

Preface

Experimental and Applied Mechanics, Volume 6: Proceedings of the 2014 Annual Conference on Experimental and Applied Mechanics represents one of eight volumes of technical papers presented at the 2014 SEM Annual Conference & Exposition on Experimental and Applied Mechanics organized by the Society for Experimental Mechanics and held in Greenville, SC, June 2–5, 2014. The complete Proceedings also includes volumes on: *Dynamic Behavior of Materials*; *Challenges in Mechanics of Time-Dependent Materials*; *Advancement of Optical Methods in Experimental Mechanics*; *Mechanics of Biological Systems and Materials*; *MEMS and Nanotechnology*; *Experimental Mechanics of Composite, Hybrid, and Multifunctional Materials*; *Fracture, Fatigue, Failure and Damage Evolution*.

Each collection presents early findings from experimental and computational investigations of an important topic within the field of Experimental Mechanics. This volume includes papers on Residual Stress, Thermomechanics and Infrared Imaging, Hybrid Techniques and Inverse Problems.

Residual stresses are especially important in engineering systems and design. The insidious nature of residual stresses often causes them to be underrated or overlooked. However, they profoundly influence structural design and substantially affect strength, fatigue life, and dimensional stability. Since residual stresses are induced during most materials processing procedures, for example, welding/joining, casting, thermal conditioning, and forming, they must be included and addressed in engineering design and applications.

In recent years the applications of infrared imaging techniques to the mechanics of materials and structures have grown considerably. The expansion is marked by the increased spatial and temporal resolution of the infrared detectors, faster processing times, and much greater temperature resolution. The improved sensitivity and more reliable temperature calibrations of the devices have meant that more accurate data can be obtained than were previously available.

Advances in inverse identification techniques have been coupled with optical methods that provide surface deformation measurements and volumetric measurements of materials. In particular, inverse methodology was developed to more fully use the dense spatial data provided by optical methods to identify mechanical constitutive parameters of materials. Since its beginnings during the 1980s, creativity in inverse methods has led to applications for a wide range of materials, with different constitutive behavior, across heterogeneous material interfaces. Complex test fixtures have been implemented to produce the necessary strain fields for identification. Force reconstruction has been developed for high strain rate testing. As developments in optical methods improve for both very large and very small length scales, applications of inverse identification methods have expanded to include geological and atomistic events.

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Experimental and Applied Mechanics, Volume 6
Proceedings of the 2014 Annual Conference on
Experimental and Applied Mechanics

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2015, VIII, 201 p. 161 illus., 125 illus. in color.,

Hardcover

ISBN: 978-3-319-06988-3