

Preface

The European Conference on Numerical Mathematics and Advanced Applications (ENUMATH) is an established series of conferences held every 2 years to provide a forum for discussion on recent aspects of numerical mathematics and challenging scientific and industrial applications at the highest level of international expertise. The ENUMATH conferences previously took place in Paris (1995), Heidelberg (1997), Jyvaskyla (1999), Ischia (2001), Prague (2003), Santiago de Compostela (2005), Graz (2007), Uppsala (2009). This volume contains a selection of papers presented at ENUMATH 2011, organised by the Department of Mathematics, University of Leicester, UK, and held at Leicester's Main Campus between September 5–9, 2011.

The 2011 edition of ENUMATH attracted about 300 participants from around the world, including ten invited talks by:

- J.-F. Gerbeau (Inria-Rocquenc., France), on “Direct and inverse modeling in hemodynamics”;
- V. Girault (Paris, France), “On the coupling of Stokes or Navier-Stokes and Darcy flows through porous media”;
- I. Graham (Bath, UK), on the “Solution of elliptic PDEs with high contrast heterogeneous coefficients”;
- T. Lelievre (Cermics/U. Paris 6, France), on “Sampling techniques in molecular dynamics”;
- V. Simoncini (Bologna, Italy), on “Iterative solvers for saddle point algebraic linear systems: tools of the trade”;
- C.-W. Shu (Brown, USA), on “Maximum-principle-satisfying and positivity-preserving high order discontinuous Galerkin and finite volume schemes”;
- A. Stuart (Warwick, UK), on “Filtering the Navier-Stokes Equation”;
- S. Turek (Dortmund, Germany), on “Hardware-oriented Numerics (for PDE) - Motivation, Concepts, Software”;
- K. Urban (Ulm, Germany), on “Reduced Basis Methods for Optimization in Industrial Challenges”, and
- R. Winther (Oslo, Norway), on “Bounded cochain projections, why and how”,

28 minisymposia on various aspects of numerical and applied mathematics, a large number of contributed talks and a public lecture by Prof. Nicholas J. Higham, FRS (Manchester, UK), on “Numerical Linear Algebra in the UK: from Cayley to Exascale Computing.” The conference made a contribution to development of numerical mathematics internationally and, in particular, in the UK.

We hope that this ENUMATH 2011 Proceedings Volume will appeal to a wide range of readers, giving an overview and recent developments in computational mathematics, their applications and some related fields. A total of 87 contributions appear in the proceedings of ENUMATH 2011, from a wide range of topics: from theory and analysis of numerical methods, applications in biology, finance, physics and engineering, to high performance algorithms for scientific computing. The volume is organised in 11 parts, namely:

- I A Posteriori Error Estimation and Adaptive Methods;
- II Computational Electromagnetics;
- III Computational Methods;
- IV Convection-diffusion, Conservation laws, and Hyperbolic Systems;
- V Discontinuous Galerkin Methods;
- VI Finite Element and Finite Volume techniques;
- VII Fluid Mechanics;
- VIII High Performance Computing;
- IX Multiscale Modeling and Simulations;
- X Preconditioners and Solvers;
- XI Uncertainty, Stochastic Modelling, and Applications.

A number of contributions could be attributed to more than one part in terms of their content. In these cases the criterion of the coherence of the proceedings was also taken into consideration.

We would like to thank all the contributors for submitting their work for inclusion in the Proceedings Volume and for their timely response during the reviewing process. We express our sincere gratitude to all the participants of ENUMATH 2011 for their attendance, valuable scientific contributions, and stimulating discussions during the conference. We particularly extend our thanks to the minisymposia organisers who did an excellent job in putting them together coherently and within the given time restrictions, and to the chairs of the contributed sessions for agreeing to serve as such. A big share of the success of this conference series has been due to the members of the Programme Committee: F. Brezzi, M. Feistauer, R. Glowinski, R. Jeltsch, Y. Kuznetsov, J. Periaux, and R. Rannacher. We would also like to thank the Scientific Committee of ENUMATH 2011 for agreeing to give valuable input into this Proceedings Volume and for their general support of the conference.

Special gratitude goes to our sponsors: the Institute of Mathematics and its Applications, DataVisibility, Associated Architects, Oxford University Press, Numerical Algorithms Group (NAG), the Department of Mathematics at Leicester, and Leicester Conferences for supporting ENUMATH 2011 in a number of ways. We would also like to thank Springer-Verlag for their support and patience while preparing this volume.

This conference would not have been made possible without the tireless efforts of the staff and the PhD students of the Department of Mathematics at Leicester, to whom a big thanks is due. Very special thanks goes to our Administrator Tara Chakraborti for taking excellent care of the bulk of organisation of the conference, and to Dan Carter for doing a great job at keeping everything running smoothly.

We believe that Leicester ENUMATH 2011 was a very interesting and worthwhile experience, and we hope that the participants had a good and fruitful time in Leicester.

Leicester, UK

The Local Organising Committee:

Andrea Cangiani
Ruslan Davidchack
Manolis Georgoulis
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