# UK Fluids Conference 2019
# Centre for Mathematical Sciences, Cambridge

# Programme Tuesday 27 August 2019

**12.30-14.00:** Registration & Lunch, Churchill College
**14.00-14.15 MR2:** Welcome
**14.15-15.00 MR2:** Plenary Lecture **Dwight Barkley**, University of Warwick
**15.00-15.30 Central Core:** Coffee
**15.30-17.40 MR2, MR3, MR9:** Parallel Session A

| | MR2 | MR3 | MR9 |
|---|---|---|---|
| Session **A** | A2: Aerodynamics | A3: GFD & Porous Media Flow | A9: Droplets |
| 15.30 **1** 15.43 | 1.27 Analysis of the boundary layer vortex sheet for surging and rotating bodies of finite thickness: **P. Gehlert et al.** | 1.23 Defending against lava flows: **E. Hinton et al.** | 1.49 Coalescence of droplets with dissimilar surface tension: **T. Sykes et al.** |
| 15.43 **2** 15.56 | 1.3 Modelling dynamic stall of a pitching airfoil in large-scale freestream turbulence: **T. Boye et al** | 1.46 Rivulet flow down an inclined permeable membrane: **A. Alshaikhi et al.** | 1.59 Self-propelled droplet transport on liquid surfaces: **G. Launay et al.** |
| 15.56 **3** 16.09 | 1.7 An investigation into the trigger of wake bimodality behind squareback bluff bodies using LES: **F. Hesse** | 1.84 The dynamics of anisotropic ice in simple configurations: **D. Richards et al.** | 1.73 Contact line dynamics and hysteresis measurements on socal surfaces: **H. Barrio-Zhang et al.** |
| 16.09 **4** 16.22 | 1.31 LES-based investigation of the angle of attack-dependence of flow past a cactus-shaped cylinder with four ribs: **O. Zhdanov et al.** | 1.90 On the formation of hydraulic jump for low- and high-viscosity liquids: **R. Khayat et al.** | 2.14 Power spectrum and machine learning analysis applied to dried blood droplets: **L. Hamadeh et al.** |
| 16.22 **5** 16.35 | 1.38 Negating gust effects by actively pitching a wing: **I. Angulo** | 2.16 How long to reach similarity? **H. Huppert et al.** | 1.67 Bifurcation analysis of evaporating droplets on smooth surfaces: **M. Ewetola et al.** |
| 16.35 **6** 16.48 | 1.58 On the aerodynamics of the gliding seeds of Javan cucumber: **D. Certini et al.** | 1.48 Hele-Shaw flows in doubly connected domains: **S. McCue et al.** | 1.52 Effect of vapour pressure on the performance of a Leidenfrost engine: **P. Agrawal et al.** |
| 16.48 **7** 17.01 | 1.70 Low-order prediction & modelling of intermittent flow separation & reattachment in unsteady 2D flows: **D. Fernando et al.** | 1.1 Saturation-dependence of non-Fickian transport in porous media: **V. Niasar** | 1.109 Fluid dynamics of single/ multiple droplets onto a substrate with a topographical feature: **K. Al-Ghaithi et al.** |
| 17.01 **8** 17.14 | 1.86 On the lift augmentation mechanism of an asymmetrically pitching foil: **S. Otomo et al.** | 1.99 On dispersion in heterogeneous porous rocks: **N. Bhamidipati et al.** | 1.115 A droplet mop: **J. Saczek et al.** |
| 17.14 **9** 17.27 | 1.92 Computational aerodynamic solutions of hovering rotors by high-order schemes on unstructured grids: **P. Silva et al.** | 1.127 Coarse grained models for reactive flows in porous media: homogenisation and numerical simulations: **F. Municchi et al.** | 1.134 From walking to shooting modes in droplet vibrations: **L. Kahouadji et al.** |
| 17.27 **10** 17.40 | 1.55 Experimental simulation of the vortex ring state: **D. Pickles et al.** | 1.123 Dune-dune repulsion: **K. Bacik et al.** | |

**17.40-18.40 Central Core:** Icebreaker Poster Session

# Programme Wednesday AM 28 August 2019

**9.00-12.08 MR2, MR3, MR9:** Parallel Sessions B & C, with coffee break

| | MR2 | MR3 | MR9 |
|---|---|---|---|
| Session **B** | B2: High Speed Flows | B3: GFD: High Re | B9: Biofluids: Flagella/Swimming |
| 9.00 **1** 9.13 | 1.8 Surface roughness effects in finite-rate reacting hypersonic boundary layers: **A. Margaritis et al.** | | 1.18 Extending generalised Taylor dispersion theory for the population-level model of a suspension of micro-swimmers: **L. Fung et al.** |
| 9.13 **2** 9.26 | 1.36 Numerical simulations of wall cooling performance and associated effects on transition in hypersonic flows with injection from porous surfaces: **A. Cerminara et al.** | 1.65 Experimental study of atmospheric stratification and urban flow and dispersion: **D. Marucci et al.** | 1.21 Active vs. passive bundling of prokaryotic flagella: **A. Chamolly et al.** |
| 9.26 **3** 9.39 | 1.53 Flow physics and sensitivity to RANS modelling assumptions of a multiple normal shock wave boundary layer interactions: **K. Boychev et al.** | 1.71 Is climate change increasing atmospheric turbulence? **P. Williams** | 1.50 Efficient implementation of elastohydrodynamic integral operators for Stokesian filaments: **A. Hall-McNair** |
| 9.39 **4** 9.52 | 1.131 Shaping supersonic contoured nozzles for cold spraying metallic particles: **A. Rona et al.** | 1.102 On analytical solutions for the mean wind profile in an urban canopy: **O. Coceal** | 1.62 Spontaneous synchronization of beating cilia: An experimental proof using vision-based control: **M. Elshalakani et al.** |
| 9.52 **5** 10.05 | 1.85 Supersonic wind tunnels: Effects of nozzle geometry: **K. Sabnis et al.** | 1.108 Quantifying the effect of morphological features of river channels on discharge relations: **D. Livesey** | 1.66 FAST, NEAREST and flagellar regulation: **M. Gallagher et al.** |
| 10.05 **6** 10.18 | 1.88 Aerodynamic optimisation of supersonic aerofoils based on deep neural networks: **A. Feria-Alanis et al.** | 1.118 A dam-break driven by a moving source: a simple model for a powder snow avalanche: **J. Billingham** | 1.68 Finite element modelling of microswimmers with applications in reproductive biology: **C. Neal et al.** |
| 10.18 **7** 10.31 | 2.17 Potential flows through periodic domains with multiple objects per period: **P. Baddoo et al.** | 1.136 Turbulent flows over sparse canopies: **A. Sharma et al.** | 1.139 SPT: Slender phoretic theory of chemically active filaments: **P. Katsamba et al.** |
| 10.31 10.50 | Central Core: Coffee | Central Core: Coffee | Central Core: Coffee |
| Session **C** | C2: Computational Methods | C3: Stratified Flows | C9: Biofluids: Low Re |
| 10.50 **1** 11.03 | 1.19 A customized immersed boundary method for turbulent flows with moving objects: application to vertical axis tidal turbines: **A. Giannenas et al.** | 1.4 Regime transitions and energetics of sustained stratified shear flows: **A. Lefauve et al.** | 1.91 Vesicle transport and cytoplasmic streaming in the pollen tube: **R. Dyson et al.** |
| 11.03 **2** 11.16 | 1.20 An adaptive lattice Boltzmann solver with complex sub-grid scale turbulence models: **C. Gkoudesnes et al.** | 1.26 Scale-resolving simulations of three-dimensional gravity currents beyond the Boussinesq limit: **P. Bartholomew et al.** | 1.83 Structural and physical determinants of solute transport in complex microvascular networks: **I. Chernyavsky et al.** |
| 11.16 **3** 11.29 | 1.28 A novel CFD methodology for prediction of direct laser metal deposition: **A. Basso** | 1.35 Asymptotic dynamics of high dynamic range stratified turbulence: **G. Portwood et al.** | 1.74 A computational model to predict the onset of secondary flows of blood in a cone & plate rheometer: **N. Kelly et al.** |
| 11.29 **4** 11.42 | 1.33 A lattice Boltzmann Method in generalized curvilinear coordinates: **J. Reyes Barraza et al.** | 1.95 Particle-laden gravity currents: **M. Lippert et al.** | 1.87 Evaporation-driven transport through soft hydrogels: **M. Etzold et al.** |
| 11.42 **5** 11.55 | 1.44 Modelling flows in thermochemical nonequilibrium adaptive and mapped meshes: **C. Atkins et al.** | 1.100 Internal gravity waves, shear, and mixing in forced stratified turbulence: **C. Howland et al.** | 1.138 Flow-induced symmetry breaking in growing bacterial biofilms: **P. Pearce** |
| 11.55 **6** 12.08 | 1.137 CFD-based optimisation of swirl inducing multi-nozzle annular jet pump: **A. Morrall** | 1.105 Turbulence in the body of gravity currents: **C. Marshall** | 1.43 A microfluidic assay to study the migration behaviour of marine bacteria in viscosity gradients: **S. Pasupuleti et al.** |

# Programme Wednesday PM 28 August 2019

**12.15-13.00 MR2:** Plenary Lecture **Ian Hewitt,** University of Oxford
**13.00-14.00:** Lunch, Churchill College
**14.00-14.45 MR2:** Plenary Lecture **Anne-Virginie Salsac**, CNRS/UTC
**14.50-15.30 MR2:** UKFN Thesis Prize: **A. Lefauve, M. Arran & P. Baj**
**15.35-18.18 MR2, MR3, MR9:** Parallel Sessions D & E with coffee break

| | MR2 | MR3 | MR9 |
|---|---|---|---|
| Session **D** | D2: Turbulence: Simulations | D3: Plumes | D9: Non-Newtonian Fluids |
| 15.35 **1** 15.48 | 1.72 Numerical simulations of grid-turbulence, and dissipation modelling in large-eddy simulations: **R. Hetherington** | | 1.34 Shear-thinning fluids can be slippery! Non-identifiability of parameters for the Bird-Cross-Carreau-Yasuda family of models when applied to blood rheology: **D. Smith et al.** |
| 15.48 **2** 16.01 | 1.81 DNS of a turbulent rotating jet: **S. Dunstan et al.** | 1.79 Multiphase plumes in a stratified ambient: **N. Mingotti et al.** | 1.51 Determining how the microstructure of the Endothelial Glycocalyx Layer affects its bulk fluid-dynamical properties: **T. Lee et al.** |
| 16.01 **3** 16.14 | 1.93 Simulation of turbulent flows with Nek5000: **D. Fenton** | 1.75 Large eddy simulations of plumes in a stratified room: **C. Vouriot** | 1.64 The role of protein concentration on the rheology of synovial fluid when modelling elastohydrodynamic lubrication of joint prostheses: **L. Nissim et al.** |
| 16.14 **4** 16.27 | 1.94 Drag reduction by anisotropic permeable substrates: analysis & DNS: **G. Gomez-de-Segura et al.** | 1.76 Sedimentation of tephra from stratified plumes: **D. Ward** | 1.77 Elasticity suppresses fluidisation of yield-stress material under vibrations: **A. Garg et al.** |
| 16.27 **5** 16.40 | 1.116 Feedback stabilization of a plane Couette flow exact coherent structure: **G. Claisse et al.** | | 1.13 CFD modelling of alginate production: A first approach to dynamic rheology & its impact on stirred & aerated bioprocesses: **C. Sadino-Riquelme et al.** |
| 16.40 17.00 | Central Core: Coffee | Central Core: Coffee | Central Core: Coffee |
| Session **E** | E2: Multiphase Flows | E3: Industrial Flows: Low Re | E9: Biofluids: Applications |
| 17.00 **1** 17.13 | 1.15 Experimental measurements in transitional partially-filled pipe flows using stereoscopic particle image velocimetry: **T. Thornhill et al.** | 1.17 Confinement effects for 3D advection-diffusion boundary layers in U-shape and V-shape channel flows: **J. Landel et al.** | 1.9 Multifunctional adsorbent structures for use as emergency respirators: **J. Barnard et al.** |
| 17.13 **2** 17.26 | 1.80 Predicting orientation of suspensions of elongated particles in three-dimensional thin channel flow: **G. Cupples et al.** | 1.39 Nematic liquid crystal flow during the manufacture of liquid crystal devices: **J. Cousins et al.** | 1.121 A multicompartment SIS stochastic model with zonal ventilation for the spread of nosocomial infections: detection, outbreak management and infection control: **M. Lopez-Garcia et al.** |
| 17.26 **3** 17.39 | 1.113 Development & verification a green approach towards isolating essential oils from *Rosmarinus officinalis* using ultrasound-assisted supercritical CO2: **M.-C. Wei et al.** | 1.135 Implementation & verification of CFD model for crude-oil fouling: **G. Goncalves et al.** | 1.45 A fluid dynamics model of kidney morphogenesis: **V. Zubkov** |
| 17.39 **4** 17.52 | 1.114 Production of essential oil from *Lavandula angustifolia* through a green procedure & its theoretical solubility consideration: **Y.-C. Yang et al.** | 1.89 Adjoint-based optimal control of an inkjet waveform: **P. Kungurtsev et al.** | 1.69 Applying the Goldilocks principle to predict coral habitat engineering: **K. Georgoulas** |
| 17.52 **5** 18.05 | 1.106 A new approach to modelling polydisperse sprays with phase exchange based on the fully Lagrangian approach: **O. Rybdylova et al.** | 2.15 Flow analysis and fouling behavior in 3-D printed wavy-patterned membranes: **S. Mazinani et al.** | 1.122 Evaluating CFD against a zonal ventilation model for predicting airborne pathogen transfer under different hospital ward ventilation configurations: **R. Jones et al.** |

**18.30 for 19.30:** Reception & Conference Banquet, Churchill College

# Programme Thursday AM 29 August 2019

**9.00-12.08 MR2, MR3, MR9:** Parallel Sessions F & G, with coffee break

| | MR2 | MR3 | MR9 |
|---|---|---|---|
| Session **F** | F2: Industrial Flows: High Re | F3: Planetary Flows | F9: Bubbles |
| 9.00 **1** 9.13 | 1.124 Nonlinear feedback control of the bi-modal flow behind a three-dimensional blunt bluff body: **D. Ahmed et al.** | 1.2 Interactions between tidal flows and convection: **C. Duguid et al.** | 1.10 A new method of microbubble production for dissolved air flotation: **B. Swart et al.** |
| 9.13 **2** 9.26 | 1.37 Evaluating turbine wake steering techniques using scale-resolving simulations: **G. Deskos et al.** | 1.11 Boundary layer control of rotating convection in the Earth's core: **R. Long et al.** | 1.12 A theoretical study of the invariant sets and transient dynamics of a finite air bubble in a perturbed Hele-shaw: **J. Keeler et al.** |
| 9.26 **3** 9.39 | 1.47 Time-frequency analysis for wakes of accelerating ships: **R. Pethiyagoda** | 1.104 Detour induced by the piston effect in double-diffusive convection of near-critical fluids: **Z.-C. Hu et al.** | 1.25 Modelling bubble propagation in elasto-rigid Hele-Shaw channels: **J. Fontana** |
| 9.39 **4** 9.52 | 1.103 The effect of rotor wakes on compressor flow field within the multistage machines: **P. Przytarski et al.** | 1.5 The construction and evolution of an inviscid background state for Earth's magnetic field: **C. Hardy et al.** | 1.111 Energy cascade in a homogeneous swarm of bubbles rising in a vertical channel: **B Fraga et al.** |
| 9.52 **5** 10.05 | 1.125 Influence of moving ground use on the unsteady wake of a small-scale commercial road vehicle: **A. Rejniak et al.** | 1.78 Parallel-in-time integration of dynamo simulations: **A. Clarke** | 1.133 DNS for the dynamics of 3D surfactant-laden bursting bubbles: **R. Constante-Amores et al.** |
| 10.05 **6** 10.18 | 1.119 Large-eddy simulation of enhanced mixing for water treatment applications: **B. Chen et al.** | 1.129 High-order integration of particle motion for particle-in-cell schemes using the Boris algorithm with spectral deferred corrections: **K. Smedt** | 1.132 Impact of surfactants on inertia-induced undulations on the surface of capillary bubbles: **A. Batchvarov et al.** |
| 10.18 **7** 10.31 | 1.130 Influence of stack chimneys on the displacement ventilation of an enclosed geometry: **D. Dosil** | 1.141 Variability of stochastically forced zonal jets: **L. Cope** | |
| 10.31 10.50 | Central Core: Coffee | Central Core: Coffee | Central Core: Coffee |
| Session **G** | G2: Wall-bounded Flows | G3: Compressible Flows | G9: Capillary Effects |
| 10.50 **1** 11.03 | 1.22 Relative importance of dispersive and Reynolds stresses in turbulent channel flow over irregular Gaussian roughness: **T. Jelly et al.** | 1.42 Evolution of hydroacoustic waves in deep oceanic waters with generalised sound-speed profiles: **S. Michele et al.** | 1.6 Capillary retraction of an axisymmetric liquid ligament: **F. Conto et al.** |
| 11.03 **2** 11.16 | 1.30 Drag reduction and net-energy saving in a turbulent boundary layer using Bayesian optimisation and wall blowing: **O. Mahfoze et al.** | 1.96 Sound generation by entropy perturbations passing through cross-sectional area changes: **D. Yang et al.** | 1.24 Capillary adhesion on rough surfaces: When is splitting droplets beneficial? **M. Butler et al.** |
| 11.16 **3** 11.29 | 1.61 The effect of heat transfer on boundary layer kinetic energy dissipation: **L. Jardine et al.** | 1.97 Shape sensitivity analysis of thermoacoustic instability in an annular combustor using an adjoint Helmholtz solver: **S. Falco** | 1.63 A lattice-Boltzmann model of electrocapillarity: **E. Ruiz-Gutierrez et al.** |
| 11.29 **4** 11.42 | 1.117 Coherent patterns and bypass laminar turbulent transition in boundary layers: **J. Oloo et al.** | 1.54 Effect of ambient pressure oscillation on the primary break-up of jet spray: **Z. Zhang et al.** | 1.128 Three-dimensional numerical simulations of a thin film falling vertically down the inner surface of a rotating cylinder: **U. Farooq et al.** |
| 11.42 **5** 11.55 | 1.82 The impact of shark skin denticles on the turbulent flat plate boundary layer: **C. Lloyd et al.** | 1.126 Exit dynamics of a 2D cylinder from the water: **I. Ashraf et al.** | 1.120 Droplet retention & shedding on slippery substrates: **B. Orme et al.** |
| 11.55 **6** 12.08 | 1.101 A unified approach to the study of turbulence over smooth and drag-reducing surfaces: **J. Ibrahim et al.** | 1.140 Recasting Navier-Stokes equations: **S. Dadzie et al.** | 1.40 Jetting behaviour in the presence of surfactants in inkjet printing: **E. Antonopoulou et al.** |

**12.15-13.30:** Lunch & Close, Churchill College

# Poster Session Tuesday PM 27 August 2019

**2.1:** Methods for investigating dissolution in surfactant solutions
**R. Hendrikse**

**2.2:** Accurate lattice Boltzmann simulations of gas permeability through nanoporous media
**D. Fan et al.**

**2.3:** Predicting spray impact on and carry-over from complex shaped surfaces
**L. Gray**

**2.4:** Fluid transport correlations in partially filled pipes for nuclear decommissioning
**C. Cunliffe et al.**

**2.5:** Massively parallelized models of fluid-solid multiphase flow
**D. Adekanye**

**2.6:** The Zhang–Viñals equations for pattern forming problems
**R. Coyle**

**2.7:** Folding and necking of layered viscous structures
**O. Goulden**

**2.8:** Turbulence modelling in astrophysical turbulent mixing layers
**J. Finn**

**2.9:** Conventional and cryogenic coolants for machining applications
**E. Harvey**

**2.10:** Direct numerical simulation of an Oldroyd-B filament thinning
**K. Zinelis et al.**

**2.11:** Utilisation of instrumented particles for the study of incipient entrainment
**K. Al Obaidi et al.**

**2.12:** Hydrological representations of extreme precipitation in East Africa under climate change using a convection-permitting model
**C. West**

**2.13:** Modelling the motion of the vitreous humour: A boundary integral approach
**L. Bevis**

**1.29:** Flow regimes of stratified particle-laden plumes
**J. Barnard**

**1.56:** Robust optimization of microfluidic flow systems
**F. Zagklavara**

**1.57:** Droplet mobility on the flexible slips (F-slips) (
**M. Rahman et al.**

**1.41:** Experimental modelling of infectious aerosols from people with cystic fibrosis
**J. Proctor**

**1.32:** The late-time evolution of an isolated symmetrically unstable front
**A. Wienkers et al.**

**1.107:** Aerosol generation from liquid droplet impact on solid surfaces:
**I. Salem**