



THE UNIVERSITY
of EDINBURGH

Soft Matter/ Biological/Statistical Physics & Astrobiology

Finding Physics in unexpected places

PhD coordinator: Dr Simon Titmuss

simon.titmuss@ed.ac.uk

<https://tinyurl.com/softstatbio>

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the world

Institute of Condensed Matter & Complex Systems

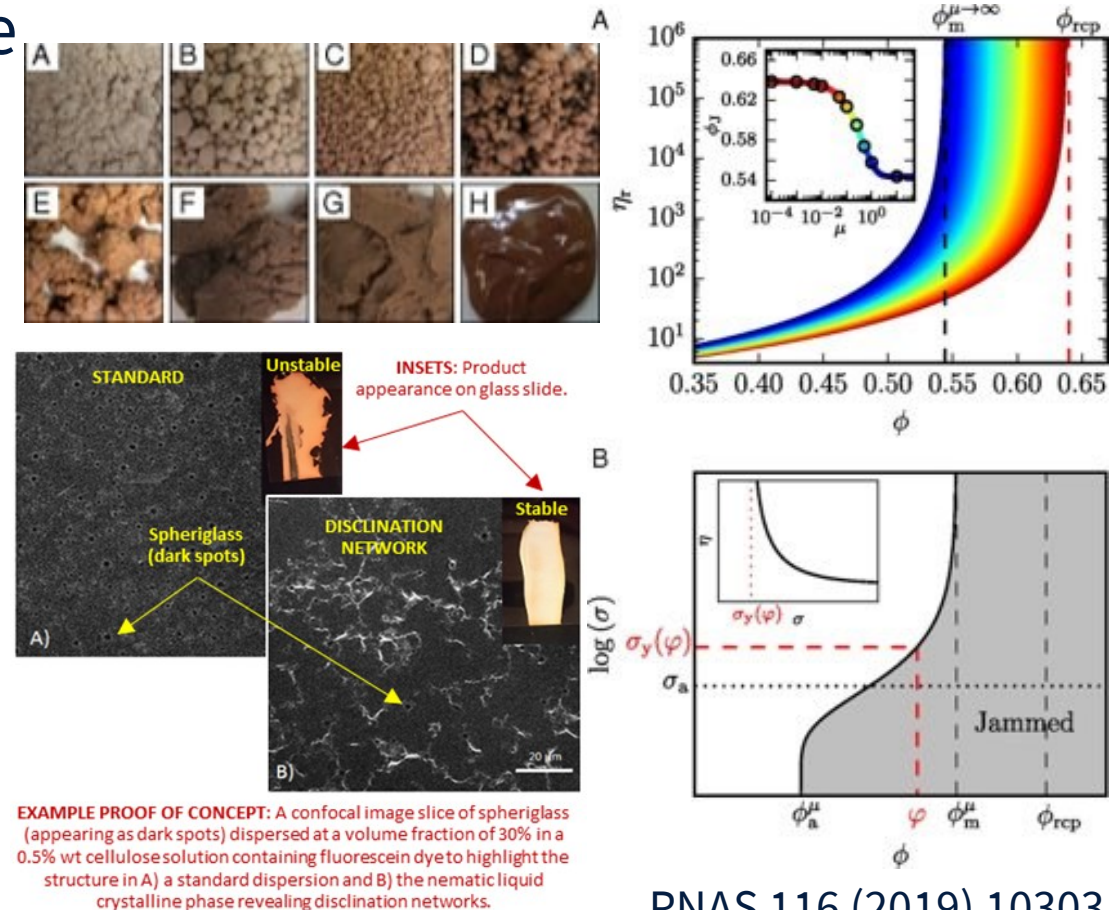
- 20 faculty working across soft matter/statistical/biological physics & astrobiology
- ~50 PhD students and postdocs
- Extensive collaboration between experimentalists, simulators & theoreticians
- We use confocal microscopy, rheo-imaging, electron microscopy, microfluidics, synchrotrons & neutrons
- We collaborate extensively with industrial partners
- Track record of finding interesting physics in a wide-range of applications



Soft matter in motion: rheology, wetting and evaporation

Wilson Poon, Job Thijssen, Tiffany Wood, Alexander Morozov, John Royer, Simon Titmuss, David Fairhurst, Daniel Hodgson

- Flow of dense suspensions, e.g. chocolate
- Droplet physics: wetting & evaporation
- Liquid crystals/colloids flow
- Viscoelastic turbulence
- Physics of blood



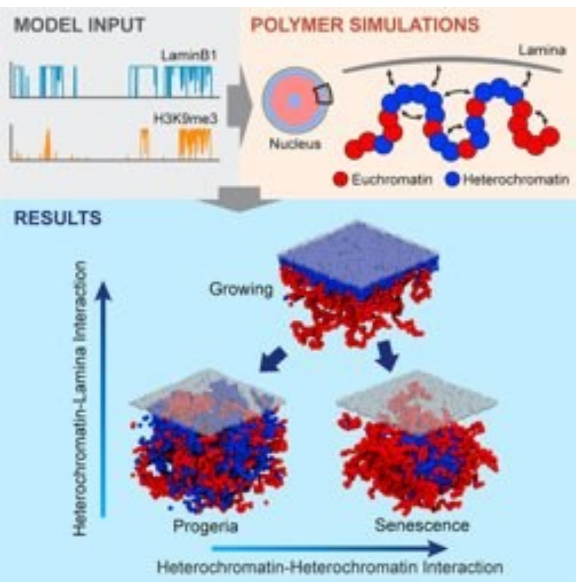
PNAS 116 (2019) 10303



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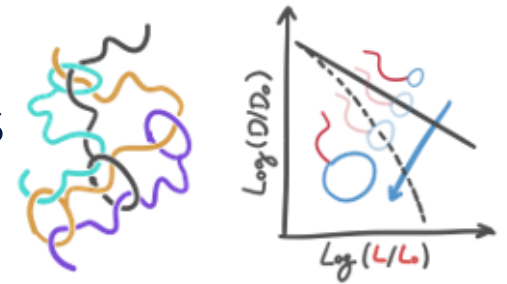
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Physics of Life & Death: DNA, bacteria & viruses



Davide Marenduzzo, Wilson Poon, Tyler Shendruk, Chris Brackley, Davide Michieletto, Alexander Morozov, Aidan Brown, Gavin Melaugh, Cait MacPhee, Simon Titmuss, Patrick Pietzonka, Willem Vanderlinden, Giuseppe Negro

- Experiments & simulations of genome materials
- Experiments & simulations of biofilms & swimmers
- Population dynamics: bacteria & phages
- Soft matter physics and respiratory virus droplets



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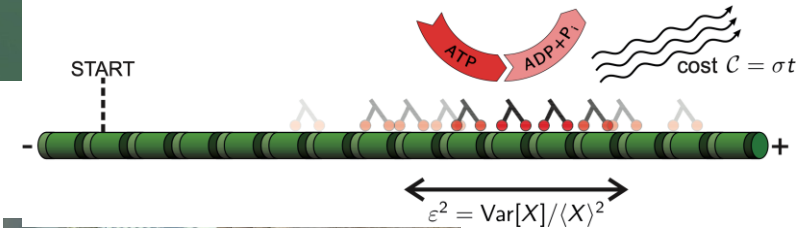
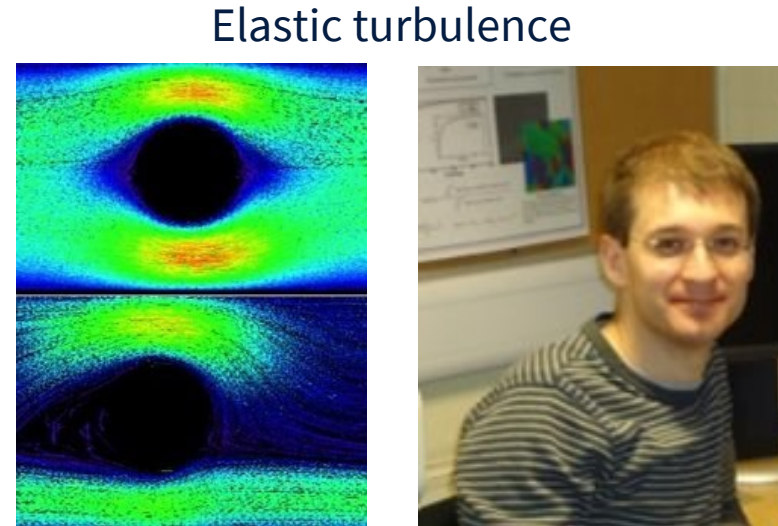
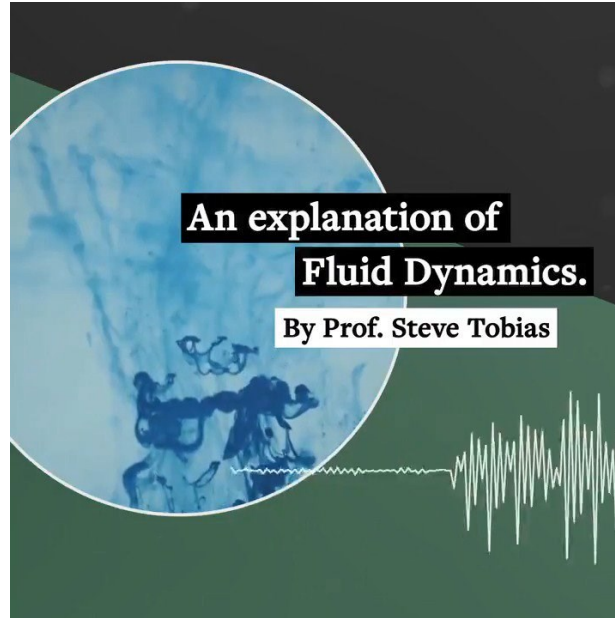
Driven systems: Transport models

Martin Evans, Richard Blythe, Alexander Morozov, Tyler Shendruk, Somrita Ray, Patrick Pietzonka, Steve Tobias (incoming Tait Professor)

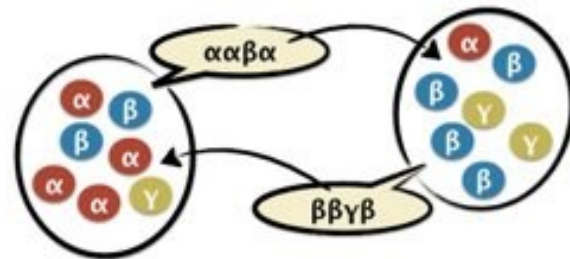


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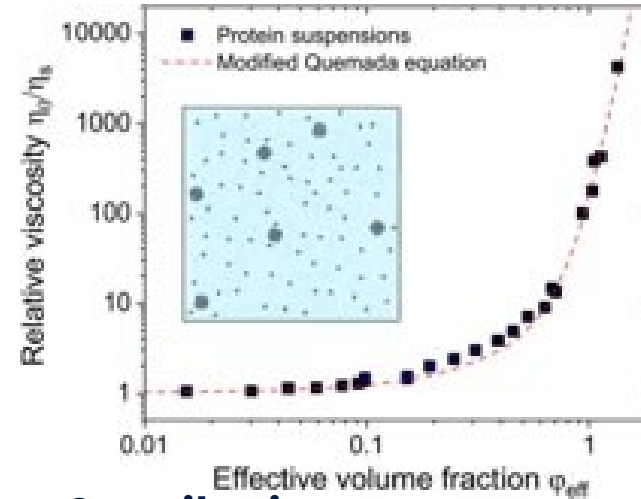
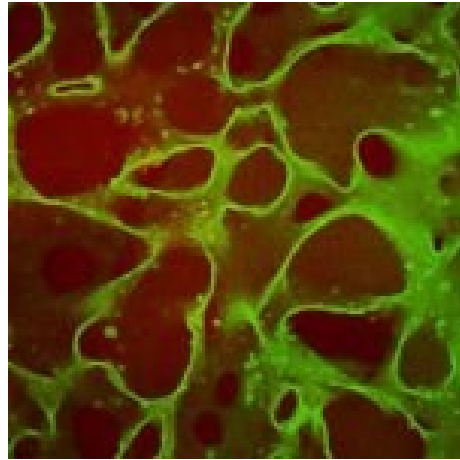
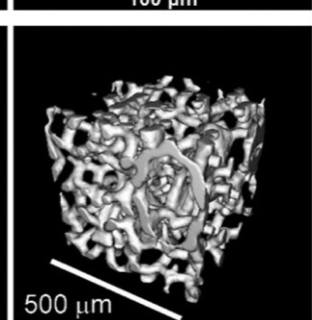
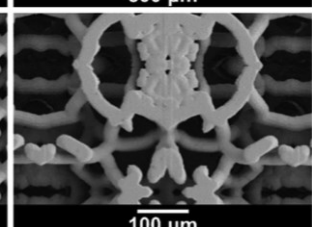
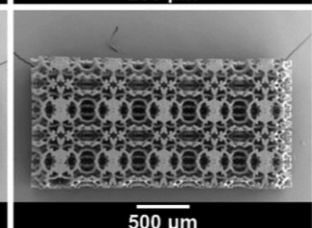
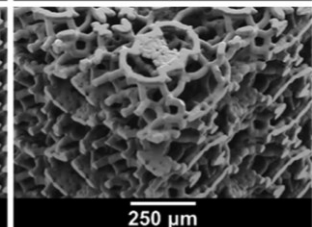
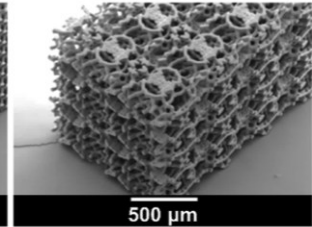
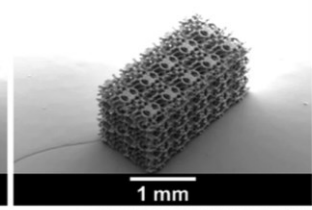
Thermodynamics of precision



Simple cultural evolutionary model for linguistic behaviour

Arrested systems: new materials & processes

Paul Clegg, Job Thijssen, Davide Marenduzzo, Wilson Poon, Cait MacPhee



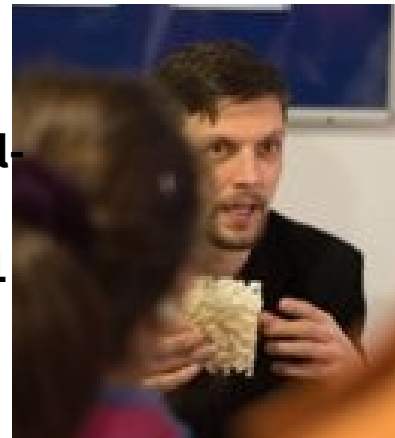
Viscosity of protein-stabilized emulsions: Contributions of components and development of a semi-predictive model

Journal of Rheology **63**, 179-190 (2019)

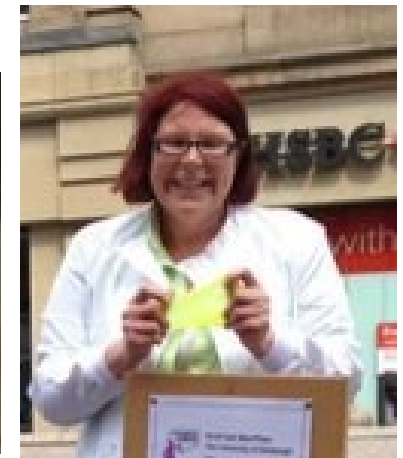
Hybrid electrolytes with 3D bicontinuous ordered ceramic and polymer microchannels for all-solid-state batteries

Energy Environ. Sci **1** (2018) 185-201

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Slow-melting ice cream ingredient discovered by scientists



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Astrobiology

Charles Cockell, Sean McMahon, Rosa Santomartino, Cait MacPhee



**UK Centre for
Astrobiology**



- Habitability & limits of Life
- Subsurface Astrobiology
- Astrobiology in Deep Time: Planetary Paleobiology
- Microbial biofilms, life in extremes, microorganisms in microgravity



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What is ECFP?



Biotechnology and
Biological Sciences
Research Council



THE UNIVERSITY of EDINBURGH
School of Biological Sciences



THE UNIVERSITY of EDINBURGH
School of Engineering



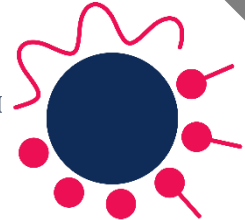
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School of Physics
& Astronomy



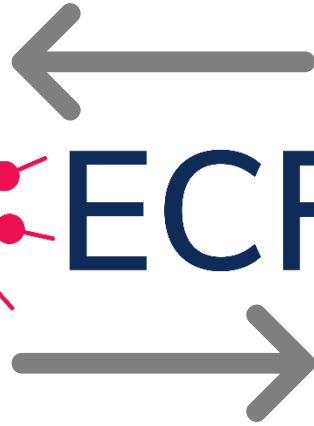
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School of Chemistry



Medical
Research
Council



ECFP



SCOTLAND
FOOD & DRINK

CORNING

SOLVAY



PEPSICO



Lamellar Biomedical



TOYOTA



Unilever



ECFP Vision

Leading global centre for physics-driven
formulation