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Preface

A special session on Numerical Analysis,
in honor of Professor Graeme Fairweather's 70^{th} birthday

This special issue of *Advances in Applied Mathematics and Mechanics* consists of a selection of invited and contributed papers that were presented in a Special Session of the 8^{th} International Conference on Scientific Computing and Applications that was held at the University of Nevada, Las Vegas, from April 1 to 4, 2012. The Special Session was organized in order to celebrate the 70^{th} birthday of Professor Graeme Fairweather.

Graeme Fairweather is one of the pioneers of numerical analysis. He was born in Dundee, Scotland, in 1942 and, after graduating with a First Class Honours degree in Applied Mathematics from the University of St Andrews in 1963, he continued his graduate studies at the same university, under the supervision of Andrew Ronald Mitchell, and was awarded a PhD in Applied Mathematics three years later.

Graeme started his academic career in 1965 as a Lecturer of Applied Mathematics at the University of St Andrews, where he remained until 1969 with an interlude of one academic year (1966-67) which he spent visiting Rice University. His experience at Rice proved to be decisive and, in 1969, he joined its Department of Mathematics as an Assistant Professor. In 1971 he moved to the Department of Mathematics of the University of Kentucky where he remained, first as Associate Professor and then as Professor, until 1994. He then moved, to the Department of Mathematical and Computer Sciences of the Colorado School of Mines, where he remained as Professor and Head of Department until 2008. Since 2008, Graeme is Executive Editor of Mathematical Reviews, at the American Mathematical Society in Ann Arbor, Michigan.

Graeme's main research has always been in the numerical solution of partial differential equations. In the early years of his career he worked on finite difference/ADI methods for elliptic and parabolic equations. In this connection, of particular importance is the scheme that he proposed jointly with A. R. Mitchell for improving the ADI methods of Douglas, Peaceman and Rachford for parabolic and elliptic equations. This scheme is known in the literature as the Mitchell-Fairweather scheme. His subsequent involvement in finite element Galerkin methods resulted in the publication, by Marcel Decker Inc. in 1978, of his now classic book on the subject.

Over the years, Graeme also worked on problems arising in other areas of numerical analysis, such as numerical integration and numerical linear algebra. One such problem led to the now commercial library of FORTRAN packages for solving almost block

diagonal linear systems by modified alternate row and column elimination, which he developed jointly with J. C. Diaz and P. Keast in 1983. In Kentucky, he also worked with F. Rizzo and D. Shippy on the boundary integral equation method. His interest in boundary methods continued and, while on sabbatical at the University of Toronto, he worked with L. Johnston on developing a new method, which is now known as the Method of Fundamental Solutions. More recently, Graeme has worked on spline collocation methods for the solution of various partial differential equations. He has also made a substantial contribution to ADI orthogonal spline collocation methods for time-dependent problems. In addition to his research interests, Graeme has been actively involved in Mathematics Education.

The special issue honouring Graeme Fairweather contains the following eleven papers on topics from various areas of the numerical solution of partial differential equations:

- *A method of lines based on immersed finite elements for parabolic moving interface problems*, by Tao Lin, Yanping Lin and Xu Zhang;
- *Explorations and expectations of equidistribution adaptations for nonlinear quenching problems*, by Matthew A. Beauregard and Qin Sheng;
- *Galerkin formulations of the method of fundamental solutions*, by J. R. Berger and Andreas Karageorghis;
- *The Crank-Nicolson Hermite cubic orthogonal spline collocation method for the heat equation with nonlocal boundary conditions*, by Bernard Bialecki, G. Fairweather and J. C. Lopez-Marcos;
- *The method of fundamental solutions for solving exterior axisymmetric Helmholtz problems with high wave number*, by Wen Chen, Ji Lin and C. S. Chen;
- *Alternating direction implicit orthogonal spline collocation on non-rectangular regions*, by Bernard Bialecki and Ryan I. Fernandes;
- *A moving pseudo-boundary MFS for three-dimensional void detection*, by Andreas Karageorghis, Daniel Lesnic and Liviu Marin;
- *B-spline Gaussian collocation software for two-dimensional parabolic PDEs*, by Zhi Li and Paul Muir;
- *Using Gaussian eigenfunctions to solve boundary value problems*, by Michael McCourt;
- *A new composite quadrature rule*, by W. Sun and Q. Zhang;
- *Finite element analysis of Maxwell's equations in dispersive lossy bi-isotropic media*, by Yunqing Huang, Jichun Li and Yanping Lin.

On behalf of the organizers of the workshop, we would like to thank Yunqing Huang and Chang Shu, Editors-in-Chief of Advances in Applied Mathematics and Mechanics,