

Preface

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Various topics in the research field of mechanics of materials, like mechanics of defects on macro, meso and nanoscales, wave propagation in micro-structured solids, mechanics of generalized continua etc., have in common that not only is the physical placement of a continuum changed due to applied physical forces, but also the configuration of the body, e.g., by defect motion within the material. This gives rise to the notion of configurational, material or ESHELBYan forces and to the whole edifice of ESHELBYan mechanics.

During recent decades, enormous progress has been made in various fields of ESHELBYan mechanics ranging from thermal-shock driven fracture to stress-relaxation in filled elastomeres, from influence surfaces in material space to linear chains with hyperstresses, from chemical reaction-front propagation to ceramic biomaterial-induced bone regeneration; hybrid-interference fit, phase-field model, multiscale defect kinetics, etc. All these aspects are discussed, deepened, interchanged and combined at the biennial International Symposia on Defect and Material Mechanics (ISDMM) bringing together diverse groups of researches from theoretical, experimental and computational modeling of the mechanics of materials.

The aim of this Special Issue on Defect and Material Mechanics is to highlight current progress in ESHELBYan mechanics by bringing together papers submitted for publication (and thus subjected to the usual review procedure) in the International Journal of Fracture, as an outgrowth of 7th ISDMM 2015 held at the University of Bremen, Germany, September 14–17, 2015. It is expected the present volume will be a valuable resource to researchers in the field of ESHELBYan mechanics and will motivate the young research community interested in the field.

This special issue is dedicated to the late Professor Gérard A. Maugin (1944–2016). He was a giant in all aspects of classical non-linear field theories, e.g., electrodynamics, thermodynamics, relativity and biomechanics. He also made important contributions to the foundation of ESHELBYan mechanics. His encyclopedic knowledge is manifested in his recent books on the history of continuum mechanics. He also cared deeply about people. He helped many to advance and to be recognized in many countries around the world. None of us will forget his passion for continuum physics, his enthusiasm and his friendship.

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