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EDITORIAL

Trends in computational material modeling

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Within the last years, the investigation of complex materials and related computational methods for predicting the behaviour in solids and structures has been a topic of intense research. The aim of the development is to devise robust solution schemes and new discretization techniques that can be applied to different problem classes. The collection of twelves papers in this special issue honours the achievements of Prof. Tomaz Łodygowski on behalf of his 70th birthday. They represent some of the significant research directions in the field of numerical modelling of materials and structures. The papers include topics like elasto-plastic material response in static and dynamic analysis, micromechanical and nano material models, and damage behaviour and parameter identification. This selection matches the work of Tomaz Łodygowski who is an expert in the areas related to numerical analysis and simulations of complex mechanical processes. His research interests included: testing materials for various strain rate and temperature ranges and using these properties in numerical analyses; simulation of biomechanical systems (segments of the spine, designing the optimal implants, simulation of angioplasty surgery, etc.); safety of structures under blast loadings; and optimal design of structures.

Tomasz Łodygowski was born in Poznań (Poland) in 1951. In 1974 he graduated with a Master's degree in Civil Engineering. Upon graduation, he began to work at the Poznań University of Technology as an assistant in the Chair of Structural Engineering. He taught strength of materials, structural mechanics, elasticity, and plasticity. At the outset of his scientific career, Prof. Łodygowski collaborated with professors from the Polish Academy of Sciences (Institute of Fundamental Technological Research, Warsaw). Professor Maria Duszek was the supervisor of his Ph.D. thesis "Geometrically nonlinear rigid-plastic and elastic–plastic beams and plane frames." As a postdoctoral fellow, Prof. Łodygowski was awarded two prestigious scholarships: Fulbright (at Northwestern University, USA, 1986–1988) and Humboldt (at University of Hannover, Germany, 1992–1994) working, respectively, in the groups of Ted Belytschko and Erwin Stein. The research interests of Prof. Łodygowski were focused on numerical methods for simulations of thermomechanical processes in materials and structures, particularly those which exhibit a softening behaviour. He published several papers and obtained his habilitation with the thesis "Theoretical and Numerical Aspects of Plastic Strain Localization".

Professor Łodygowski was involved in many administrative activities serving as vice-director of the Institute of Structural Engineering (1999–2002), as vice-rector of PUT for Education (2002–2008), and as the Rector of the Poznań University of Technology (2012–2020). In 2019, Tomasz Łodygowski was honoured with the title of Doctor Honoris Causa by the Igor Sikorsky Kyiv Polytechnic Institute in Ukraine.

The wide spread spectrum of the contributed papers underlines the diversity of Tomasz Łodygowski's work which is devoted to modeling and simulation of complex inelastic material response and safe and optimal design of structures.

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