

**Outcomes Report on NSF-MoM Workshop on  
“New frontiers of solid mechanics – from earthquakes to single molecules”  
Providence, Rhode Island from June 1 to June 3 of 2011**

The NSF-MoM workshop on “New frontiers of solid mechanics” was successfully held at the Renaissance Providence Downtown Hotel for three days starting from 5pm on Wednesday June 1 and ending at 5:30pm on Friday June 3, 2011. It was planned and organized by the organizing committee composed of of Huajian Gao and Kyung-Suk Kim of Brown University, and Ares Rosakis and Guruswami Ravichandran of California Institute of Technology with help of the advisory committee including J. D. Achenbach of Northwestern University, R. J. Clifton of Brown University, J. W. Hutchinson of Harvard University, W. D. Nix of Stanford University, J. R. Rice of Harvard University and J. R. Willis of Cambridge University. In addition, the workshop leveraged the opportunities of reviewing past and ongoing research on solid mechanics by concurrently co-organizing the Freund Symposium supported by separate private organizations.

**Intellectual Merit:** This workshop has provided an environment to communicate the latest research and developments in “New frontiers of solid mechanics – from earthquakes to single molecules”, gathering and sharing information on possible future directions in mechanics research. The invited oral and poster presentations embraced forefront research in mechanics of materials. The area of presented research ranges over mechanics problems in broad scales in diverse fields – geomechanics, biomechanics, mechanics of energy materials, mechanics of nanostructures such as nanotubes, nanowires and graphene, etc., and nano- and micro-mechanics of coupled multi-physical and multi-scale phenomena including molecular mechanics. The issues include dynamics of solids, nonlinear mechanics of soft materials and phase transformations, structural instabilities, micromechanics of stretchable functional materials, experimental dynamics of solids. Methodologies cover mathematical formalism for the description of molecular, thermomechanical or biomechanical motions in solids, large scale computational algorithms, and instrumentations for fast or small length scale motions.

**Broad Impacts:** This workshop attracted a diverse group of researchers; approximately seventy people of young as well as established researchers participated in the workshop, including graduate students and 51 registered senior leading researchers representing a variety of disciplines in engineering and science. A critically important aspect of the commitment required for broad impact is in education, that is, the preparation of young people for contributing roles in an area of research that will be changing continuously. The research contents presented in this workshop showed important research areas of continuous evolution. This will help deciding contents of graduate programs in mechanics within universities, which should be guided to some extent by broad national research needs identified by this workshop. The tools of mechanics which result from the workshop presentations are also made more readily accessible to those who can benefit from their applications. The workshop program is posted indefinitely at [http://www.brown.edu/Departments/Engineering/Labs/Nanomicro/index\\_files/FreundSymposium.htm](http://www.brown.edu/Departments/Engineering/Labs/Nanomicro/index_files/FreundSymposium.htm) .