Cultivating next generation Nanoscience: The Center for Nanoscale Systems at Harvard University

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The Center for Nanoscale Systems (**CNS**) at Harvard University has rapidly advanced as an important national nanotechnology resource. This *"open"* center has developed a diverse, versatile, array of tools, and instrumentation that enable *world-class* scientific work ranging from nanoscale electronics, photonics and plasmonics, to studies of advanced Systems Biology, and the development of biomedical systems and devices. As the New England node of the National Nanotechnology Coordinated Infrastructure (**NNCI**), CNS is one of the most heavily used nanofabrication and imaging facilities in the world. With more than 1600 users, CNS forms an extremely synergistic *nanotechnology ecosystem*. With its large, diverse user base, well-established user infrastructure, characterization tools, and advanced processing protocols, CNS is positioned as a strong leader driving world-class nanoscience, nanoengineering, as well as exploring new characterization paradigms. For example, scanning probe spectral techniques are poised to play an important role in the development and study of next generation nanomaterials and nano-devices. In particular, Multimodal Atomic Force Microscopy – where the excitation and detection of two flexural eigenmodes of a cantilever with the output signal of the first mode used to image the topography of the surface and the output signal of the second mode used to measure changes in tip-sample interactions - has allowed exquisite nanoscale *(10nm),* monitoring of the mechanical, magnetic, electrical, and optical properties of systems, in essence detecting materials responses as pN forces at the cantilever. These new probes offer important new insights into complex nanoscale materials and devices. In this talk we will briefly review the activities and wide ranging capabilities of CNS. In addition, we will explore new experimental resources being developed at CNS using scanning probes to explore spectral and dielectric behavior at the nanoscale.