

# Preface

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During the past 15 years, research in the field of computational mechanics has advanced remarkably, mainly because of the development of a sound mathematical background and efficient computational strategies. Beyond the classical finite element method, several innovative techniques and novel approaches for the analysis of microstructural evolution, growth, damage, and structural failure in multi-field and multi-scale problems have emerged. The book collects different contributions to the field of computational mechanics. It is dedicated to the 60th birthday of Professor Michael Ortiz, who, along his outstanding career, has been at the forefront of this field with his work being a source of inspiration for many researchers.

**from IUTAM prop:**

The aim of the proposed symposium is twofold. First, we would like to present a comparative overview of different computational strategies for multi-field and multi-scale problems, by gathering the most innovative—non necessarily the nowadays most popular—techniques through oral presentations. Second, we would like to open a forum to discuss new horizons and new perspectives of multi-field applied mechanics. In our vision, the topics of this symposium must cover a large domain of actual research, from computational materials modeling, including crystal plasticity, micro-structured materials, biomaterials, to multi-scale simulations of multi-physics phenomena. Particular emphasis will be on pioneering discretization methods for the solution of coupled non-linear problems at different length-scales.

The Symposium aims at gathering a remarkable group of active scientists and engineers within well-defined research fields. The Symposium will be organized in a single session format, to encourage interactions and discussions between participants in the spirit of the IUTAM conferences format.

**from Springer prop:**

The book offers the readers a collection of high quality papers in selected topics of Numerical Mechanics written by leading experts in the field of computational solid mechanics. The topics of this book cover a large domain of actual research, from computational materials modeling, including crystal plasticity, micro-structured materials, biomaterials, to multi-scale simulations of multi-physics phenomena.

**from Springer prop:**

Our book is supposed to be part of the series Lecture Notes in Applied and Computational Mechanics (LNACM) which aims to report new developments in applied and computational mechanics at a high level. In the book we will collect high quality contributions of 13 authors in the field, all of them collaborators of Michael Ortiz, who has been at the forefront of computational mechanics for the last decades. Our book will continue a tradition of high-level contributions on the topic of computational mechanics, which aside of other books of the LNACM series, refers to Springer books, like, e.g., the IUTAM Symposium on Micro- and Macrostructural Aspects of Thermoplasticity (1997) or IUTAM Symposium on Computational Methods in Contact Mechanics (2006).

**Welcome text from Bad Schnellenberg:**

During the past two decades research in the field of computational mechanics has progressed remarkably, mainly because of the development of a sound mathematical background and efficient computational strategies. Beyond the classical finite element method, several innovative techniques and novel approaches for the analysis of microstructural evolution, growth, damage, and structural failure in multi-field and multi-scale problems have emerged.

It is our pleasure to welcome a remarkable group of 50 scientists to this IUTAM symposium “Innovative numerical approaches for materials and structures in multi-field and multi-scale problems”. Official host of the event is the University of Siegen, a modern institute of higher education with about 18.000 students located on the hills of the city of Siegen, North Rhine-Westphalia.

Our symposium especially celebrates the 60<sup>th</sup> birthday of Professor Michael Ortiz. Along his exceptional career, Professor Ortiz has been at the forefront of computational mechanics, his work being a constant source of inspiration for many. All participants of this symposium are grateful to Professor Ortiz for being an inspiring collaborator, a reliable colleague, an illuminating scientist, and a valuable friend. We all wish to convey him our brightest wishes for many enjoyable and productive further years!

The venue of this IUTAM symposium is the castle Burg Schnellenberg, a mighty fortress located north of Siegen, in the green heart of Westphalia. With its massive gateways, stone bridges, high vaulted ceilings, and tower rooms, the castle takes you back to medieval times. Once again, we welcome in Burg Schnellenberg all the attendees, wishing a symposium full of interesting presentations, fruitful conversations and inspiring discussions.