

Foreword

**Elizabeth Mansfield · Evelyne Hubert ·
Gloria Marí Beffa**

Published online: 9 July 2013
© SFoCM 2013

It is with great pleasure that we introduce this celebration volume in honor of Peter Olver. Peter is both a world leader and a champion of computational applied mathematics. In recognition of Peter's valuable role in FoCM as a board member, conference organizer, and former Managing Editor of this Journal, the FoCM community presents this volume as our mathematical gift to him.

Peter has been the world's best mathematician in the application of Lie group actions to differential and discrete systems, including to Hamiltonian and integrable systems, for 30 years. It would be difficult to study all his papers and books in a single lifetime, let alone write them as Peter has done. With over 130 articles and five books (not counting his numerous proceedings volumes), his work has reached all corners of the mathematical world, from undergraduate education to professional research. Among this vast production, two bodies of work have influenced us the most, namely his graduate textbook "*Applications of Lie groups to differential equations*", and his

E. Mansfield
SMSAS, University of Kent, Canterbury CT2 7NF, UK
e-mail: mansfield@kent.ac.uk

E. Hubert
INRIA Méditerranée, 2004 route des Lucioles, 06902 Sophia Antipolis, France
e-mail: Evelyne.Hubert@inria.fr

G. Marí Beffa (✉)
Mathematics Department, University of Wisconsin, Madison 480 Lincoln Drive, Madison,
WI 53705, USA
e-mail: maribeff@math.wisc.edu

series of papers on Lie group-based moving frames. The former includes a fully detailed, computational proof of the exactness of the smooth variational complex, together with a rigorous discussion of Noether's conservation laws and computational methods for infinite dimensional Poisson geometry and Hamiltonian systems. With a clear, self-contained exposition of the subject which makes it accessible to anyone with an interest in the application of Lie theory techniques to differential equations, the book is commonly found in the library of any researcher working on differential equations, and has been used all over the world as a reference book for graduate classes. It is without a doubt the best-known and most widely used book in the subject. The papers on group-based moving frames opened the door to the extended use of both geometric and algebraic methods in other fields. As it refers to moving frames, it was the last step in the full realization of the Erlanger program to move geometry into the realm of group theory, also fully in line with Cartan's vision, of which Peter is a great connoisseur. The papers are based on the exceedingly simple idea of equivariance, described in a way that is free from the confines of any one particular field, in particular that of differential geometry, where frames had been used traditionally. Given Peter's preference for the wide application of simple ideas, moving frames are now being applied in many settings beyond Cartan's original path, including discrete systems, computer vision, numerical methods, and image processing.

Thus, group-based frames have served as bridge between different branches of mathematics, invigorating them and their interaction.

Along with original research, Peter's bibliographic and historical researches are second to none. One would be hard pressed to find a paper of interest that Peter does not know about, a knowledge that he is happy to share with anyone. While we all each follow our own muse, it is, however, always a special achievement to solve a problem Peter says he could not do or did not see how to do—achievements enjoyed by Peter as well. Indeed, he is known for the inclusive nature of his research group, always welcoming, encouraging, and nurturing interested researchers. Thus it is no surprise that he has 20 graduate students and countless collaborators, most of whom have had a sustained relationship with what has felt like a mathematical family.

We wish Peter all the very best for his seventh decade, and hope to share many great results, conferences and visits with him, for many fun mathematical times to come.