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

**Innovation, 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
<table>
<thead>
<tr>
<th>Confirmed Speakers</th>
<th>Country</th>
<th>University/Institution</th>
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<tbody>
<tr>
<td>Wolfgang Baumeister</td>
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<td>Michelle Peckham</td>
<td>Austria</td>
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<td>Professor, Centre for Molecular Biophysics</td>
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Microscopy Congress 2015 – 30 November – 1 December, London

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steve@globalengage.co.uk +44 (0) 1865 849841
10.05-10.30  Global Engage Welcome Address
Stream Chair: Raluca Niesner, Group Leader, Biophysical Analysis, German Rheumatism Research Centre Berlin (DRFZ), Germany

Global Engage Welcome Address
Registration & Coffee

10.35-10.05  Keynote Address: Fluorescence Microscopy at the Nanoscale
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

Fluorescence Microscopy at the Nanoscale

10.35-11.15  Instrumentation, Techniques and Developments
Stream Chair: Raluca Niesner, Group Leader, Biophysical Analysis, German Rheumatism Research Centre Berlin (DRFZ), Germany

11.15-12.10  Shedding New Light on Biology: Label-free imaging with non-linear Microscopic imaging techniques to observe cellular processes
Confirmed: Julian Moger, Associate Professor in Biophotonics, University of Exeter, UK

12.10-12.35  Light sheet microscopy
Confirmed: Hans-Ulrich Dott, Professor, Department of Bioelectronics, Vienna University of Technology, Austria

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

Confirmed:
Kevin O’Holleran, Director of Light Microscopy, Cambridge Advanced Imaging Centre, University of Cambridge, UK

14.25-14.50 Fluorescence Lifetime Imaging Microscopy: a sensitive tool for monitoring HIV-1 molecular interactions

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

14.50-15.15 Fluorescence-Based Metabolic and Environmental Imaging of Cells by Dark State Transitions

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

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.

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

16.35-17.00 Studying bone ultrastructure using 3D imaging

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

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

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

Chair’s Closing Remarks and End of Day 1
Networking Drinks Reception

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For more information please contact Steve Hambrook, Conference Director, Global Engage Ltd.

steve@globalengage.co.uk +44 (0) 1865 849841
08.40-09.10  Keynote address: Electron Microscopy: From Molecules to Cells
Elisa D’Este, Postdoctoral Researcher, Interdisciplinary Nanoscience Center, Aarhus University, Denmark

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

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 1 nm range. The potential of the method will be illustrated with in situ structural studies of the 26 S proteasome and of neurotoxic aggregates.

09.10-09.40  Solution Provider Presentation
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09.40  Super-Resolution Microscopy
Stream Chair: Elisa D’Este, Associate Professor, Interdisciplinary Nanoscience Center, Aarhus University, Denmark

Image Analysis / Big Data Challenges

09.40-10.10  Subcortical Cytoskeleton Periodicity in the Nervous System
Elisa D’Este, Postdoctoral Researcher, Interdisciplinary Nanoscience Center, Aarhus University, Denmark

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

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

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.

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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 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

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 guidelines 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

Correlative Light Electron 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

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
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

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

Fluorescent Microscopy in the Detection of Reactive Oxygen Species (ROS) in Cells and Tissues

Institute of Cancer Research, UK

Confirmed:

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

In vivo and in vitro studies of cancer-associated fibroblasts (CAFs) have shown that these cells have a crucial role in many cancer types. We used correlative light microscopy to investigate the behaviour and functions of CAFs in vivo. Confirmed:

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

Fluorescent Microscopy in the Detection of Reactive Oxygen Species (ROS) in Cells and Tissues

Confirmed:

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

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 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 nanoworld more comprehensively. Confirmed:

Miriam Lucas, Senior Researcher, ScopeM, ETH Zurich, Switzerland

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:

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Miriam Lucas, Senior Researcher, ScopeM, ETH Zurich, Switzerland
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

Venue

London Heathrow Marriott Hotel
Bath Road
Hayes, UB3 5AN
United Kingdom

A special rate will be available on registration.

For more information please visit our website for details - www.globalengage.co.uk/microscopy/venue.html

For more information please contact Steve Hambrook, Conference Director, Global Engage Ltd.

steve@globalengage.co.uk  +44 (0) 1865 849841
Making a poster presentation

Poster presentation sessions will take place in breaks and alongside the other breakout sessions of the conference. Your presentation will be displayed in a dedicated area, with the other accepted posters from industry and academic presenters.

We also issue a poster ebook to all attendees with all abstracts in full.

Whether looking for funding, employment opportunities or simply wanting to share your work with a like-minded and focused group, these are an excellent way to join the heart of this congress.

In order to present a poster at the forum you need to be registered as a delegate. Please note that there is limited space available and posters space is assigned on a first come first served basis (subject to checks and successful registration).

For further information on submission, approval and the technical poster spec, please contact: submit@globalengage.co.uk or go to www.globalengage.co.uk/microscopy/posters.html

Related Congresses:

3rd qPCR and Digital PCR Congress
Bringing together over 300 industry & academic experts working in areas such as molecular biology/diagnostics, gene expression, genomics, biomarkers, pathogen detection, GMO, mRNA, NGS, bioinformatics and data management, the congress will examine the latest developments, opportunities and applications of both dPCR and qPCR through case studies across diverse areas such as oncology, virology, infectious diseases, vaccines, prenatal diagnosis, clinical applications, microbiology, food microbiology, plant/ecology genomics and other novel applications.

www.globalengage.co.uk/qpcr.html

2nd Digital Pathology Congress
Attracting industry & academic experts working in all areas of Pathology, this two day meeting will provide the opportunity to take home cutting edge strategies, analysis techniques, case study examples and methods to allow you to fully understand both the technology and accompanying informatics and image analysis tools and utilize digital pathology to its greatest potential.

www.globalengage.co.uk/digital-pathology.html