

## Preface

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This issue of Numerical Algorithms is based on invited and contributed talks presented at the international conference Auckland Numerical Ordinary Differential Equations (ANODE 2013) held on January 7–11, 2013, to honour Professor John Butcher on his 80th birthday. The meeting was attended by 57 participants from 15 countries, all of whom welcomed the opportunity to celebrate the life achievements of Professor Butcher and his outstanding contributions to the numerical analysis of differential equations for over 50 years.

The conference took place in the Department of Mathematics and Statistics, the University of Auckland, New Zealand, and we wish to acknowledge the hospitality and support provided by the Department and warmly thank the conference organizers, in particular Angela Tsai, Noorhelyna Razali and Robert Chan, for making this enjoyable meeting the success that it was.

The 18 papers in this collection have been ordered alphabetically according to the members of the editorial board (Kevin Burrage, Zdzisław Jackiewicz and Chus Sanz-Serna) who edited them and a brief summary of these papers is given below.

In the first set of contributions, the paper by Cardone, Jackiewicz, Sandu and Zhang investigates extrapolation-based implicit-explicit general linear methods. The paper by Chan and Razali considers the smoothing effects on the midpoint and

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trapezoidal rules. The paper by Conte, D'Ambrosio, Izzo and Jackiewicz studies properties of Natural Volterra Runge-Kutta methods. The paper by Lawrence considers the stability properties of root finding when using Barycentric Lagrange interpolants. The paper by Li and Wu gives an error analysis of explicit TSERKN methods when applied to highly oscillatory systems and finally the paper by Sandu invites a new approach to studying the Chemical Master Equation.

In the second set of contributions, the paper by Butcher and Imran investigates symplectic, effective order Runge-Kutta (RK) methods up to order four for ODEs. The paper by K. Burrage and P. Burrage examines structure preserving RK methods for stochastic Hamiltonian equations. The contribution by Chen investigates numerically the efficiency of singly implicit RK methods for stiff differential systems. The paper by Verner is devoted to the construction of explicit RK pairs of low stage order. The article by D'Ambrosio, De Martino, and Paternoster studies order conditions for general linear Nyström methods for differential systems of the second order. The paper by Khashin examines the symmetries of explicit RK methods using a new approach to the solution of the order conditions.

In the third set of contributions, Brugnano and Sun consider the preservation of multiple invariants of Hamiltonian problems by schemes of RK type. The efficient implementation of Gauss and Hamiltonian Boundary Value methods is the subject of the contribution by Brugnano, Frasca Caccia and Iavernaro. The paper by Fang, You and Ming deals with the solution of oscillatory differential equations by fitted two-derivative RK schemes. Tina Chan describes in detail the relationship between B-series and Hopf algebras. The article by Tsai, Chan and Wang proposes a novel discretization method for PDEs. The final paper by Wang and Wu is devoted to the integration of oscillatory Hamiltonian systems by extended RK Nyström methods.