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Mechanics of Biological Systems and Materials and the Mechanics of Composite, Hybrid & Multifunctional Materials, Vol. 3

Proceedings of the 2025 Annual Conference on Experimental and Applied Mechanics

Editors:

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Mechanics of Biological Systems and Materials and the Mechanics of Composite, Hybrid & Multifunctional Materials represents one of five volumes of technical papers presented at the 2025 SEM Annual Conference & Exposition on Experimental and Applied Mechanics organized by the Society for Experimental Mechanics and held in Milwaukee, WI, June 2-5, 2025. The complete Proceedings also includes volumes on: Dynamic Behavior of Materials; Advancement of Optical Methods & Digital Image Correlation in Experimental Mechanics; Fracture, Fatigue, Failure, Damage Evolution and Thermomechanics & Infrared Imaging; and Mechanics of Additive & Advanced Manufacturing, Inverse Methods and Machine Learning.

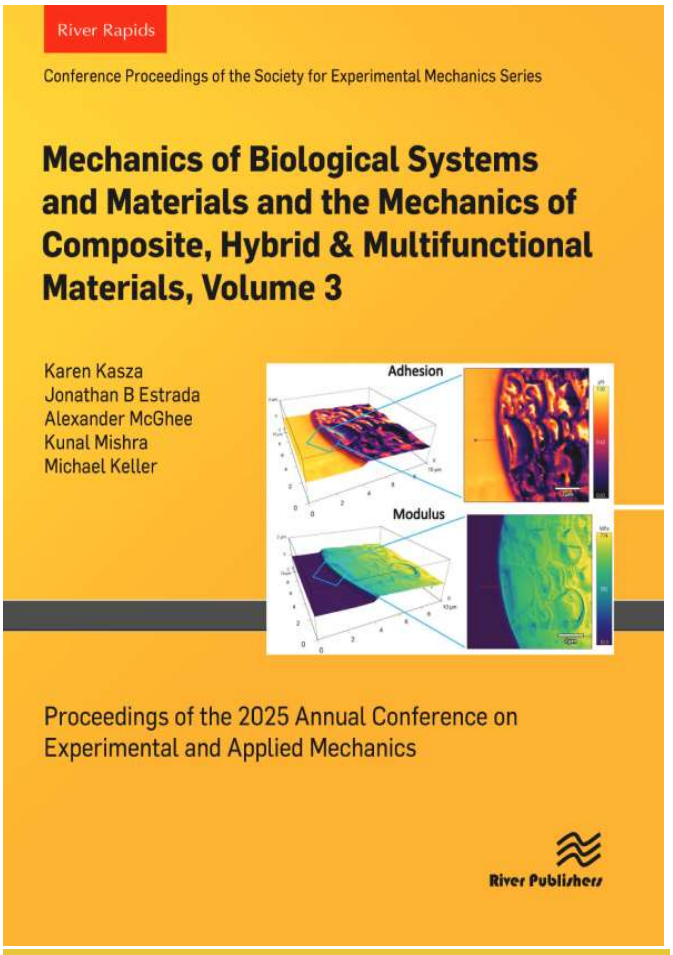
Each collection presents early findings from experimental and computational investigations on an important area within Experimental Mechanics, the Mechanics of Biological Systems and Materials, Micro-and Nanomechanics and other experimental and applied mechanics such as research in progress.

The Biological Systems and Materials segment of this volume summarizes the exchange of ideas and information among scientists and engineers involved in the research and analysis of how mechanical loads interact with the structure, properties and function of living organisms and their tissues. The scope includes experimental, imaging, numerical and mathematical techniques and tools spanning various length and time scales. This symposium at the Annual Meeting of the Society for Experimental Mechanics provides a venue where state-of-the-art experimental methods can be leveraged in the study of biological and bio-inspired materials, traumatic brain injury, cell mechanics and biomechanics in general. A major goal of the symposium was for participants to collaborate in the asking of fundamental questions and the development of new techniques to address bio-inspired problems in society, human health, and the natural world. The 2025 Symposium is the 15th International Symposium on the Mechanics of Biological Systems and Materials. The organizers would like to thank all the speakers and staff at SEM for enabling a successful program.

This volume also includes papers presented from the 11th International Symposium on the mechanics of composite, hybrid & multifunctional materials. These papers highlight how the commercial market for composite continues to expand with a wide range of applications from sporting equipment to aerospace vehicles. This growth has been fueled by new material developments, greater understanding of material behaviors, novel design solutions, and improved manufacturing techniques. The broad range of applications and the associated technical challenges require an increasingly multidisciplinary and collaborative approach between the mechanical, chemical, and physical sciences to sustain and enhance the positive impact of composites on the commercial and military sectors.

New materials are being developed from recycled source materials, leading to composites with unique properties and more sustainable sources. Existing materials are also being used in new and critical applications, which requires a deeper understanding of material behaviors and failure mechanisms on multiple length and time scales. In addition, the unique properties of composites present many challenges in manufacturing and in joining with other materials. New testing methods must be developed to characterize the novel composite properties, to evaluate application and product life cycle performance, as well as to evaluate impacts and merits of new manufacturing methods.

This segment of the volume presents early research findings from experimental and computational investigations related to the processing, characterization, and testing of composite, hybrid, and multifunctional materials.



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