



Workshop: Advanced Biophotonics - from Bench to Bedside

Code: WAPM11 | Wednesday, 26th June

Royal Geographical Society

Co-Chairs and Organisers:

Khushi Vyas, The Hamlyn Centre, Imperial College, UK

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08:30-09:00 Registration and Coffee

09:00 Opening: Welcome & Introduction

Guang-Zhong Yang, The Hamlyn Centre, Imperial College London, UK

09:10 Fluorescence Lifetime Imaging: from Bench to Robotic Surgery in Patients

(Keynote) Laura Marcu, University of California Davis, USA

09:45 Multidimensional Fluorescence Spectroscopy of the Heart and Development of Multiphoton Imaging Systems for Biomedical Applications

Chris Dunsby, Imperial College London, UK

10:15 Bespoke Multispectral Filter Arrays for Biophotonic Imaging Applications

Calum Williams, University of Cambridge, UK

10:45-11:20 Coffee Break

11:20 Ultra-fast Frequency Domain Pulse Oximetry for Real Time Monitoring of Tissue Viability and Metabolism

Darren Roblyer, Boston University, USA

11:50 Unravelling Approaches for DNA Analysis

Tracy Melvin, University of Southampton, UK

12:20 Poster Teasers

13:00-14:00 Lunch Break & Poster Session

- 14:00** **Robotic Transthoracic Surgery**
(Keynote) Qingquan Luo, Shanghai Chest Hospital, Jiao Tong University, China
- 14:20** **Guided Bronchoscopy System for the Diagnosis and Treatment of
Peripheral Lung Nodules**
Jiayuan Sun, Shanghai Chest Hospital, Jiao Tong University, China
- 14:35** **An Update on Bronchoscopic and CT-guided Treatments for Central and
Peripheral Lung Cancers**
*Justin Garner, Royal Brompton and Harefield NHS Foundation Trust, Imperial
College London, UK*
- 15:05** **Robotics in Urology: Inside-out**
Ranan Dasgupta, St. Marys hospital, Imperial College London, UK
- 15:35-16:05** **Coffee Break & Poster Session**
- 16:05** **Panel Discussion**
- 16:55** **Prize Time**
- 17:05** **Closing Remarks**

**Keynote Speaker:**

Qingquan Luo, Shanghai Chest Hospital, Jiao Tong University, China

Title:

Robotic Transthoracic Surgery

Biography:

Dr. Luo was educated in China and received his M.D. degree from Hua Xi Medical University in 1988. He has completed his residency in thoracic surgery and served as a thoracic surgeon in Shanghai Chest Hospital ever since then. In 2005 and 2014, he received his master's degree in Anatomy from Shanghai Jiao Tong University Medical School and a Ph.D. degree in Oncology from Nanjing Medical University, respectively.

Currently, Dr. Luo is the Surgical Director of the Department of Oncology in the Shanghai Chest Hospital. He is an experienced expert in the field of thoracic surgery and has performed over 10,000 operations since he began working. With a particular focus on minimally invasive treatments for lung tumors, Dr. Luo is a pioneer of video and robot-assisted thoracoscopic surgery. In 2009, he completed the first Da Vinci robot-assisted thoracoscopic surgery (RATS) in mainland China and remained the top thoracic surgeon who has performed the most robotic surgeries (over 1,000 till 2018) in China. He now serves as the Vice President of the Chinese Association for Medical Robots (Chinese Medical Doctor Association), Standing Committee Member for the Experts on Minimally Invasive Thoracic Surgery (Chinese Medical Doctor Association), Leader of the Lung Cancer Academic Group of the Shanghai Anti-Cancer Association, as well as many other academic positions.

Research Interests:

His main research interests are the diagnosis and treatment of lung cancer and innovation for minimally invasive surgery, especially robotic techniques. He is the author of over 60 original articles published in both Chinese and English and was awarded a utility model invention patent in 2012. He is currently responsible for several international and domestic projects including projects from the National Health and Technology Development Research Center, the International Cooperation Project of the Ministry of Science and Technology, and the Shanghai Science and Technology Commission Fund.

**Keynote Speaker:**

Laura Marcu, University of California, Davis, USA

Title:

Fluorescence Lifetime Imaging: from Bench to Robotic Surgery in Patients

Biography:

Dr. Marcu's group is best known for researching and engineering fluorescence lifetime-based instrumentation and multimodal imaging systems that enable studies of the molecular, metabolic and morphologic changes in living systems ranging from biological cells and animal models to human patients. Her research targets unique applications that impact clinical management of critical human disease, with an emphasis on three distinct areas: cardiovascular systems (intravascular

diagnostics), oncology (intraoperative delineation of surgical margins) and regenerative medicine (tissue engineering).

Research Interests:

Fluorescence lifetime spectroscopy and imaging techniques, optical diagnosis of biological tissue, clinical applications of biophotonic technologies, label-free optical characterization of biomaterials.



Speaker:

Ranan Dasgupta, St. Marys hospital, Imperial College London, UK

Title:

Robotics in Urology: Inside-out

Biography:

Mr Dasgupta qualified from Cambridge University, and underwent higher surgical training in London. He studied for a thesis in neuro-urology, and joined a training fellowship in endourology (stone disease). He is active in clinical research studies on prostate disease, voiding dysfunction, stone surgery and urothelial cancer.



Speaker:

Chris Dunsby, Imperial College London, UK

Title:

Multidimensional Fluorescence Spectroscopy of the Heart and Development of Multiphoton Imaging Systems for Biomedical Applications

Biography:

Chris Dunsby is a joint lecturer between Photonics, Department of Physics and the Division of Experimental Medicine in the Department of Medicine. His research interests are centred on the application of photonics and ultrafast laser technology to biomedical imaging and include multiphoton microscopy, multiparameter fluorescence imaging and fluorescence lifetime imaging.

Research Interests:

Fluorescence lifetime spectroscopy, multiphoton imaging techniques, optical diagnosis of biological tissue, clinical applications

**Speaker:**

Justin Garner, Royal Brompton and Harefield NHS Foundation Trust, Imperial College London, UK

Title:

An Update on Bronchoscopic and CT-guided Treatments for Central and Peripheral Lung Cancers

Abstract:

An update on Bronchoscopic and CT-guided Treatments for Central and Peripheral Lung Cancers': In this session, we will review the latest gadgets for the interventional pulmonologist with a focus on robotic assistance and hybrid CT-virtual navigation for targeting peripheral lesions.

Biography:

Justin qualified from Imperial College School of Medicine, UK, in 2008. He is training as a specialist respiratory registrar in the North West Thames deanery. He is currently undertaking a PhD in Interventional Bronchoscopy under Professor Pallav Shah and Dr Omar Usmani.

**Speaker:**

Tracy Melvin, University of Southampton, UK

Title:

Unravelling Approaches for DNA Analysis

Biography:

Dr Tracy Melvin is part of the Institute for Life Sciences at the University of Southampton. Tracy Melvin obtained her PhD from University College London. After post-docs at the University of Illinois, Urbana-Champaign, USA and the Max Planck Institut fuer Strahlenchemie, Germany, she worked in the MRC Radiation and Genome Stability Unit on direct ionisation and enzymatic detection of DNA damage. After researching in the area of charge-migration in DNA, she became interested in the interface of microsystems and microelectronics with biochemistry and took up a research post in the CNRS working at the Centre de Biophysique Moleculaire and the Laboratoire de Physique et Metrologie des Oscillateurs, France.

Research Interests:

Tracy Melvin is interested in the areas of optical microdevices for bioanalysis and self-assembled photonic and electronic devices. Her research activities are based in the Optoelectronic Research Centre where she leads a team with academic backgrounds from biology to electronic engineering. Her research crosses the medical science - micro-optical device interface and includes bionanotechnology methods. On-going projects include optical technology for stem cell biology, microfluidic-optical methods for the analysis of long genomic DNA fragments (relevant to cancer diagnosis) and microfluidic-optical devices for the sensitive detection of proteins (cytokines) from microlitre volumes of serum. The focus of her research is to create technologies to provide the potential to answer bioscience questions that are difficult or cannot be answered in any other way.

**Speaker:**

Darren Roblyer, Boston University, USA

Title:

Ultra-fast Frequency Domain Pulse Oximetry for Real Time Monitoring of Tissue Viability and Metabolism

Biography:

My group utilizes a suite of optical technologies to study cancer at the molecular, cellular, and tissue levels. We specialize in both diffuse optical techniques and multiphoton imaging to study tumor drug response and chemoresistance in the lab and in the clinic. Our long term goal is to personalize cancer therapies through continuous monitoring with label-free and safe optical technologies. We are developing a range of optical technologies that target both preclinical and clinical applications in oncology. For example, we've developed a technique called digital Diffuse Optical Spectroscopic Imaging (dDOS) that measures the frequency-domain optical tissue response of breast tumors. dDOS allows us to track quantitative metabolic and molecular features of tumors in vivo at unprecedented timescales during treatment. We are also developing wearable optical probes to achieve continuous monitoring of human subjects throughout their cancer treatments. In the future, this may allow physicians to personalize and adjust treatment for individual patients. We are also developing Spatial Frequency Domain Imaging (SFDI) as a new tool for small animal oncology imaging. SFDI allows us to recapitulate the clinical environment in the laboratory, and test new drugs and treatment regimens. Finally, we have a unique skill set in fabricating 3-D printed optical phantoms with customized optical properties.

One of our long term research goals is to improve the efficacy of therapeutic agents by using optical techniques to help explore and validate novel drug combinations and schedulings. This approach has the potential to improve treatment outcomes and delay treatment resistance. We are testing a range of cytotoxic, antiangiogenic, and immuno-active agents to determine how optical treatment feedback using SFDI and intravital multiphoton imaging can delay tumor growth, improve response rates, and identify chemoresistance. In the clinic, we utilize dDOS and wearable optical probes to discover and characterize non-invasive optical signatures of chemotherapy response and resistance in cancer patients. We have an ongoing clinical study at the Boston Medical Center (BMC) which uses a range of optical technologies to monitor breast cancer patients receiving neoadjuvant chemotherapy at timescales from minutes to months.

Research Interests:

Optical Functional Imaging, Diffuse Optics, Near Infrared Spectroscopy, Monitoring of Emerging Targeted and Cytotoxic Therapies in Oncology, Non-Invasive Monitoring of Tumor Metabolism.

**Speaker:**

Calum Williams, University of Cambridge, UK

Title:

Bespoke Multispectral Filter Arrays for Biophotonic Imaging Applications

Biography:

Calum obtained a BSc (Hons) in Physics from Cardiff University (2011), an MPhil (Dist.) in Micro & Nanotechnology at the University of Cambridge (2012), and in 2013 joined the Photonic Systems Development Centre for Doctoral Training at the University of Cambridge. He completed his Ph.D. (Engineering) in 2017, with doctoral research in plasmonic nanostructures for enhanced optical devices. Calum is now a Postdoctoral Research Associate, funded by the Cancer Research UK Pioneer Award, and became a Junior Research Fellow at Wolfson College in 2018. Calum is a Postdoctoral Researcher across the Departments of Engineering and Physics. He is member of the Institution of Engineering and Technology (IET) and the Optical Society (OSA).

Research Interests:

Nanophotonics and biomedical optical imaging.