NSF Award in Mathematical and Physical Sciences

Principal investigator: Horacio Espinosa, mechanical engineering
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- **Project**: Deformation and Fracture of Metallic Nanostructures
- **Start Date**: July 1, 2009
- **Total Award Amount**: $560,000

**How the results of this project will benefit society:**
The combined experimental-computational approach developed under this project could be employed in the study of electro-mechanical coupling in semiconducting nanowires, field effect transistors, and other nanosystems. The strain dependence of electrical properties, surface reconstruction and interaction between molecules, all important phenomena essential in the design of nanoscale sensors and devices, could then be investigated following the same ideas.

**The problem the project is trying to solve:**
One-dimensional nanostructures will be key components in the next generation of electronics and sensors as either nanoelectromechanical systems or interconnects. The protocols developed under this project will allow the identification of mechanical and electrical properties that are essential in the design of these systems and will also impact the development of computational tools used in their design.

**How this project will work:**
The educational and outreach component of this project will focus on providing opportunities to undergraduate and minority students, through existing programs within the NSF-NSEC at Northwestern University, to participate in 9-week summer internships.

Likewise, the PI will add a lab on in-situ SEM nanomanipulation and testing of nanowires in the dual level course Experiments in Micro/Nano Science and Engineering he teaches at Northwestern University.

The PI also will develop course materials on atomistic/quantum modeling using embedded-atom method (EAM) type potentials and reactive force fields for his graduate-level course Special Topics in Nano Engineering.

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