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# Preface

*Special Issue Dedicated to Professor Eitan Tadmor's 60th Birthday*

On the occasion of the 60th birthday of Professor Eitan Tadmor, the 5th International Conference on Scientific Computing and Partial Differential Equations (SCPDE14) was organized and held at the Hong Kong Baptist University (HKBU) during 8–12 December, 2014. This conference was also part of the SCPDE conference-series aiming to promote research interests in scientific computation and partial differential equations, which has been organized by the HKBU once every 3 years since 2002. The SCPDE14 was well attended by international experts in respective disciplines and was found highly successful in providing a forum for the exchange of ideas and the latest results within a multi-disciplinary setting. This special issue consists of articles contributed by participants of the SCPDE14 and it is dedicated to Professor Eitan Tadmor on the occasion of his 60th birthday.

Prof. Tadmor is a Distinguished University Professor at the University of Maryland (UMd), College Park and the Director of the university Center for Scientific Computation and Mathematical Modeling (CSCAMM). He received his Ph.D. in Mathematics from Tel Aviv University in 1979, and began his scientific career as a Bateman Research Instructor in CalTech, 1980-1982. Tadmor held professorship positions at Tel-Aviv University, 1983-1998, where he chaired the Department of Applied Mathematics from 1991-1993, and at

 

UCLA, 1995-2004, where he was the founding co-director of the NSF Institute for Pure and Applied Mathematics (IPAM) 1999-2001. Since 2002, he has served on the faculty of the Department of Mathematics and the Institute for Physical Sciences and Technology at UMd, where he was recently awarded as the PI of the NSF research network on kinetic description of emerging challenges in multiscale problems of natural sciences (KI-Net).

A main aspect of Tadmor's early work focused on the analysis and computation of nonlinear time-dependent PDEs. He has pioneered many of the numerical methods that are regularly used to compute high-resolution approximations of nonlinear conservation laws. In particular, we mention Tadmor's development of the class of non-oscillatory central schemes, which are widely used as computationally efficient black-box solvers for systems of conservation laws, and the spectral viscosity method for computing spectrally accurate and stable approximations of nonlinear conservation laws, such as the compressible as well as incompressible Euler equations. His work on the design of strongly stability preserving (SSP) time integration schemes has paved the way for non-oscillatory time integration of conservation laws and other nonlinear PDEs with singularities.

In another line of research, Tadmor introduced the notion of entropy conservative schemes for systems of conservation laws and utilized them to design entropy stable methods. One of the highlights of this program was the design of arbitrarily high-order accurate and entropy stable so-called TeCNO schemes. The entropy stability of these methods is based on the identification of a subtle sign property for the ENO reconstruction procedure which provides the only known rigorous stability result for this well-established and widely used piecewise-polynomial approximation framework for functions with discontinuities. His recent work uses these entropy stable methods to compute entropy measure valued solutions of multi-dimensional systems of conservation laws.

Prof. Tadmor has also made significant contributions to the analysis of nonlinear PDEs. One of his outstanding results in this field is the derivation of kinetic formulation for conservation laws and convection-dominated diffusion equations. This novel formulation has led to the discovery of many interesting properties of entropy solutions of conservation laws. He has also pioneered the use of spectral dynamics in order to answer issues of regularity, blow-up and critical thresholds for many interesting classes of nonlinear PDEs, such as the Euler-Poisson equations.

His work in the field of image processing has focused on using hierarchical decompositions for image de-noising and multiscale image representation. He introduced novel ideas of multi-scale hierarchical descriptions of images. In recent years, Prof. Tadmor has pioneered the design of microscopic, mesoscopic and macroscopic models for group dynamics of interesting biological and social systems, with particular emphasis on models that represent formation of consensus and emergence of leaders in such systems. Particularly, he has led an ambitious interdisciplinary research program (including KI-Net) in modeling and analysis of collective dynamics with applications to flocking and opinion dynamics.

Prof. Tadmor has published more than one hundred and fifty research papers, mostly in Numerical Analysis and Applied Partial Differential Equations. He serves on the edi-