European Optical Society

Coherence for Europe

1st EOS Topical Meeting on Frontiers in Optical Imaging (FOI 2013)

16 - 18 September 2013, Centre Loewenberg, Murten, Switzerland

FINAL PROGRAMME

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PROGRAMME

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INFORMATION FOR AUTHORS AND ATTENDEES

ORAL PRESENTATIONS

Time slots:
Regular presenting authors are allotted 15 minutes (12 min. presentation plus 3 min. for discussion), keynote and invited speaker slots are 45 minutes (35 min. presentation plus 10 min. for discussion).

Presentation upload:
Speakers are requested to upload their presentation to the computer in the meeting room well in advance to their talk.

Presentation format:
Please bring your presentation on a USB mass storage and include all video files. File formats: ppt, pptx and pdf. A Windows-based presentation computer will be provided.

For Mac users:
To make sure your presentation is displayed correctly, please:
... bring your presentation as pdf-file with fonts embedded or
... restrict yourself to Arial/Times New Roman (not Times)/Courier New (not Courier)/Symbol/Wingdings when creating your ppt- or pptx-file.

Technical equipment:
All technical equipment (presentation computer, video projector, laser pointer) is provided by the organizer. Please do not use your own laptop for the presentation, but bring your presentation on a USB stick. Connecting other laptops to the video projector easily causes technical problems and avoidable delays.

POSTER PRESENTATIONS

Poster authors are requested to be present at their posters during the official poster session on Tuesday, 17 September from 15.00 to 17.00. Poster set-up and removal is in the responsibility of the authors. Material for poster set-up will be provided by the organiser.

Any posters left on the boards at the close of the poster session will be discarded. Poster numbers will be displayed on the poster boards to show authors where to place their poster.

Required poster size: width 110cm / height: 140cm

EOS REGISTRATION DESK

On-site registration hours		**Information / Receipts / Confirmation of attendance / Cash payment**
Sunday, 15 September	tba.	
Monday, 16 September	tba.	Attendees paying by cash must bring the exact change in Euro.
Tuesday, 17 September	tba.	
Wednesday, 18 September	tba.	

EOS CONFERENCE DIGEST

The registration fee includes a CD-ROM with the complete volume of accepted abstracts. The EOS does not publish conference proceedings with extensive papers. Authors who wish to publish in-depth papers are welcome to take advantage of the special publication offer from JEOS:RP (see next paragraph). This publication offer is an option but no obligation.

JEOS:RP - SPECIAL PUBLICATION OFFER

Attendees of FOI 2013 are welcome to submit a paper to the Journal of the European Optical Society - Rapid Publications (JEOS:RP). JEOS:RP is a peer-reviewed open-access journal at www.jeos.org.

The paper must be an original high-quality contribution connected to FOI 2013 and will be reviewed according to the normal procedure of the journal. In case of acceptance authors receive a 20% discount on the publication rate. The paper must be submitted no later than 30 October 2013.

JEOS:RP EOS
www.jeos.org

Special publication fee for standard papers
... 280 €* (instead of 350 €) for full EOS members
... 320 €* (instead of 400 €) for non EOS members [* plus 19% VAT if applicable]

BEST STUDENT PRESENTATION AWARD

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The best student oral and poster presentation will be awarded a diploma and a book prize sponsored by Springer. All student oral and poster contributions are eligible. The criteria for the award are relevance, originality, scientific merit and clarity. The winners of the best student oral and poster award will be announced at the end of the last session.

VENUE

Centre Löwenberg
Löwenberg 43, 3280 Murten, Switzerland
www.sbb.ch/sbb-konzern/centre-loewenberg.html

WIFI ACCESS

Centre Löwenberg offers free WIFI access.

GETTING AROUND IN MURTEN

BY PUBLIC TRANSPORT

Public transportation in and around Murten is based on a well organised bus and train network.

From Centre Loewenberg to the city centre & the Old Town
From the next station to the venue, *Muntelier-Löwenberg*, trains depart regularly towards *Murten Central Station*, the journey takes only about 2 min. From there it is just a short walk of ~ 5-10 min. to the Old Town of Murten.

Tickets

- A single journey ticket costs about CHF 2.20.
- A one-day ticket costs about CHF 5.70.

Running times

From 'Muntelier-Löwenberg' to 'Murten Central Station'

Weekend:	06:38; XX:39, XX:56 from 06:56 to 21:56 22:42, 22:56, 23:31, 23:39, 00:34, 00:45
Mon.-Fri.:	06:09, 06:38 XX:39 and XX:56 from 06:56 to 22:56 22:42, 23:31, 23:39 XX:09 from 06:09 to 09:09, from12:09 to 14:09, from 17:09 to 19:09

From 'Murten Central Station' to 'Muntelier-Löwenberg'

Weekend:	XX:15,XX:58 from 06:15 to23:15; 00:23 23:58 only Saturday
Mon.-Fri.:	XX:15, XX:45, XX:58 from 06:15 to18:58 XX:15, XX:58 from 19:15 to 23:58 00:23 only Friday

Links

- Find your connection from the venue (stop *Muntelier-Löwenberg*) to a touristic attraction your favoured restaurant in Murten at the operator's website: http://fahrplan.sbb.ch/bin/query.exe/en
- SBB vending machines: www.sbb.ch/en/station-services/am-bahnhof/dhl-service-point/automatic-ticket-machine.html

CONFERENCE DINNER

Date and time:	Monday, 16 September 2013, starting at 20.00
Location:	Hotel Murtenhof & Krone Rathausgasse 1-5 CH-3280 Murten www.murtenhof.ch

How to get there from Centre Loewenberg:

- Go to the train stop "Muntelier-Loewenberg" (distance: ~ 750 m)
- Take the train S5 direction "Murten"
- Exit at the next stop "Murten" (duration: ~ 4 min.)
- When you have left the train turn right on "Bahnhofstrasse", follow "Bahnhofstrasse" for about 300 m and then turn right into "Rathausgasse".

GENERAL CHAIRS

Peter Seitz
ETH Zurich, EPFL Lausanne and Hamamatsu Photonics (CH)

Hervé Rigneault
Institut Fresnel (FR)

PROGRAMME COMMITTEE

Joseph Braat, Delft Univ. of Technology (NL)
Bart Dierickx, Free Univ. of Brussels (BE)
Christian Eggeling, Univ. of Oxford (UK)
Sylvain Gigan, Institute Langevin (FR)
Franco Gori, Univ. di Roma (IT)
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Volker Seyfried, Leica Microsystems (DE)
Jacob Stamnes, Univ. of Bergen (NO)
Nicolas Treps, École Normale Supérieure - Paris (FR)
Michael Unser, EPFL (CH)

DAILY OVERVIEW

MONDAY, 16 SEPTEMBER 2013	
09.00 - 10.30	OPENING SESSION
10.30 - 11.00	COFFEE BREAK
11.00 - 12.30	3D OPTICAL IMAGING
12.30 - 14.00	LUNCH BREAK
14.00 - 15.30	RAMAN IMAGING
15.30 - 16.00	COFFEE BREAK
16.00 - 17.15	ADVANCED OPTICAL IMAGING METHODS
17.30 - 19.00	MICROCOR MANAGEMENT MEETING
20.00	CONFERENCE DINNER

TUESDAY, 17 SEPTEMBER 2013	
09.00 - 10.30	FLUORESCENCE MICRO– AND NANOMICROSCOPY
10.30 - 11.30	COFFEE BREAK
11.30 - 12.30	ADVANCED MICROSCOPY METHODS
12.15 - 14.00	LUNCH BREAK
14.00 - 15.00	NOVEL CONTRAST MECHANISMS
15.00 - 17.00	POSTER SESSION
17.00 - 19.00	MICROCOR FEMALE MENTORSHIP ESR SESSION

WEDNESDAY, 18 SEPTEMBER	
09.00 - 10.30	COMPLEX MEDIA IMAGING AND QUANTUM OPTICS
10.30 - 11.00	COFFEE BREAK
11.00 - 12.45	POLARIZATION IMAGING
12.45 - 13.00	STUDENT AWARD CEREMONY
13.00 - 14.00	END OF FOI 2013

09.00 - 09.10 **WELCOME AND OPENING**
P. Seitz (ETH Zurich, EPFL, Hamamatsu Photonics, CH)

09.10 - 10.00 **KEYNOTE TALK**
GEOMETRY AND LIGHT: THE SCIENCE OF INVISIBILITY
U. Leonhardt (Weizmann Institute of Science, IL)
Science Magazine [1] listed transformation optics among the top 10 science insights of the decade 2000-2010. The lecture gives an introduction into this subject [2] that may, literally, transform optics.

10.00-10.15
Space and time multiplexing for field curvature correction in miniature imaging systems
E. Logean, T. Scharf, H.P. Herzig (EPFL IMT OPT, CH)
The correction of field curvature by space or time multiplexing enables the design of a very simple imaging system for mobile device. Here, the optical design is presented and methods to correct the field curvature are discussed. This imaging system can be fabricated with wafer-level processes enabling large-scale and low cost production. [1569782037]

10.15-10.30
The superresolution imaging with optical vortex scanning microscope
J. Masajada, A. Popiolek-Masajada, I. Augustyniak (Wroclaw Univ. of Technology, PL)
The idea of the optical vortex scanning microscope is presented. The basic measurement methodology and instrument characteristics are discussed. The experimental verification of the OVSM idea is also presented. [1569776401]

10:30-11:00 Coffee break

11.00-12.30 3D OPTICAL IMAGING
Session Chair: Christian Eggeling (University of Oxford, GB)

11.00-11.15
Optical coherence tomography with dispersion cancelation based on classical spectral intensity correlations
T. Shirai[1], A. Friberg[2] ([1]National Institute of Advanced Industrial Science and Technology (AIST), JP; [2]Univ. of Eastern Finland, FI)
We present a setup for spectral-domain optical coherence tomography based on classical intensity correlations and show theoretically that it enables resolution-enhanced cross-sectional imaging including dispersion cancelation effects. The method employs a Hong-Ou-Mandel interferometer and requires no scanning and no fast detectors. [1569776965]

11.15-11.30
High resolution 3D quantitative imaging with tomographic diffractive microscopy
Y. Ruan[1], T. Zhang[1], G. Maire[1], P. Chaumet[1], H. Giovanni,[1] K. Belkebir[1], A. Sentenac[1], A. Talneau[2] ([1]Aix-Marseille Univ., CNRS, FR; [2]Laboratoire de Photonique et de Nanostructures, CNRS, FR)
We have developed a tomographic diffractive microscope and a nonlinear inversion procedure to reconstruct the permittivity map of tri-dimensional objects in the multiple scattering regime, where linear scattering models cannot be applied, with a resolution well beyond the Rayleigh criterion. [1569782141]

11.30-11.45 STUDENT PRESENTATION
Tomographic incoherent phase imaging, a diffraction tomography alternative
S. Aknoun[1,2], P. Bon[1], J. Savatier[1], B. Wattelier[2], S. Monneret[1] ([1] Institut Fresnel, CNRS, FR; [2] PHASICS SA, FR)
We describe the use of tomographic incoherent phase imaging to reconstruct the refractive index distribution of semi-transparent biological samples. A quadri-wave lateral shearing interferometry technique is used to process quantitative phase imaging (QPI) recording both intensity and phase components of an incident electromagnetic field. [1569782685]

11.45-12.00 STUDENT PRESENTATION
Optimising detectors distribution for photoacoustic imaging
N. Song, C. Deumie, A. da Silva (Aix Marseille Université, CNRS, FR)
Breast cancer dominates cancers in females. Among the various techniques for breast imaging, photoacoustic imaging is gaining increasing importance, because it offers potentially the possibility to couple high sensitivity brought by the optical illumination and high spatial resolution by the acoustical detection. In the present work, the focus is put on optimizing the distribution and sizes of the transducers for the optimal design of a photoacoustic mammography. [1569782135]

12.00-12.15 STUDENT PRESENTATION
Object and Aberration Retrieval by Using Extended Nijboer-Zernike Theory
Y. Shao, A. Polo, S.F. Pereira, H.P. Urbach (Delft Univ. of Technology, NL)
The object and aberration retrieval from intensity measurements is studied with the aid of the Extended

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Nijboer-Zernike theory. A robust retrieval algorithm is developed involving the implementation of Tikhonov regularization and L-curve method for choosing the regularization parameter. [1569782017]

12.15-12.30 STUDENT PRESENTATION

High-Speed Imaging of Short Wind Waves by Shape from Refraction

D. Kiefhaber[1], P. Fahle[1], R. Rocholz[1,2], B. Jähne[1,3] ([1]Heidelberg Univ., Inst. fuer Umweltphysik, DE; [2]Heidelberg Engineering GmbH, DE; [3]Heidelberg Univ., Heidelberg Collaboratory for Image Processing, DE)

This paper introduces the first high-speed system for slope imaging of wind-induced short water waves based on telecentric illumination and imaging optics and using the shape from refraction principle. Surface slopes up to 2 are measured with a resolution of 960 x 720 at more than 1500 fps. The principle is explained and illustrated with example images. [1569777127]

12.30-14.00 LUNCH BREAK

14.00-15.30 RAMAN IMAGING

Session Chair: Julian Moger (University of Exeter, GB)

14.00-14.45 INVITED TALK

Tip-Enhanced Raman Spectroscopy

R. Zenobi, C. Blum L. Opilik, T. Schmid, B. Stephanidis (ETH Zurich, CH)

Tip-enhanced Raman Spectroscopy (TERS) is the spectroscopic "cousin" of AFM and STM. The principle is very similar to SERS, where metallic nanostructures on a surface, onto which a sample film is deposited, leads to a huge enhancement (1000 - 10**6 times) of the normally quite weak Raman scattering. TERS can be viewed as "SERS upside down": instead of bringing the sample to the enhancing SERS substrate, a single metallic nanostructure is brought by means of a scanning microscope tip to the sample of interest. With the introduction of highly enhancing TERS tips, fast CCD detectors, and advanced scanning probe microscopy techniques, true spectroscopic imaging has become a reality. Images can now be recorded with full spectral information at every pixel, using large pixel numbers, within minutes. This will be exemplified with spectroscopic maps obtained on mixed dye layers, segregated lipid domains, self-assembled monolayers, and graphene. [1569777179]

14.45-15.00

Evaluation of polyglutamine aggregate structure in vitro and in vivo, new avenues for CARS microscopy

T. Melvin[1]; N.M. Perney[1], L. Braddick[1],B. Brocklesby[1], M. Jurna[2], H. Offerhaus[2], L. Serpell[3], E. Blanch[4], L. Holden-Dye[5] ([1]Univ. of Southampton, GB); [2]Univ. of Twente, NL; [3]Univ. of Sussex, GB; [4]Univ. of Manchester, GB; [5]Univ. of Southampton, GB)

Coherent anti-Stokes Raman scattering (CARS) microscopy has been demonstrated for the evaluation of the protein secondary structure of polyglutamine (polyQ) aggregates in vivo. [1569776991]

15.00-15.15

Visualising drug delivery to the skin using Stimulated Raman Scattering

N.L. Garrett, J. Moger (Univ. of Exeter, GB)

Skin is physically tough, highly scattering to light and relatively impermeable to chemical compounds, thus investigation into the penetration of drugs into the skin is a complex and dynamic problem. We present Stimulated Raman scattering (SRS) as a technique to visualise structural features within pig skin models and live human skin. Penetration of topically applied drugs via hair follicles and through the stratum corneum was visualised using SRS microscopy. We present the first SRS visualisation of drug penetration via apocrine sweat glands, an important finding for the development of effective transdermal drug delivery systems. [1569777197]

15.15-15.30 STUDENT PRESENTATION

Imaging human sweat pore and molecular absorption in skin with coherent Raman scattering microscopy

X. Chen[1], P. Gasecka[1], D. Pele[2], F. Formanek[2], J.-B. Galey[2], H. Rigneault[1] ([1]Institut Fresnel, MOSAIC, CNRS, FR; [2]L'Oréal Advanced Research, FR)

Coherent Raman scattering (CARS and SRS) microscopy are used to study (1) the penetration of cosmetic active molecules in artificial and human skin and, (2) the in vivo sweating process from individual human sweat pore. [1569775727]

15.30-16.00 Coffee break

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16.00-17.15 ADVANCED OPTICAL IMAGING METHODS
Session Chair: Yaron Silberberg (Weizmann Institute of Science, IL)

16.00-16.45 INVITED TALK

Advancing optical imaging with spatial light modulators

M. Ritsch-Marte (Innsbruck Medical Univ., AT)

High resolution spatial light modulators (SLMs) can advance linear and non-linear light microscopy in many ways, concerning improved contrast, resolution, or tailored illumination. Apart from flexible Fourier -filtering, multi-panel imaging is possible, e.g. for depth-of-field multiplexing or single-shot quantitative microscopy of dynamic samples. [1569781935]

16.45-17.00 STUDENT PRESENTATION

Combining micropipette aspiration and Non-Linear Microscopy to study protein-lipid interactions

B.C. Sarri, P.G. Petrov, J. Moger, C.P. Winlove (Univ. of Exeter, GB)

We demonstrate the possibility of combining micropipette aspiration techniques with non-linear optical microscopy. Protein-lipid interactions are investigated and their effect on microdomain organization when pressure is applied is visualised at the same time. This opens the possibility to investigate the effect of membrane lateral tension on protein-membrane interactions and microdomain membrane organisation. Giant unilamellar vesicles were used as a model membrane system and highlighted using Stimulated Raman Scattering. Two proteins of interest have been studied: alpha-elastin and spectrin. Elastin is an auto-fluorescent protein of the extracellular matrix which was imaged using two-photon fluorescence whereas spectrin is the main component of the cytoskeleton of the red blood cell (RBCs), responsible for maintaining RBC's shear elasticity. Spectrin was FITC-tagged and imaged using one photon fluorescence microscopy. [1569777039]

17.00-17.15

Toward endoscopes with no distal optics

E. R. Andresen[1], G. Bouwmans[2], S. Monneret[1], H. Rigneault[1] ([1]Institut Fresnel, FR; [2]Univ. de Lille, FR)

We realized a video-rate lens less point scanning endoscope. A 2 m long 400 µm diameter bundle of single-mode fibers was used as the endoscope probe. Point scanning was achieved by spatial pulse shaping and galvanometric scanning before the bundle. The method was validated on a resolution test chart. [1569775639]

17.30-19.00 MICROCOR MANAGEMENT MEETING

20.00 CONFERENCE DINNER
HOTEL MURTENHOF & KRONE

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09.00-10.30 FLUORESCENCE MICRO– AND NANOMICROSCOPY
Session Chair: Renato Zenobi (ETH Zurich, CH)

09.00-09.45 **INVITED TALK**

Fluorescence RESOLFT Nanoscopy of the Living Cell

C. Eggeling (Univ. of Oxford, GB)

Recent developments in fluorescence far-field microscopy have realized cellular imaging with a spatial resolution far below the diffraction limit. We present the implementation of STED, RESOLFT, and GSD nanoscopes for novel insights into live cell mechanisms with focus on plasma membrane heterogeneity and receptor signaling. [1569778563]

09.45-10.00 **STUDENT PRESENTATION**

High-Resolution 2-D Fluorescence Imaging of the Mass Boundary Layer Thickness at Free Water Surfaces

C. Kräuter[1], D. Trofimova[1,2], L. Nagel[1,2], B. Jähne[1,2] ([1]Univ. of Heidelberg, DE); [2]Heidelberg Collaboratory for Image Processing, DE)

A novel 2-D fluorescence imaging technique has been developed in order to measure the thickness of the mass boundary layer in the top micrometers of the water surface with high spatial and temporal resolution. This paper presents the used method, its deployment at a large wind-wave tank, and shows first results. [1569782085]

10.00-10.15 **STUDENT PRESENTATION**

Imaging Nitrogen-Color center in diamond nanocrystals by STED microscopy

M.-P. Adam[1], S. Arroyo Camejo[2], J.-J. Greffet[3], J.-P. Hugonin[3], M. Besbes[3], J. Jacques[1], F. Treussart[1], S. Hell[2], J.-F. Roch[1] ([1]ENS Cachan & Univ. Paris Sud, FR; [2]Max Planck Institute for Biophysical Chemistry, DE; [3]Institut d'Optique ParisTech, FR)

We show that the working principle of STimulated Emission Depletion (STED) microscopy is preserved even for imaging of Nitrogen-Vacancy (NV) centres in nanodiamonds (ND) of sub-wavelength size. The resolution of single NVs and the resolvability of close NVs are comparable to the performance in bulk diamond. [1569777021]

10.15-10.30

Polarization resolved fluorescence and nonlinear microscopy: A unified approach for structural bio-imaging

J. Duboisset, P. Ferrand, F.-Z. Bioud, P. Gasecka, A. Kress, J. Savatier, H. Rigneault, S. Brasselet (Institut Fresnel, MOSAIC, CNRS, FR)

We present a general method for the read-out of polarization resolved fluorescence and nonlinear signals. We show that adding polarization sensitivity to microscopy contrasts provides refined multimodal structural and functional information complementing morphological imaging in cells and tissues. [1569782169]

10:30-11:00 Coffee break

11.00-12.30 ADVANCED MICROSCOPY METHODS
Session Chair: Monika Ritsch-Marte (Medical University of Innsbruck, AT)

11.00-11.15 **STUDENT PRESENTATION**

Multimode optical fiber based excitation for Optical-Resolution Photoacoustic Microscopy

I.N. Papadopoulos[1], O. Simandoux[2], S. Farahi[1], J.-P. Huignard[3], E. Bossy[2], D. Psaltis[1], C. Moser[1] ([1]EPFL, CH; [2]ESCPI ParisTech, FR; [3]Jphopto-consultant, FR)

We demonstrate Optical Resolution Photoacoustic Microscopy by using a multimode fiber for the optical excitation part. The field at the output of the fiber is focused and scanned using Digital phase conjugation and we report on OR-PAM images with a resolution of 1.5um and a Field of View of 201x201um. [1569777027]

11.15-11.30 **STUDENT PRESENTATION**

Optimized phase-sensitive near-field nanoscopy using a modified lock-in detection

A. Al Mohtar[1,2], A. Bruyant[1], J. Vaillant[1], M. Kazan[3], L. Joly[4], C. Stoeffler[4], J. Cousin[4], A. Khoury[2], N. Dumelié[4], R. Deturche[1] ([1]Univ. of Technology of Troyes, FR; [2]Lebanese Univ., LB; [3]American Univ. of Beirut, LB; [4]Univ. de Reims, FR)

Phase-sensitive near-field nanoscopy is performed in the mid-IR region using modified lock-in detection. The method which is optimum in terms of signal to noise ratio is presented, in addition to its application on different samples. Precise, stable, and highly resolved detection was achieved with an efficient suppression of unwanted background light. [1569781987]

11.30-11.45 **STUDENT PRESENTATION**

IR nanoscopy of cells and intracellular therapeutic agents

E. Kennedy, R. Al-Majmaie, M. Al-Rubeai, D. Zerulla, J.H. Rice (Univ. College Dublin, IE)

Infrared nanospectral absorption imaging (nano-IRI) is applied to map the subcellular localization of a photodynamic agent (toluidine blue-conjugated gold nanoparticles) within colon adenocarcinoma cells. We illustrate that nano-IRI enables subcellular analysis with studies of cell numbers that are statistically significant. [1569776867]

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11.45-12.00
Measuring Image Resolution in Localization Microscopy
R. Nieuwenhuizen, B. Rieger, S. Stallinga (Delft Univ. of Technology, NL)
We propose an integral resolution measure for optical nanoscopy based on Fourier Ring Correlation (FRC). The FRC-resolution can be used to compare different localization and other image processing algorithms, labeling strategies, monitor resolution buildup during data acquisition, characterize heterogeneity and anisotropy of resolution in 2D and 3D, and, surprisingly, enables counting of the number of molecules contributing to the image. [1569776831]

12.00-12.15
The reduction-annihilation of the aberrations of an optical system by a balancing ghost imaging technique
F. Wang[1], Y. Cai[1], B. Hoenders[2] ([1]Soochow Univ., CN; [2]Univ. of Groningen, NL)
It is shown, using ghost imaging techniques, that it is possible to reduce or even annihilate (some) of the aberrations of an arbitrary optical system like a lithographic lens. To this end we consider a ghost imaging setup which consists of two arms each containing an optical system. The reduction- cancelation is achieved manipulating the values of the pertinent aberration coefficients of one of the lenses in an arm of the ghost imaging device. Examples of such a reduction- cancellation are shown e.g. for the spherical aberration and defocusing aberrations. [1569776971]

12.15-14.00 LUNCH BREAK

14.00-15.00 NOVEL CONTRAST METHODS
Session Chair: Hervé Rigneault (Institut Fresnel, FR)

14.00-14.15
NEXRAY: Next Generation X-rays
R. Kaufmann[1], A. Dommann[1], H. von Känel[3], P. Gröning[2], T. Bandi[1], B. Batlogg[3], A. Bischof[1], C. Bosshard[1], D. Chrastina[4], H. Elsener[2], C. Falub[3], S. Giudice[1], O. Gröning[2], F. Isa[4], G. Isella[4], R. Jose James[1], C. Kottler[1], T. Kreiliger[3], R. Longtin[2], L. Miglio[4], A. Neels[1], P. Niedermann[1], A. Pezous[1], J. Sanchez[2], G. Spinola Durante[1], A. Taboada[3], Y. Zha[4] ([1]CSEM, CH; [2]EMPA, CH; [3]ETH, CH; [4]L-NESS, IT)
Within the Swiss Nano-Tera project NEXRAY new miniaturised X-ray sources and highly integrated detectors were developed, which enable totally new X-ray imaging modalities like e.g. static tomography without any moving parts. [1569777061]

14.15-14.30
Dark field imaging with a grating interferometer for materials characterization
V. Revol[1], C. Kottler[1], B. Plank[2], R. Kaufmann[1], J. Kastner[2], A. Neels[3] ([1]CSEM, Zurich, CH; [2]Univ. of Applied Sciences Upper Austria, AT; [3]CSEM Neuchâtel, CH)
Scatter dark field imaging with an X-ray grating interferometer is implemented for the characterisation of materials, in particular for polymers, composites and light metals. Experimental results are used to illustrate how sub-pixel features and/or defects can be analysed quantitatively in large samples and with reasonable measurement times. [1569776995]

14.30-14.45
High-resolution fluorescence imaging by LiF detectors for characterization of X-ray poly-capillary optics
F. Bonfigli[1], D. Hampai[2], S.B. Dabagov[2,3], R.M. Montereali[1] ([1]ENEA, IT; [2]INFN - LNF, IT; [3]RAS P.N Lebedev Physical Institute, RU)
High-resolution solid-state imaging detectors based on photoluminescent color centers in lithium fluoride have been successfully used for X-ray imaging performed by conventional X-ray tube combined with poly-capillary optics. We present the characterization of X-ray beam propagation through poly-capillary lens by the use of LiF detectors. [1569776863]

14.45-15.00
Dry mass and cell cycle follow-up from quantitative phase imaging
J. Savatier[1], S. Aknoun[1,2], P. Bon[1], S. Monneret[2] ([1]Inst. Fresnel, CNRS, Aix-Marseille Univ., FR; [2]PHASICS SA, FR)
We propose a simple method to analyze cell cycle and dry mass fluctuations of live cells using quantitative phase imaging. It uses a sensitive wave front sensor that can be implemented on any microscope with a regular white light. We analyzed dry mass of yeast, red blood cells and different cell lines under different conditions. [1569782407]

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15.00-17.00 POSTER SESSION

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Object reconstruction for imaging optical system
J. Novak, P. Novak, A. Miks (Czech Technical Univ. in Prague, CZ)
A theoretical analysis of the imaging process of the object by the aberrated optical system and the influence of aberrations on the process of the object reconstruction is described. Two approaches for the reconstruction are presented in the spatial and frequency domain. [1569772083]

Irreversibility and partial polarization
P. Réfregier[1], T. Setälä[2], A. Friberg[2] ([1]Fresnel Institute, FR; [2]University of Eastern Finland, FI)
We analyze and discuss the irreversible (i.e. oriented) evolution of degrees of order, such as degrees of coherence and degrees of polarization in 2D and 3D, which can appear when partially polarized light is modified by random transformations. [1569775653]

Recent progress in ophthalmic diagnostic imaging technologies
V.K. Shinoj[1], J. James[1], V.M. Murukeshan[1], M. Baskaran[2], T. Aung[2] ([1]Nanyang Technological University, SG; [2]Singapore Eye Research, SG)
This article analyses the visualisation capabilities of various ocular imaging techniques such as gonioscopy, optical coherence tomography (OCT), ultrasonography (US) and photoacoustic imaging (PAI) for anterior chamber imaging applications. [1569776261]

Multispectral CARS imaging of thiophenol adsorbed on silver nanoaggregates
S. Centeno[1], G. Schäfer[2], R. Görgülü[2], D. Wöll[2], J. C. Otero[1], A. Zumbusch[2] ([1]Univ. of Málaga, ES; [2]Univ. of Konstanz, DE)
In this work we present multispectral CARS images of thiophenol adsorbed on silver nanoaggregates. A lambda stack of the sample is recorded by tuning the frequency difference of the pump lasers along the 8a ring vibrational resonance. CARS intensities on each spot were analyzed using a 2D Gaussian fit and tracked along the different lambda frames so that the corresponding spectrum was derived. [1569777047]

Exploring lipid distributions in human liver cell lines using CARS microscopy
A. D. G. Nunn[1], T. Scopigno[1], N. Pediconi[2], M. Levrero[2], A. Mai[3], H. Fink[4], H. Hagman[4], A. Enejder[4] ([1]Sapienza Univ. of Rome, Dept. of Physics, IT; [2]Sapienza Univ. of Rome, Dept. of Internal Medicine, IT; [3]Sapienza Univ. of Rome, Dip. di Chimica e Tecnologie del Farmaco, IT; [4]Chalmers Univ. of Technology, SE)
We study the effect on the lipid droplet distributions in fixed hepatocytes using 3D coherent anti-Stokes Raman (CARS) imaging of oleic acid induced overload steatosis treatment thereof with a model drug, and of wild-type and mutated Hepatitis B virus transfections. [1569778393]

Single Molecule Fluorescence Imaging of Pyrrolopyrrole Cyanines Dyes
G. Bosman. M. Winterhalder, S. Wiktorowski, A. Zumbusch (Univ. of Konstanz, DE)
We propose a new scheme for the extraction of the vibrational information from a single fluorescent molecule at room temperature. This scheme allowed for the first observation of anti-stokes fluorescence at the single molecule level of Pyrrolopyrrole Cyanine dyes. [1569782051]

Studies of the third order response from a globular photonic crystal (opal) by fs - CARS in a confocal arrangement
G. Knopp, Y. Liu, Y. Sych, P. Radi, T. Gerber (Paul Scherrer Institut, CH)
Confocal time-domain fs-CARS experiments have been performed on an opal matrix. The radiation in epi-direction at the anti-Stokes wavelength has been detected as function of the delay time and intensity. Large intensity modulations depending on the pulse energy and time delay have been observed. [1569782167]

Imaging Hydrogels 3D structure for tissue engineering with OPT and SPIM STUDENT PRESENTATION
A. Soto de la Cruz, J. Hyttinen, E. Figueiras (Tampere Univ. of Technology, FI)
Hydrogels have many applications in tissue engineering (TE) research due to their similarities to soft tissue. Benefits of using optical projection tomography (OPT) and selective plane illumination microscopy (SPIM) optical techniques for image 3D hydrogel structures are discussed. [1569776637]

STUDENT PRESENTATION
In situ dissolution analysis using coherent anti-Stokes Raman scattering (CARS) microscopy
A. Fussell[1], E. Garbacik[1], H. Offerhaus[1], P. Kleinebudde[2], C. Strachan[3] ([1]Univ. of Twente, NL; [2]Heinrich Heine Univ., DE; [3]Univ. of Helsinki, FI)
CARS microscopy was used to visualize solid-state changes on the surface of theophylline tablets undergoing dissolution and to correlate these changes with variations in dissolution rate. We observed solid-state changes on the tablet's surface and were able to correlate the solid-state change with a change in dissolution rate. [1569776753]

Multi-Channel Spectrometer for Depth Sensing Applications STUDENT PRESENTATION
D. Ernst[1], P. Steiner[1,2], A. Bossen[1], B. Považay[1], Ch. Meier[1] ([1]Bern Univ. of Applied Sciences, CH; [2]University of Bern, CH)
A compact multi-channel spectrometer for low coherence interferometry and optical coherence tomography is presented that features a spectral resolution better than 0.1nm per pixel for application in phase-stable, depth resolved optical sensing. [1569776915]

15.00-17.00 POSTER SESSION (CONTINUED)

Quantitative birefringence imaging using quadri-wave lateral shearing interferometry (QWLSI)
S. Aknoun[1,2], P. Bon[1], J. Savatier[1], B. Wattelier[2], S. Monneret[1] ([1]Institut Fresnel, CNRS, FR; [2]PHASICS SA, FR)
We describe the use of quantitative phase imaging (QPI) to enhance specifically the contrast of ordered components inside biological samples. [1569782909]

17.00-19.00 MICROCOR FEMALE MENTORSHIP/EARLY STAGE RESEARCHER SESSION

NOTES

09.00-10.30 COMPLEX MEDIA IMAGING AND QUANTUM OPTICS
Session Chair: Ulf Leonhardt (Weizmann Institute of Science, IL)

NOTES

09.00-09.45 INVITED TALK

Controlling light in complex media: Looking around corners and through turbid layers

Y. Silberberg (Weizmann Institute of Science, IL)

The propagation of light in inhomogeneous media, such as biological tissues and the turbulent atmosphere, results in wavefront distortion and scattering, which imposes a major limitation in many applications. Examples range from microscopy and nanosurgery to astronomy. In addition to the frequently encountered spatial distortions, multiple-scattering also randomly distorts the polarization state of the incident light, and its temporal and spectral characteristics. However, although multiple-scattering is a random process, it is a deterministic one and it can be undone. I shall review recent progress in the field of wavefront shaping, where spatial light modulators (SLM) are used to control and correct the spatial, temporal, spectral and polarization distortions in random media. I shall demonstrate this technique applicability for spatiotemporal focusing of femtosecond pulses through biological tissues, and for real-time imaging 'around corners' and through scattering layers.

09.45-10.00

Quasi-confocal second harmonic microscopy

C. Macias-Romero, S. Roke (EPFL, CH)

Second harmonic microscopy is a powerful imaging technique used increasingly in life sciences. We explore the possibility of decreasing image acquisition times and label-free time-resolved imaging of surface processes. To do so we have modified the typical configuration of the second harmonic microscope into a mixture of confocal and Koehler illumination, and we opted for a laser source pulsed in the KHz regime. In this talk we present the system in detail and show examples of biological samples. We also explore dynamic processes such as droplet/particle tracing and diffusion. [1569776173]

10.00-10.15

Artefact suppression in SRS microscopy

P. Berto, E.R. Andresen, H. Rigneault (Institut Fresnel, FR)

We implement a three colours scheme in SRS microscopy that is able to cancel the cross phase modulation in SRS imaging. We demonstrate the potential of the technique on model and human tissue samples. [1569776101]

10.15-10.30 STUDENT PRESENTATION

Quantum and classical photon correlation in four wave mixing

R. Vered, M. Rosenbluh, A. Pe'er, L. Ben-Or (Bar Ilan Univ., IL)

We demonstrate two-photon interference with bi-photons produced by FWM. We explore the quantum / classical nature of the light by observing the loss dependence of the interference contrast at various intensities across the quantum-to-classical transition. [1569776041]

10:30-11:00 Coffee break

11.00-12.45 POLARIZATION IMAGING
Session Chair: Sophie Brasselet (Institut Fresnel, FR)

11.00-11.15

Design and optimization of a polarization imaging system independent of intensity fluctuations

G. Anna[1], F. Goudail[1], M. Boffety[1], F. Lerondeau[1], D. Dolfi[2] ([1]Laboratoire Charles Fabry, FR; [2]Thales Research & Technology, FR)

We propose a polarimetric system design that allows one to optimize the contrast between a target and a background by using independent illumination and acquisition polarization states. We show that using these degrees of freedom and taking into account the correct source of noise improve significantly the contrast of the images. [1569776869]

11.15-11.30

Polarization--multiplexed encoding at a nanometer scale

C. Macias-Romero[1], P. Török[2] ([1]EPFL, CH; [2]Imperial College London, GB)

Optical data storage was developed using binary encoding primarily due to signal to noise ratio considerations. We report an alternative to binary encoding that allows a seven fold storage increase per storage layer per side and propose one that can yield a 20+ fold increase. The increase is achieved by encoding information in the orientation of nanostructures that emit strongly polarized light when excited by unpolarized light. The increase in storage density is possible due to the significantly reduced polarization crosstalk that results from using unpolarized light in a fully coherent system: a laser scanning confocal microscope. The optical data storage technology resulting from this novel approach is compatible with existing technologies and can thus enhance the signal-to-noise ratio in binary-encoded systems. The findings presented here have significant ramifications for polarization imaging and hence applicable to orientational measurements in diverse areas of science. [1569777215]

11.30-11.45 STUDENT PRESENTATION

Coherent-mode decomposition of pulsed electromagnetic beams

T. Voipio, T. Setälä, A. Friberg (Univ. of Eastern Finland, FI)

We present the coherent-mode decomposition for nonstationary electromagnetic fields in space-frequency and space-time domains. We show that there is a one-to-one relationship between the time and frequency domain modes, and we introduce the overall degrees of temporal and spectral coherence. [1569776253]

11.45-12.00 STUDENT PRESENTATION

Semi-supervised contrast enhancement in polarimetric images using non-parametric statistical snake

G. Anna[1], N. Bertaux[2], F. Galland[2], M. Boffety[1], F. Goudail, D. Dolfi[3] ([1]Laboratoire Charles Fabry, FR; [2]Aix Marseille Univ., FR; [3]Thales Science & Technology, FR)

We present a semi-supervised method for contrast enhancement in polarimetric images. This method consists in combining iteratively image segmentation and contrast optimization. The benefits of this approach are demonstrated on real-world images and in difficult situations where target and background differ only by polarimetric properties. [1569776895]

12.00-12.15

Miniaturized Polarization Sensitive Detector Unit for Swept Source Optical Coherence Tomography

A. Holzer[1], D. Ernst[1], S. Remund[1], A. Bossen[1], A.H. Bachmann[2], P. Vorreau[2], M. Duelk[2], B. Považay[1], Ch. Meier[1] ([1]Bern Univ. of Applied Sciences, CH; [2]EXALOS AG, CH)

A miniaturized polarization sensitive single-shot detection unit for swept source optical coherence tomography (SS-OCT) has been realized. Almost achromatic balancing could be achieved by a free space interferometer resulting in sensitivity improvement of 5 dB in respect to an optimized fiber-optical device. [1569776937]

12.15-12.30

Depolarization imaging by field orthogonality breaking for endoscopy applications

J. Fade, E. Schaub, M. Alouini (Univ. de Rennes 1, CNRS, FR)

We address a new depolarization sensing modality based on the concept of polarization orthogonality breaking. We experimentally validate how this technique is easily implemented and well suited to remote sensing through optical fibers, thus paving the way for high sensitivity and real time depolarization endoscopic imaging. [1569775803]

12.30-12.45

Resolving a sample's symmetry with FWM microscopy using circular polarization

C. Cleff, S. Brasselet, H. Rigneault, J. Duboisset (Institut Fresnel, CNRS, Aix-Marseille, FR)

We present a method for Four Wave Mixing (FWM) microscopy that allows direct imaging of individual orders of symmetry of the molecular orientation of a sample. This provides detailed knowledge of a sample's symmetry as well as a new contrast mechanism to distinguish components of different symmetry. [1569776263]

12.45-13.00 STUDENT AWARD CEREMONY

13.00-14.00 END OF FOI 2013

NOTES

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