Pennsylvania, USA.* Preliminary results on human subjects with breast cancer undergoing neoadjuvant chemotherapy suggest early changes in blood flow measured with diffuse correlation spectroscopy may serve as a potential predictor for therapeutic efficacy.

BW3A.6 • 15:00

Diffuse Optical Tomography Imaging System for Monitoring Breast Tumor Response to Neoadjuvant Chemotherapy, Jacqueline E. Gunther[1], Molly Flexman[1], Emerson Lim[2], Hyun K. Kim[1], Mindy Brown[4], Dawn Hershman[2,4], Andreas H. Hielscher[1,3]; *[1]BIOMEDical Engineering, Columbia Univ., USA; [2]Department of Internal Medicine, Columbia Univ., USA; [3]Department of Radiology, Columbia Univ., USA; [4]Herbert Irving Comprehensive Cancer Center, USA.* We developed a diffuse optical tomography (DOT) system that can be used to perform longitudinal studies of breast tumors during neoadjuvant chemotherapy. Preliminary results demonstrate that DOT can image early tumor vascular response to treatment.

BW3A.7 • 15:15

Neoadjuvant Chemotherapy Monitoring using Dynamic Breast Compression Imaging, Stefan Carp[1], Christy M. Wanyo[1], Qianqian Fang[1], David Boas[1], Steven J. Isakoff[2]; *[1]Radiology / Martinos Center, Massachusetts General Hospital, USA; [2]Gilette Breast Cancer Center, Massachusetts General Hospital, USA.* We use diffuse optical breast tomography during fractional mammographic compression to monitor neoadjuvant chemotherapy response. Preliminary results show static and dynamic measurements are sensitive to therapy induced changes in breast cancer.

BW3B • Spectroscopy of Elastic Light Scattering II—Continue

BW3B.4 • 14:30

Rapid Determination of Tissue Hemoglobin Concentration and Oxygen Saturation of Head and Neck Cancers for Global Health Applications, Fangyao Hu[1], Karhik Vishwanath[1], Janelle E. Phelps[1], Justin Lo[1], Walter T. Lee[2,3], Nimmi Ramanujam[1]; *[1]BIOMEDical Engineering, Duke Univ., USA; [2]Division of Otolaryngology-Head and Neck Surgery, Duke Univ. Medical Center, USA; [3]Section of Otolaryngology-Head and Neck Surgery, Veterans Administration Medical Center, USA.* A ratiometric method for quantitative estimation of tissue hemoglobin concentration and oxygen-saturation is presented. A 600X speed-up was achieved on clinical diffuse reflectance data relative to an inverse Monte Carlo with comparable accuracy.

BW3B.5 • 14:45

Within Vessel Multiple Sequential Scattering Sensitize Diffuse Correlation Spectroscopy Measurements to Erythrocyte Shear Induced Diffusion, Stefan Carp[1], Sava Sakadzic[1], Vivek J. Srinivasan[1], Nadege Roche-Labarbe[2], Maria Angela Franceschini[1], David Boas[1]; *[1]Radiology / Martinos Center, Massachusetts General Hospital, USA; [2]Universite de Caen, France.* We suggest that scatterer motion measured using diffuse correlation spectroscopy is substantially related to shear induced erythrocyte diffusion in the blood flow frame of reference, due to multiple sequential scattering events in most vessels.

BW3B.6 • 15:00

The Mapping of Tissues Scattering Properties on the Poincaré Sphere, Igor Meglinski[1], Callum Macdonald[1], Anthony Karl[1], Han-Seung Yoon[2], Michael Eccles[2]; *[1]Department of Physics, Univ. of Otago, New Zealand; [2]Department of Pathology, Univ. of Otago, New Zealand.* By tracking the state of polarization on the Poincaré sphere the scattering of circular polarized light has been exploited to point out properties of biological tissues, including cancerous tissues.

BW3B.7 • 15:15

The Correlation between Side Scattering and Internal Structures of Mammalian Cells with and without Acetic Acid Exposure,
Judith R. Mourant[1], Oana C. Marina[1], Claire K. Sanders[1]; *[1]Bioscience, LANL, USA.* The contribution of different cell constituents to side scatter is determined for mammalian cells with and without 0.6% acetic acid. Contributions depend on the polarization of the incident light and on exposure to acetic acid.

DW3C • Digital Holographic Microscopy III - Continue

DW3C.4 • 14:30

Short-Coherence Off-Axis Holographic Microscopy of Live Cell Dynamics, Stefan Witte[1,2], Andrius Plauska[1], Marloes L. Groot[1,2]; *[1]LaserLaB, VU Univ., Netherlands; [2]Neuroscience Campus Amsterdam, VU Univ., Netherlands.* We demonstrate single-shot holographic microscopy that combines ultrashort pulses with an off-axis geometry through a controlled pulse front tilt. Quantitative phase images of cells are obtained, and osmotic swelling of HEK293 cells is studied.

DW3C.5 • 14:45

High-speed 4-D biological microscope based on parallel phase-shifting digital holography, Tatsuki Tahara[1], Ryosuke Yonesaka[1], Seiji Yamamoto[1], Takashi Kakue[1], Peng Xia[1], Yasuhiro Awatsuji[1], Kenzo Nishio[2], Shogo Ura[1], Toshihiro Kubota[3], Osamu Matoba[4]; *[1]Graduate school of Science and Technology, Kyoto Inst. of Technology, Japan; [2]Advanced Technology Center, Kyoto Inst. of Technology, Japan; [3]Kubota Holography Laboratory Corporation, Japan; [4]Graduate School of System Informatics, Kobe Univ., Japan.* We constructed a high-speed four-dimensional (4-D) microscope for dynamically moving biological specimens. By use of parallel phase-shifting digital holography, 3-D behavior and phase distribution were captured at 150,000 frames-per-second.

DW3C.6 • 15:00

Heterodyne digital holography study of plasmonic nanoantennas, Sarah Y. Suck[1], Ariadna Martinez Marrades[1], Stéphane Collin[2], Nathalie Bardou[2], Yannick De Wilde[1], Gilles Tessier[1]; *[1]ESPCI - Institut Langevin, France; [2]Laboratoire Photonique et Nanostructures, France.* Optical nanoantennas convert near field to directional far-field radiation. Digital holography allows the characterization of the 3D directivity of scattering antennas, but also reveals heating induced by near field plasmonic confinement

Symphony I & II	Symphony III	Symphony IV
BIOMED I	BIOMED 2	DH

15:30—16:00
COFFEE BREAK, *Concerto Ballroom*

16:00 - 18:00
BW4A • Tomography
Hamid Dehghani; Univ. of Birmingham, UK, Presider

BW4A.1 • 16:00
Fast 3D Optical Mammography using ICG Dynamics for Reader Independent Lesion Differentiation, Sophie K. Piper[1], Paul Schneider[2], Nassia Volkwein[2], Nils Schreiter[2], Alexander Poellinger[2], Christoph H. Schmitz[1,3]; *[1]Department of Neurology, Charité Berlin, Germany; [2]Department of Radiology, Charité Berlin, Germany; [3]NIRx Medizintechnik GmbH, Germany.* Based on ICG bolus kinetics of the absorption changes in the reconstructed DOT images in suspicious lesion bearing breasts, we derived a reader independent classification between malignant and benign lesions with high sensitivity and specificity.

BW4A.2 • 16:15 Invited
Wide-field Time Resolved Optical Tomography, Xavier Intes[1]; *[1]RPI Rensselaer Polytechnic Inst., USA.* Abstract not available.

16:00 - 18:00
BW4B • New Spectroscopic Techniques and Applications

BW4B.1 • 16:00
Noninvasive optical imaging and spectroscopy for quantitative monitoring of the progression of oral premalignant lesions, Sharon Mondrik[1], Richard A. Schwarz[1], Mark C. Pierce[2], Wen Gao[1], Mary K. Quinn[1], Vijayashree Bhattar[3], Michelle D. Williams[3], Nadarajah Vigneswaran[4], Ann M. Gillenwater[3], Rebecca Richards-Kortum[1]; *[1]Bioengineering, Rice Univ., USA; [2]BIOMEDical Engineering, Rutgers Univ., USA; [3]Univ. of Texas M. D. Anderson Cancer Center, USA; [4]Univ. of Texas Dental Branch at Houston, USA.* Interim results are presented from a longitudinal study in which optical imaging and spectroscopy are used to monitor progression of oral premalignant lesions. A total of 447 sites in 120 patients were tracked over time.

BW4B.2 • 16:15
Development of Spatial Frequency Domain Instrument for the Quantification of Layer Specific Optical Properties of Pigmented Lesions, Rolf B. Saager[1], Kendrew Au[1], Kristen M. Kelly[2], Anthony J. Durkin[1]; *[1]Beckman Laser Inst., Univ. of California - Irvine, USA; [2]Dermatology, Univ. of California - Irvine, USA.* A clinical, spatially modulated quantitative spectroscopy (SMoQS) instrument has been designed and deployed to evaluate its ability to quantitatively isolate layer-specific optical properties of pigmented lesions in skin in vivo.

BW4B.3 • 16:30
Validation of a Monte Carlo Model for Determination of Fluorophore Concentration on Scattering Media, Paulo R. Bargo[1], Steven L. Jacques[2], Scott A. Prahl[3]; *[1]Johnson & Johnson Consumer Companies, USA; [2]Oregon Health & Sciences Univ., USA; [3]Oregon Medical Laser Center, USA.* Experimental validation of a Monte Carlo code for correcting the effect of optical properties on fluorescence measurements is presented. The error for predicting true concentration was 4% and 10% for absorbing-only and turbid samples, respectively.

16:00 - 18:00
DW4C • Special Techniques of Digital Holography III
Yi-Pai Huang, National Chiao Tung Univ., Taiwan, Presider

DW4C.1 • 16:00 Invited
Digital Holographic Interferometry and ESPI at Long Infrared Wavelengths with CO2 Lasers, Marc Georges[1], Jean-François Vandenrijt[1], Cedric Thizy[1], Frank Dubois[2], Patrick Queeckers[2], Dominic Doyle[3], Igor Alexeenko[4], Giancarlo Pedrini[4], Wolfgang Osten[4]; *[1]Centre Spatial de Liege, Universite de Liege, Belgium; [2]Microgravity Research Center, Universite Libre de Bruxelles, Belgium; [3]ESTEC, ESA, Netherlands; [4]Institut für Technische Optik, Universität Stuttgart, Germany.* Holography and speckle techniques for various metrology and non destructive applications were developed in the 10 µm wavelength range allowing large displacements measurement. Other specific advantages are emphasized like combining temperature and displacement measurement.

DW4C.2 • 16:30
Combination of recording wavelengths for improvement of color reproduction of color digital holography using spectral estimation, Peng Xia[1], Yasunori Ito[1], Yuki Shimozato[1], Tatsuki Tahara[1], Takashi Kakue[1], Yasuhiro Awatsuji[1], Shogo Ura[1], Kenzo Nishio[2], Toshihiro Kubota[3], Osamu Matoba[4]; *[1]Graduate School of Science and Technology, Kyoto Inst. of Technology, Japan; [2]Advanced Technology Center, Kyoto Inst. of Technology, Japan; [3]Kubota Holography Laboratory Corporation, Japan; [4]Graduate School of System Informatics, Kobe Univ., Japan.* We propose a combination of recording wavelengths of color digital holography using spectral estimation for improvement of color reproduction, and numerically confirmed that the color differences were greatly reduced by the combination.

Symphony I & II	Symphony III	Symphony IV
BIOMED I	BIOMED 2	DH

BW4A • Tomography –Continue

BW4A.3 • 16:4

Tomographic Fluorescence Lifetime Imaging, Scott B. Raymond[1], Craig J. Goergen[1], Alexei Bogdanov[2], David J. Sosnovik[1], Anand T. Kumar[1]; *[1]Radiology, Mass Gneneral Hospital, USA; [2]Radiology, Univ. of Massachusetts Medical School, USA.* We present theory and methods for in vivo diffuse time domain fluorescence lifetime tomography. As examples, we will discuss in vivo lifetime imaging of both targeted and activatable probes in mouse models of cardiac disease and cancer.

BW4A.4 • 17:0

Virtual Source Patterns for Fluorescence Tomography, Gianluca Valentini[1], Nicolas Ducros[1], Andrea Bassi[1], Cosimo D'Andrea[1,2], Martin Schweiger[3], Simon R. Arridge[3]; *[1]Department of Physics, Politecnico di Milano, Italy; [2]Italian Inst. of Technology, Italy; [3]Centre for Medical Image Computing, Univ. College London, Italy.* A novel method, named virtual source patterns method, is introduced to allow negative intensities in a pattern-based approach for fluorescence molecular tomography

BW4A.5 • 17:1

Fluorescence Optical Tomography of Preclinical Glioma Models Using Spatial Frequency Domain Imaging, Soren D. Konecky[1], Chris M. Owen[2], Tyler Rice[1], Pablo A. Valdes[3,4], Kolbein Kolste[4], Brian C. Wilson[5], Fredric Leblond[4], David W. Roberts[3], Keith D. Paulsen[4], Bruce J. Tromberg[1]; *[1]Beckman Laser Inst. and Medical Clinic, Univ. of California - Irvine, USA; [2]Department of Neurological Surgery, Univ. of California - Irvine, USA; [3]Section of Neurosurgery, Dartmouth-Hitchcock Medical Center, USA; [4]Thayer School of Engineering, Dartmouth College, USA; [5]Univ. of Toronto/Ontario Cancer Inst., Canada.* Spatial frequency domain imaging of 5-aminolevulinic acid induced protoporphyrin IX was used to recover absorption, scattering, and fluorescence properties of glioblastoma multiforme in tissue-simulating phantoms and in vivo in a mouse model.

BW4B • New Spectroscopic Techniques and Applications—Continue

BW4B.4 • 16:45

Diffuse Correlation Spectroscopy for Flow Assessment & Management of Acute Ischemic Stroke, Rickson C. Mesquita[1,2], Steven S. Schenkel[2], Turgut Durduran[3], Christopher G. Favilla[4], Meeri N. Kim[2], David L. Minkoff[2], Michael Mullen[4], Joel H. Greenberg[4], John A. Detre[4,5], Scott E. Kasner[4], Arjun G. Yodh[2]; *[1]Inst. of Physics, Univ. of Campinas, Brazil; [2]Department of Physics & Astronomy, Univ. of Pennsylvania, USA; [3]ICFO - Institut de Ciències Fotòniques, Mediterranean Technology Park, Spain; [4]Department of Neurology, Univ. of Pennsylvania, USA; [5]Department of Radiology, Univ. of Pennsylvania, USA.* We used diffuse correlation spectroscopy to assess cerebral autoregulation in acute ischemic stroke patients. Larger perfusion changes were observed in the infarcted hemisphere, and a novel relationship between perfusion and NIHSS was discovered.

BW4B.5 • 17:00

Time-gated Cherenkov emission spectroscopy from linear accelerator irradiation of tissue phantoms, Rongxiao Zhang[1], Adam Glaser[1], Scott Davis[1], David Gladstone[2], Brian Pogue[1,3]; *[1]Thayer School of Engineering, Dartmouth College, USA; [2]Norris Cotton Cancer Center, Dartmouth-Hitchcock Medical Center, USA; [3]Department of Physics and Astronomy, Dartmouth College, USA.* A time-gated-acquisition method is introduced to measure the Cherenkov emission from linear accelerator (LINAC) in tissue mimic phantom and shown to be an effective way to enhance the intensity of the Cherenkov emission over the ambient light.

BW4B.6 • 17:15

Effect of cerebral cortex sulci on near-infrared light propagation during monitoring and treatment, Ting Li[1,2], Qingming Luo[3], Steven L. Jacques[1,4]; *[1]Department of BIOMEDical Engineering, Oregon Health and Science Univ., USA; [2]Center of Neuro-Inf., Univ. of Electron. Sci. & Technol. of China, China; [3]Britton Chance Center for BIOMEDical Photonics, Wuhan National Laboratory for Optoelectronics, Huazhong Univ. of Science and Technology, China; [4]Department of Dermatology, Oregon Health and Science Univ., USA.* Central sulcus substantially affects NIRS/NIRI spatial sensitivity and LLLT fluence rate in the study of light transport within a high-resolution 3D anatomical head structure, allowing deeper penetration of light than previous models predicted.

DW4C • Special Techniques of Digital Holography III—Continue

.DW4C.3 • 16:45

Improved axial resolution of digital holography via compressive reconstruction, Lei Tian[1], Yi Liu[1], George Barbastathis[1,2]; *[1]Massachusetts Inst. of Technology, USA; [2]Singapore-MIT Alliance for Research and Technology (SMART) Centre, Singapore.* We experimentally show that compressed sensing can improve the axial resolution of digital holography when the resolution is limited by the finite pixel pitch.

DW4C.4 • 17:00

Two dimensional sub-pixel movement detection using spiral phase filtering and compressive holography, Yi Liu[1], Lei Tian[1], Yuanhao Huang[2], George Barbastathis[1,2]; *[1]MIT, USA; [2]Singapore-MIT Alliance for Research and Technology (SMART) Centre, Singapore.* We present experimental results of using spiral phase filtering and compressive holography to quantify two-dimensional (2D) sub-pixel movement

DW4C.5 • 17:15

Coherent Depth Fusing Method for Phase-only Hologram Generation, Jisoo Hong[1], Jiwoon Yeom[1], Byoungho Lee[1]; *[1]School of Electrical Engineering, Seoul National Univ., Republic of Korea.* Phase-only hologram generation method, which can overcome the maximum longitudinal sampling rate of iterative Fourier transform algorithm, is proposed based on the depth fusing method developed considering coherent imaging system.

Symphony I & II	Symphony III	Symphony IV
BIOMED I	BIOMED 2	DH

BW4A • Tomography –Continue

BW4A.6 • 17:30

Whole Body Fluorescence Imaging in Humans, Jan Mehnert[1,2], Sophie K. Piper[1], Christina Habermehl[1], Christoph H. Schmitz[1,3], Hellmuth Obrig[2,4], Jens Steinbrink[1,5]; *[1]Department of Neurology, Charité Univ. Medicine Berlin, Germany; [2]Department of Neurology, Max Planck Inst. for Human Cognitive and Brain Sciences, Germany; [3]NIRx Medizintechnik GmbH, Germany; [4]Clinic of Cognitive Neurology, Univ. of Leipzig, Germany; [5]Center for Stroke Research, Charité Univ. Medicine Berlin, Germany.* Whole body fluorescence imaging was performed in two adult subjects following injection of ICG. Results show that bolus tracking is very well feasible in humans and might be used for studying peripheral vascular diseases.

BW4A.7 • 17:45

Multi-View, Multi-Spectral Bioluminescence Tomography, James A. Guggenheim[1,2], Hector R. Basevi[1,2], Iain B. Styles[2], Jon Frampton[3], Hamid Dehghani[1,2]; *[1]PSIBS Doctoral Training Centre, College of Engineering and Physical Sciences, Univ. of Birmingham, UK; [2]School of Computer Science, College of Engineering and Physical Sciences, Univ. of Birmingham, UK; [3]School of Immunity and Infection, College of Medical and Dental Sciences, Univ. of Birmingham, UK.* An automated, multi-view, spectral bioluminescence tomography system that utilises structured-light-based surface capture techniques along with a model-based approach to image reconstruction is presented.

BW4B • New Spectroscopic Techniques and Applications—Continue

BW4B.7 • 17:30

Polarized Multispectral Imaging in a Rigid Endoscope Based on Polarized Light Scattering Spectroscopy, Ji Qi[1,2], Barriere, Clement[1,2], Daniel S. Elson[1,2], *[1] Hamlyn Centre for Robotic Surgery, Imperial College London, UK; [2] Department of Surgery and Cancer, Imperial College London, UK.* We investigate polarized multispectral endoscopic imaging to detect the micron-sized scatterers, tested with microspheres and animal livers. It is feasible to endoscopically image scatterer size with potential for in vivo diagnosis of dysplasia.

DW4C.7 • 17:45

Compressive Fresnel holography for object reconstruction through an occluding plane, Yair Rivenson[1], Alon Rot[1], Sergey Balber[1], Adrian Stern[1], Joseph Rosen[1]; *[1]Ben-Gurion Univ. of the Negev, Israel.* We report the ability to recover a partially occluded object from its recorded Fresnel hologram, by adopting the compressive Fresnel holography framework.

DW4C • Special Techniques of Digital Holography III—Continue

DW4C.6 • 17:30

Some Considerations About the Role of the Diaphragm in Digital Image-Plane Holography, Pascal Picart[1,3], Maryssa Karray[1], Pierre Slangen[2]; *[1]LAUM CNRS, France; [2]EMA, France; [3]ENSIM, France.* This paper presents a theoretical and experimental comparison between digital Fresnel holography and digital image-plane holography. The role of the aperture diaphragm in image-plane holography is highlighted and some figures of merit are discussed

DW4C.7 • 17:45

Compressive Fresnel holography for object reconstruction through an occluding plane, Yair Rivenson[1], Alon Rot[1], Sergey Balber[1], Adrian Stern[1], Joseph Rosen[1]; *[1]Ben-Gurion Univ. of the Negev, Israel.* We report the ability to recover a partially occluded object from its recorded Fresnel hologram, by adopting the compressive Fresnel holography framework.

18:00—18:15
BIOMED CLOSING REMARKS, Symphony I & II

18:00—18:15
DH CLOSING REMARKS, Symphony IV

Key to Authors and Presiders

(Bold denotes Presider or Presenting Author)

Key to Authors and Presiders

Key to Authors and Presiders

Key to Authors and Presiders

Key to Authors and Presiders

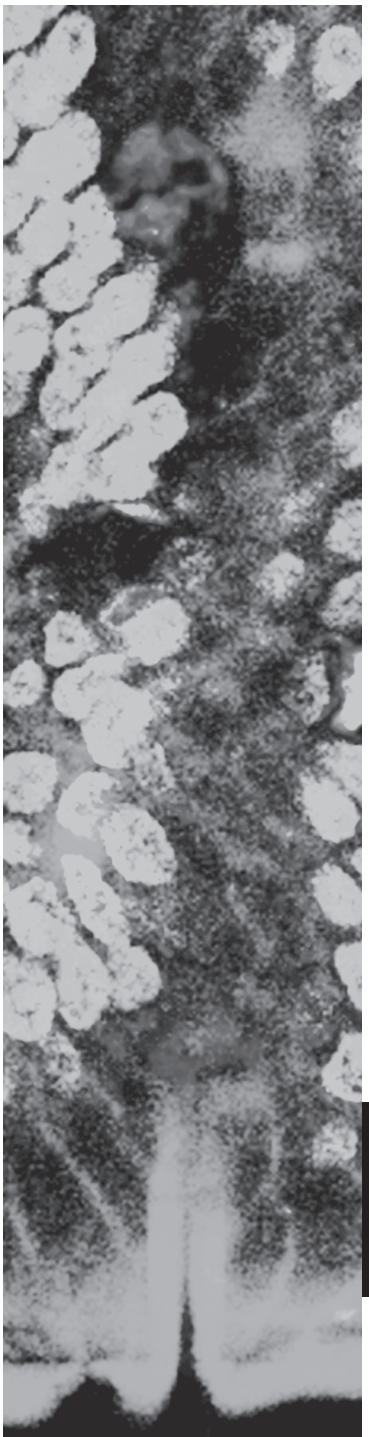
Key to Authors and Presiders

Key to Authors and Presiders

Key to Authors and Presiders

Key to Authors and Presiders

2012 OSA OPTICS & PHOTONICS CONGRESS



www.osa.org/congresses

POSTDEADLINE PAPERS

Biomedical Optics and Three-Dimensional Imaging

Biomedical Optics (BIOMED)

Digital Holography & 3-D Imaging (DH)

ISBN 978-1-55752-945-9

28 April – 2 May 2012

Miami Hilton Downtown
Miami, Florida, USA

Photo credit: Diaspro, Alberto; et al. Multi-Photon excitation microscopy. Biomedical Engineering Online, 2006, 5:36.

OSA® The Optical Society

Biomedical Optics Postdeadline Session

Sunday, 29 April 2012, *Symphony I & II*
16:30 – 20:40

16:30 – 19:30
BSu5A • BIOMED Postdeadline Session
Xingde Li; *Johns Hopkins University, USA, Presider*

BSu5A.1 • 18:30
Branched gold nanoparticles for a combined photoacoustic imaging and photothermal therapy, A. D'Hollander[1,2], D. Fuchs[3], B. Vanspauwen[2], H. Jans[2], G. Vandevelde[1], L. Lagae[2,4], U. Himmelreich[1]; *[1]Radiology / BioNMR Unit, K.U.Leuven, Belgium; [2]imec, Belgium; [3]Visualsonics, Canada; [4]Solid State Physics and Magnetism, K.U.Leuven, Belgium.* In this work, both *in vitro* and *in vivo* studies will show that branched AuNPs are ideally suited for a combined photoacoustic imaging and photothermal therapy of cancer.

BSu5A.2 • 18:40
Upconverting nanoparticles as contrast agents for *in vivo* luminescence imaging and tomography
Stefan Andersson-Engels[1], Haichun Liu[1], Can T. Xu[1], Pontus Svenmarker[1], Anna Gisselsson[2], Pontus Kjellman[2], Linda Andersson[2], Rene in't Zandt[2], Fredrik Olsson[2], and Sarah Fredriksson[2]; [1]*Department of Physics, Lund University, Sweden; [2]Genovis AB, Sweden.* Upconverting nanoparticles have recently drawn increasingly attention as contrast agents for optical bioimaging. They enable autofluorescence-free imaging within the tissue optical window, and improved spatial resolution as compared to conventional fluorescence-based contrast agents.

BSu5A.3 • 18:50
On the Validity of Assumptions to Incorporate Absorption in Monte Carlo Simulations, Katherine W. Calabro and Irving J. Bigio; *Dept. of Biomedical Engineering, Boston University, USA; Dept. of Electrical and Computer Engineering, Boston University, USA.* Incorporation of absorption in Monte Carlo simulations of light transport in tissue is widely achieved by assuming photon packets and equal fractional loss per step. We report differences between this method and more rigorous algorithms under conditions common in biomedical optics research.

BSu5A.4 • 19:00
Numerical nonlinear microscopy of collagen fibres, Daaf Sandkuijl[1,2,3], Adam Tuer[1,2,3], Danielle Tokarz,[1,3,4], and Virginijus Barzda[1,2,3]; *[1]Department of Chemical and Physical Sciences, University of Toronto Mississauga, Canada; [2]Department of Physics, University of Toronto, Canada; [3]Institute for Optical Sciences, University of Toronto, Canada; [4]Department of Chemistry, University of Toronto, Canada.* Numerical results of a new method of collagen fibril nonlinear microscopy are presented. Focalspot shaping and polarization control of the excitation beam is used, which generates unique collagen fibril signatures in the far field pattern.

BSu5A.5 • 19:10
Bacteria Classification by Means of the Statistical Analysis of Fresnel Diffraction Patterns of Bacteria Colonies, Halina Podbielska[1], Igor Buzalewicz[1], Agnieszka Suchwałko[1,3] , Alina Wieliczko[2]; *[1]Bio-Optics Group, Institute of Biomedical Engineering and Instrumentation, Wroclaw University of Technology, Poland; [2]Department of Epizootiology and Veterinary Administration with Clinic of Infectious Diseases, Wroclaw University of Environmental and Life Science, Poland; [3]Medicwave AB, Strandgatan, Sweden.* The novel optical system for analysis of Fresnel diffraction patterns of bacterial colonies is proposed. Obtained results have shown that features extraction and statistical of Fresnel patterns enables bacteria species classification with high accuracy.

BSu5A.6 • 19:20
Scattered Light Fluorescence Microscopy in Three Dimensions, C. Aegerter[1], G. Ghielmetti[1]; [1]*Physik-Institut, University of Zurich, Switzerland.* Here we show that imaging behind strongly turbid layers is possible using wave-front shaping of the illuminating light and the optical memory effect. The imaging method is shown to be applicable in three dimensions.

BSu5A.7 • 19:30
Computer Aided Monitoring of Neoadjuvant Chemotherapy for Breast Cancer, David R. Busch[1], Wensheng Guo[2], Regine Choe[3], Turgut Durduran[4], Michael D. Feldman[5], Carolyn Mies[5], Brian J. Czerniecki[6] , Julia Tchouf[6] , Angela DeMicheleg[7], Mark A. Rosenh[8], Michael D. Schnall[8], and Arjun G. Yodh[1]; *[1]Dept. Physics and Astronomy, Univ. of Pennsylvania, USA; [2]Department Biostatistics, Univ. of Pennsylvania, USA; [3]Dept. Biomedical Engineering, University of Rochester, USA; [4]ICFO-Institut de Ciancies Fotoniques Castelldefels, Spain; [5]Dept. Pathology and Laboratory Medicine, Univ. of Pennsylvania, USA; [6]Dept. Surgery, Univ. of Pennsylvania, USA; [7]Dept. Medicine (Hematology/Oncology) and Epidemiology; [8]Dept. of Radiology, Univ. of Pennsylvania, USA.* Diffuse Optical Tomography creates 3D maps of physiological properties. We previously reported a statistical analysis of these maps to automatically localize cancer. We now utilize this technique to monitor locally advanced cancers during neoadjuvant chemotherapy.

Biomedical Optics Postdeadline Session

Sunday, 29 April 2012, *Symphony I & II*
16:30 – 20:40

BSu5A.8 • 19:40
Measurement of Raman Spectra for Tomographic Reconstruction, Jennifer-Lynn Demers[1], Scott Davis[1], Brian W. Pogue[1], Michael D. Morris[2]; [1]*Thayer School of Engineering, Dartmouth College, USA;* [2]*Department of Chemistry, Univ. of Michigan, USA.* Raman signal is measured through a tomography set-up with 8 distinct spectrometers allowing for increased spectral resolution. Reconstructed images show good localization and contrast of Raman signal to background for Teflon inclusions within gelatin-based phantoms.

BSu5A.9 • 19:50
PDT induced changes assessed by time-gated fluorescence tomography [1]Ulas Sunar, [1]Weirong Mo, [1]Daniel Rohrbach; *Dept of Cell Stress Biology & PDT Center, Roswell Park Cancer Institute, USA*. We report 3D reconstruction of fluorescence yield and lifetime of a photosensitizer before and after PDT. The results demonstrate both yield and lifetime contrasts may be useful for PDT monitoring.

BSu5A.10 • 20:00
In-vivo risk stratification of pancreatic cancer by evaluating optical properties in duodenal mucosa, [1]Nikhil N. Mutyal, [1]Andrew Radosevich, [2]Shailesh Bajaj, [2]Sudeep Upadhye, [1]Jeremy D. Rogers, [2]Hemant K. Roy, [1]Vadim Backman. [1]*Department of Biomedical Engineering, Northwestern Univ., USA;* [2]*Department of Gastroenterology, Northshore Univ. Healthsystems, USA*. We present a novel approach of measuring optical properties with fiber optic probe from endoscopically accessible Peri-Ampullary duodenum as way to detect pancreatic cancer at early stages.

BSu5A.11 • 20:10
Breast Cancer Detection in the Spectral Subspace of Biomarkers, Yi Sun[1], Yang Pu[2], Laura A. Sordillo[2], Yuanlong Yang[2], R. R. Alfano[2]; [1]*Electrical Engineering Department,* [2]*Institue for Ultrafast Spectroscopy and Lasers and Physics Department of The City College of City University of New York, USA.* A novel approach of fluorescent spectral subspace of four key biomarkers with 340 nm excitation is proposed to detect breast cancer and determine efficacy of collagen, NADH, flavin,
and elastin.

BSu5A.12 • 20:20
Single gradient-index-multimode-fiber Enabled Fourier-domain Low Coherence Interferometry and Reflectance Spectroscopy Towards Fine-needle-probing of Steatosis, Anqi Zhang[1], Daqing Piao[1], Kenneth E. Bartels[2], G. Reed Holyoak [2], Jerry W. Ritchey[3]; [1]*School of Electrical and Computer Engineering, Oklahoma State University, USA;* [2]*Department of Veterinary Clinical Sciences, Center for Veterinary Health Sciences, Oklahoma State University, USA;* [3]*Department of Veterinary Pathobiology, Center for Veterinary Health Sciences, Oklahoma State University, USA.* We present dual-modality Fourier-domain common-pass low coherence interferometry and reflectance spectroscopy based on single gradient-index multimode fiber fitting a 24 gauge needle. The objective is to assess the condition of donor liver steatosis.

BSu5A.13 • 20:30
Preliminary Intravital Microscopic Analysis Reveals Specific Monocyte Uptake of Circulating Nanotubes and Peptide-Dependent Delivery into Tumor, [1]Bryan R. Smith, [1]Eliver Ghosn, [1]Harikrishna Rallapalli, [1]Jarrett Rosenberg, [1]Jennifer Prescher, [1]Lee Herzenberg, [1]Sanjiv S. Gambhir; *Stanford University Departments of Radiology, Immunology, Bioengineering, and Chemistry, USA.* Nanoparticle targeting efficiency to tumor is poor and not well-understood. Applying intravital microscopy in a mouse-model to interrogate vasculature-targeted nanotubes, we found that monocytes specifically take up nanotubes and are programmed to enter tumor.

Digital Holography and Three-Dimensional Imaging Postdeadline Session

Sunday, 29 April 2012, *Symphony IV*
16:30 – 19:30

16:30 – 19:30
DSu5B • DH Postdeadline Session
Myung K. "Paul" Kim; *Univ. of South Florida, USA, Presider*

DSu5B.1 • 18:30
Dry Decoupling Of Index Of Refraction And Topography Through Digital Holographic Microscopy, Freddy Alberto Monroy Ramírez[1], Jorge Garcia-Sucerquia[2]; [1]*Physics Department, Universidad Nacional de Colombia, Colombia;* [2]*School of Physics, Universidad Nacional de Colombia, Colombia.* In interferometric essays the measured phase merges the topography and index of refraction. Multiple wavelength illumination, variation of the index of refraction of the surrounding medium in containing cambers are common methods to separate those two features of the samples. In this work we present the use of the change of the air pressure on a perfusion camber to decouple the topography and index of refraction. The method is applied to fully characterize a partially stripped optical fibre.

DSu5B.2 • 18:45
Measurement of Asymmetric Temperature Field by Using Digital Holographic Multidirectional Interferometry, Doleček Roman[1,2,] Psota Pavel[1,2], Lédl Vít[1,2], Vít Tomáš[1,2], Václavík Jan[1,2], Kopecký Václav[2]; [1]*Research Centre TOPTEC, Institute of plasma physics ASCR, Czech Republic;* [2]*Technical University of Liberec Studentská Czech Republic.* This paper presents a digital holographic method for measurement of periodic asymmetric temperature fields. The method is based on modified Twymann-Green setup, in which only one precisely synchronized and triggered CCD allows for the 3D measurement and reconstruction.

DSu5B.3 • 19:00
Comparison of Digital Holographic Method for Very Small Amplitudes Measurement with Single Point Laser Interferometer and Laser Doppler Vibrometer, Psota Pavel[1], Lédl Vít[1], Doleček Roman[1], Václavík Jan[1], Šulc Miroslav[1];[1] *Institute of Plasma Physic, Czech Republic.* This paper describes a measurement setup and measurement results of simultaneous measurement of small vibration by a recently developed digitally holographic method, single point laser interferometry and laser Doppler vibrometer.

DSu5B.4 • 19:15
New Calculation Method for Quadrature Phase-shifting Interferometer and Its Application to Digital Holography, Suezou Nakadate[1], Tomohiro Kiire[1], Shinya Sawada[2], Masato Shibuya[1]; [1]*Dep. of Media and Image Tech., Faculty of Engineering, Tokyo Polytechnic University, Japan;* [2]*Center for Optical Research and Education, Utsunomiya University, Japan.* A new calculation method for a quadrature phase-shifting interferometer is presented and its application to digital holography is also described. Two sets of quadrature phase-shifed interferograms or holograms are acquired and the new calculation method proposed gives the phase distribution of the wavefront measured. The principle of the calculation method with computer simulations and its application to digital holography with experimental results are given.

DSu5B.5 • 19:30
High fidelity reconstruction of three-dimensional objects by FINCH fluorescence microscopy, Nisan Siegel[1,2], Joseph Rosen[1,2,3], Gary Brooker[1,2]; [1]*Department of Biomedical Engineering, Johns Hopkins University, USA;* [2]*Microscopy Center, Johns Hopkins University Montgomery County Campus, USA;* [3]*Department of Electrical and Computer Engineering, Ben-Gurion University of the Negev, Israel.* FINCH holography produces super-resolved images above and below the focal plane of the microscope objective but with different magnifications. A method is presented to faithfully reconstruct 3D objects with dimensional fidelity.

Biomedical Optics and 3D Imaging Congress

- Biomedical Optics (Biomed)
- Digital Holography and 3D Imaging (DH)

Exhibit: 29 April – 2 May ♦ Miami Hilton Downtown, Miami, Florida, USA

Allied Laser Solutions
61 Union Street
Westfield, MA 01085
P: +1 413.562.4006
F: +1 413.562.6167
arb@alliedlasersolutions.com
www.alliedlasersolutions.com
Allied Laser Solutions (ALS) is the exclusive North American distributor for Innolas Laser Munich , a German leading manufacturer of Pulsed Nd: Yag. Models ranging from mJ to 2J @ 1064nm @ 20Hz for scientific and 200uJ @ 500KHz for industrial. Many options like 532, 355, 266, 213, seeding, tunable dye lasers & OPOs available.

Becker & Hickl GmbH
Nahmitzer Damm 30
Berlin 12277 Germany
91 Boylston Street
Brookeline, MA 02445
P: +49 30. 787. 5632
F: +49 30. 787. 5734
info@becker-hickl.com
www.becker-hickl.com
World Leader in Time Correlated Single Photon Counting (TCSPC) for picosecond time resolved measurements of repetitive optical waveforms. Applications include diffuse optical tomography, fluorescence lifetime measurement, fluorescence lifetime imaging, and single molecule detection. Products include data recording and analysis electronics and software, photon counting detector modules, picosecond diode lasers and confocal scanners to convert any research grade microscope into a confocal laser scanning microscope. New compact lower cost OEM modules now available.

Boston Electronics Corporation
91 Boylston Street
Brookeline, MA 02445 USA
P: +1 617.566.3821
F: +1 617.731.0935
boselec@boslec.com
www.boselec.com
Photon Counting specialists. US Agents for Becker & Hickl GmbH of Berlin Germany and for id Quantique SA of Carouge (Geneva) Switzerland. Time Correlated Single Photon Counting (TCSPC) for Diffuse Optical Tomography and for Fluorescence Lifetime measurement applications including FLIM/FRET. Picosecond time resolved measurements of repetitive optical waveforms in convenient modular hardware for science.

Boulder Nonlinear Systems, Inc.
450 Courtney Way, #107
Lafayette, CO 80026 USA
P: +1 303.604.0077
kelly@bnonlinear.com
www.bnonlinear.com
Boulder Nonlinear Systems, Inc. (BNS) designs, manufactures, and sells standard and custom light control solutions. Spatial Light Modulators, Polarization Rotators, and Optical Shutters are offered for beam forming, beam steering, biotechnology, microscopy, military/civil defense, phase/polarization control, pulse shaping, wavefront analysis/testing, and other applications.

Genia Photonics, Inc.
500 Cartier Blvd. W Suite 131
Laval, QC H7V 5B7 Canada
P: +1 450.680.3401
F: +1 450.680.3391
info@geniaphotonics.com
www.geniaphotonics.com
Genia Photonics Inc. is an innovative company specializing in high-speed picosecond fiber-based lasers and spectroscopic measurement systems. Centered around our patented fiber laser technology, Genia's compact, easy to use and controlled via software systems will change the methodology for various applications in biomedical, industrial as well as defense and security.

Hamamatsu Corporation
360 Foothill Road
Bridgewater, NJ 08807 USA
P: +1 908.231.0960
F: +1 908.231.1539
hbylicki@hamamatsu.com
www.**hamamatsu**.com/
Hamamatsu Corporation is the North American subsidiary of Hamamatsu Photonics K.K. (Japan), a leading manufacturer of devices for the generation and measurement of infrared, visible, UV light and x-rays. These devices include photomultiplier tubes, photodiodes, image sensors, cameras, and light sources. Hamamatsu Photonics also offers specialized systems for select applications.

ID Quantique
Chemin de la Marbrerie 3
Carouge, Geneva CH-1227 Switzerland
P: +41.22.301.83.71
F: +41.22.301.83.79
michael.desert@idquantique.com
www.idquantique.com
IDQ offers photon-counters based on avalanche photodiodes in Geiger mode for the visible and infrared regions. It also includes Telecom short-pulse laser sources (id300). id100 is a photon counter based on silicon APD for VIS wavelength. id210 and id220 are based on InGaAs/InP APD (900-1700nm). The id210 has a 100MHz max. trigger rate and can operate in free running. The id220 offers the lowest dark count rate in free-running. The id400 is optimized for 1064nm.

Innolas Laser GmbH
Justus-von-Liebig-Ring 8
Krailing 82152 Germany
P: +1 413.562.4040
F: +1 413.562.6167
info@innolas-laser.com
www.innolas.com
Innolas is a leading German manufacturer of pulsed Nd:YAG lasers. Innolas offers models from 200-2000mJ, available in flash lamp or diode pumped lasers in order to go up to 200Hz. SHG, THG, FSG, seeding, and double pulse options are available.

ISS, Inc.
1602 Newton Drive
Champaign, IL 61822 USA
P: +1 217. 359. 8681
F: +1 271. 359. 7879
samantha.redes@iss.com
www.iss.com
ISS will be exhibiting the OxiplexTS – the first non-invasive monitoring device capable of determining the absolute concentration of the oxygenated and deoxygenated hemoglobin in tissues. ISS also provides a confocal microscope for FLIM, FRET, FFS applications; lifetime fluorometers working in either frequency-domain or TCSPC mode and modular components for building your own fluorometer or confocal microscope. Please visit us at www.ISS.com.

Lucid, Inc.
95 Methodist Hill Drive Suite 500
Rochester, NY 14623 USA
P: +1 585.239.9800
F: +1 585.239.9806
lucid@lucid-tech.com
www.lucid-tech.com
Lucid is the word leader in noninvasive confocal cellular imaging of skin in vivo. The company's innovative technologies are applied in a wide variety of application in basic research, cosmetics, aesthetics, pharmaceuticals and medical imaging and diagnostics. Lucid has built a secure networking platform that allows images to be captured and shared with a diverse team, enhancing the ability of the user to collaborate with others.

Navitar, Inc.
200 Commerce Drive
Rochester, NY 14623
P: +1 585.359.4000
F: +1 585.359.4999
info@navitar.com
www.navitar.com
Navitar is a leading manufacturer of precision optics for biotechnology and medical applications. Our high performance modular components - from Bio Kohler illumination to fluorescence to HMC® objectives - integrate into OEM and biotech research imaging systems. We help you create a solution as unique as your application.

NKT Photonics
1400 Campus Drive West
Morganville, NJ 07751 USA
P: +1 732.972.9937
F: +1 732.414.4094
laser_sales@nktphotonics.com
www.nktphotonics.com
NKT Photonics provides supercontinuum solutions, from nonlinear fibers to complete SuperK laser systems with plug and play accessories. Supercontinuum laser sources provide a white light output with the brightness of a laser and the spectral width of a lamp, replacing lasers and other sources used today for fluorescence imaging, OCT, FLIM, FRET and other applications in the 400-2400nm wavelength range. Use all the light, or tune, shape and manipulate it with our SuperK accessories.

Photonics Media
2 South Street
Pittsfield, MA 01201 USA
P: +1 413.499.0514
F: +1 413.442.3180
www.photonics.com
Photonics Media – the Pulse of the Industry – invites you to explore the information leader and all that we have to offer. As the publisher of Photonics Spectra, BioPhotonics and EuroPhotonics magazines, Photonics Buyers' Guide, Photonics.com, and more, we bring you the news, research and applications articles you need to succeed. Visit www.Photonics.com for your FREE subscriptions and much more.

PicoQuant Photonics North America, Inc.
8A Pumpkin Lane
Westfield, MA 01085 USA
P: +1 413.562.6161
F: +1 413.562.6167
info@picoquant-usa.com
www.picoquant-usa.com
Product lines include Pulsed Diode Lasers, Time-Correlated Single Photon Counting (TCSPC) electronics and detectors, fluorescence lifetime spectrometers, time-resolved fluorescence microscopes and upgrade kits for Laser Scanning Microscopes. Applications include Single Molecule Spectroscopy, Fluorescence Lifetime Imaging (FLIM), Fluorescence Resonance Energy Transfer (FRET), Fluorescence Correlation Spectroscopy (FCS), Optical tomography and Quantum Key Distribution.

PolarOnyx, Inc.
2526 Qume Drive, Suites 17&18
San Jose, CA 95131 USA
P: +1 408.573.0930
F: +1 408.573.0932
sales@polaronyx.com
www.polaronyx.com
World leading company in high energy/power ultrashort (fs,ps,ns) fiber lasers. Excellent for material processing, micromachining, spectroscopy, microscopy, biomedical instrumentation & optical sensing applications. OEM and instrument version are available. Wavelength ranges from UV to Mid-IR. Contact: Lihmei Yang, Director Sales & Product, lihmeiyang@polaronyx.com.
New products: Compact high energy/power ultrafast fiber lasers (UV to Mid-IR), GHz ultrafast fiber laser.

Santec USA Corporation
433 Hackensack Ave
Hackensack, NJ 07601 USA
P: +1 201. 488. 5505
F: +1 201. 488. 7702
info@santec.com
www.santec.com
Established in 1979, Santec is a global photonics engineering company and a leading manufacturer of Tunable Lasers, Optical Test and Measurement Products and Optical Components. Santec's high speed scanning levels were developed specifically for OCT applications, and feature high power, wide tuning, and fast scan to achieve high resolution real time 2-D imaging. Santec also offers a complete OCT system, IVS-200, which utilizes the HSL-200.

Time-Bandwidth Products, Inc.
8A Pumpkin Lane
Westfield, MA 01085 USA
P: +1 413. 564. 0610
F: +1 413. 562. 6167
sales-usa@tbwp.com
www.tbwp.com
Time-Bandwidth Products manufactures passively mode-locked tunable and fixed pico and femtosecond DPSS lasers using our patented SESAM© technology. Wavelengths from 262nm to1550nm are available at different rep rates and power levels reaching up to 50W to match your application in research or for industrial applications.

No photography is permitted in the exhibit hall.

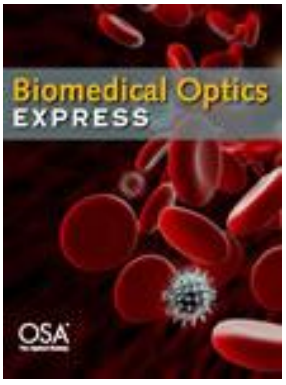
Thank you!

Toptica
1286 Blossom Drive Suite 1
Victor, NY 14564 USA
P: +1 585.657.6663
F: +1 877.277.9897
lisa.riggs@toptica-usa.com
http://www.toptica.com/
TOPTICA is a recognized global leader in diode laser and ultrafast technology for industrial and scientific markets. We offer the widest range of single mode tunable light in the 190 to 2900nm and 0.5-2.5THz spectral region with various accessories to measure, characterize, stabilize and analyze light. Our robust and most compact ultrafast fiber lasers are opening new avenues for spectroscopy, microscopy and life sciences, even for clinical integration. With our Passion for Precision, TOPTICA delivers!

Biomed and DH THANK OUR CORPORATE SPONSORS!

THORLABS

AMERICAN ELEMENTS®



2012 Biomedical Optics and Three-Dimensional Imaging Technical Program Update Sheet

Withdrawn Presentations

BSu3A.53 (BIOMED Poster Session I), **In-vivo Imaging of Embedded Surgical Sutures and the Surrounding Physiology with Photoacoustic Microscopy**, *A. Giannoula[1], L. Funk[2], C. Weis[2], P. Turon[2], T. Durduran[1]; [1] Institute of Photonic Sciences, Castelldefels, Spain; [2]Braun Surgical SA, Barcelona, Spain.*

DSu2C.7 (Special Techniques of Digital Holography) **Photorefractive Digital Holographic Microscopy,** Marcos Gesualdi[1]; *[1]Universidade Federal do ABC (UFABC), Santo Andre, Brazil.*

JM3A.22 (Joint BIOMED/DH Poster Session), **In vivo quantification of tumor metabolic demand in pre-clinical models using optical spectroscopy,** Tony Jiang[1], Narasimhan Rajaram[1], Chengbo [Liu1, 2], Fangyao Hu[1], Nimmi Ramanujam[1]; [1] Biomedical Engineering, Duke University, USA; [2]School of Life Science and Technology, Xi'an Jiatong University, Xi'an, China.

Changes in Presenters

BM2B.5, **Quantitative Photoacoustic Imaging by Acousto-Optically Measured Light Fluence**, will be presented by Khalid Daoudi, *University of Twente, MIRA Institute for Biomedical Technology and Technical Medicine - Biomedical Photonic Imaging group, Netherlands*

BW2A.2, **Dual-Band FDML Laser for Swept Source Spectroscopic OCT,** will be presented by Jianbing Xu, *the Univ. of Hong Kong, China.*

JM3A.4, **Wavelet synchronization index to assess variations in regional cerebral oxygenation in infants on life support**, will be presented by Ilias Tachtsidis, *Univ. College London, UK.*

JM3A.32, **Individualised Optimisation of Modelling Cerebral Oxgenation Near-Infrared Spectroscopy Signals** will be presented by Ilias Tachtsidis, *Univ. College London, UK.*

JM3A.38, **Correction of Shape-induced artifacts in spectroscopic imaging of biological media**, will be presented by Thu Nguyen, *Catholic Univ., USA*

JM3A.46, **Normative database of judgment of complexity task with functional near infrared Spectroscopy Application for TBI** will be presented by Laleh Najafizadeh, *HJF/CNRM/NIH, USA*

JM3A.55, **Superposition Procedure for Improvement of Digital Holographic Particle Field Reconstruction** will be presented by Dhananjay Kumar Singh, *I.I.T. Kanpur, India*

JM3A.62, **Geometrical Characterization of Micro-fiber in 3D Volume using Digital In-line Holography**, will be presented by Dhananjay Kumar Singh, *I.I.T. Kanpur, India*

JM3A.67, **Intensity Based Holographic Reconstruction of Symmetric and Asymmetric Object Field,** will be presented by Dhananjay Kumar Singh, *I.I.T. Kanpur, India*

JM3A.69, **Diffuse Optical Tomography Imaging of the Hemodynamic Response to a Breath Hold for Use in Breast Cancer Detection** will be presented by Jacqueline Gunther, *Columbia Univ., USA.*

Presider Changes

Session BW3A, Breast Cancer Imaging (13:30-15:30 Wednesday 2 May) will be presided by Stefan Andersson-Engels, *Lund Univ., Sweden.*

Session BW4B, New Spectroscopic Techniques and Applications, (16:00 – 18:00, Wednesday 2 May) will be presided by Martin Wolf, *Univ. Hospital of Zurich, Switzerland.*

Change in Author

BW1B.6, **Stokes Shift Spectroscopy and imaging for highlighting the difference of breast cancerous and normal tissues**, added author Tang Guichen, *City College of City Univ of New York - Physics, Institute for Ultrafast Spectroscopy and Lasers, USA.*

Program Changes

Myung "Paul" Kim will now be giving a tutorial presentation in place of George Barbastathis. The presentation will be titled: Special Techniques in Digital Holography and will be presented on Tuesday, 1 May from 8:00-8:40 am during the Digital Holographic Microscopy II session.

The OIDA Session will be held 18:00-20:00 Tuesday, 1 May in Symphony IV.