New Research Horizons in NanoMedicine

Hughes Hall Cambridge, 4th December 2014

Programme

1:00 pm– 1:10 pm. ***Arrival and Registration*** *(coffee/tea/biscuits will be available)*

1:10 pm– 1:20 pm. ***Welcome and Introduction***

1:20 pm - 2:45 pm. ***Nanomedicine Research in Cambridge***

Prof. Nigel Slater, "*Biopolymer-mediated intracellular transport for drug delivery and human cell cryopreservation"*

Dr. Oren Scherman *"Dynamic Supramolecular Polymers in Drug Delivery: From Hydrogels to Microcapsules"*

Dr. David Fairen-Jimenez, "*Adsorption Processes in Metal-Organic Frameworks for Healthcare*"

Dr. Su Metcalfe *"Research Horizons in Nanomedicine: Multiple Sclerosis"*

Dr. Yan Yan Shery Huang *"Biointerface and Organ-on-Chips"*

Dr. Sarah Bohndiek *"Imaging in nanomedicine"*

2:45 pm - 3:15 pm. ***Break with coffee and cake***

3:15pm – 4:00 pm. ***Panel Discussion***

Led by **Dr. Stefano Pluchino**

4:00 pm-4:15 pm. ***Nanomedicine Research within the Nanoforum Network***

Prof. Jeremy Baumberg

4:15 pm – 5:15 pm. ***Networking event***

5:15 pm- 5:30 pm. ***Closing remarks***

Biography and Research Interests of Speakers

Dr. Sarah Bohndiek

seb53@cam.ac.uk
University Lecturer, Department of Physics
Junior Group Leader, Cancer Research UK
Cambridge Institute
Fellow, Corpus Christi College

Background:

Dr Sarah Bohndiek is a Group Leader jointly appointed in the Department of Physics and the Cancer Research UK Cambridge Institute at the University of Cambridge. She completed her PhD in Radiation Physics at UCL in 2008 and then worked in both the UK and USA as a postdoctoral fellow. During that time, Sarah published over 30 research articles primarily on molecular imaging of cancer, which have received over 700 citations. She was awarded the Institute of Physics Paterson Medal in 2014 recognition of this work.

Research Interest:

"Imaging in nanomedicine"

My lab develops novel imaging approaches to apply to the study of tumour biology. We are particularly interested in how tumours use oxygen, both from a delivery and metabolic perspective. This is crucial for cancer therapy, since both chemotherapy and radiotherapy rely on the presence of oxygen in their effects.

Dr. David Fairen-Jimenez

df334@cam.ac.uk
Department of Chemical Engineering and Biotechnology,
University of Cambridge, United Kingdom.
http://people.ds.cam.ac.uk/df334

Background:

Dr. David Fairen-Jimenez leads the Adsorption & Advanced Materials Group in the Dept. of Chemical Engineering & Biotechnology at the University of Cambridge and undertakes fundamental research in the interface between chemical engineering, materials science and biotechnology. In particular, his research concerns the study of the molecular mechanisms that control adsorption processes in porous materials. He is particularly interested in drug delivery systems, where nanotechnology has a fundamental impact to revolutionise cancer diagnosis and therapy. He is also interested in the use of novel porous materials for the necessary shift from today's fossil-based energy economy to a more sustainable economy based on hydrogen and renewable energy, linked to the carbon capture to mitigate the effects of global warming. His objective is to evaluate new strategies in the study of adsorption processes, the study and design of new porous materials such as metal-organic frameworks (MOFs) and to develop new methods in the prediction of their performance. DF-J joined the Dept. of Chemical Engineering in 2012 as a Royal Society University Research Fellow. Before that, he was awarded his PhD at the University of Granada, Spain, in 2006 and was working 4 years at The University of Edinburgh as a Marie Curie fellow. After this experience, he moved to Northwestern University, USA, as a senior research associate. He has published 40 papers in leading journals including the Journal of American Chemical Society, Agewandte Chemie and Chemical Communications.

Research Interest: ***Adsorption Processes in Metal-Organic Frameworks for Healthcare***

Self-assembled functional materials have emerged as an extensive class of materials with an extraordinary degree of variability. On a fundamental level, self-assembled materials symbolise the beauty of chemical structures and the possibility of modifying their individual chemical and physical properties. In particular, metal-organic frameworks (MOFs), one of the most exciting developments in recent porous-materials science, have received great attention as an attractive way of combining structural diversity with multiple organic functionalities. MOFs are known for their extraordinarily porosities, being able to reach apparent surface areas up to 8,000 m^2 per gram of material. The fundamental understanding of the specific properties of these systems presents a critical importance in the necessary shift from today's fossil-based energy economy to a more sustainable economy based on hydrogen and renewable energy, as well as medicine applications, where nanotechnology has a fundamental impact to revolutionise cancer diagnosis and therapy.

The fundamental understanding of the adsorption phenomena is crucial for the design of new porous materials and MOFs and the study of their performance in industrial applications. In our research, we combine molecular computational techniques with a range of experimental techniques that include gas adsorption, neutron and X-Ray diffraction and *in vitro* studies for drug delivery applications. This combination of techniques presents several benefits. Firstly, experimental characterisation is crucial for an application under realistic conditions. On the other hand, simulations provide a detailed picture on the molecular scale that is not easily accessible from experimental methods. This allows studying in detail how the structure influences the adsorption performance and therefore forms an essential part in the identification and design of promising materials.

Dr Yan Yan Shery Huang

yysh2@cam.ac.uk
Department of Engineering, University of Cambridge, CB2 1PZ
Phone: +44 1223 7 48559
Fax: +44 1223 3 32662

Background:

Dr Shery Huang is a University Lecturer in Bioengineering in the Department of Engineering. She completed her MEng degree in Materials Science and Engineering from Imperial College London in 2007. With a Cambridge Gates Scholarship, she then pursued a PhD in Physics at Cambridge, focusing on carbon nanotechnology. She was a visiting researcher at University of Texas at Austin (2008), during which she worked with Raman microscopy of photosynthetic organisms. After graduating from her PhD in 2011, she was awarded an Oppenheimer Fellowship and a Homerton College Junior Research Fellowship to start her independent research in advancing device interface with biological systems. Since Aug 2013, she has started her Lectureship in Bioengineering. For more information, please visit: http://www.eng.cam.ac.uk/profiles/yysh2

Research Interest:

Talk title: ***Biointerface and Organ-on-Chips***

Research Keywords: Bioengineering; Biofabrication; Organ-on-Chips; Bioelectronics;

Research Project:

Biofabrication (3D printing, multi-material deposition)

In vitro cancer metastasis model

Neural stem cell scaffold engineering

Vascular tissue engineering

Dr. Su Metcalfe

smm1001@cam.ac.uk
Department of Clinical Neurosciences
University of Cambridge, United Kingdom.
http://www.neuroscience.cam.ac.uk/directory/profile.php?smm1001

Background:

Current Position: As a member of the University of Cambridge Clinical School, I take a keen interest in students and serve on the Degree Committee whilst also promoting new opportunities including working with Professor Jeremy Baumberg to establish the cross-Schools NanoMed Initiative. As PI, I have funded my group through major grant awards including from the MRC, BHF, NKRF, JDRF, NIHR-i4i, ROTRF, and both local and national Trusts including Addenbrooke's NHS Trust. Experience includes commercial development of my academic discoveries assisted by support from two sequential NIHR-i4i awards. I own patents shared with Yale and in 2013 founded LIFNano Therapeutics Ltd with co-founder Tarek Fahmy (Yale).

Research Interest:

The goal of my research is to develop LIF-based NanoTherapy, following my discovery that LIF, a stem cell factor (Leukaemia Inhibitory Factor), is a critical mediator of immune tolerance in addition to being a powerful biological repair factor.

Parkinson's Disease: Currently untreatable illnesses including neurodegenerative diseases (NDD) present key future targets for nano-therapeutic intervention. By loading biocompatible, biodegradable nano-particles with growth factor, and targeting to sites of tissue damage, a synthetic biologically instructive niche can be created to repair tissues in situ, and/or to support cell survival in regenerative cell therapy. Based in the John van Geest Centre for Brain Repair my recent work has focused on cell-based therapy for Parkinson's Disease together with Professor Roger Barker. *REF: Zhao et al Disease Models and Mechanisms 2014 Oct; 7 (10): 1193-1203.*

Multiple Sclerosis: Nanotechnology could revolutionise treatment for patients suffering from multiple sclerosis (MS). I recently received a $250,000 (£150,000) award from the Merck-Serono's "Grants for Multiple Sclerosis International" (GMSI) scheme. One of only five awards made worldwide, and the first to a UK scientist, this award is to fund preclinical trials of our therapeutic LIF-nanoparticle that taps into the body's natural mechanisms for repair of myelin and avoids use of drugs. Proof of concept of therapeutic benefits in animal models is well established. The GMSI award now allows LIF-nano to be evaluated in a series of preclinical trials where the safety in humans is already confirmed for the nano-formulation platform.

Dr. Oren Scherman

oas23@cam.ac.uk
University Reader
Department of Chemistry
Melville Laboratory for Polymer Synthesis
University of Cambridge,
Lensfield Road CB2 1EW

Background: Oren Scherman graduated from Cornell University in Ithaca, New York with a BA in Chemistry in 1999. He then went on to complete a PhD under the supervision of Professor Robert H. Grubbs at the California Institute of Technology (Caltech) in Pasadena, California in 2004. After finishing his PhD in the area of olefin metathesis and controlled polymerisation, he moved to the Netherlands to work on supramolecular polymers, at the Eindhoven University of Technology (TU/e), with Professors E. W. (Bert) Meijer and Rint P. Sijbesma. In 2006, he moved to Cambridge to take an academic position where he is now a University Reader in Supramolecular and Polymer Chemistry, Next Generation Fellow and director of the Melville Laboratory for Polymer Synthesis in the Department of Chemistry at the University of Cambridge.

Research Interest: Our research interests include the synthesis of functional nanosystems, controlled polymer architectures and dynamic supramolecular assemblies through molecular recognition processes.

The underlying theme of our research lies at the interface between synthetic organic efforts on small molecules and macroscopic properties at the materials level, developing a macro-organic approach to chemistry. Dynamic supramolecular self-assembly of materials will be an area of great importance in the coming years, allowing for innovations in nanotechnology and at the biological and chemical interfaces.

We are particularly interested in exploring topics such as water-soluble and stimuli-responsive materials, template and imprinting technologies of functional polymers for use in chiral separations and enantioselective catalysis, and controlling material morphologies and architectures both in solution and in the solid state through rational design and a multi-step, hierarchical self-assembly process.

Prof. Nigel Slater

nkhs2@cam.ac.uk
Professor of Chemical Engineering
Head Department of Chemical Engineering and Biotechnology
University of Cambridge
Pembroke Street,
Cambridge CB2 3RA.
Te: +44 1223 762953

Background: Nigel graduated in Chemistry and obtained a PhD in Physical Chemistry at Cambridge. Following a Lectureship in Chemical Engineering he was Bioprocessing Section Manager at the Unilever Research Laboratory in The Netherlands then Head of Biopharmaceutical Development at the Wellcome Research Laboratory. He returned to Cambridge in 2000 were he leads a research group that specialises in downstream and secondary manufacturing of biopharmaceuticals.

Research Interest:

Current projects

- Microfluidic devices for chromatographic separations and drug delivery
- Cryo- and Lyopreservation of stem cell regenerative medicines
- Biopolymer mediated drug delivery systems
- Liposomal formulations for RNA vaccines

Contact details of participants

Megha Agrawal	ma547@cam.ac.uk
Jeremy Baumberg	jjb12@cam.ac.uk
Sarah Bohndiek	seb53@cam.ac.uk
Philip Buttery	pcb10@cam.ac.uk
Kevin Chalut	kc370@cam.ac.uk
David Fairen-Jimenez	df334@cam.ac.uk
Javier Garcia Nafria	jgarcia@mrc-lmb.cam.ac.uk
Kerstin Goepfrich	kg360@cam.ac.uk
Ahu Gumrah-Parry	agd33@cam.ac.uk
Silvia Hernandez-Ainsa	smh80@cam.ac.uk
Yan Yan Shery Huang	yysh2@cam.ac.uk
Agnieszka Iwasiewicz-Wabnig	ai261@cam.ac.uk
Karishma Jain	kj259@cam.ac.uk
James Joseph	jj412@cam.ac.uk
Rebecca Kershaw	rdk30@cam.ac.uk
Ulrich Keyser	ufk20@cam.ac.uk
Ji Liu	jl838@cam.ac.uk
Su Metcalfe	smm1001@cam.ac.uk
Andre Neves	andre.neves@cruk.cam.ac.uk
Eileen Nugent	en270@cam.ac.uk
Katherine Orchard	klo24@cam.ac.uk
Claudia Orellana	cao35@cam.ac.uk
Myriam Ouberai	mmo25@cam.ac.uk
Simon Pacey	scp46@medschl.cam.ac.uk
Stefano Pluchino	spp24@cam.ac.uk
Stefanie Reichelt	sr411@cam.ac.uk
Oren Scherman	oas23@cam.ac.uk
Nigel Slater	nkhs2@cam.ac.uk
Jayden Smith	jas256@cam.ac.uk
Silvia Sonzini	ss2005@cam.ac.uk
Michelle Teplensky	mt619@cam.ac.uk
Alexandra Vaideanu	agv25@cam.ac.uk
Silvia Vignolini	sv319@cam.ac.uk
Jana Voigt	jana.voigt@medschl.cam.ac.uk
Mark Welland	mew10@cam.ac.uk
Jenny Zhang	jz366@cam.ac.uk