30 November – 1 December 2015, London, UK

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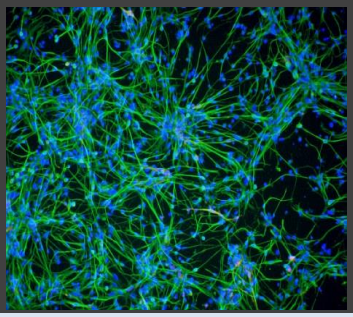


Microscopy Congress 2015

UTILIZING MICROSCOPICAL TECHNOLOGIES AS A TOOL FOR PROGRESSING MEDICAL RESEARCH

Global Engage are pleased to announce the Microscopy Congress 2015, which will be held on 30th November – 1st December 2015 in the London Heathrow Marriott Hotel, UK. The conference is part of the highly successful personalised medicine series which includes the Digital Pathology Congress, which attracted over 25 exhibitors, plus the Precision Medicine Congress, Digital Health Congress, and qPCR & Digital PCR Congress.

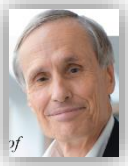
Attracting experts working in all areas of microscopy, including optical and electron microscopy, super-resolution microscopy, 3D imaging, Cryo-EM and CLEM, the conference will examine the latest developments in the technologies and techniques being used for progressing medical research in areas such as diagnostic microscopy, neuroscience, pathology, and developmental biology. The challenges of image analysis will also be examined in a session on handling big data derived from microscopes.

With the significant breakthrough in resolution capabilities brought about by the 2014 Nobel Prize in Chemistry winners, this is an exciting time to be working in microscopy. Not only is it one of the most fundamental techniques used by biologists, microscopy is also facilitating crucial advances in healthcare and drug discovery, allowing scientists to observe the micro world in ever increasing detail.

Should you be an expert in developing microscopical technologies, or a scientist using microscopy to further medical research, the conference will provide an interactive networking forum to answer your queries through a dynamic exhibition room filled with technology providers showcasing their technologies and solutions, networking breaks allowing interaction with your peers, expert led case study presentations, and interactive Q&A panel discussions examining key issues over two days in areas of instrumentation and technology in microscopy, as well as real life case studies and applications in medical research.

Confirmed Speakers Include:

Wolfgang Baumeister
Professor, Head of Department, Max Planck Institute of Biochemistry, Germany



Christoph Cremer
Professor, Institute of Pharmacy and Molecular Biotechnology, Heidelberg University. Group Leader, Super Resolution Microscopy, Institute of Molecular Biology, University of Mainz

Michelle Peckham
Professor of Cell Biology, Faculty of Biological Sciences, University of Leeds, UK

Conference Synopsis

Stream One

Instrumentation, Techniques and Developments

- Latest developments in optical and electron microscopy
- Scanning probe microscopy
- TEM/STEM
- Cryo-EM and immersion freezing
- Electron backscatter diffraction (EBSD)
- Advanced fluorescence imaging
- Correlative light electron microscopy (CLEM)
- Confocal microscopy
- Digital / virtual microscopy
- 3D imaging and tomography
- Advances in sample preparation techniques
- Light sheet microscopy

Super Resolution Microscopy

- Latest techniques and developments in super resolution microscopy
- Deterministic super-resolution
- Stochastic super-resolution – STORM, PALM and FPALM

Stream Two

Life Science Case Studies

- Diagnostic microscopy
- Live cell imaging / medical imaging / *in vivo* imaging
- Neuroscience
- Stem cell biology
- Deep tissue imaging
- Pathology and oncology
- Biomedical engineering
- Developmental biology / monitoring cell growth
- Structural biology
- Single molecule imaging

Image Analysis / Big Data Challenges

- Data analysis and challenges
- Image handling
- Image analysis
- Bioimage informatics
- Making sense of big data
- DICOM
- Image processing
- Tools to automate tracking and analysis of microscopy image sequences

Confirmed Speakers

Wolfgang Baumeister
Professor, Head of Department, Max Planck Institute of Biochemistry, Germany

Ben Giepmans
Principal Investigator, Faculty of Medical Sciences, University of Groningen, Netherlands

Michelle Peckham
Professor of Cell Biology, Faculty of Biological Sciences, University of Leeds, UK

Isabella Ellinger
Associate Professor, Department of Pathophysiology and Allergy Research, Medical University of Vienna, Austria

Fernando Calvo
Team Leader, Tumour Microenvironment Group, Institute of Cancer Research, UK

Julian Moger
Associate Professor in Biophotonics, University of Exeter, UK

Sergi Padilla-Parra
Principal Investigator, Nuffield Department of Medicine, University of Oxford, UK

Yves Mely
Professor and Director, Laboratory of Biophotonics and Pharmacology, CNRS, France

Prasad Shastri
Professor & Director, Institute for Macromolecular Chemistry, University of Freiburg, Germany

Kevin O'Holleran
Director of Light Microscopy, Cambridge Advanced Imaging Centre, University of Cambridge, UK

Hans-Ulrich Dodt
Professor, Department of Bioelectronics, Vienna University of Technology, Austria

Rainer Leitgeb
Professor of Medical Physics, Medical University of Vienna, Austria

Michael Knop
Professor, Centre for Molecular Biology, University of Heidelberg, Germany

Corinne Smith
Associate Professor, Director of the Biological Electron Microscopy Facility, University of Warwick, UK

Jacob Hoogenboom
Assistant Professor, Faculty of Applied Sciences, Delft University of Technology, Netherlands

Paul Verkade
Reader in Cell Imaging, School of Biochemistry, University of Bristol, UK

Jerker Widengren
Professor, Department of Applied Physics, KTH Royal Institute of Technology, Sweden

Diana Peckys
Senior Researcher, Leibniz Institute for New Materials, Germany

Miriam Lucas
Senior Researcher, ScopeM, ETH Zurich, Switzerland

Thomas Walter
Team Leader, Mines ParisTech, France

Elisa D'Este
Postdoctoral Researcher, Department of Nanobiophotonics, Max Planck Institute for Biophysical Chemistry, Germany

Victoria Birkedal
Associate Professor, Interdisciplinary Nanoscience Center, Aarhus University, Denmark

Raluca Niesner
Group Leader, Biophysical Analysis, German Rheumatism Research Centre Berlin (DRFZ), Germany

Jens Rittscher
Professor of Engineering Science, Nuffield Department of Medicine, University of Oxford, UK

Bettina Boettcher, Professor, School of Biological Sciences, University of Edinburgh, UK

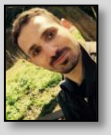
James McGinty
Lecturer in Biophotonics, Faculty of Natural Sciences, Imperial College London, UK

Peter O'Toole
Head of Imaging and Cytometry, Department of Biology, University of York, UK

Alexandra Porter
Reader in Bioimaging & Analysis, Faculty of Engineering, Imperial College London, UK

Yannick Schwab
Team Leader and Head of Electron Microscopy Core Facility, EMBL, Germany

Kurt Anderson
Professor of Cell Migration, Beatson Institute for Cancer Research, University of Glasgow, UK



Dimitrios Lamprou
Assistant Professor in Pharmaceutical Sciences and Director of the Wolfson Foundation / RPIF Funded "Pharmaceutical Surfaces Laboratory", University of Strathclyde, UK

Paul van Bergen en Henegouwen
Associate Professor, Cell Biology Group, Utrecht University, Netherlands

Thomas Cotter
Professor, School of Biochemistry and Cell Biology, University College Cork, Ireland

Michael Duchen
Professor of Physiology, Department of Cell and Development Biology, University College London, UK

Monika Ritsch-Marte
Director of the Division of Biomedical Optics, Professor of Medical Physics, Innsbruck Medical University, Austria

Ingela Parmryd
Associate Professor, Department of Medical Cell Biology, Uppsala University, Sweden

Patrick Schultz
Team Leader, Institut Génétique Biologie Moléculaire Cellulaire, GBMC, France

Bruno Humbel
Head of Electron Microscopy Facility, University of Lausanne, Switzerland

Miep Helfrich
Professor, The Institute of Medical Sciences, University of Aberdeen, UK

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Agenda: Day One – Monday 30th November 2015

08.00-08.50	Registration & Coffee	
08.50-09.00	Global Engage Welcome Address Stream Chair's Opening Remarks: **Raluca Niesner, Group Leader, Biophysical Analysis, German Rheumatism Research Centre Berlin (DRFZ), Germany**	
09.00-09.35	**Keynote Address: Fluorescence Microscopy at the Nanoscale** Novel developments in optical technology and photophysics made it possible to radically overcome the diffraction limit (ca. 200 nm laterally, 600 nm along the optical axis) of conventional far-field fluorescence microscopy. Presently, three principal "nanoscopy" families have been established: "Nanoscopy" based on focused laser beams; nanoscopy based on Structured Illumination; and nanoscopy based on various modes of Localization Microscopy. These and related far-field light microscopy methods have opened an avenue to image nanostructures down to single molecule resolution. Application examples obtained by focused, structured, and localization techniques cover a variety of biostructures, such as membrane complexes, neuronal synapses, cellular protein distribution, nuclear nanostructures of normal and cancer cells, as well as the "nanoimaging" of individual viruses and lithographically generated nanostructures. Confirmed: **Christoph Cremer, Professor, Institute of Pharmacy and Molecular Biotechnology, Heidelberg University, Group Leader, Super Resolution Microscopy, Institute of Molecular Biology, University of Mainz, Germany**	
09.35-10.05	**Keynote Address: Optical coherence microscopy for lable-free structural and functional in-vivo imaging** Optical coherence microscopy combines high speed imaging, which is important for in-vivo assessment, and penetration depths of up to a few millimeters due to its intrinsic gating mechanisms, with the availability of the backscattered sample field phase. The latter opens exciting functional imaging possibilities such as quantitative measurement of perfusion, or the access to biomechanical properties. Furthermore, recent advances in OCM of using digital wavefront correction methods for enhancing penetration and lateral resolution are reported. The talk reviews the method and gives examples ranging from high-resolution brain imaging, over in-vivo cellular imaging of the retina, to applications in cancer and diabetes research. Confirmed: **Rainer Leitgeb, Professor of Medical Physics, Medical University of Vienna, Austria**	
10.05-10.35	**Solution Provider Presentation** For sponsorship opportunities please contact Steve Hambrook at steve@globalengage.co.uk	
10.35-11.45	Morning Refreshments Poster Presentation Sessions	
	Instrumentation, Techniques and Developments **Stream Chair: Raluca Niesner, Group Leader, Biophysical Analysis, German Rheumatism Research Centre Berlin (DRFZ), Germany**	**Life Science Case Studies** **Stream Chair: Prasad Shastri, Professor & Director, Institute for Macromolecular Chemistry, University of Freiburg, Germany**
11.45-12.10	**Shedding New Light on Biology: Label- free imaging with non-linear vibrational spectroscopy** Imaging deep within tissues with sub-cellular resolution and the ability to identify chemical species has been a dream for scientists in many disciplines for many years. This dream is becoming reality. Nonlinear microscopy has become a powerful tool for studying living tissues due to several unique advantages over traditional methods. The nonlinear dependence on excitation intensity provides inherent 3-D sectioning and the near-IR excitation provides both superior optical penetration and reduced photodamage. Recently, non-linear optical imaging techniques have emerged that allow quantitative label-free imaging of tissues. These techniques are based on coherent Raman scattering (CRS) and derive chemically specific contrast from molecular vibrations to provide a potent new form of real-time imaging. This presentation will give an overview of CRS microscopy and examples of how it can be applied to a wide range of biomedical applications. Confirmed: **Julian Moger, Associate Professor in Biophotonics, University of Exeter, UK**	**Microscopic imaging techniques to observe cellular processes** Confirmed: **Michael Knop, Professor, Centre for Molecular Biology, University of Heidelberg, Germany**
12.10-12.35	**Light sheet microscopy** Confirmed: **Hans-Ulrich Dodt, Professor, Department of Bioelectronics, Vienna University of Technology, Austria**	**Using microscopy to study mitochondrial metabolism in living cells** Mitochondrial dysfunction plays an important role in the pathophysiology of many major diseases, and mitochondria are therefore an important potential therapeutic target. It is therefore essential to be able to assess mitochondrial function in order both to understand the relevant pathophysiological pathways and also to design assays for drug discovery. I will show how microscopy can be used to explore aspects of mitochondrial function in living cells and how these principles can be developed for drug discovery. Confirmed: **Michael Duchen, Professor of Physiology, Department of Cell and Development Biology, University College London, UK**
12.35-13.05	**Solution Provider Presentation** For sponsorship opportunities please contact Steve Hambrook at steve@globalengage.co.uk	
13.05-14.00	Lunch	

14.00-14.25	**Light sheet microscopy for biomedical research**	**Nanoscale Imaging and Analysis across the Cell-Materials Interface** The analytical electron microscope (TEM) is a powerful tool for imaging and analysing the structure and chemistry of biomaterials interfaces with high energy and spatial resolution. When combined with dynamic imaging techniques, this technique can provide unprecedented information about the molecular scale events leading to implant failure and tissue pathologies. This talk will discuss the results of studies in our laboratory where we have applied state-of-the art 3 D and transmission electron microscopy techniques to test hypotheses about how the stability of biomaterials can be related to their bioreactivity in the cellular environment. Application of analytical microscopy to study the molecular origins of bone pathologies will also be described.
	Confirmed: **Kevin O'Holleran, Director of Light Microscopy, Cambridge Advanced Imaging Centre, University of Cambridge, UK**	Confirmed: **Alexandra Porter, Reader in Bioimaging & Analysis, Faculty of Engineering, Imperial College London, UK**
14.25-14.50	**Fluorescence Lifetime Imaging Microscopy : a sensitive tool for monitoring HIV-1 molecular interactions** Förster resonance energy transfer (FRET) between two fluorescently labelled proteins only occurs when they interact together. By measuring the fluorescence decay at each pixel of the cell, the Fluorescence lifetime imaging (FLIM) technique allows extracting fluorescence lifetimes that, in contrast to fluorescence intensities, do not depend on the instrumentation or the concentration of fluorophores. As FRET occurrence is associated to a shortening of the donor fluorescence lifetime, it is possible to unambiguously detect, map and monitor with time the interactions between the labelled proteins in live cells. Using FRET-FLIM, we monitored the assembly of the HIV-1 Gag protein, and characterized the role of the nucleocapsid domain of Gag and of host proteins in the assembly process.	**Structural Maturation of Hepatitis B core** Hepatitis B virus consists of a capsid formed by icosahedrally arranged Hepatitis B core protein (HBC) and an envelope with three different types of membrane integrated surface proteins (HBS). During viral maturation, the RNA-pregenome is reversely transcribed into a partly double stranded DNA. The reverse transcription is concomitant with the dephosphorylation of HBC. Only after the reverse transcription is completed the viral capsid is enveloped. Interestingly a single, naturally occurring point mutation I/F97L in HBC causes premature envelopment of the capsid. We have used electron cryo microscopy and image processing to investigate the structure of phosphorylated and unphosphorylated HBC cores as well as of the premature envelopment mutant to understand the structural mechanisms of capsid maturation.
	Confirmed: **Yves Mely, Professor and Director, Laboratory of Biophotonics and Pharmacology, CNRS, France**	Confirmed: **Bettina Boettcher, Professor, School of Biological Sciences, Personal Chair in Electron Microscopy & Image Processing, University of Edinburgh, UK**
14.50-15.15	**Fluorescence-Based Metabolic and Environmental Imaging of Cells by Dark State Transitions** This presentation will describe how additional, to-date largely unexploited, information about molecular interactions and microenvironments can be retrieved from long-lived, non-fluorescent, photo-induced transient states of organic fluorophores and their dynamics. By two major approaches, where the transient state information is obtained either from fluorescence fluctuation analysis or by recording the time-averaged fluorescence response to a time-modulated excitation, it is possible to combine the detection sensitivity of the fluorescence signal with the environmental sensitivity of the long-lived transient states. Proof-of-principle experiments, advantages, limitations and applications will be discussed and live cell transient state (TRAST) imaging of cellular metabolism and membrane microviscosity will be presented.	**3-D optical tomography for ex vivo and in vivo imaging** Optical tomography covers a range of techniques that use light to determine the 3-D structure/properties of a sample. In this talk I will describe my work under two regimes; optical projection tomography (OPT) and diffuse fluorescence tomography (DFT). OPT is a 3-D imaging technique applicable to (semi)-transparent specimens and often described as the optical equivalent of X-ray CT. I will introduce the basic concept of OPT including its typical performance characteristics. I will them describe methods to improve the spatial resolution and light collection efficiency using multiplexed imaging and remote focal scanning. I will then describe how similar hardware can be applied to highly scattering samples (e.g. mice) for DFT. During the talk I will give example applications, including immunohistology of excised whole mouse pancreas, in vivo fluorescence lifetime OPT of zebrafish embryos, mapping of tumour progression and vascularisation in live adult zebrafish and resolving a FRET interaction in a mouse model.
	Confirmed: **Jerker Widengren, Professor, Department of Applied Physics, KTH Royal Institute of Technology, Sweden**	Confirmed: **James McGinty, Lecturer in Biophotonics, Faculty of Natural Sciences, Imperial College London, UK**
15.15-15.45	**Solution Provider Presentation** For sponsorship opportunities please contact Steve Hambrook at steve@globalengage.co.uk	
15.45-16.35	Afternoon Refreshments Poster Presentation Sessions	
16.35-17.00	**Nanomechanical Tissue Diagnosis and Soft Material Analysis by SPM** Nanomechanical investigations of tissues have opened new ways to better understand and diagnose diseases. Scanning probe microscopy (SPM) can provide nanomechanical investigations (including stiffness and adhesion measurements) and their quantitative and statistical analysis very accurate. SPM can be a multifunctional molecular toolbox in the nano-bio-interface that can facilitate better understanding of pathology as well as toxicology and could be used to quantify many risks in the body. By using SPM we may in future be able to analyse patients' blood and tell if nanomaterials are accumulating in their livers or arterial walls, causing stiffness which may increase their chances of developing diseases. All this will be discussed using data from our lab in order to explore the use of SPM as a diagnostic tool of the future.	**Studying bone ultrastructure using 3D imaging**
	Confirmed: **Dimitrios Lamprou, Assistant Professor in Pharmaceutical Sciences and Director of the Wolfson Foundation / RPIF Funded "Pharmaceutical Surfaces Laboratory", University of Strathclyde, UK**	Confirmed: **Miep Helfrich, Professor, The Institute of Medical Sciences, University of Aberdeen, UK**

17.00-17.25

Targeting Rare Fluorescent Objects in Multicellular Specimens by Multimodal Correlative Microscopy

- Advanced electron microscopy for life sciences is now benefiting from the correlation with other imaging techniques (fluorescence, confocal, microCT) and from extended capacity to explore complex specimens in 3D. Such progresses are leading to unprecedented structure-function insight of large volumes at a subcellular resolution.
- Among the enabling techniques are correlative light and electron microscopy (CLEM) and also automated serial imaging in scanning electron microscopy. When dealing with multicellular samples, CLEM allows for a targeted imaging in a full organism. When applied to automated serial imaging, CLEM has also the potential to drastically optimize the data size and collection speed, as it restricts the EM acquisition to the sub-volume of interest.
- Applications of such targeting strategies will be presented for various model organisms such as zebrafish embryos and mouse tissues with a specific highlight on innovative techniques to drastically improve the throughput of data collection.

Confirmed:
Yannick Schwab, Team Leader and Head of Electron Microscopy Core Facility, EMBL, Germany

Super-Resolution Imaging of the Cytoskeleton
I will cover the use of the Airy Scan, iSIM (instant Structured Illumination) and 3D-PALM/STORM (Photactivated localisation microscopy/stochastic optical reconstruction microscopy) to image the cytoskeleton at different resolutions, in fixed and live cells. The talk will include a discussion on the advantages and disadvantages of each approach and how they are suited to different problems in trying to image cytoskeletal structures at 'super-resolution'.

Confirmed:
Michelle Peckham, Professor of Cell Biology, Faculty of Biological Sciences, University of Leeds, UK

17.25-17.50

Nanobodies for Cancer Imaging and Therapy
Nanobodies have been developed that specifically bind to tubulin, EGFR or Her2. Nanobodies are single domain antibody fragments obtained from heavy-chain antibodies from Llama. Despite their small size (15 kDa) they bind with subnanomolar affinity to their target proteins. Application of these nanobodies will be demonstrated in superresolution light microscopy (microtubules), in vivo molecular imaging of EGFR or Her2 expressing cancer cells, and for treatment of EGFR expressing tumors using nanobody-targeted Photodynamic therapy (PDT)

Confirmed:
Paul van Bergen en Henegouwen, Associate Professor, Cell Biology Group, Utrecht University, Netherlands

3D Cryo-Electron Microscopy of Clathrin Cage Complexes
Clathrin-mediated endocytosis enables cells to selectively absorb molecules and interfaces with multiple vital cellular processes such as synaptic vesicle recycling, signaling and development. We aim to understand how clathrin interacts with its multiple binding partners but these complex cage structures are challenging for structural biology. New detectors and methods of single particle image processing have provided us with an opportunity to tackle this challenge using cryo-EM. I will discuss how we have sought to understand clathrin structure and function by combining cryo-EM methods with kinetic studies to investigate the mechanism of clathrin cage assembly and disassembly.

Confirmed:
Corinne Smith, Associate Professor, Director of the Biological Electron Microscopy Facility, University of Warwick, UK

17.50-18.15

Cryo electron microscopy of the transcriptional co-activator SAGA
The transcriptional co-activator SAGA is a large multi-subunit complexes required to transform the activation signal mediated by sequence-specific transcription factors into the assembly of a productive transcription initiation complex leading to mRNA synthesis. This macromolecular complex integrates several functions such as activator binding, interaction with general transcription factors, readers and writers of chromatin modifications as well as binding to promoter DNA. Single particle cryo-electron microscopy studies show the modular organization of SAGA and locate functional interfaces such as the histone modifying enzymes Gcn5 and Ubp8 responsible of the acetylation and the deubiquitination of histone tails, respectively. The analysis of functional complexes allowed us to identify the TBP binding sites and to decipher the initial steps of activated transcription.

Confirmed:
Patrick Schultz, Team Leader, Institut Génétique Biologie Moléculaire Cellulaire, GBMC, France

18.15	Chair's Closing Remarks and End of Day 1
18.15-19.15	Networking Drinks Reception

08.00-08.35	Coffee and Networking Meetings	
08.35-08.40	Stream Chair Welcome Address: **Victoria Birkedal, Associate Professor, Interdisciplinary Nanoscience Center, Aarhus University, Denmark**	
08.40-09.10	**Keynote address: Electron Microscopy: From Molecules to Cells** EM single particle analysis is becoming a key method for studying large macromolecular complexes with increasingly higher resolutions. The method will be exemplified with structural studies of the 26S proteasome, a molecular machine of 2.5 MDa and built of 34 canonical subunits plus a number of interactions. Electron tomography enables structural studies of macromolecular supramolecular assemblies in situ, i.e. in their functional environment. Technical advances in sample preparation and in image recording allow to attain resolutions in the 1nm range. The potential of the method will be illustrated with in situ structural studies of the 26 S proteasome and of neurotoxic aggregates. Confirmed: **Wolfgang Baumeister, Professor, Head of Department, Max Planck Institute of Biochemistry, Germany**	
09.10-09.40	**Solution Provider Presentation** For sponsorship opportunities please contact Steve Hambrook at steve@globalengage.co.uk	
09.40	**Super-Resolution Microscopy** Stream Chair: **Victoria Birkedal, Associate Professor, Interdisciplinary Nanoscience Center, Aarhus University, Denmark**	**Image Analysis / Big Data Challenges**
09.40-10.10	**Subcortical Cytoskeleton Periodicity in the Nervous System** In the axons of cultured hippocampal neurons actin forms various structures: bundles, patches and a recently reported periodic ring-like structure. Nevertheless, the overlaying organization of actin in neurons and in the axon initial segment (AIS) is still unclear, mainly due to a lack of adequate imaging methods. By harnessing live-cell STED nanoscopy, we show that the periodic subcortical actin structure is in fact present both in axons and dendrites, and in the peripheral nervous system. Cytosolic actin organization strongly depends on the developmental stage and on subcellular localization. Altogether the study reveals hitherto unseen cytoskeletal features and demonstrates that the periodic organization of the subcortical cytoskeleton is in reality a more general feature of the nervous system. Confirmed: **Elisa D'Este, Postdoctoral Researcher, Department of Nanobiophotonics, Max Planck Institute for Biophysical Chemistry, Germany**	**Applying image analysis techniques to biological image data** Confirmed: **Jens Rittscher, Professor of Engineering Science, Nuffield Department of Medicine, University of Oxford, UK**
10.10-11.10	Morning Refreshments Poster Presentation Sessions	
11.10-11.40	**Solution Provider Presentation** For sponsorship opportunities please contact Steve Hambrook at steve@globalengage.co.uk	
11.40-12.05	**Novel Quantitative, Label-Free to Super-Resolution Correlative Imaging and Balancing the Needs of Users with R&D** Ptychography is a quantitative label-free, high-contrast, imaging technique that can image fixed sections, cells or time-lapse live-cells to study cell cycle, apoptosis, differentiation. Using the unique information, we are seeking to identify subtle details and changes within primary cell cultures. We are also developing novel Super Resolution Microscopy (SRM) and Correlative Light and Electron Microscopy (CLEM) techniques in collaboration with Lucy Collinson at the CRUK London Research Institute. Despite recent advances in this area, for many biological studies the methods are far from simple to apply by non-specialists and cannot visualise all aspects of the mechanisms involved in complex biological systems. Our developments are trying to bridge this gap by exploiting both electron and light microscopy. Confirmed: **Peter O'Toole, Head of Imaging and Cytometry, Department of Biology, University of York, UK**	**Bioimage Informatics for High Content Screening (HCS)** High Content Screening (HCS) allows the collection of phenotypic responses of cellular populations to perturbations, such as alterations of gene expression. Here, I will review how we can decipher the molecular basis of fundamental biological processes by the computational analysis of HCS data. I will also show that these image data sets are formidable scientific resources that can be remined in order to increase our knowledge on other cellular processes. Cellular phenotyping is not only informative about gene function, but it is also disease relevant. I will present tools to automatically quantify cellular phenotypes in Hematoxylin & Eosin stained tumor tissue sections. While technically more challenging, I believe that such tools will become increasingly important in cancer research as they ideally complement omics approaches. Confirmed: **Thomas Walter, Team Leader, Mines ParisTech, France**

12.05-12.30	**Large Scale CLEM with Distinct Probes: From acquisition to analysis** • Genetically-encoded and affinity-based CLEM probes • Large-scale EM (www.nanotomy.org): Acquisition and analysis • Nanotomy in Type 1 diabetes research Confirmed: **Ben Giepmans, Principal Investigator, Faculty of Medical Sciences, University of Groningen, Netherlands**	**Colocalisation Analysis in Fluorescence Microscopy** Colocalisation analysis is commonplace, but what this actually is means is vague. We propose the creation of two categories; co-occurrence that measures to what extent fluorophores are in the same region and correlation that measures the strength of the relationship between the two fluorophores. Co-occurrence can be measured by area or using the M1 and M2 coefficients, and should be compared to random distributions. Correlation analysis should use the Pearson and/or Spearman coefficients including only pixels containing both fluorophores, ideally using replicate based noise corrected correlation to eliminate the effect of image noise. Quantitation requires differentiating between the presence and absence of fluorescence, and measurements should be made within biologically relevant regions of interest. Confirmed: **Ingela Parmryd, Associate Professor, Department of Medical Cell Biology, Uppsala University, Sweden**
12.30-12.55	**TBC** Reserved: **Gijs Wuite, Professor, Physics of Living Systems Section, VU University Amsterdam, Netherlands**	**Modelling Variability in Quantitative Immunohistochemistry** Automated quantitative fluorescence microscopy has become an emerging research tool for Life Sciences, but currently results still suffer from non-standardized process elements related to biology (1) as well as computer science (2), which we try to address 1/ Intra- and intertissue variability adds to the uncertainty of the quantitative endpoints determined, but this is seldom considered in the planning of experiments. Models for that variability are required. 2/ The community lacks guidlines for evaluations of automated segmentations that are optimized towards the mean of a number of several experts and the quantification of the effect of inter-rater variability on the final outcome variables (e.g. cell area detected, fluorescence intensity detected). Confirmed: **Isabella Ellinger, Associate Professor, Department of Pathophysiology and Allergy Research, Medical University of Vienna, Austria**
12.55-13.55	Lunch	
	Instrumentation, Techniques and Developments	**Life Science Case Studies** **Stream Chair:**
13.55-14.20	**Correlative Light Electron Microscopy** Confirmed: **Bruno Humbel, Head of Electron Microscopy Facility, University of Lausanne, Switzerland**	**Synthetic Holographic Microscopy** • Introduction to spatial light modulators as tools for synthetic holography. • Synthetic holography to emulate various microscopic techniques. • Making the most of it: Multiplexed phase masks. Confirmed: **Monika Ritsch-Marte, Director of the Division of Biomedical Optics, Professor of Medical Physics, Innsbruck Medical University, Austria**
14.20-14.45	**Correlative Light Electron Microscopy: 1+ 1 = 3** The combination of different microscopy modalities in one experiment (Correlative Microscopy) can provide more information that each technique on its own, hence 1 + 1 = 3. Using experimental examples I will discuss some of the available techniques that combine light microscopy with transmission EM. Confirmed: **Paul Verkade, Reader in Cell Imaging, School of Biochemistry, University of Bristol, UK**	**Imaging Molecular Dynamics: from cell biology to animal models** • We use a pipeline of intermediate systems to bridge the gap between cell culture and in vivo models. • FRAP and FRET can be used to assess pharmacodynamics in vivo by crossing reporter mice with appropriate disease models. • Mutant p53 mobilizes E-cadherin and drives sub-cellular activation of Rho in the KPC model of pancreatic ductal adenocarcinoma. These effects are reversed by treatment with Dasatinib. Confirmed: **Kurt Anderson, Professor of Cell Migration, Beatson Institute for Cancer Research, University of Glasgow, UK**

14.45-15.10		**Examining the heterogeneity of growth factor receptor complex formation in intact breast cancer cells in liquid state with Correlative Light- and Electron Microscopy** Proteins of the epidermal growth factor receptor (EGFR) family play a crucial role in many cancer types. We used correlative light microscopy and liquid scanning transmission electron microscopy (Liquid-STEM) to gather information about the dimerization, clustering and subcellular localization of these membrane proteins in intact cells in their native liquid state. Our unique approach opens up a wide spatial examination window, from hundreds of cells at the light microscopic level, to protein complex dimensions that have been quantitatively studied using a resolution of 3 nm. We were thus able to consider the large phenotypic heterogeneity of cancer cells, and detect and study protein complexes in rare cells, such as cancer stem cells, which otherwise remain hidden in the main cell population. Confirmed: **Diana Peckys, Senior Researcher, Leibniz Institute for New Materials, Germany**
	Reserved: **Industry Presentation**	
15.10-15.40	**Afternoon Refreshments** **Poster Presentation Sessions**	
15.40-16.05	**Improving Correlative Microscopy with Integrated Inspection** A crucial challenge in microscopy is to image functional molecules at high resolution within their nanoscale structural environment. With correlative light and electron microscopy (CLEM) the locations of fluorescence labelled molecules can be embedded into the surrounding ultrastructure imaged with the electron microscope. However, broad implementation and high-throughput application of CLEM is hindered when the same sample has to be inspected on two stand-alone microscopes with widely different inspection and preparation protocols. I will present a different approach, relying on a novel integrated microscope that automatically maps fluorescence and electron data into a single image. Using the unique axial alignment in the integrated microscope, this fluorescence-electron overlay image can be generated with nanometer-scale accuracy without the need to incorporate fiducial markers. Further, I will discuss implementation of integrated inspection in biology and sketch the prospects for such a system to go beyond mere correlation of data. Confirmed: **Jacob Hoogenboom, Assistant Professor, Faculty of Applied Sciences, Delft University of Technology, Netherlands**	**Imaging Cancer-Associated Fibroblasts** Cancer-associated fibroblasts (CAFs) are non-malignant cells prominently found in many solid tumours that can favour tumour aggressiveness and dissemination. CAFs have a pathologically activated status responsible for their tumour-promoting activities, which contrasts with the known anti-tumorigenic effect of normal quiescent fibroblasts. I investigate the pathological activated phenotype and functions of CAFs in primary breast tumours aiming to identify strategies to reprogram them and deter tumour progression. Multiple imaging modalities are used to address this goal and I will discuss them during my talk. These include confocal and super-resolution microscopy to characterize cytoskeletal rearrangements and signalling pathway activation in CAFs, and intravital multiphoton microscopy to investigate the behaviour and functions of CAFs in vivo. Confirmed: **Fernando Calvo, Team Leader, Tumour Microenvironment Group, Institute of Cancer Research, UK**
16.05-16.30	**3D Correlative Light and Scanning Electron Microscopy Allows Large-Scale Volume Imaging** 3D Correlative light and electron microscopy (3D-CLEM) combines large-scale volume imaging of cells or tissues from LM with a high-resolution description of their morphology using EM. The combination of 3D microscopy techniques such as CLSM with 3D Scanning-EM (e.g. FIB-SEM, SBF-SEM or Array-Tomography) opens up exciting possibilities to expand morphological context description and analysis into to the third dimension on the nm-scale. 3D-CLEM is now a valid alternative to TEM-based serial-sectioning approaches. Modern SEM-platforms allow imaging with an x/y resolution of 2 3nm, and offer the advantage of automated imaging. FIB-SEM and SBF-SEM are destructive since a slice of the sample is removed for each follow-up image plane, whereas Array-Tomography allows post-embedding staining and labelling and thus reinvestigation of sections ad libitum. The results are 3D LM & SEM datasets with different resolutions, which are merged in-silico to 3D models of biological systems to access the nano-world more comprehensively. Confirmed: **Miriam Lucas, Senior Researcher, ScopeM, ETH Zurich, Switzerland**	**Fluorescent Microscopy in the Detection of Reactive Oxygen Species (ROS) in Cells and Tissues** • Microscopy (confocal and multiphoton) methods for the detections of ROS in models of retinal degeneration and cancer • Probe specificity and colour choice • Real time, fixed and 3D animation images Confirmed: **Thomas Cotter, Professor, School of Biochemistry and Cell Biology, University College Cork, Ireland**

16.30-16.55	**Multi-Modal Imaging to Visualise Tumours** Confirmed: **Prasad Shastri, Professor & Director, Institute for Macromolecular Chemistry, University of Freiburg, Germany**	**Novel Quantitative Fluorescence Microscopy Approaches to Pinpoint HIV-1 Entry and Fusion** • We will introduce the usefulness of developing quantitative approaches to better understand HIV-1 entry both in reporter cells and in CD4+T cells • The use of novel FRET-based biosensors is particularly interesting to recover HIV-1 fusion on the fly, both in single cells and population of cells • The use of these advanced fluorescence-based approaches will help to elucidate the route of entry and the point of HIV-1 fusion in different cell lines and physiological contexts Confirmed: **Sergi Padilla-Parra, Principal Investigator, Nuffield Department of Medicine, University of Oxford, UK**
16.55	**Chairman's Closing Remarks and Conference Close**	

Venue

London Heathrow Marriott Hotel
Bath Road
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A special rate will be available on registration.

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