



## EDITORIAL

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# Special Issue of the 10th German–Greek–Polish symposium on “Recent Advances in Mechanics” 2019

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## Preface

The German–Greek–Polish symposium was initiated by our former colleagues Oskar Mahrenholtz (Germany), Anthony Kounadis (Greece), and Roman Bogacz (Poland). The first meeting took place in Pułtusk, Poland, 1991. Unfortunately, two founding fathers passed away in the meantime. Professor Bogacz passed away in 2018 and Professor Mahrenholtz in 2020. Every 3 years about 15 participants from each nation meet for a scientific exchange. In 2019, the Polish group under Professor Łodygowski organized the 10th meeting in Będlewo, Poland. We hope that these meetings will be maintained and meet the expectations of the founding fathers, particularly, for the memory of Professor Mahrenholtz and Professor Bogacz. Both passed away in recent years.

This special issue contains a selection of contributions of the participants, which have changed from the original meetings in the nineties mainly focusing problems in dynamics toward aspects in Solid Mechanics. These meetings are of great importance especially against the background of current developments in the world, as they promote intercultural discourse in addition to the actual content of modeling problems of mechanics. Besides, the three speakers of the symposium would like to thank the local organizer Professor Wojciech Sumelka, Poznan University of Technology, for his sacrificial activities which led to the success of the conference.

In this special issue, the following contributions are provided, considering mainly different materials. One article investigates the generation of residual stresses in steels induced by high temperature and subsequent cooling phases (Uebing, Brands, Scheunemann, Schröder). Further questions, which are of particular interest for metallic materials, are crack evolution, which are calculated with the phase field method. Of interest here are, on the one hand, the cyclic behavior and crack evolution (Schreiber, Müller, Kuhn), and, on the other hand, jumps in the material properties and the fracture development concerned (Hansen-Dörr, Brummund, Kästner). Describing damage behavior with gradient-based models is explored in a paper by Wosatko. In particular, interfaces are of high experimental interest, which is reflected in a contribution modeling the T-Peel test (Naumenko, Bagheri). Closely related is also the numerical modeling of composite materials in long fibers (Witt, Kaiser, Menzel). However, this question is more difficult for short-fiber composites with curved, soft

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fibers. Here, the statistical distribution must be considered first, which in turn requires necessary measures characterizing such curvilinear fibers (Hartmann, Liese). How the material parameters are uniquely determined for unidirectional fabrics will be discussed intensively in another paper (Hartmann, Gilbert, Kheiri Marghzar, Leistner, Kumar Dileep). In addition, there are multiphysical problems that arise especially with flexoelectric (Giannakopoulos, Zisis) and piezoelectric (Koutsianitis, Tairidis, Stavroulakis) materials. These are studied by analytical and numerical methods. The investigations are completed with soils, where classical models are extended with fractional derivatives (Sun, Sumelka, Gao). Unfortunately, this article appeared in a regular issue, but it should be specially emphasized here. Finally, the numerical treatment of new polygonal finite elements is studied regarding methods developed in image analysis so that in the future such methods can be applied for various materials (Petö, Duvigneau, Juhre, Eisenträger), and the simulation hydrodynamic bearings considering two-phase flow cavitation (Ziese, Nitzschke, Woschke).

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