



Physics Meets Biology 2019

9–11 September 2019

University of Oxford, Oxford, UK

Programme

Sunday 8 September

St Anne's College, Oxford

14:30 **Registration and check-in for residents**
The Lodge

17:30 **Welcome Reception**
Outreach Room

19:30 **Welcome Dinner**
Main Dining Hall

Monday 9 September

University of Oxford: Clarendon Laboratory, Department of Physics and St Anne's College

09:00–18:00 **Registration**
Martin Wood Foyer

10:20 **Introduction**
Andrew Turberfield, University of Oxford, UK
Martin Wood Lecture Theatre

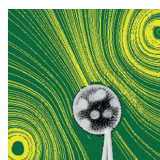
10:25–11:15 **Chair: Waclaw Bartłomiej**
University of Edinburgh, UK

10:25 **(Keynote) The role of rare “jackpot” events in the dynamics of evolution and ecology**
Oskar Hallatschek, University of California, USA
Martin Wood Lecture Theatre

11:15 **Refreshment Break**
Martin Wood Foyer

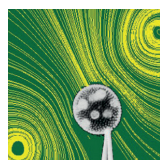
11:30–12:50 **Chair: Achilles Kapanidis**
University of Oxford, UK

11:30 **(Invited) Gene transfer between bacteria: from single molecules to genome dynamics**
Berenike Maier, University of Cologne, Germany
Martin Wood Lecture Theatre



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- 12:00 **(Invited) Cell-size control and homeostasis: lessons from bacteria**
Suckjoon Jun, University of California San Diego, USA
Martin Wood Lecture Theatre
-
- 12:30 **The electrical ecology of outdoor foraging bumblebees**
Clara Montgomery, University of Bristol, UK
Martin Wood Lecture Theatre
-
- 12:50 **Lunch**
St Anne's College Main Dining Hall
British Biophysical Society AGM
Martin Wood Lecture Theatre
- 14:10–
15:50 **Chair: Mark Leake**
University of York, UK
-
- 14:10 **(Invited) Super-resolution microscopy with DNA molecules: Towards localizomics**
Ralf Jungmann, Max Planck Institute of Biochemistry, Germany
Martin Wood Lecture Theatre Room
-
- 14:40 **Single-molecule observation of co-transcriptional effects**
Heesoo Uhm, University of Oxford, UK
Martin Wood Lecture Theatre
-
- 15:00 **Tracking proteins in 3D within bacteria**
Helen Miller, University of Oxford, UK
Martin Wood Lecture Theatre
-
- 15:20 **(Invited) Visualizing molecular electrostatics in an optical microscope**
Madhavi Krishnan, University of Oxford, UK
Martin Wood Lecture Theatre Room
-
- 15:50 **Poster Session 1**
Simpkons Lee Room, Beecroft Building
- 18:00–
18:50 **Chair for Keynote Lecture 2: Thomas Waigh**
University of Manchester, UK
-
- 18:00 **(Keynote) Interfacial challenges to antibody bioprocessing**
Chris van der Walle, AstraZenca, UK
Martin Wood Lecture Theatre Room
-
- 19:30 **Dinner**
St Anne's College Main Dining Hall



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Tuesday 10 September

University of Oxford: Clarendon Laboratory, Department of Physics and St Anne's College

08:00– **Registration**

18:10 *Martin Wood Foyer*

09:00– **Chair: Tom McLeish**

11:00 *University of York, UK*

09:00 **(Keynote) Biological polyelectrolytes: single-molecule spectroscopy of intrinsically disordered proteins and their interaction mechanisms**

Ben Schuler, University of Zurich, Switzerland

Martin Wood Lecture Theatre

09:50 **Silk: A natural example of a sticky entangled polymer**

Charley Schaefer, University of York, UK

Martin Wood Lecture Theatre

10:10 **(Invited) Protein self-assembly**

Tuomas Knowles, University of Cambridge, UK

Martin Wood Lecture Theatre

10:40 **Liquid-liquid phase separation morphologies in ultra-white beetle scales and a synthetic equivalent**

Andrew Parnell, University of Sheffield, UK

Martin Wood Lecture Theatre

11:00 **Refreshment Break**

Martin Wood Foyer

11:30– **Chair: Sarah Harris**

12:50 *University of Leeds, UK*

11:30 **(Invited) Biophysics of liquid-liquid phase condensation of intrinsically disordered proteins**

Tom McLeish, University of York, UK

Martin Wood Lecture Theatre

12:00 **A minimalist model for probing liquid-liquid phase separation in protein-D(R)NA mixtures**

Jerelle Joseph, University of Cambridge, UK

Martin Wood Lecture Theatre

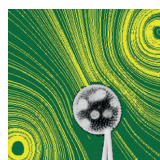
12:20 **(Invited) How bacterial biofilms structure their local environment**

Cait MacPhee, University of Edinburgh, UK

Martin Wood Lecture Theatre

12:50 **Lunch**

St Anne's College Main Dining Hall



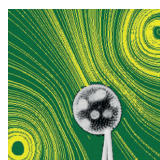
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- 14:10–
16:00 **Chair: Madhavi Krishnan**
University of Oxford, UK
-
- 14:10 **DNA double-strand break repair at the single molecule level in bacteria**
Meriem El Karoui, University of Edinburgh, UK
Martin Wood Lecture Theatre
-
- 14:40 **Single-molecule biomechanics probed via novel 3D holographic microscopy and parabolic masking**
James Flewelling, Francis Crick Institute, UK
Martin Wood Lecture Theatre
-
- 15:00 **(Invited) Mesoscale computer models of molecular motors**
Sarah Harris, University of Leeds, UK
Martin Wood Lecture Theatre
-
- 15:30 **(Invited) Single-molecule super-localization optical microscopy reveals how barriers to DNA replication are resolved in living cells**
Mark Leake, University of York, UK
Martin Wood Lecture Theatre
-
- 16:00 **Poster Session 2**
Simpkins Lee Room, Beecroft Building
-
- 18:10 **IOP Biological Physics Group AGM**
Martin Wood Lecture Theatre
-
- 19:30 **Drinks Reception**
Foyer B Ruth Deech Building
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- 20:00 **Conference Dinner**
St Anne's College Main Dining Hall

Wednesday 11 September

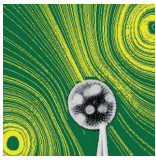
University of Oxford: Clarendon Laboratory, Department of Physics and St Anne's College

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- 08:00–
15:20 **Registration**
Martin Wood Foyer
- 09:00–
11:00 **Chair: Andrew Turberfield**
University of Oxford, UK
-
- 09:00 **(Keynote) Ultrafast pump probe experiments: challenges and insights**
Ilme Schlichting, Max Planck Institute for Medical Research, Germany
Martin Wood Lecture Theatre
-
- 09:50 **Molecular resolution of the effects of antibiotics on gram-positive bacteria cell wall using atomic force microscopy**
Laia Pasquina-Lemonche, University of Sheffield, UK
Martin Wood Lecture Theatre



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- 10:10 **Introducing handhold-mediated strand displacement: A new template-catalysed reaction for DNA nanotechnology**
Javier Cabello Garcia, Imperial College London, UK
Martin Wood Lecture Theatre
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- 10:30 **(Invited) Revisiting the structure-function relationship with mass photometry**
Philipp Kukura, University of Oxford, UK
Martin Wood Lecture Theatre
-
- 11:00 **Refreshment Break**
Martin Wood Foyer
- 11:30–
12:40 **Chair: Cait MacPhee**
University of Edinburgh, UK
-
- 11:30 **(Invited) Physical principles of retroviral integration in the human genome**
Davide Michieletto, University of Edinburgh, UK
Martin Wood Lecture Theatre
-
- 12:00 **Surfing on protein waves: modeling the bacterial genome partitioning**
Jean-Charles Walter, CNRS & Université de Montpellier, France
Martin Wood Lecture Theatre
-
- 12:20 **A heteromorphic polymer model for cis-regulatory interactions in gene loci**
Chris Brackley, University of Edinburgh, UK
Martin Wood Lecture Theatre
-
- 12:40 **Lunch**
St Anne's College Main Dining Hall
- 14:00–
15:10 **Chair: Michelle Peckham**
University of Leeds, UK
-
- 14:00 **Single molecule imaging of self-assembled peptide gel dynamics demonstrates states of prestress**
Thomas Waigh, University of Manchester, UK
Martin Wood Lecture Theatre
-
- 14:20 **Towards bioinspired acoustic metamaterials for advanced noise control solutions**
Marc Holderied, University of Bristol, UK
Martin Wood Lecture Theatre
-
- 14:40 **(Invited) Membrane tension as a regulator of malaria parasite invasion in red blood cells**
Pietro Cicuta, University of Cambridge, UK
Martin Wood Lecture Theatre
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- 15:10 **Closing Remarks**
Andrew Turberfield, University of Oxford, UK
Martin Wood Lecture Theatre

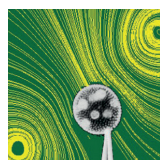


Poster programme

Poster programme 1

Simpkins Lee Room, Beecroft Building

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- P1.1** **Diagnosis of malaria based on phase coherence between oscillations of instantaneous heart frequency and respiration**
Yunus Abdulhameed, Lancaster University, UK
-
- P1.2** **Proteoliposomes as energy transferring nanomaterials: enhancing the spectral range of light-harvesting proteins using lipid-linked chromophores**
Peter Adams, University of Leeds, UK
-
- P1.3** **Developing a model of hormone pulsatility using light for high throughput drug screening**
Danothy Bennett, University of Bristol, UK
-
- P1.4** **Deformation and DNA damage in migrating cancer cells**
Rachel Bennett, University of Bristol, UK
-
- P1.5** **Measuring the geometrical dimensions of the double helix in solution**
Maria Bespalova, University of Oxford, UK
-
- P1.6** **Defect dynamics of an active nematic confined to a spherical shell**
Aidan Brown, University of Edinburgh, UK
-
- P1.7** **The hard X-ray Nanoprobe at Diamond Light Source**
Julia Parker, Diamond Light Source, UK
-
- P1.8** **Antibacterial surfaces inspired by Cicada Wing nano-topography**
Thomas Catley, University of Sheffield, UK
-
- P1.9** **Microtubule cytoskeleton self-organisation is robust and depends on cell geometry alone**
Lyubov Chumakova, University of Edinburgh, UK
-
- P1.10** **Wavefront propagation speeds in a bacteriophage-bacteria system**
Rory Claydon, University of Edinburgh, UK
-
- P1.11** **Molecular reach as a control parameter for surface receptor signalling**
Omer Dushek, University of Oxford, UK
-
- P1.12** **Electric ecology and aerial electroreception in predator-prey interactions**
Sam England, University of Bristol, UK
-
- P1.13** **Fundamental insight into ionic transport through biological ion channels**
William Gibby, Lancaster University, UK
-
- P1.14** **Bioaerosol sensing using deep learning**
James Grant-Jacob, Optoelectronics Research Centre, UK



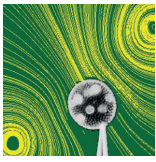
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- P1.15** **Super-resolution imaging using deep learning**
James Grant-Jacob, Optoelectronics Research Centre, UK
-
- P1.16** **Tracking replication restart on crosslinked DNA in vivo at the single molecule level**
Alex Hargreaves, University of York, UK
-
- P1.17** **What is brewing? – New insights into barley cell wall structure**
Erik Hedlund, Katholieke Universiteit Leuven, Belgium
-
- P1.18** **Response to exogenous electromagnetic fields by planarian flatworms: is this a like dissolves like phenomenon?**
Victoria Hossack, Laurentian University, Canada
-
- P1.19** **The 2B subdomain of Rep helicase links translocation along DNA with protein displacement**
Jamieson Howard, University of York, UK
-
- P1.20** **Plant fertilizers affect the electric ecology of foraging bees**
Ellard Hunting, University of Bristol, UK
-
- P1.21** **Peptide assembly directed and quantified using megadalton DNA nanostructures**
Juan Jin, University of Oxford, UK

Poster programme 2

Simpkins Lee Room, Beecroft Building

-
- P2.1** **Gene circuits and multi-dimensional optical microscopy: Characterisation of cellular stress**
Sarah Lecinski, University of York, UK
-
- P2.2** **In vivo single-molecule imaging of DNA gyrase**
Ji-Eun Lee, University of York, UK
-
- P2.3** **Single-molecule real-time observations of DNA repair in E. coli**
Alessia Lepore, University of Edinburgh, UK
-
- P2.4** **Selective interactions and disruption modes of peptides with model lipid membranes: Combination of coarse-grained simulations with experiments**
Mingrui Liao, University of Manchester, UK
-
- P2.5** **Stochastic modeling of intracellular transport performed by kinesin-1 and mammalian dynein motor proteins**
Gina Monzon, Saarland University, South Africa
-
- P2.6** **Transport along cytoskeletal networks**
Kristian Müller-Nedebock, Stellenbosch University, Germany
-
- P2.7** **Dynamics of endoplasmic reticulum tubules in live cells**
Hannah Perkins, University of Manchester, UK
-
- P2.8** **Control of antigen discrimination by accessory receptors**
Johannes Pettmann, University of Oxford, UK



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- P2.9** **Nonequilibrium correlations in minimal dynamical models of polymer copying**
Jenny Poulton, Imperial College London, UK
-
- P2.10** **Origin of asymmetry in tip cell mitosis**
Christopher Revell, Boston University, USA
-
- P2.11** **In vivo dynamics and assembly of the Ssn6-Tup1 global corepressor complex upon glucose repression in yeast *Saccharomyces cerevisiae***
Sviatlana Shashkova, University of York, UK
-
- P2.12** **General sol to gel transition of liquid-liquid phase separated protein under shear**
Yi Shen, University of Cambridge, UK
-
- P2.13** **The emergence of sequence-dependent structural motifs in stretched, torsionally constrained DNA**
Jack Shepherd, University of York, UK
-
- P2.14** **An action principle for living systems**
Richard Summers, University of Mississippi Medical Center, USA
-
- P2.15** **From magnets to biological nanosprings**
Marie Synakewicz, University of Cambridge, UK
-
- P2.16** **New methods to harvest micro-algae in suspensions using depletion interaction**
Naoual Taghi, Queen Mary University of London, UK
-
- P2.17** **Electrofusion of escherichia coli giant spheroplast and giant unilamellar vesicle**
Sho Takamori, University of Cambridge, UK
-
- P2.18** **Glucose nanosensors and single-molecule microscopy to better understand glucose signal transduction and diabetes**
Adam Wollman, University of York, UK
-
- P2.19** **Modeling intrinsic biases in high-throughput sequencing data for chromatin accessibility**
Chongzhi Zang, University of Virginia, USA
-
- P2.20** **The conductivity of self-assembling peptide composites**
Lin Zhang, University of Manchester, UK
-
- P2.21** **Supracellular mechanical architecture of the intact bone microenvironment**
Jamie Hobbs, University of Sheffield, UK