

Uncertainty Quantification and Stochastic Modelling of Materials (USM)

SHORT REPORT

L. Angela Mihai* Johann Guilleminot[†] Alain Goriely[‡]

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As we fully enter the era of big data, the USM research programme aimed to establish stochastic methodologies as effective and powerful tools for the modelling and design of materials. The scientific focus of this programme was on stochastic methods, covering probabilistic techniques, identification methodologies and validation strategies, and on cutting-edge applications in mechanics, biomedical engineering, and soft matter.

The programme started with a week-long summer school where experts in uncertainty quantification and stochastic modelling introduced their fields to an interdisciplinary audience. It later hosted a workshop on advanced mathematical modelling in biomechanics. These events were complemented by two public lectures by Distinguished Visiting Fellows Prof Martin Ostoja-Starzewski (Rothschild Fellow) on “Tensor Random Fields in Mechanics” and Prof Apala Majumdar (Kirk Fellow) on “Liquid Crystals: Where Mathematics Meets Physics and Applications”, as well as a seminar series where participants at different stages of their career showcased their own work. The programme further featured a day celebrating “Equality in Physical Sciences”, with a lecture on challenges and opportunities by Prof Helen Gleeson OBE, followed by discussions on professional developments for women and other under-represented groups.

Cross-disciplinary scientific interactions naturally extended to exchanges between the USM participants and those from the two concurrent programmes, namely: “New Statistical Physics in Living Matter” and “Mathematics of Movement”. Synergies between the three programmes were also discussed.

Therefore, the Isaac Newton Institute offered the perfect environment for establishing many interdisciplinary scientific links in order to further the field of mathematics and widen its range of applications.

*School of Mathematics, Cardiff University, Senghennydd Road, Cardiff, CF24 4AG, UK, Email: MihaiLA@cardiff.ac.uk

[†]Department of Civil and Environmental Engineering, Duke University, Durham, NC 27708, USA, Email: johann.guilleminot@duke.edu

[‡]Mathematical Institute, University of Oxford, Woodstock Road, Oxford, OX2 6GG, UK, Email: goriely@maths.ox.ac.uk