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PREFACE

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PREFACE

This special issue contains contributions that were invited on the occasion of the Peridynamic Theory symposium held at the 17th U.S. National Congress on Theoretical and Applied Mechanics (USNCTAM) at Michigan State University in June, 2014.

One theme of these papers is exploiting the potential of peridynamics in contemporary technology, particularly by including multiple physical effects and applying it to nanoscale mechanics. The paper by Turner, Val Bloemen Waanders, and Parks develops an inverse method to determine heterogeneous nonlocal material properties from experimental data, including digital image correlation (DIC). Wildman and Gazonas couple peridynamic mechanics with a model for electrical conduction and Joule heating to simulate fracture caused by high voltage dielectric breakdown. Application of peridynamics to friction and wear at the nanoscale is demonstrated in the paper by Ebrahim, Steigmann, and Komvopoulos.

Another general theme of the special issue is making peridynamic mechanics more practical as a general analysis tool for applications involving fracture. The paper by Mitchell, Silling, and Littlewood describes a new material model within peridynamics that helps avoid difficulties due to the nonlocal nature of the theory in treating free surfaces. With the goal of applying peridynamics only within a small subregion of a large structure where damage is expected, Silling, Littlewood, and Seleson investigate techniques for varying the peridynamic horizon within a model, including application to local-nonlocal coupling. In a related paper elsewhere in this journal (DOI 10.2140/jomms.2015.10.167), Oterkus and Madenci describe a specialization of peridynamics to anti-plane shear and torsion, resulting in a considerable simplification over the full 3D equations.

These papers reflect a sample of the broad spectrum of research on the peridynamic theory ongoing around the world.

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