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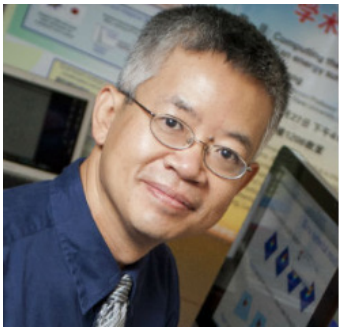
Nonlocal Calculus of Variations and Asymptotically Compatible Schemes



Qiang Du
Fu Foundation Professor of Applied Mathematics
Columbia University

Monday, June 22, 2015 ◈ Noon
BSF/Crick (2008)

Dr. Du has held faculty positions at the University of Chicago, Michigan State University, Iowa State University, and Hong Kong University of Science and Technology and was the Verne M. Willaman Professor of Mathematics and Professor of Materials Science and Engineering at Penn State University. Recognitions for his work include: the Frame Faculty Teaching Award (1992); the Liberal Arts and Sciences Award for outreach/extension (2000); the Feng Kang prize in scientific computing (2005); the Eberly College of Science Medal (2007); and selection as a 2013 SIAM Fellow for contributions to applied and computational mathematics with applications in materials science, computational geometry, and biology. Dr. Du's research interests are in numerical analysis, mathematical modeling, and scientific computation with selected applications in physical, biological, materials, data, and information sciences. He earned his Ph.D. in Mathematics (1988) from Carnegie Mellon University.

Nonlocality is a generic feature of multiscale modeling. In this talk, Dr. Du will present recent developments of nonlocal calculus of variations based on the nonlocal vector calculus. Being reminiscent of classical calculus and variational methods, these nonlocal analogs represent the basic elements of a systematic and axiomatic framework for the mathematical understanding of nonlocal operators and nonlocal models, and they have been successful in applications used to analyze various linear and nonlinear nonlocal balance laws and variational problems. They also have provided the foundation for development of asymptotically compatible schemes as robust discretizations of nonlocal models and their local limits. Such schemes may be important for validation and verification of multiscale models and simulations.

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