

Society for Industrial and Applied Mathematics

United Kingdom and Republic of Ireland Section (SIAM-UKIE)



SIAM-UKIE Newsletter

Number 6, February 2015

19th Annual Meeting of the UK and Republic of Ireland Section of SIAM, Bath, 2015

The [19th Annual Meeting of the UK and Republic of Ireland Section of SIAM](#) was held on January 8, 2015, at the Department of Mathematical Sciences, University of Bath. This event attracted over 75 delegates, and included members as well as non-members of SIAM. For the first time, this year, the Section invited [SIAM Student Chapter representatives from the UK and the Republic of Ireland](#) to this annual



meeting, and offered financial support towards the travel expenses of these delegates. In addition, there was no participation fee for students. The programme featured six invited talks and a poster session by graduate students.

In the opening talk, [Robert Scheichl](#) (University of Bath) discussed the prohibitively large cost of Markov chain Monte Carlo methods for uncertainty quantification in large-scale PDE applications with high dimensional parameter spaces, and proposed a new multilevel Metropolis-Hastings algorithm applicable to model problems in subsurface flow, for which he provided a theoretical analysis of its cost, and demonstrated the theoretical and numerical advantages over the standard Metropolis-Hastings strategy. The morning session continued with a presentation by [Michel Destradre](#) (University of Galway) who described some of the numerous difficulties faced by biomedical engineers and medical doctors when measuring in the laboratory or in situ the mechanical properties of natural soft tissues by standard testing protocols. He then presented a non-invasive, non-destructive procedure based on the propagation of elastic waves, which is applicable to materials capable of sustaining large strain deformations, and in particular to skin and brain tissue.

The afternoon session was opened by [Jon Chapman](#) (University of Oxford) who explained different approaches to the problem of calculating the effective diffusion coefficient in a material with microstructure, and in particular when the microstructure comprises a collection of impenetrable spheres. He discussed an extension of the method of multiple scales to account for non-uniform porosity distributions, and compared the result to averaging over a stochastic distribution of

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The session continued with a talk by [Vanessa Styles](#) (University of Sussex) on the rigorous analysis of a phase field approach for structural topology optimization which allows for topology changes and multiple materials. Several numerical examples for

mean compliance problems were presented to illustrate the efficiency of this approach. Then [Marco Iglesias](#) (University of Nottingham) introduced a novel level-set method for geometric inverse problems within an infinite dimensional Bayesian framework. This type of problem arises, for example, in the characterisation of subsurface formations where interfaces between geological structures must be inferred from subsurface flow measurements, or in electrical impedance tomography where the geometry of unhealthy tissue must be inferred from measurements of voltages associated to current distributions of a given configuration of electrodes. The concluding talk was given by [Beth Wingate](#) (University of Exeter) who is a climate scientist and a published poet. In her presentation, she focused on a new parallel-in-time algorithm for highly oscillatory PDEs, applicable to weather and climate models. She further introduced a new method for computing linear propagators in a highly parallel way and posed some questions about the type of parallelism an algorithm like this could have for heterogeneous computing architectures.

There were lively interactions between speakers and the audience during each session, and the discussions continued over dinner at the Aqua restaurant in Bath. A contiguous [IMA Conference on Research in Mathematics and its Applications](#) was held at the University of Bath on January 9, 2015 to further strengthen the links between the two Societies.

The [20th SIAM-UKIE Annual Meeting](#) will be hosted by the Department of Applied Mathematics and Theoretical Physics, University of Cambridge, in January 2016.

3rd Annual SIAM Chapter Day, Cardiff University, 2015



On January 15, 2015, Cardiff School of Mathematics hosted the [3rd Annual SIAM Chapter Day](#), an annual series which aims to provide a platform for discussions on current research on mathematical modelling, analysis, and simulation of problems in science and engineering at Cardiff University. The programme included invited lectures and poster presentations, and gave all participants the opportunity for discussions on a wide range of topics, a fact which was reflected by the high turnout in faculty and student members of Cardiff University, who were not all (at the time of the event) members of SIAM.

In the opening talk, [Des Higham](#) (University of Strathclyde) illustrated the power of analysing large data sets collected by Twitter to quantify interactions between twitter users and how they evolve through time. [Peter Wells](#) (Cardiff University) gave an informative

overview of past and current medical ultrasonic imaging techniques, and highlighted some of the challenges faced by contemporary research in the area, which may benefit from a deeper mathematical understanding. The concluding talk was given by [Kevin Glazebrook](#) (University of Lancaster), who demonstrated how to find a near-optimum route for a patroller to protect points of interest from attack. The next SIAM Chapter event at Cardiff University will be held on February 24, 2015, with a guest lecture by Peter Harman from [CyDesign Labs](#). — *Ross McKenzie (SIAM Chapter President, Cardiff University)*

SIAM Chapter Conference, NUI Galway, 2014

On December 11, 2014, the [Irish SIAM Student Chapter](#) hosted a one day conference for applied mathematics research students, in conjunction with the Stokes Research Cluster for Applied Mathematics, at NUI Galway. The aim of the meeting was to bring together research students from different universities (including NUI Galway, University of Limerick, Dublin City University, Trinity College Dublin, Dublin Institute of Technology, University College Dublin, NUI Maynooth, University of Edinburgh, University of Sydney), giving them the opportunity to present their work in a formal setting. The programme comprised two plenary lectures, by [Sebastian Wieczorek](#) (UCC), on rate-

induced bifurcations applied to the study of phenomena such as the sudden release of carbon from peatlands ("compost-bomb instability"), and [Michel Destrade](#) (NUI Galway), about elastic waves in soft tissue, with applications to non-destructive testing of brain-matter, as well as numerous student talks and poster presentations. The topics discussed included dynamics on complex networks, brewing of coffee, mathematical finance, nonlinear turbulent wave systems, and blood platelet aggregation. The meeting concluded with the award of a best student presentation prize to Robert Gower, University of Edinburgh. — *Shane Burns (SIAM Chapter Vice-President, NUI Galway)*

Events Update

[InFoMM UK Graduate Modelling Camp 2015](#), March 17–20, 2015, University of Oxford.

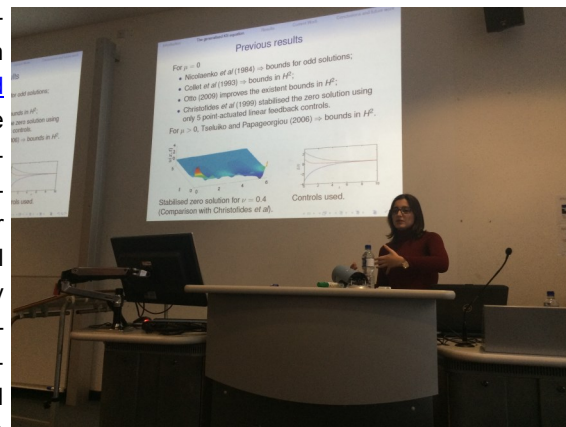
[26th Biennial Numerical Analysis Conference](#), June 23–26, 2015, University of Strathclyde.

[Young Researchers in Mathematics Conference](#), August 17–20, 2015, University of Oxford.

[New directions in numerical computation: In celebration of Nick Trefethen's 60th birthday](#), August 25–28, 2015, University of Oxford.

AMMP Day, Imperial College London, 2014

On 10th December 2014, the SIAM Student Chapter at Imperial College London hosted the [Applied Mathematics and Mathematical Physics \(AMMP\) Day](#). The aim of the event was to provide an opportunity for PhD students and junior researchers within the college to share their research and ideas before the seasonal holidays. The event included a plenary lecture by [Richard Craster](#) (Imperial College London) on "Homogenisation of Multiscale Media for Wave Problems" and student presentations on different topics ranging from malware detection to the dynamics of corporations. Congratulations go to Susana Gomes (pictured) whose talk on "Controlling Chaos in Thin Films" won the best student presentation prize. — *Joseph Maestri (SIAM Chapter President, Imperial College London)*



induced bifurcations applied to the study of phenomena such as the sudden release of carbon from peatlands ("compost-bomb instability"), and [Michel Destrade](#) (NUI Galway), about elastic waves in soft tissue, with applications to non-destructive testing of brain-matter, as well as numerous student talks and poster presentations. The topics discussed included dynamics on complex networks, brewing of coffee, mathematical finance, nonlinear turbulent wave systems, and blood platelet aggregation. The meeting concluded with the award of a best student presentation prize to Robert Gower, University of Edinburgh. — *Shane Burns (SIAM Chapter Vice-President, NUI Galway)*